

Welcome to The Texas CoCoRaHS

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

Inside this issue

West Texas Summary	3
By: James DeBerry	
Austin/San Antonio Summary	5
By: Keith White	
El Paso Regional Summary	8
By: Connor Dennhardt	
West Central Texas Summary	10
By: Joel Dunn	
Wichita Falls Summary	14
By: Charles Kuster	
North Texas Summary	16
By: Greg Story	
Corpus Christi Summary	23
By: Juan Carlos Pena	
East Texas Summary	27
By: Davyon Hill	
Southeast Texas Summary	29
By: Ron Havran	
Brazos Valley Summary	35
By: John Nielsen Gammon	
Lower Rio Grande Valley Summary	36
By: Barry Goldsmith	
Summer 2022 Weather Outlook	40
By: Bob Rose	
CoCoRaHS Tips & Training	42
By: CoCoRaHS Staff	
Scheduled CoCoRaHS Webinars	44

Texas Weather Summary Spring, 2022

John Nielsen-Gammon, Texas State Climatologist Figure from the PRISM group, Oregon State University, generated using SC-ACIS



Spring 2022 was quite dry across much of the state. Some areas of West Texas, from Midland to the Rio Grande, received less than half an inch of rainfall, and about half the state received less than 5". Not all was doom and gloom; parts of North and East Texas managed more than 15" of rainfall. Continued on page 2 \rightarrow

Website: <u>https://www.cocorahs.org/</u>

"Because Every Drop Counts, As Do All Zeros"

Texas Spring Weather Summary (continued)

The dry weather has left Texas with more drought in early June than any year since 2013. The one clearly worse June in the US Drought Monitor was 2011, which remained dry through the summer.

I'm wondering whether Texas might manage to have its second hottest summer on record. The hottest, again, was 2011, when Texas and Oklahoma were in a virtual dead heat for hottest statewide summer ever recorded in the United States. When Texas goes into the summer dry, it doesn't take much too really dry things out, and that's when the heat shows up and locks into place.

We've already had a bit of heat. You might recall that December 2021, while not hot in an absolute sense, was ridiculously warm compared to normal. The next few months were not so bizarre, but unusual temperatures returned in May. A good bit of Central Texas recorded its hottest May on record, from Abilene and San Angelo through San Antonio to Victoria and Galveston. Overall, May 2022 tied for the second warmest May on record, with records going back to 1895.

June hasn't exactly provided much relief. As I write this, Texas is in the middle of a stretch of four or so days with triple-digit temperatures across most of the state. This heat is starting to dry things out, where it wasn't already dry enough.

This time of year, moderately dry conditions followed by unusually hot, dry weather can lead to something called "flash drought". The name itself is intended to evoke the opposite of "flash flood", and it shares with flash floods the concept of speed. In a flash drought, plants and crops go from happy and green to severely drought stressed in a matter of weeks.

The starting point for flash drought is adequate, but not excessive, soil moisture. Plants are able to access all the water they need. Then, when temperatures spike, plants are transpiring water at a rapid rate. The moisture in the soil is rapidly depleted, and plants go from plenty of water to not enough. The dry weather dries the leaves, and the plants start going brown or dormant.

Flash drought normally happens in the spring and early summer, after moisture has built up over the winter and around the time temperatures are starting to approach summertime levels. That means now, so watch out if the weather has been dry and hot for a few weeks. It will be easy to notice a change in plant greenness, assuming plants started out green. If you're in one of those places that has been dry all year, then you won't get flash drought. Drought can't develop rapidly if it's already here!

Late spring and early summer is also a critical time for agriculture in the state. Many areas are already having problems because of the drought, but a flash drought can cause even good crops to go south quickly. But just as June is a time of flash droughts, it's also the climatologically wettest month of the year for Texas as a whole, so we can also get flash floods. Rarely does the weather play nice in Texas.

West Texas Regional Summary

A Very Dry Spring for the Region

By: James DeBerry, Meteorologist/Hydrology Program Manager, NWS Midland

<u>March</u>

The drought persisted through March, despite a couple of days of isolated thunderstorms that produced localized heavy rainfall. However, no notable hydrologic events occurred.

Monthly radar precipitation estimates ranged from nothing over most of West Texas to up to 1.5" in the Guadalupe Mountains and southeast Regan County. However, the highest observed rainfall was 1.18" at Pine Springs in Culberson County. Average rainfall was a whopping 0.08".



Figure 1: March 2022 Precipitation for West Texas. <u>April</u>

April (lack of) showers bring (no) May flowers. The drought continued in April, with either most dryline events initiating farther east in Texas or not at all. However, one event was noted. Early in the morning of April 24th, thunderstorms developed into Big Spring in Howard County. Homes were flooded in various parts of the city.

Monthly radar precipitation estimates ranged from nothing over most of the area, to up to 6" over the lower Trans Pecos. Highest observed rainfall was 0.88" in Big Spring in Howard County. Average rainfall was 0.07".



Figure 2: April 2022 Precipitation for West Texas.

<u>May</u>

On May 1st, severe thunderstorms developed along the dryline. An HP supercell moved into Scurry County, and dumped 4"-5" of rainfall at Snyder, rendering multiple roads impassable across the southern half of the county, necessitating high water rescues. Deep Creek near Dunn briefly spiked into moderate flood stage on the morning of the 2nd.

A few other hydrologic events occurred during May, but no flooding was reported. Rainfall was on an uptick in May, but the drought is far from over.

Monthly radar precipitation estimates ranged from no rain in western Culberson and Eddy Counties to up to 6" in the upper Colorado River Valley. Highest observed rainfall was 4.37" in Snyder in Scurry County. Average rainfall was 0.50".



Figure 3: May 2022 Precipitation for West Texas.

Overall, spring 2022 leaves West Texas and Southeast New Mexico in extreme to exceptional drought over all but the lower Pecos River Valley. Area reservoirs are at 54.1% conservation capacity as of June 1st.



Figure 4: Drought conditions across West Texas at the end of spring.

Austin/San Antonio Regional Summary

Warmer, Drier than Average Conditions Lead to Drought Expansion

By Keith White, Monte Oaks, and Eric Platt – WFO Austin/San Antonio

The state of ENSO (El Niño/Southern Oscillation) can play a big role in our local climate in the winter and spring, and this year was no different. La Niña conditions (negative ENSO index) continued through this spring and sea surface temperatures in the eastern Pacific Ocean, one measure of ENSO, actually cooled in April which is very rare. Largely as a result of this, our typical warmer and drier than normal La Nina conditions that came to fruition over the winter only worsened this spring. In fact, Austin Camp Mabry, San Antonio International, and Del Rio Airport all finished with average spring temperatures in the top 5 all time with data dating back to 1898, 1885, and 1906, respectfully. Most of the legwork there was done by a very warm May that was, by far, the warmest ever recorded at Austin and San Antonio and just a tenth of a degree shy of the hottest May ever in Del Rio.

Meteorological spring started on a dry note along with a warming trend. Some light precipitation developed on March 7-9 as colder air filtered in from the north, with most of the rain falling east of I-35/I-37. Most areas remained dry, with below normal temperatures into the middle of the month. Another round of rain developed over areas east of I-35/I-37 on the 14th, this time with 0.25"-1" or so of rain over Fayette County. The weather pattern briefly turned active March 20 - 21, with severe weather resulting in multiple tornadoes from near Seguin northward into the Austin Metro area. Three of these tornadoes were rated EF-2, with significant damage to portions of Round Rock, Granger, and Elgin. Some beneficial rainfall amounts did occur, but most of the higher amounts in excess of 1.5" fell in a thin ribbon near and just east of I-35 from San Antonio northward. Reports from CoCoRaHS observers the next morning revealed a maximum of 2.5"-4" or more in western Bastrop County and far eastern Williamson County.

A warming and drying trend remained intact across most of the region to end the month. Some rainfall did occur March 29-31 across northern and eastern portions of South-Central Texas. However, amounts were only 0.5" or less and not enough to alleviate the ongoing drought conditions. Wildfire activity escalated during March, as several weather systems produced strong wind gusts from both northerly winds behind cold fronts, and also dry southerly winds before Gulf moisture was able to spread inland. Several Red Flag Warning days were noted. For the month of March there were 4 documented wildfires by the State Operations Center that were larger than 1000 acres. Wildfire activity continued during the first half of April, with two additional large fires including the 'Training Area 23' fire in Bexar County at an estimated 3005 acres. Fire activity then decreased through the second half of the spring.

The first few days of the April remained dry and warm across all areas, with widespread, record setting heat observed on April 5th. Areas hardest hit by the ongoing drought, including the Rio Grande Plains, did manage to pick up some rainfall April 4-6th with amounts of up to 1" or so in portions of Maverick and southern Dimmit and Val Verde counties. Rainfall coverage was fairly sparse and was not enough to alleviate the Severe to Exceptional drought conditions. Mostly dry conditions continued into the second full week of April. A few storms did manage to drop some rainfall across portions of the San Antonio metropolitan area during the late evening and early morning of April 10-11th. A brief round of severe weather occurred on the 12th across Burnet and Williamson counties, with a tornado reported across far northern Williamson County that went on to do EF3 damage just to our north in Bell County. A few strong storms across the Rio Grande plains on the 19th did bring some beneficial rains to far northern Val Verde County and western Uvalde County.

Some additional storms developed across the Rio Grande Plains and southern Edwards Plateau on the 24th. Showers and storms spread across the rest of South-Central Texas on the 25th, providing one of only three days of widespread rainfall to the region this spring. The area just north of Del Rio as well as portions of the Austin area, northeast San Antonio Metro, and Coastal Plains picked up some localized 2"-3+" amounts. But most locations received less than 1" of rain and some areas, such as near Llano and along US-90 west of San Antonio, generally received 0.25" or less.

After a few isolated storms rounded out the month, a period of above to well above normal temperatures settled in, maximizing on May 7th-11th but continuing through the 21st. Several days with scattered showers and storms impacted the region, including near Del Rio which, after starting out the first 3.5 months of 2022 the driest on record, picked up more than 1.5" of rainfall on the 1st through the 4th. Storms on the 4th-5th traversed the US-90 corridor with winds up to 70 mph and hail as large as baseball size (2.75" in diameter) was reported near Spofford. The next afternoon, showers and storms impacted the eastern Hill Country, Austin Metro and eastward to La Grange and Giddings, with 2" hail reported near Johnson City. Rainfall amounts were still mainly less than 1", but as much as 2" fell over northern Burnet County.

Austin/San Antonio Regional Summary (continued)

After last spring, (also a La Niña year), which featured at least seven different events with very large (2+") hail, this spring came close with six. However, the heavier rains that came during the second half of spring 2021 did not materialize this year. Aside from a couple of days where dryline storms impacted the southern Edwards Plateau (the 10th and 13th), most of the region saw no rain between May 6th and 21st. Relatively widespread thunderstorm activity then brought sorely needed rain to the region on the 21st, and we are thankful to have received several timely and extremely useful hail reports from CoCoRaHS observers that helped verify several Severe Thunderstorm Warnings across the Hill Country. A few isolated storms occurred on the 23rd, with one last round of widespread and beneficial showers and storms on the 24th. But in total over those few days, more than half of South-Central Texas saw less than 1.5" with only a few pockets of 2"-5"+, mainly in Dimmit and southern Maverick as well as Frio, Burnet, northern Travis, western Kerr, and northern Val Verde Counties. We then re-entered a dry and warm pattern that continued into early June.

Spring 2022 featured a seemingly above normal amount of Wake Lows. A Wake Low usually occurs behind a thunderstorm complex when the pressure rapidly drops and winds can whip back up to near or above severe limits in extreme cases despite not being directly associated with a thunderstorm. In one interesting case on the night of May 24th-25th, a weather station at Kenedy recorded a 63 mph wind gust out of the south as weakening storm gave it a glancing blow, then less than an hour later as a squall line rolled through the site recorded a NW wind gust to 60 mph.

Spring typically ends with the rainiest 2-week period of the year for much of South-Central Texas, and March, April, and May is the 1st or 2nd rainiest meteorological season in our region dependent on location. But this year didn't quite stack up to the 30-year normals. A few CoCoRaHS observers near I-35 measured as much as 7.5" of rain this spring. The big winners were east, with an observer in Fayette County measuring 8.29" just north of the Colorado River and another in far eastern Williamson County measuring 9.34". However, rainfall amounts across the Highland Lakes were as much as 4"-7" below normal (Figure 1), and even where the heavier rains fell, they were almost all below normal values which range from about 5"-6" west near the Rio Grande to about 8"-11" along and east of I-35/I-37. The only exceptions are in southern Dimmit County where a small area of ~10" fell, and in northern Val Verde County where 6-8" fell, about 1"-2" above average. On the opposite end of the spectrum, some areas (i.e. northern Atascosa County) ended spring with less than 2" of rain, or less than 25% of normal.



Figure 1: Departure from Normal Rainfall for the 90 days ending 7am 5/29/2022.

Austin/San Antonio Regional Summary (continued)

The combination of the widespread rainfall deficits and warm temperatures have led to dry soils and low streamflow's and ultimately a large area of Extreme to Exceptional Drought (D3-D4; Figure 2) covering more than half of the region. Warmer and drier than normal conditions are favored to continue into this summer, and while we don't anticipate a summer quite as hot as 2011, it very well could fall in 2nd place all time when we take a look back in September.



Figure 2: United States Drought Monitor for Central Texas valid 7am May 31st.

CoCoRaHS QC Tip: Be a Hero-Report Your Daily Zeros

Thanks for participating in CoCoRaHS and for entering your precipitation reports.

We realize that it takes time to enter your data each day. It may be more interesting to measure and report precipitation when there is something in your gauge. But keep in mind that it is just as important to know when and where it DIDN'T rain as it is to know where it DID rain. We even care about trace (T) amounts. Your reports of 0.00" for dry days are greatly appreciated. This data is used every day in the drought forecasting models that produce drought maps for the U.S. Drought Monitor. CoCoRaHS daily reports are single largest data source for U.S. Drought Monitor Mapping.

El Paso Regional Summary

Duo of March Winter Storms Highlight Dry Spring Season

By: Connor Dennhardt, Meteorologist - National Weather Service El Paso

Dry weather prevailed across far West Texas during the region's climatologically driest season, aided by a persistent La Niña and numerous windy weather systems passing to our north. The season began rather cool with a series of cold fronts keeping temperatures below climate normals in early March. Several nights of below freezing temperatures were recorded the week of March 7th-13th, including a monthly low of 25 degrees at El Paso International on March 13th.

Very few precipitation events occurred this season, but the most notable event occurred March 11th when a light rain/snow mix fell across far West Texas. Light snow accumulations were measured in portions of El Paso and Hudspeth Counties, focusing primarily over locations along the east slopes of the Franklin Mountains. CoCoRaHS observers in northeast El Paso recorded snow measurements of **2"-3"**, while observers in eastern and central El Paso only saw a trace of snowfall or just rainfall. Precipitation totals ranged from **0.10"-0.25"**.



Figure 1: Morning snowfall in El Paso, Texas after the winter weather on March 11th. Photo Credit: Ray Chiarello

A second precipitation event occurred March 22nd, bringing light rains to the region. Temperatures were a little warmer than the previous event, which limited snowfall mainly to the mountains. Observers in far West Texas recorded rain totals of **0.05**"-**0.20**".

El Paso Regional Summary (continued)



Figure 2: AHPS Precipitation Analysis for May 2022 in far west Texas

April and May featured an almost completely dry season. The prevailing weather pattern through the season featured strong and consistent westerlies which kept the dryline confined to the east and prevented any rain from falling west of the Guadalupe Mountains. Moisture struggled to reach far West Texas and any intrusions that did occur were brief and unfruitful. The only measurable precipitation occurred in west El Paso on April 26th when a strong thunderstorm tracked over 300 miles through northern Mexico and across the International border. This storm produced golf ball sized hail in neighboring Sunland Park, NM which brought this writer's roof, windows, and rain gauge to an untimely death. Elsewhere, hail fell along the New Mexico/Texas state line resulting in a quick and unexpected **0.25"-0.50"** in Canutillo and Anthony, TX.

Season precipitation totals ranged from a **trace to 0.70**", with most observers failing to surpass **0.25**" over the 92-day spring season. This is well below climate normals despite the spring typically being our driest season of the year. El Paso International recorded a season total of **0.15**", falling well short of the climate average of **0.84**" and the driest spring since 2016. Drought conditions worsened by the start of June, with much of El Paso and Hudspeth Counties returning to Abnormally Dry (D0) or Moderate Drought (D1) status, according to the U.S. Drought Monitor. This was most noticeable in New Mexico as it experienced one of the worst wildfire seasons on record.

The spring season featured 29 active observers in El Paso County, and 1 in Hudspeth County. A total of 1,396 daily reports were submitted, along with 34 multiple-day reports. Only 74 daily reports had measurable precipitation, which means 95% of total reports were 0.00". No Significant Weather or Condition Monitoring reports were submitted this season. Thanks again to all our local observers who participated in the 2022 spring season!

West Central Texas Regional Summary

Lack of Moisture & Huge Temperature Swings for the Season

By: Joel Dunn (Observation Program Leader), NWS Abilene/San Angelo

March 2022

With the winter season behind us and the spring season ahead, it was hoped that the rollercoaster of temperatures would be over. However, given the lack of soil moisture and continued influence of La Niña, the pattern persisted, with afternoon highs warming into the 80s one week, then plummeting into the 40s, and 50s the next. A severe lack a rainfall was also noted. According to image below, but for a few isolated areas, the whole of West Central Texas was well below normal.



Image 1 - March Percent of Normal

Given the lack of moisture the swings in high temperatures were extreme at times. Below is a chart showing the largest temperature difference between two consecutive afternoon highs.

City	Temperature Difference	Dates
Abilene	29°F	March 10 - 11
San Angelo	37°F	March 10 - 11
Junction	19°F	March 6 - 7, March 10 - 11

Table 1 - Largest Difference in high temperature between two days

One event of note in March was the arctic front, which pushed through the area on the 10th. This arctic air mass brought overnight lows into the 30s with wind chills in the teens and 20s. Wintry precipitation was possible. However, due to steady north winds, which would evaporate any precipitation, and the shallow depth of moisture, nothing developed resulting in cold and dry conditions. With skies clearing and winds forecast to diminish, the overnight lows were going to be quite cold, with temperatures dropping into the teens. Below is a chart showing the resulting overnight low temperatures.

City	Overnight Low on March 12th
Abilene	17°F
San Angelo	15°F
Junction	19°F

Table 2 - Overnight Low Temperatures on March 12th, 2022

West Central Texas Regional Summary (continued)

April 2022

As the area received more and more sunlight, the warming trend continued, though the ups and downs of afternoon highs persisted, April didn't see such swings as the month of March, with 80s one day and 50s the next, though a few instances occurred where the afternoon high from day to day was different by 15-20°F. Clearly, La Niña was still present and influencing the weather across West Central Texas.

Northern Edward's Plateau received much needed relief from dry conditions with healthy rainfall totals occurring with the passage of a late season cold front. These totals resulted in the monthly normal in excess of 300%. Likewise, portions of the northern Big Country also received between 100-200% of normal precipitation for the month. Elsewhere, mainly across the Concho Valley and Heartland, rainfall was scare with totals generally less than 0.50" for the month. A lack of soil moisture only contributed to higher than normal temperatures, leaving much of West Central Texas drier and warmer than normal.



Image 2 - April Percent of Normal

City	Rainfall Total	Departure from Normal
Abilene	0.47"	-1.39″
San Angelo	0.13"	-1.34"
Junction	0.66″	-1.16"

Table 3 - Rainfall totals and departure from normal

May 2022

May, climatologically the wettest month in West Central Texas, remained quite dry. La Niña, according to the Climate Prediction Center (CPC), was forecast to continue. In this part of the United States that meant hot and dry conditions would persist. The month of May ended as March and April had, with above normal temperatures and below normal precipitation. Though some relief was felt on the 24th of the month as a complex of storms moved across West Central Texas, with the highest totals across the Concho Valley. Yet, even high totals could not wholly save the area from ending the month with below average totals.

West Central Texas Regional Summary (continued)



Image 3 - May Percent of Normal

City	May Precipitation	Departure From Normal
Abilene	0.76″	-2.45″
San Angelo	1.51″	-1.54"
Junction	1.25″	-1.91″

Image 4 - May precipitation	for the month and	departure from normal
-----------------------------	-------------------	-----------------------

The big story in May was the temperature, namely 100° days. On average the first 100° day doesn't take place until after the 1st of June, though the earliest reports occurred in early April. Thus, the 100° days were a little early, yet the full story is less about the first reported 100° day and more about how many were recorded. We compared this against 2011 (see the table below), the year with the most 100° days on record. On average May would record one (1) 100° day, yet this year records were set for the amount (see table below), more than double that of 2011. Not only were the 100° days numerous they were exceptionally hot, with Abilene and San Angelo having recorded three (3) 107° days each.

City	Number of 100° Days	100° Days in a row	100° Days in 2011
Abilene	14 (record)	5	5
San Angelo	14 (Record)	8	7
Junction	11	6	4
	Table 4 - Compariso	n of 100° Day Data	

Overall, the spring was unseasonably warm and dry. This will have farther reaching effects on the summer as soil moisture plays a pivotal role in observed temperatures. Though summer isn't typically as dry as winter, enough additional moisture to compensate for the debt left by spring isn't likely unless the tropical season is active in this part of Texas.

Become a CoCoRaHS County Coordinator

By: Ron Havran, Texas CoCoRaHS Assistant State Coordinator

CoCoRaHS County Coordinators Wanted

Our network consists of over 25,000 individual volunteer observers across all fifty United States, all providing accurate, highquality precipitation data for our numerous end-users on a timely basis. Our data is used by a wide variety of organizations and individuals, including the National Weather Service, other meteorologists, hydrologists, and many more. We have excellent quality control systems and processes in place to make sure our data is reliable and error-free. Our state and regional coordinators, as well as teams of quality control members, volunteer hours of their time to find potential errors in data across the state. But, in order to have the data to check, we need coordinators at the local level to help fill in the numerous gaps in data points.

That's why we are looking for local coordinators at the county level. Local county coordinators help support the CoCoRaHS network in many ways, primarily to spread the word about the network. Because of the high variability of rainfall over short distances, local county coordinators can help increase the density of precipitation data available throughout the country by encouraging volunteer weather observing. Becoming a citizen scientist in our network is both fun and rewarding, and becoming a local county coordinator is, too.

Coordinator Responsibilities

Local County Coordinators help support CoCoRaHS in the following ways:

* Help recruit new volunteers through local press, contacts with local service organizations, social media, or through other creative means

- * Help organize and attend local training sessions as needed
- *Provide support for volunteers in their county

Become familiar with the CoCoRaHS website (https://www.cocorahs.org) Other opportunities, if willing:

- * Help volunteers with the installation of their equipment
- * Help volunteers who do not have internet access by entering their data
- * Quality control check the list of observers in your area and check for any stations no longer reporting

The CoCoRaHS website has a current listing of counties in the state of Texas without a local county coordinator. (https://www.cocorahs.org/Content.aspx?page=coord) Please take a look and see if the county you are in is listed as one without a CoCoRaHS County Coordinator.

If you would like to be considered as a local county coordinator, please feel free to contact Bill Runyon, our Texas state coordinator for CoCoRaHS, at texas@cocorahs.org

Remember: You are one of our most valuable resources, and we truly appreciate your time and efforts!

Wichita Falls Regional Summary

May Brings Severe Weather and Slight Drought Relief

By Charles Kuster

CIWRO/NSSL

This spring was generally quiet across our area with drought conditions persisting (Fig. 1). March started dry with only three wet days (at least one CoCoRaHS station reported 0.05" or more) across the region. By the beginning of May, exceptional drought conditions were relatively widespread across the western third of our region (Fig. 1b, c).



Figure 1. Changes in drought conditions over the spring according to the U.S. Drought Monitor (available at <u>https://droughtmonitor.unl.edu/</u>) for Texas on a) March 1, 2022, b) and c) May 3, 2022, and d) May 31, 2002.

The first half of May unfortunately brought several rounds of severe weather but also some much-needed rainfall. On May 4, a significant tornado produced EF3 damage in Wilbarger County. The small community of Lockett was impacted by this tornado where EF2 damage was found (Fig. 2). Tornadoes were also reported in Foard County on this date.

Wichita Falls Regional Summary (continued)

Thanks to the rain, by the end of May, drought conditions had improved slightly (Fig. 1c, d), but widespread severe to extreme drought conditions continue according to the U.S. Drought Monitor. (<u>https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?TX</u>).



Figure 2. Damage reports from National Weather Service damage surveys showing three separate tornadoes (triangles) and an area of straight-line wind damage (circles).

Overall, our region experienced below normal precipitation and above normal temperatures this spring (Fig. 3). In total, there were 75 dry days (all CoCoRaHS stations reported less than 0.05") and 17 wet days (at least one CoCoRaHS station reported 0.05" or more). For comparison, the region experienced 62 dry days and 30 wet days last spring.



Figure 3. Departure from normal a) precipitation and b) temperature for the beginning of March through the end of May. Warm colors indicate below normal precipitation (a) and above normal temperatures (b), while cool colors indicate above normal precipitation (a) and below normal temperatures (b).

North Texas Regional Summary

Beneficial Rains near Red River while Most Locations had Rainfall Deficits

By: Grey Story, North Texas CoCoRaHS Regional Coordinator

Greetings from North Texas! After a winter that saw a trend toward abnormally dry weather, spring continued to be quite dry. In fact, a good part of North Texas is observing a moderate to severe drought with dry soil moisture conditions as of June 9. The region west of Waco and over toward Lampasas is experiencing an exceptional drought, which is the worst drought category. It reminds me that your rainfall reports are as valuable as ever in determining areas of drought as well as floods. Your reports continue to be invaluable to the National Weather Service and other entities (such as the Texas State Climatologist and the National Drought Mitigation Center). I am thankful to each and every one of you for reporting your rainfall via CoCoRaHS!

Over the past several months, in November it was quite dry over the majority of the state, especially the northwest half of Texas where below normal precipitation occurred. Meanwhile, it was very wet with above normal precipitation over Deep South Texas. In December, it was dry over almost all of Texas, with very few locations receiving normal precipitation. The precipitation deficits were largest over northern and western Texas. January 2022 was also a dry month for most of Texas, however the regions along and near the Texas Gulf coast did see some near to above normal precipitation. But much of North Texas saw severe rainfall deficits. In February 2022 the precipitation deficits weren't nearly as bad, although much of the state did have near to below normal amounts. A small area of north Texas from northwest of Fort Worth down to northwest of San Angelo actually had above normal precipitation. In March it was extremely dry over western and southern Texas. Meanwhile, there were some locations that had above normal precipitation over East Central and Southeast Texas. Most of North Texas had near or below normal rainfall. In April it was very dry from Central into Northwest Texas. However, there were a few spots that got above normal precipitation, including extreme North Texas, parts of East Central Texas, Deep South Texas, and the area near and north of Del Rio. In May most of Texas had below normal rainfall. Only the Texas panhandle and the lower Rio Grande valley near Laredo saw above normal precipitation. Near normal rainfall was noted over East Central Texas, but it was dry most everywhere else.



Figure 1: Percent of normal precipitation map for March 2022. The dark green, blue and purple colors indicate above normal precipitation; the beige, dark yellow and light green colors indicate near normal, while the orange and dark red colors indicate below normal precipitation. In March it was extremely dry over western and southern Texas. Above normal rainfall was over east central and SE Texas.

At DFW Airport in March 2.12" of precipitation fell. The normal amount for March is 3.30", this is 1.18" below normal. Waco picked up 1.29" of precipitation for March. The normal amount for March is 3.31", this is 2.02" below normal.

For each month, I will highlight the more significant weather events. I know there is a lot of information given, and it is intended for you to pick your "favorite" storm or a particular day to see what happened. Which days did you report your heaviest precipitation amounts? You can compare what you observed against the maximum amounts. There were about seven storm systems which affected our weather in March. Here are the highlights of the weather for the month on the following page.

North Texas Regional Summary (continued)

March 5 - 7:

A large upper atmospheric low pressure system developed over northern California early on the 5th. Some very light rain developed ahead of this storm on the 5th over mainly Central and Southeast Texas, but amounts were 0.10" or less. On the 6th a strong cold front moved across the northern part of Texas, with showers and some thunderstorms developing both ahead of and behind the front. During the day and evening of the 6th the heaviest rain was 0.78" at Lufkin. In North Texas, north of Cisco they received 0.52". Some light rainfall lingered on the 7th as the upper low weakened and passed north of Texas. The heaviest rainfall was over Southeast Texas where the area just north of Montgomery received 1.00", as did the area east southeast of Chester.

March 8:

A new upper level disturbance influenced Central and East Texas. Showers and a few thunderstorms developed in the morning. The maximum rainfall was along the Texas/Louisiana border where 2.75" fell south of Toro on the Louisiana side of Toledo Bend Lake, while at the dam north northeast of Burkeville TX 2.52" was recorded.

March 11:

A trough of low pressure approached Texas from the west. Ahead of the trough, a strong cold front passed through the region. Showers, and even some wintry precipitation, developed behind the front. Before sunrise, 0.35" fell northwest of Sherman TX. Thereafter, the heaviest rain was over South Texas, with Corpus Christi receiving a little over a half inch.

March 14 - 15:

A short wave trough developed over the Rocky Mountains which moved eastward. This pushed the dryline east into North Central Texas by late afternoon. Showers and thunderstorms developed along and ahead of the dryline, as well as along the cold front which trailed behind it. The rainfall wasn't overly heavy, with the maximum amount being 1.57" northeast of Paris TX. Further south, 2.10" was observed at Lufkin. A mesoscale vorticity center developed early on the 15th near Texarkana. This low produced some very light rain over Northeast Texas.

March 17 - 18:

Yet another upper level low pressure system formed over New Mexico on the 17th. Showers and thunderstorms developed along the dryline over the western parts of North Texas into Oklahoma during the evening hours. Much further east where the Gulf moisture was increasing, showers and thunderstorms developed late in the evening into the overnight hours. The heaviest rainfall in North Texas was slightly over 0.50" northwest of Richardson. But over the Arklatex they received 1.56" at Logansport, LA and around an inch near Center, TX. Most of the rain moved out of the state early on the 18th.

March 21 – 22:

A large storm system developed over the western U.S. and moved eastward. This set up a springtime storm pattern for severe thunderstorms over Central and East Texas. The initial rainfall prior to sunrise on the 21st was light (under 0.33") and was centered over South Central Texas. More showers and thunderstorms developed during the day on the 21st. A prolific tornado outbreak occurred, along with locally heavy rainfall. In North Texas the heaviest rainfall was southeast of Ravenna with 3.17" and at Bonham with 2.92". But over East Texas very heavy rain fell, with the area southwest of Alto receiving 6.91" and the area east of Alto getting 5.52". Residual showers and thunderstorms remained into the morning hours on the 22nd over East and Southeast Texas before moving east out of the state. The heaviest rain that lingered was 3.06" south southeast of Kirbyville and 2.33" south southwest of Jasper.

March 29 – 31:

A deep low pressure system developed off the coast of California on the 28th which moved eastward over Arizona on the 29th. As the low continued to move northeastward, a cold front crossed Texas. Showers and thunderstorms developed over West Texas on the evening of the 29th which moved east across Central and East Texas through the night on the 29th and on the 30th. Prior to sunrise on the 30th, the heaviest rain over North Texas was near the Red River valley. Just south of Powderly where 2.46" fell while northeast of Bonham 1.66" was observed. During the day on the 30th, as the squall line moved east, the heaviest rainfall was over eastern Texas. There was a report of 1.42" east southeast of Colmesneil and 1.36" just south of Fred TX. In North Texas the area south of Grand Prairie at Joe Pool Lake got 0.85". A few lingering showers developed to the south of the closed low pressure system over North Texas on the morning of the 31st.



Figure 2: April 2022 percent of normal precipitation map. The dark green, blue and purple colors indicate above normal precipitation; the light yellow and light green colors indicate near normal, while the orange and dark red colors indicate below normal precipitation. In April it was very dry from Central into Northwest Texas, as well as along the middle Texas Gulf coast. However, there were a few spots that got above normal precipitation, including extreme North Texas, parts of East Central Texas, Deep South Texas, and near and north of Del Rio.

DFW Airport received 2.54" of rainfall in April 2022. The normal amount for April is 3.22", this is 0.68" below normal for the month. Waco picked up 1.81" of rainfall for April 2022. The normal amount for April is 3.30", this is 1.49" below normal. There were about eight storm systems which affected Texas weather in April. Here are the highlights for the month.

April 1 - 2:

A minor short wave trough passed across the southern plains. This produced some light showers across mainly North Texas late on the 1st into the morning of the 2nd. While most rainfall amounts were 0.25" or less, over the western parts of North Texas 0.57" fell west of Truscott and 0.37" fell west southwest of Burkburnett.

April 4 - 5:

A short wave trough moved across the southwestern U.S. into the southern plain states. Showers and thunderstorms started to develop over Northwest Texas early in the day on the 4th. Before sunrise, 1.32" fell in the area north of Abilene. Additional showers and thunderstorms developed during the day on the 4th and spread eastward into the evening hours. Very heavy rainfall fell over parts of North Texas. They received 4.56" in Frisco and 3.93" just west of Highland Village. Some showers and thunderstorms lingered into the 5th over southern and eastern Texas before ending later in the day. Rainfall amounts were light over North Texas, but there was 0.66" east of Milam.

April 10 - 11:

A short wave trough began moving toward the central plains from the west. A few showers and a couple thunderstorms began to develop on the 10th ahead of this wave. While rainfall was light and spotty on the 10th over North Texas, they did receive up to 0.80" in the San Antonio metropolitan area. On the 11th, rainfall was light and spotty over North Texas, while over extreme Southeast Texas Beaumont picked up 0.95".

April 12 - 13:

Another upper air disturbance moved into the plain states on the 12th. This made the dryline very active on the afternoon and evening of the 12th. Showers and severe thunderstorms developed over North and Central Texas ahead of the dryline, and this rain swept east across Texas through the evening and nighttime hours. In North Texas, the extreme southern part received the heaviest rain with 2.70" west of Belton. But the heaviest rainfall in the state was further east where 4.87" fell northeast of Nacogdoches. New showers and thunderstorms formed early on the 13th across Northeast Texas along a cold front. The heaviest rainfall was at Arthur City with 1.59" and south of Powderly with 1.48".

April 17:

A cold front and a weak short wave trough produced some scattered showers and thunderstorms over primarily South Texas. The heaviest rainfall was 1.02" at Medina and 0.84" west northwest of Boerne.

April 20:

A few showers and thunderstorms developed as a short wave trough crossed North Texas. Rainfall amounts were light, with 0.38" falling east northeast of Gainesville.

April 22 – 26:

An upper atmospheric low pressure system developed over the central Rockies late on the 22nd. This produced some severe thunderstorms along the dryline over the Texas panhandle on the 22nd. Then on the 23rd the upper low moved out toward the northern plain states. As this occurred showers and thunderstorms developed over the western parts of North Texas, while severe weather occurred over Oklahoma. The heaviest rainfall of 1.96" occurred east southeast of Stamford. On the 24th, showers and thunderstorms continued over the western parts of North Texas and spread eastward. Very heavy rainfall occurred over extreme North Texas as thundershowers trained over the same locations. The highest amounts were 6.30" east southeast of Denison and 5.47" south of Sanger. On the 25th the upper low progressed to the western Great Lakes region. This pushed a cold front through Texas. Showers and thunderstorms continued to advance slowly eastward across especially southern and eastern Texas. The southeast parts of North Texas received the most rain, with the area northeast of Easterly receiving 2.84" while the region east southeast of Marlin got 2.35". But over South Texas rainfall was 5.28" at Del Rio (Rough Canyon) and 4.60" north of Schertz. On the 26th rain lingered over Deep South Texas. It was heavy in spots, with 1.93" recorded southeast of Armstrong and 1.56" at Freer.

April 30:

A weak cold front moved across Texas. There were some showers and thunderstorms along the front as it passed, especially across Southeast Texas. A station recorded 2.43" west southwest of Huntsville and 2.42" at Shiro.



Figure 3: Percent of normal precipitation map for May 2022. The dark green, blue and purple colors indicate above normal precipitation; the beige, light yellow and light green colors indicate near normal, while the orange and dark red colors indicate below normal precipitation. In May most of Texas had below normal rainfall. Only parts of the Texas panhandle and the lower Rio Grande valley near Laredo saw above normal precipitation. Near normal rainfall was noted over East Central Texas, but it was dry most elsewhere else.

At DFW Airport received 3.00" of rain in May. The normal for May is 4.78", this is 1.78" below normal. In Waco for May 2.85" of rainfall fell. The normal for May is 4.44", this is 1.59" below normal. There were about six significant storm systems which affected Texas weather in May. Highlights and details for the month follow on the next page.

May 1 – 3:

A short wave trough aloft triggered showers and strong thunderstorms up and down the dryline over West Texas. The showers and thunderstorms moved east into Central Texas before weakening on the morning of the 2nd over East Texas. The heaviest rain over North Texas was south of Sanger with 3.17" and east northeast of Lincoln Park with 2.79". But the rainfall amounts were heavier further west with 4.11" measured south southwest of Snyder and 3.34" in Snyder. Another short wave trough passed to the north of Texas on the 2nd, and it pushed a cold front through Oklahoma into Texas. Showers and thunderstorms developed along and ahead of the front over Oklahoma, and these moved into northern and eastern Texas late on the 2nd into the 3rd. Rainfall prior to sunrise on the 3rd was heaviest over East Texas where 1.98" fell east of Marshall and 1.93" occurred east of Big Sandy. In North Texas 1.67" was measured in Frisco and 1.64" fell east of Granbury. Residual showers and thunderstorms occurred mainly over South Central and Southeast Texas during the day on the 3rd. Maximum rainfall amounts were 1.80" west of Tow TX and 1.35" at San Augustine.

May 4 - 6:

A strong closed upper atmospheric low pressure system developed over Colorado, which moved to Kansas. This pushed the dryline eastward and a weak cold front southward. Initially on the 4th the heaviest rainfall was over Oklahoma and extreme North Texas, as well as over parts of South Central Texas. Over the western parts of North Texas at Crowell they had 2.27". But over South Texas the maximum rainfall was 2.53" at Del Rio. During the day on the 5th numerous showers and thunderstorms developed from Central into Northeast Texas. The heaviest rain was south and east of DFW. In North Texas the maximum rainfall amount was Valley Mills with 3.49". But over East Texas they received 4.17" at Carthage and 4.15" west of New Summerfield. The rain left the state on the 6th with residual rain over East Texas, which was light. A station had 0.41" west of Lufkin.

May 10:

The dryline was very active over West Texas during the evening of the 10th, producing showers and strong thunderstorms. A station had 1.93" west northwest of Denver City and 1.74" at Del Rio.

May 16:

A mesoscale convective system (MCS) moved out of Oklahoma into North Texas. The thunderstorms did produce some isolated heavy rainfall. A station had 2.37" northwest of Sherman and a station had 1.66" south southwest of Rockwall.

May 21 – 22:

After a week of record-breaking high temperatures, a strong cold front advanced across the state. Showers and thunderstorms broke out along and ahead of this front the afternoon of the 21st. Some locally heavy rainfall occurred. In North Texas, the heaviest rainfall was east northeast of Goldthwaite with 2.03". But over Central and Southeast Texas, 6.65" fell east southeast of Colmesneil and 5.04" was measured southeast of Cameron. The rain continued into the 22nd but decreased or moved out of the state later in the day. Residual rainfall was heaviest on the 22nd over Deep South Texas, with 4.09" measured east of El Cenizo and 2.23" west northwest of Corpus Christi.

May 24 - 25:

A deep low pressure system over Southeast Colorado became a closed low pressure system by the evening of the 24th over the southern plains. Ahead of this low, showers and thunderstorms occurred mainly over the western parts of North Texas in the early morning hours. East of San Saba recorded 2.78". And around midnight early on the morning of the 24th, extremely heavy rains occurred over Deep South Texas. A station had 8.10" at Rio Grande City and 5.95" southeast of San Manuel. Showers and thunderstorms redeveloped with daytime heating over much of Texas, with the heaviest rain over North Texas. There was 4.97" recorded northwest of Springtown and 4.41" east southeast of McKinney. The rain moved out of the state during the day on the 25th. A maximum residual rainfall amount of 2.20" was observed southeast of Brownsville.







Figure 4: Spring season precipitation for 2022. The brown, orange and bright red colors indicate the largest precipitation totals, while the light green and blue colors show the lightest amounts.





The blue and dark green colors indicate above normal precipitation. The brown, orange and red colors indicate below normal amounts. As you can see, it was a drier than normal spring over most of Texas. There was some prolonged dryness over the Texas Hill Country and much of far West and Southwest Texas. But also of note was the isolated spots along the Red River, over East Texas, and over Deep South Texas near Laredo that received above normal amounts.

At DFW airport for the spring season (March – May) 7.66" of rain was recorded. The normal spring rainfall is 11.30", this is 3.64" below normal for the season.

In Waco for the spring season (March – May) had 5.05" of rainfall. The normal spring rainfall is 11.05", so Waco was 5.10" below normal for the season.

Since the start of 2022, DFW airport has received 9.77". The normal amount for the year through the end of May is 16.59", this is 6.82" below normal.

In Waco since the start of 2022, 7.99" of rain has been recorded. The normal amount for the year through the end of May is 16.32", this is 8.33" below normal.



Figure 6: Current Drought Monitor for Texas as of June 2. The dry weather of this past spring and previous months shows up well on this drought monitor. With the exception of the far eastern and extreme northern portions of North Texas, everyone is experiencing moderate drought conditions or worse. Exceptional drought is occurring from west of Waco to around Lampasas.

Thanks again for your dedication for taking all your weather observations! Now that much of the North Texas region is experiencing drought, we appreciate it you report zero rainfall on dry days. Why? Because if you go a month without measurable rainfall, that tells us a lot, too!

Remember, now that vacation season is here, on days you are not home or unable to report your 24-hour rainfall for any reason, you can make a multi-day accumulation report upon your return. This is important information as well. And that includes zero rainfall.

For those of you who are new to CoCoRaHS, welcome! You may wonder if anyone looks at your weather reports day in and day out. Rest assured; someone is! This data is carefully examined and incorporated by the National Weather Service at the West Gulf River Forecast Center each day. Everyone, please consider inviting your neighbors, relatives and friends to join CoCoRaHS! The more rainfall observers we have, the better our chances are of determining the highest rainfall totals during rainfall events. If we can help you with your observations or reporting in any way, please let us know!

Have a great summer season, stay cool, and happy observing!

Greg Story

Corpus Christi Regional Summary

If Not for a Couple of Cold Fronts, Spring Would Have Been Very Dry

By: Juan Pena, Meteorologist - NWS Corpus Christi

March was a tale of several cold fronts. Rainfall was scarce during the month due to a lack of beneficial rainfall. During the month of March, several cold fronts swept across the area, however, only one lead to anything resembling beneficial rain, and even that confined to a small area. During the beginning and middle of the month, a couple of cold fronts swept across the area which aided in the development of weak scattered showers. With these two cold fronts, observers across the region reported a cumulative total of a 0.10" to as high as 0.50". With the third and strongest front, some observers reported isolated accumulations of 1.00" to 1.50" across South Texas. When the month of March was said and done, the majority of observers saw less than 1.00" of resulting in a departure from normal rainfall greater than 1.00" across most of the region.



Figure 1: March 2022 Estimated Rainfall Totals.

Corpus Christi Regional Summary (continued)



Figure 2: March 2022 Estimated Departure from Normal Rainfall.

April resulted with more beneficial rain, at least across the Brush Country. Observers across the Brush Country saw anywhere to 1.00" to 1.50" above normal rainfall for the month while observers across the Coastal Bend and Victoria Crossroads saw anywhere from 1.50" to 2.50" inches less than normal. The majority of the month was dry, except for one cold front late in the month that brought the beneficial rainfall. From the beginning of the month through the middle of the month, there were four weather systems that moved across the area, however, only yielded isolated to scattered showers at best. Each of those systems resulted in accumulations from a trace to just shy of 0.25". Late during the month, a cold front swept through South Texas, and with favorable atmospheric conditions and a moist environment, resulted in showers and thunderstorms on April 25th ahead of the front with showers lingering through April 26th when the front finally pushed through the area. When it was all said and done, a couple observers across the Brush Country reported accumulations a tick over 3.00" while others across the Rio Grande saw just shy of 1.50". With not much of this activity reaching the coast, observers across the Coastal Bend and Victoria Crossroads reported total between 0.20" to 0.40" for the entire month of April.

Texas CoCoRaHS Observer

Spring 2022

Page 25





Figure 3: April 2022 Estimated Departure from Normal Rainfall.



Figure 4: April 2022 Estimated Rainfall Totals.

May began with several episodes of weak showers and storms. All and all, there were only a couple of days where more than a trace was reported. One of those days observers across the northern Brush Country reported just over 1.50" while the other day observers in the southern Brush Country reported just less than 1.00". The rest of the month was relatively dry until the end of May, when the majority of monthly rainfall fell. With a couple of late season fronts and favorable atmospheric conditions along with sufficient moisture, showers and storms finally lead to measurable rainfall. During the last week of the month, a couple of observers across the Rio Grande reported accumulations just

Corpus Christi Regional Summary (continued)

over 4.50" with the majority averaging between 3.00" to 5.00". Other observers across the Brush Country saw accumulations between 1.50" to 3.50" with a couple of observers just over 4.00". With the Coastal Bend finally seeing beneficial rainfall, observers reported totals between 1.50" to 3.25". The area that missed out during this wet week was the Victoria Crossroads with observers only reported between 0.50" to 1.50". When it was all said and done, areas across the Brush Country and Coastal Bend saw average amounts of rainfall while the Rio Grande saw just over 2.00" than normal. However, across the Victoria Crossroads, observers saw a deficit between 2.00" to 4.50" of rain.



Figure 5: May 2022 Estimated Rainfall Totals.



Figure 6: May 2022 Estimated Departure from Normal Rainfall.

East Texas Regional Summary Dry Conditions Early in March Improved by Late May

By: Davyon Hill (Meteorologist-National Weather Service-Shreveport)

Mostly dry conditions continued as we moved into the start of the meteorological spring. However, a wide range of weather moved across the region over the month of March. The first significant rainfall moved into the region on the 8th, when a surface low developed along the Texas Gulf Coast. Several CoCoRaHS sites in Deep East Texas reported between 1" to 1.5" of rainfall. By the 11th of the month, the weather took a sharp turn. A cold front moved across the region, bringing widespread rainfall. But, behind the front, cold air quickly filtered into the region. In several locations across extreme Northeast Texas, (mostly including Red River, Bowie, and Cass Counties), rain changed to sleet and snow on the back edge of the precipitation. Because of warm temperatures the previous days leading up this event, ground temperatures remained too warm for any impacts. By the 14th, another cold front moved across the region bringing widespread 1" to 2" of rainfall, along with some severe weather in the form of large hail. The largest hail reports came from the Lufkin area. Another round of severe weather moved across East Texas on the night of the 21st into the early morning hours of the 22nd. With a warm moist and unstable airmass in place, several tornadoes formed across the region, causing significant damage. There was also widespread rainfall amounts of 2" to 4". Dry weather moved into the region for several days following this event, before another round of severe weather moved into the region on the 30th. Tornadoes were also reported with this event in Red River and Sabine Counties.



Fig.1: Snow flurries in the Texarkana area (Bowie County) on March 11th. <u>Photo Credit: Debbie Frankum, courtesy of TXK Today</u>

East Texas Regional Summary (continued)



Fig.2: Hail in the city of Lufkin (Angelina County) on March 14th. Photo Credit: Kelly Adams-Williams, courtesy of KTRE-Facebook

Like March, the month of April started off with dry conditions. However, another cool front moved into the region on the 5th, bringing widespread severe weather in the form of straight-line winds, along with widespread rainfall totals around 1". On the 12th and 13th, squall lines brought widespread rainfall and more severe straight-line wind damage to the region. Flash flooding was reported in Nacogdoches and Shelby counties in Deep East Texas during this time, as CoCoRaHS sites reported 4" to 5" of rainfall. The National Weather Service in Shreveport received a hail report on the 17th near Mt. Pleasant in Titus County, but generally speaking, the remainder of the month was quiet from a severe weather standpoint. But, the region saw widespread rainfall totals from 1" to 3" on the 25th with the passage of another cool front.

The weather pattern became active again by the first of May as widespread 1" to 2" rainfall totals return to the CoCoRaHS sites by May 3rd. Severe weather returned on the 5th, along with another 1" to 3" of widespread rainfall. Tornadoes were reported in Nacogdoches and Rusk Counties on this day. A stretch of dry and above normal temperatures moved into the region after the 5th, with widespread significant rainfall not returning until the 21st, and again on the 24th and 25th, with the passage of several fronts. Unfortunately, additional severe weather was reported with the precipitation on the 21st and 24th in the form straight-line wind damage, along with an isolated hail report by a CoCoRaHS observer. There was also a tornado reported in Red River County of the 24th.

Despite stretches of dry conditions, the overall total precipitation increased across the region this past spring. This resulted in improved drought conditions across the region by the start of the Meteorological Summer.



Fig.3: Drought Monitor Image Courtesy of NDMC/USDA/NOAA

Southeast Texas Regional Summary

Limited Rainfall for the Season with a Very Warm April and May

By: Ron Havran, SE Texas CoCoRaHS Regional Coordinator, HCFCD Hydologic Operations

March 2022

March began with a pattern that was common in the winter with below normal temperatures and below normal precipitation. This lasted for the first three weeks of the month. A strong storm system moved through Southeast Texas on the late evening of the 21st and the morning of the 22nd producing strong to severe thunderstorms and 7 confirmed tornadoes. This event resulted in most of the rainfall for the month at many stations. More rainfall occurred near the end of the month but amounts were mostly under an inch. Most areas finished the month with below normal rainfall. CoCoRaHS stations average rainfall in counties in the Hou/Gal section with higher rainfall totals this month were San Jacinto, Liberty, Polk, and Montgomery counties. Jackson and Wharton counties had the lowest CoCoRaHS station average rainfall for the month. In Golden Triangle section Tyler County was the wettest while Jefferson County was the driest. The Golden Triangle had a CoCoRaHS station average of 4.60" while Hou/Gal section had an average of 3.09". See figures below.



Figure 1: March 2022 monthly precipitation and departure from normal values across Southeast Texas.



Figure 2: CoCoRaHS station total rainfall for March 2022.

April 2022

Warm temperatures continued into April and lasted the entire month with temperatures being 3°F to 5°F above normal across most of Southeast Texas. All of Southeast had below normal rainfall for April. In fact there were very few days of precipitation for the whole month. The only note of a significant day of rain was on the 25th in the Hou/Gal section and the 11th and 25th for the Golden Triangle section. San Jacinto and Montgomery counties had slightly higher rainfall amounts this month. All other counties in both sections had much below normal rainfall amounts. Really not much else to talk about except the drought categories were getting worse in many counties. See figures below for rainfall data.



Figure 3: April 2022 monthly precipitation and departure from normal values across Southeast Texas.



Figure 4: CoCoRaHS station total rainfall for April 2022.

Southeast Texas Regional Summary (continued)

May 2022

The warm conditions across the region in April continued into all of May resulting in the warmest May on record for most of Southeast Texas. Temperatures averaged from 3.5°F to 5.5°F above normal for the entire region. Normal lows are in the mid 60's and normal highs are in the mid to upper 80's. In the Hou/Gal section days with rainfall was very few again. The Hou/Gal section only had three days with significant rainfall on the 5th, 22nd, and 25th. The Golden Triangle section had 4 significant rainfall days on the 5th, 6th, 22nd, and 25th. The Golden Triangle CoCoRaHS station average rainfall per county was 4.42". The Hou/Gal section had a CoCoRaHS station average rainfall of 3.24". Some counties had higher totals with San Jacinto, Polk, and Montgomery counties closer to normal in the Hou/Gal section. Tyler and Jasper counties in the Golden Triangle had near normal rainfall totals. For the spring season the Hou/Gal regional CoCoRaHS station average rainfall per county was 7.97" and the Golden Triangle regional CoCoRaHS station average rainfall per county was 10.60". (Charts 1 and 2 on page 33).



Figure 5: May 2022 monthly precipitation and departure from normal values across Southeast Texas.



Figure 6: CoCoRaHS station total rainfall for May 2022.

A big thanks to all CoCoRaHS observers that reported precipitation data and daily zeros this spring. Your observations are so valuable to forecasters, hydrologists, and meteorologists in Texas that process this data to improve knowledge of meteorological conditions that affect all aspects of life in Texas.

Southeast Texas Regional Summary (continued)

May 29, 2022 90-Day Observed Precipitation Created on: May 29, 2022 - 22:36 UTC Valid on: May 29, 2022 12:00 UTC



Figure 7: Southeast Texas spring 2022 Precipitation.



Figure 8: Southeast Texas spring 2022 Percent of Normal Precipitation.

Data in the charts below from only CoCoRaHS observers in Southeast Texas. Many thanks to all the observers that submit precipitation data daily to the CoCoRaHS website database.

Spring 2022 Co	CoRaHS SE Texas St	ations Houston	n/Galveston Sec	tion Rainfall
County	March	nty Rainfall Averag April	ges in inches per m May	onth Spring Total
	AVG.	AVG.	AVG.	Mar May
Austin	3.28	1.84	1.80	6.92
Brazoria	2.83	1.16	2.43	6.42
Chambers	2.99	1.39	3.57	7.95
Colorado	3.39	1.70	1.39	6.48
Fort Bend	2.08	2.07	3.01	7.16
Galveston	2.34	1.22	3.63	7.19
Harris	2.61	1.93	3.39	7.93
Jackson	1.82	0.14	1.37	3.33
Liberty	4.46	1.62	3.02	9.10
Montgomery	3.83	2.77	4.82	11.42
Polk	4.01	1.93	5.05	10.99
San Jacinto	4.58	3.05	5.47	13.10
Wharton	2.01	0.36	3.23	5.60
Region Totals	3.09	1.63	3.24	7.97

Highlights highest rain total for a county in a month Highlights lowest rain total for a county in a month

Note: All data taken from the CoCoRaHS website in Total Precipitation Summary Report

Note: Counties without a significant number of observers reporting are not displayed on this chart

Chart 1: Houston/Galveston CoCoRaHS Observe	r county average rainfall for spring season 202
---	---

Spring 2022 CoCoRaHS SE Texas Stations Golden Triangle Section Rainfall Actual Station Measured County Rainfall Averages in inches per month					
County	March	April	May	Spring Total	
	AVG.	AVG.	AVG.	Mar May	
Hardin	4.51	1.90	4.58	10.99	
Jasper	4.98	1.49	5.26	11.73	
Jefferson	3.95	1.70	2.99	8.64	
Newton	No data	No data	No data	No data	
Orange	4.43	1.52	2.69	8.64	
Tyler	5.13	1.31	6.58	13.02	
Region Totals	4.60	1.58	4.42	10.60	
Highlights highest average rain total for a county in a month Highlights lowest average rain total for a county in a month					

Note: Counties without a significant number of observers reporting are not displayed on this chart

Chart 2: Golden Triangle CoCoRaHS Observer county average rainfall for spring season 2022.

With dry conditions continuing this spring across Southeast Texas, drought conditions have worsened to moderate to severe drought in many places. The latest drought conditions for Southeast Texas are shown in the figures below.



April and May had some extreme average temperature and precipitation ranking in Texas and nationwide. The maps below show that Texas had a much above normal April and May average temperature. It was the 2nd hottest May since 1895. Precipitation ranking were very dry for both months with April being the 24th driest since 1895 and May being the 25th driest since 1895.



Figure 14: May average temperature ranking nationwide

Figure 15: May average precipitation ranking nationwide

Brazos Valley Regional Summary

Spring 2022 Precipitation Summary Bryan-College Station/Brazos Valley Region, Texas John Nielsen-Gammon, Texas A&M University, Office of the State Climatologist of Texas



Summary:

This spring was pretty close to normal for overall rainfall totals. March started out fairly dry, but most stations received more than half of their March rains during the 24 hours ending March 22. Then came an extended dry spell, with most stations reporting less than 2" of rain until April 25-26. The one exception was Houston County, which picked up almost 4" during that period. Then came two or three substantial rain episodes, April 24-25, May 1, and May 6. The first was relatively uniform, the second had rainfall totals ranging from 0" to 2", and the third ranged from less than an inch to over 4". The remainder of the month saw little more than an inch, except for Burleson County, which picked up nearly 4".

Observer Statistics:

Overall, there were 54 observers who reported during most or all of the spring. Of these, 29 observers missed no more than ten days, with 11 having perfect records! Overall, we were able to utilize data from 45 stations to compute seasonal totals.

Season Statistics:

Wettest Day: 4.35", May 6, Walker County Wettest Seasonal Total: 15.42", Walker County Driest Seasonal Total: 6.02", Washington County Soggy Socks Award (longest spell with measurable rain): 4 days, April 16-19, Brazos County Dusty Soles Award (longest spell without measurable rain): 20 days, Washington County

Rio Grande Valley Regional Summary

Weather Story for the Rio Grande Valley: From Drought and Wildfire to Flood and Wind, March to May Had It All

By: Barry Goldsmith, Warning Coordination Meteorologist, NWS Brownsville/Rio Grande Valley



Pictures 1-4: Clockwise, from upper left: Large wildfire in late March in Kenedy County; drought impacted fields in eastern Starr County in early April; wind damage at a *colonia* north of Monte Cristo Rd. north of McAllen; flooding near Rio Grande City on May 24th.

Summary

March 2022 across the Rio Grande Valley/Deep South Texas region began where February left off: Changeable weather from warm to chilly and back again, as 'northers surged across the region on the 7th and 11th, each coming with cool but dry air which continued the steady drying trend that began in February. Low humidity, gusty winds, and warming daytime temperatures allowed drought and dryness to spread from west to east across the region, with Severe to Extreme (Level 2 and 3) Drought reaching the Rio Grande Plains and Brush Country at the end of the month (Figure 1, below). Abundantly cured brush and grasses combined with the frequent wind and low humidity to ratchet up the threat for rapid to explosive wildfire growth and spread. Unfortunately, several wildfires did just that between March 24th and 31st, resulting in more than 20 thousand acres burned – primarily on the Norias and Encino Divisions of the King Ranch. March 30th was the "Day of the Wildfires" in south Texas, with more than 65 thousand acres burned – highlighted by the Borrega Wildfire on the Santa Gertrudis Section of the King Ranch mainly in Kleberg County, which burned more than 51 thousand acres alone. The frequent dry fronts kept return moisture away, with monthly rainfall limited to light rains on the 7th.



Figure 1: Drought Monitor for the NWS Brownsville/Rio Grande Valley region, on March 1 (left) and March 29 (right), showing progressive worsening spreading from west to east.

Rio Grande Valley Regional Summary (continued)

April picked up the dry beat, and was joined by increasing heat and drought. A few more smaller, but still notable, wildfires during the first week of the month brought the seasonal total acreage burned in the Rio Grande Valley and Deep South Texas ranch country to more than 33 thousand acres. Two "heat spikes" brought new records to portions of the Valley, with McAllen soaring to 109°F on the 6th and 107°F on the 13th. Above average temperatures dominated the month as a "flat" 500 mb ridge built across northern Mexico for most of the period. Rain-free conditions combined with the heat spikes and dry to very dry conditions allowed drought to worsen across the region, with Exceptional (Level 4 on the 4 point scale) Drought reaching the Rio Grande Plains/western Brush Country of Zapata and Jim Hogg, with Extreme Drought spreading across the remainder of the Brush Country. Moderate to Severe Drought spread across the rest of the Valley, save for most of Cameron and eastern Willacy.

Just as drought was poised to reach spring levels last seen, area-wide, in the early 2010s, the first of two "one-off" rain events allowed for notable improvements. A rare (for 2022) upper level trough combined with a weak surface "cold" front late on the 25th and early on the 26th to produce thunderstorm clusters across the mid/upper Valley and ranch country, leaving a pocket of 2" to 5+" from eastern Starr through Brooks County, and fairly widespread 1" to 2" elsewhere, except along and east of U.S. 77/IH-69C near the coast, as well as western Zapata County (Figure 2). The rainfall would turn a very dry month into an average to above average month, and put a temporary dent into the drought (Figure 3).



Figure 2: Rainfall from a thunderstorm complex that formed along a late season weak cold front in late April.



Figure 3: Drought Monitor for the NWS Brownsville/Rio Grande Valley region, on April 19 (left) and May 3 (right), showing the season's peak drought conditions improving by one to two categories following welcome rainfall on April 25-26.

May will be remembered as the month when spring began to swelter, especially on many nights and early mornings, when temperatures struggled to drop much below 80°F. Such was the case for the first ten days of the month before winds collapsed and clear skies allowed a reprieve from the overnight heat by mid-month. The swelter would return by the 18th and continue through the 23rd before the season's second "one-off" locally torrential rain event arrived during the late evening of the 23rd. On this day, as well as a little over a day later, embedded upper level disturbances in northwest flow hooked up with the aforementioned low level moisture to kick off a "classic" mesoscale convective system (or MCS) late on the 23rd, which spawned a series of thunderstorm clusters for much of the overnight across the region. When the weather cleared on the 24th, a biascorrected estimated 5" to 9" of rain had fallen across a good chunk of Starr County, through southern Jim Hogg and parts of Zapata County, with 3" to 5" extending east from near McAllen through Harlingen and Los Fresnos.

Rio Grande Valley Regional Summary (continued)

The repeated torrents produced localized flash flooding across Starr and Zapata County, and turned arroyos from nearly empty channels into raging rivers in each area. An initial mini squall line surging from Zapata through central Hidalgo County produced estimated wind gusts between 65 and 80 mph, with multiple cases of roof and structure damage to largely substandard buildings along the path.

Early on the 25th, the season's final (weak) cold front surged through Kenedy, Willacy, and Cameron County, joined by a fastmoving squall line which produced wind gusts over 65 mph around daybreak in Harlingen, and a swath of 50+ mph gusts in all areas, mainly east of IH-69/U.S. 77. The lower temperatures would last a couple of days, with seasonal temperatures (day and night combined) returning to close the season.

The total rain from the late May event (Figure 4) would slam the door – at least into mid-June – on the drought (Figure 5), as local totals were as much as three times the monthly average of $2.5^{"}$ to $3.5^{"}$.



Figure 4: Torrential rainfall across the Lower Rio Grande Valley and parts of the Brush Country would finish off the drought for nearly all of Deep South Texas, May 23-25, 2022.

Figure 5: Heavy rains in May end drought conditions.



Figure 6: Spring 2022 rainfall for the Rio Grande Valley/Deep South Texas region.

Rio Grande Valley Regional Summary (continued)



Figure 7: Departure from average, spring rainfall and individual months, for the Rio Grande Valley/Deep South Texas region.

Despite a seasonably cool start to spring, April and May 2022 made up a lot of ground. While the two-month average temperatures were just a touch above the new (warmer) 1991-2020 30-year values, the combination was enough to rank first warmest, all-time, for seven official and unofficial observing locations across the Rio Grande Valley. The same was said for Texas as a whole. For Brownsville and Harlingen, each ranking number 1, records date back more than 100 years. June 2022 picked up where May left off, and heat, with lack of rainfall, could set the stage for another top-tier warmest year across the Valley. Stay tuned.

	Maximum 61-Day Mean Av Click column heading to	g Tempera sort ascendi	ture fo	or Brownsv k again to so	ille TX NWS t descending.	CWA
State	Name	Station Type	Value	Ending Date	Missing Days	Valid Date Range
TX	FALCON LAKE TEXAS	RAWS	84.4	2022-05-31	0	2002-11-15 to 2022-06-13
TX	SAN MANUEL	COOP	80.6	2022-05-31	1	2000-01-03 to 2022-06-16
TX	MCALLEN	COOP	81.8	2022-05-31	2	1941-06-01 to 2022-06-16
TX	SANTA ANA NWR TEXAS	RAWS	82.6	2022-05-31	0	1998-10-22 to 2022-06-13
TX	WFO BROWNSVILLE	COOP	79.9	2022-05-31	0	2016-04-30 to 2022-06-15
	PROMINEVILLE & PARRE INLAND INTLAR	WBAN	82.0	2022-05-31	0	1898-12-01 to 2022-06-15
TX	DRUWINSVILLE S PAURE ISLAND INTLAP					TODO TE OT TO LOLL CO TO
TX TX	ARMSTRONG 4SE	COOP	80.1	2022-05-31	2	2002-01-05 to 2022-06-16
TX TX TX ew A ther k	ARMSTRONG 4SE HARLINGEN pril-May records set across the Ric ocations (not shown) ended up am	COOP COOP Grande Va ong the top	80.1 81.5 alley/I five v	2022-05-31 2022-05-31 Deep S. Te warmest or	2 2 xas region ir record.	2002-01-05 to 2022-06-16 1912-02-07 to 2022-06-16 2022. Nearly all

Figure 8: Official and unofficial observing locations with all-time warmest April/May combined. Lower image, the mean atmospheric steering pattern (500 mb flow) that was a key reason for the persistent warmth.

Summer Weather Outlook for 2022

By: Bob Rose, Meteorologist, Lower Colorado River Authority

For anyone that's lived in Texas for a while, the mention of the summer of 2011 brings back memories of sweltering heat, endless triple-digit days and, record dry weather. In 2011, the extreme heat didn't want to end, persisting all the way into late September. The summer of 2011 was the hottest and driest summer ever recorded across Texas, dating back to 1895. It is the standard for the most miserable summer in Texas history. So, you might be asking, what does the summer of 2011 have to do with the summer of 2022? Well, possibly a lot. If forecasts are correct, summer 2022 could be extreme, with temperatures and the lack of rain rivaling that awful summer of 2011.

This year, summer-like temperatures began across Texas in early May, when the jet stream unexpectedly pulled up to the north, allowing a strong subtropical ridge of high pressure to spread north from Mexico a couple of months earlier than normal. The ridge ended up persisting across Texas for much of the rest of the month. As May ended, data showed it had become the second hottest May in Texas history. This early onset of summer appears to have been a warning sign that summer was settling in early, and it wasn't going to be back down anytime soon.

Heading into summer, the subtropical ridge of high pressure which set up in May is forecast to grow stronger, while holding in place mostly over Texas and the southern Plains states. The ridge is expected to keep the majority of storm systems away from Texas, limiting the opportunities for rain. At the same time, sinking air associated with the ridge is expected to cause a very stable atmosphere, leading to numerous sunny days with unusually hot and possibly record-setting temperatures. There are strong indications this hot and dry pattern will get established in June and persist through much of the rest of the summer—leading to conditions somewhat like we saw in the summer of 2011.

The Climate Prediction Center's summer outlook shows increased odds for temperatures to average above normal across all of Texas. But the precipitation outlook is not quite as clear. Figure 1 on next page shows the outlook maps.

Moving to a New Address Location – Please Contact CoCoRaHS to Set Up Your New Station Location

Before moving please contact us at texas@cocorahs.org, you will need to have us assign a new station name and number, even if you only move a few blocks. This is very important because when you move your CoCoRaHS station data point will stay behind at the GPS location on the map. You will keep your login and password and we will save your data from your previous CoCoRaHS location and archive it indefinitely. But in order for your new station location to display at its proper location on the rainfall data map you will need to have us assign a new station name and number. Just drop us an email at texas@cocorahs.org and we'll take care of everything so you will be able to enjoy precipitation observing at your new location.

Summer Weather Outlook for 2022 (continued)



Figure 1: Summer 2022 Seasonal Outlook

The outlook shows increased odds summer precipitation will average below normal over the western half of the state, but no clear odds for precipitation across South and East Texas. Why no clear odds on the precipitation? It turns out this summer's tropical weather season is expected to feature above normal activity due to favorable conditions in the oceans and the atmosphere. Climate Prediction Center forecasters believe periods of tropical moisture, or possibly an organized tropical cyclone could affect South and East Texas over the course of the summer, possibly bringing some much-needed rain. But short of any tropical activity, expect a pattern of drier than-normal rainfall.

Summer is here and it looks like it's going to be a rough one, possibly to the extreme of summer 2011. Stay cool and stay hydrated and heed all advisories for the very hot summer ahead.

Observer Tips, Information & Training Material

By: Ron Havran, CoCoRaHS Assistant State Coordinator

How Does Your 4" Diameter Rain Gauge Work?

After signing up to be a CoCoRaHS precipitation observer the first thing you had to do was to purchase a specially made 4" inch diameter scientific gauge to begin measuring precipitation with same instrument that all CoCoRaHS observers are using. The reason for this is to have a benchmark standard of measure that makes all observations comparable to a known standard. Also the human observer performs the reading which makes the observation an authentic real physical measurement without any error from an automatic tipping bucket rain gauge equipment.

When it rains, your gauge measures the amount of precipitation that falls through the area at the top of the gauge. When you read the gauge, you measure the depth of water that has fallen through the area and accumulated in the bottom. This is the depth of water.

How, you may ask, can this gauge work properly if the inner tube is 10 inches long but only records 1 inch depth of water? The reason has to do with accuracy. The National Weather Service (NWS) has adopted the criteria that the gauge should be able to measure to an accuracy of 0.01". The problem with a gauge that's 4" (CoCoRaHS) or 8" (NWS standard) in diameter, is that it's nearly impossible to read the depth to an accuracy of 0.01". That's where the funnel and inner tube comes into play.

The funnel of the CoCoRaHS gauge squeezes the water into the area of the inner tube, which is 1/10th of the area of outer cylinder (The NWS gauge has a similar funnel and inner tube). By reducing the area that the water falls into, the depth can be stretched by the same factor of 10. In this way, the total volume of water (area x depth) that fell through the top of the gauge and the total volume in the inner tube are the same. This stretching allows us to read the depth of water an accuracy of 0.01".



Incidentally, the Fort Collins, Colorado weather station has a CoCoRaHS and NWS gauge side-by-side and has been keeping track of their measurements for a number of years. The results show that both gauges record very similar amounts of precipitation. View the abstract from the AMS 15th Conference on Applied Climatology/13th Symposium on Meteorological Observations and Instrumentation (2005).

Other factors critical to the 4 inch diameter gauge reading accurately to 0.01" include following all guidelines on picking a proper location to install your post for the gauge and properly leveling the mounting hardware so the gauge sets level and straight on the mounting post. Once the 4 inch gauge has been installed the observer must maintain the gauge to keep it free of debris and mold that may clog the funnel and make reading the inner funnel accurately impossible. Following all training material posted on the CoCoRaHS website and previous editions of this newsletter will ensure that you will get the most accurate reading out of your gauge and many years of use out of your gauge.

Figure 1: A standard mounted 4" diameter gauge 2 feet above ground in an open area.

Observer Tips, Information & Training Material (continued)

CoCoRaHS Training for Correct Reporting of Heavy Rain and Flooding During Storms and Events – How to Submit **Significant Weather Reports of Heavy Rain**

<u>Reason and Purpose</u>: During flood events which include Hurricanes, Tropical Storms, Severe thunderstorms, and heavy rain from various weather systems observers need to know how to submit the proper reports of their observations and how often they should report and for how large of amounts of rainfall. This primer will educate the observer of correct procedures to follow on reading their gauge and the best times to read their gauge when very heavy and extreme rainfall is occurring. Many times in these type of events gauges will overflow their capacity. Tips and guidelines to help observers read rain rainfall totals that exceed the capacity of the gauge are discussed. By following these guidelines observers are adding value to their observations which are used by professionals in making critical decisions on flooding and potential impacts of the weather conditions which are being observed.

<u>CoCoRaHS rain gauge capacity</u>: The rain collector is 4.25" wide and 14" tall graduated to the nearest inch with .01" intervals for the inner cylinder tube. The inner tube measures 1" of rain and then will overflow into the outer cylinder which will hold an additional 10". The total amount the gauge can hold when completely full will be around 11.30" of rain – the 11.00" of the two cylinders plus about 0.30" of rain in the top collection funnel before overflowing. All rain must be read by measuring out in the inner funnel.

Thresholds for Significant Weather Reports (SWR) of very heavy rain events: Typical heavy rain events and storms will exceed the capacity of the CoCoRaHS gauge during a 24 hour period before the observer's next observation. A threshold for reading the rain gage when possible will be at the 6.00" level or just after the gauge looks half full. If the observer is at the location of the gauge when this is occurring the observer should try to read and empty the gauge at the first possible break in the heavy rain even if just for a few minutes. Make note of the time that this is done and then submit a SWR. Most observers may not be able to do this until later in day or evening. All observers should read and empty their gauge and please before turning in for the may be impossible to read the gauge at night. Make note of all times of reading the gauge and please keep a running total of the storm event and submit this each time a SWR is made. Also note that a SWR is not a replacement for a daily report. The two reports serve to different purposes. A daily report is a once a day for a 24 hour period total of rain from the last report made. A SWR report is for the time period entered for the report and how much rain has fallen in that time frame. The SWR is a real time update to forecasters as to the current state of rainfall and flooding at your location. Forecasters use this data on the fly in updating models and forecasting new rainfall effects on a region.





Scheduled CoCoRaHS Webinars

Upcoming WxTalk Webinars:

Webinar #82 - Thursday, July 28, 2022, 1PM EDT

International Lightning Ronald L. Holle Holle Meteorology & Photography, Oro Valley, Arizona



Webinar #83 – Late Summer 2022 - 1PM EDT

The Graphics Boom – How Not to Go Bust Todd Glickman, Craig Allen WCBS Radio New York, NY



The first TV weather graphics systems were introduced in the early 1980s. At the 14th AMS Conference on Weathercasting in Clearwater Beach, FL (June 1984), Todd Glickman gave a presentation that suggested best practices TV weathercasters could use to keep their audience engaged, primarily using radio weathercasting techniques. Now 35 years later, TV weathercasters show on-air sophisticated model presentations, high-resolution radar displays, and present forecasts farther into the future. But what has not changed is that they are challenged with telling a story that their viewers will understand, appreciate, and remember. In this presentation, we'll look at techniques to best connect with the viewer – and surprise! – in this regard, not much has changed.

CoCoRaHS		Texas CoCoRaHS Observer The official newsletter of Texas CoCoRaHS
Y	Newsletter Editor:	Ron Havran, Regional Coordinator - Houston/Galveston Region Assistant State Coordinator cocorahs.hou.galv@gmail.com
*	Texas CoCoRaHS:	Bill Runyon, Texas State Coordinator texas@cocorahs.org
	Texas CoCoRaH	S @Texas CoCoRaHS