

#### 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.

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Texas Weather Summary Spring 2023

John Nielsen-Gammon, Texas State Climatologist



Precipitation distribution for Texas, March-May 2023, using Oregon State PRISM analyses, generated from SC-ACIS.

Thank God for farmers. We wouldn't be able to eat without all the good work they do.

"Because Every Drop Counts, As Do All Zeros"

### **Texas Weather Summary (continued)**

Thank God I'm not a farmer. If I were a farmer, I'd have to deal with something like this:



Figure 1: Precipitation since the beginning of the year in Borger, Texas. Graph from SC-ACIS.

The smooth brown line is normal precipitation in the figure above. From January to the end of May, average precipitation in Borger, a town in the Texas Panhandle, is a little more than 6". This year, for most of that time, they had received almost nothing. The total by late April was less than 1". Soils were bone dry, and there wasn't much point in trying to plant anything.

Then it started raining. And raining. In a little more than a month, Borger received almost a foot of rainfall. Now the ground is too muddy to plant anything.

Basically, since the beginning of the year, Borger has had about twice its normal precipitation in about a quarter of the normal amount of time.

When you sit down to dinner tonight, spare a moment for the farmers who have to put up with Texas weather in order to feed you.

## West Texas Regional Summary

### West Texas and Southeast New Mexico had a very dry spring.

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

#### <u>March</u>

March was very dry, as progressive springtime troughs kept moisture well to the east of the Hydrological Service Area (HSA). No significant hydrologic events occurred.

Monthly radar precipitation estimates ranged from nothing over most of Southeast New Mexico to up to 3" in the Big Bend National Park in Brewster County. However, the highest observed rainfall was only 1.82" at Persimmon Gap. Average rainfall was a whopping 0.27".



Figure 1: March Precipitation

#### <u>April</u>

April showers didn't bring May flowers, unfortunately. West Texas and Southeast New Mexico had another dry month, mainly due to lack of low-level moisture. No notable hydrologic events were reported.

Monthly radar precipitation estimates ranged from nothing over most of the HSA west of the Pecos to up to 3" over the Colorado River Basin. Highest observed rainfall was 1.86" in Tarzan in Martin County. Average rainfall was 0.16".



Figure 2: April Precipitation

#### <u>May</u>

The skies finally opened in May, mainly due to the return of Gul moisture to West Texas and Southeast New Mexico. Being May, much, if not most, of the events were severe in nature. However, a few hydrologic events were noted.

On May 12<sup>th</sup>, thunderstorms flooded several roads south of Westbrook in Mitchell County.

On the 18<sup>th</sup>, thunderstorms flooded Big Spring in Howard County, flooding many city roads. Roads were closed and vehicles stranded.

On May 19<sup>th</sup>, thunderstorms finally developed over Midland in Midland County, necessitating water rescues of vehicles by the fire department.

On the 20<sup>th</sup>, thunderstorms hit Andrews in Andrews County, resulting in street flooding to the tops of wheel wells on vehicles. Later in the day, streets just west of Midland were closed due to flooding, and several vehicles were stranded.

On May 23<sup>rd</sup>, Big Spring and areas south flooded once again from thunderstorms. Streets were closed and vehicles stranded.

On the 25<sup>th</sup>, thunderstorms down on the border flooded Comanche Creek and portions of RR170.

Thunderstorms redeveloped in the Big Bend Area from May 26<sup>th</sup> through the 28<sup>th</sup>. Locally heavy rainfall, as well as rainfall on the Rio Conchos, brought the Rio Grande to minor/moderate flood from the Presidio International Bridge downstream to Boquillas.

Many rural areas of West Texas and Southeast New Mexico also likely saw some flash flooding in May, but these events were not reported due to sparse population density.

Monthly radar precipitation estimates ranged from no rain in northwest Jeff Davis County to up to 15" in the upper Colorado River Valley. Highest observed rainfall was 5.21" in Big Spring in Howard County. Average rainfall was 2.08".



**Figure 3: May Precipitation** 

Overall, in the spring of 2023, especially the uptick in rainfall in May, leaves West Texas and Southeast New Mexico in abnormally dry to moderate drought over most of the area. Southeast New Mexico and areas of West Texas to the east are still in severe to extreme drought. Area reservoirs are at 48.0% conservation capacity as of June 1st.



Figure 4: Latest Drought Conditions across West Texas at the close of meteorological spring.

### Austin/San Antonio Regional Summary

### Finally...Above Normal Rain for Many Areas! Long-Term Drought Impacts Linger. By Keith White and Christopher Morris– WFO Austin/San Antonio

With the three year La Niña event no longer impacting large scale spring weather patterns, wetter than normal conditions dominated portions of the region this spring for the first time in several years. Due to their proximity to the gulf, our Coastal Plains counties to the east of I-35 typically see much higher rainfall than locations near the Rio Grande. In fact, 30-year normals show a nearly doubling of average annual rainfall from ~20" in Val Verde County to ~40" along US-77 in Fayette, Lee, and Lavaca Counties (Figure 1). This spring, those differences were clear with more than 20 inches of rain in several of our Coastal Plains counties (Figure 2), more than twice the usual amount. Multiple flash and river flooding events resulted. Meanwhile some isolated western locations received less than 6" of rain over the last 3 months.



Figure 1: Mean Annual Precipitation for Texas using 1991-2020 Normal values. Image courtesy PRISM Climate Group at Oregon State University. South Central Texas is circled in red.

Most of the rain this spring came in April and May, as March was mostly a drier and warmer than normal month for the region as the atmospheric La Niña pattern gradually waned. A few pockets of above normal rainfall were observed near Del Rio and Crystal City, otherwise much of the Hill Country, I-35 Corridor, and Coastal Plains experienced 1-2" rainfall deficits. Some southern portions of the region got off to a good start, though. A severe thunderstorm developed during the early morning hours of March 2nd over Zavala County. This thunderstorm would track eastwards through Atascosa County before diminishing over DeWitt County. While this storm brought a swath of 0.75" to 1.25", it also resulted in a maximum of 2.5" between Dilley and Pearsall in Frio County. A secondary swath of severe storms moved across the region during the afternoon and overnight hours of the 2nd and brought widespread rainfall to areas mainly north of I-10. Mostly dry and hot conditions then dominated across the region through the middle of the month.

Strong storms occurred along a cold front during the overnight hours of the 16<sup>th</sup> into the 17<sup>th</sup>. These storms produced between 0.75-1.5" along the I-35 corridor, and across portions of the winter garden. Active westerly flow aloft allowed for a prolonged period of light rainfall on the 18<sup>th</sup> across the western Edwards Plateau which resulted in amounts from 0.5-1". Another disturbance moved through on the 28<sup>th</sup> into the 29<sup>th</sup> which brought localized rainfall amounts across the western Edwards



Figure 2: Total precipitation over the 90 days ending 7am June 1st.

Plateau of 0.5-1.25." Light rains would continue over portions of the region to end the month, before another several dry and warm days in early April. As a result, drought continued to expand and worsen, but better luck was just around the corner for most areas.

A stalled cold front brought overrunning precipitation from April 6th through the 8th. Precipitation amounts ranged from 1-4" across the I-35 corridor, northern Coastal Plains, and portions of the Hill Country. A higher swath of 4-6" occurred over southern portions of the Coastal Plains, with maximum CoCoRaHS reports of 7.39" near Swiss Alp and 7.28" near Campbellton.

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### Austin/San Antonio Regional Summary (continued)

A slow-moving cold front and associated pre-frontal disturbance initiated scattered severe storms during the afternoon and overnight hours of the 20<sup>th</sup>. One slow moving thunderstorm brought swaths of 2-4" of rain across portions of Bandera and Bexar counties, and another nearly stationary area of storms moving parallel to the cold front left a wide swatch of beneficial rains to northeastern portions of the area. Some of the rain came too much and too quickly, however. One 4-5" bullseye was over north Austin and resulted in about 50 water rescues with 21 of those at US HWY 183 and Duval Road.

Another cluster of thunderstorms moved across the area from the evening of April 22<sup>nd</sup> to the midday hours on the 23<sup>rd</sup>, developing near the Rio Grande and then tracking across southern portions of our region. Radar estimates were more than 4" over some areas near the Rio and some flooding was observed in Eagle Pass, though rain amounts were otherwise lower than 2" (and mainly less than 1").

During the overnight hours of April 26<sup>th</sup>, yet another slow-moving cold front dropped across south central Texas. A line of storms brought localized areas of 1.5-2" of rainfall to portions of the Hill Country and I-35 corridor. One final April day of scattered strong to severe storms occurred on the evening of the 28<sup>th</sup> and led to pockets of 1-2+" over central and eastern portions of the area, with a more widespread 0.25-1". We then dried out through the first several days of May.

One lone supercell developed in Mexico and moved across northern Maverick through Zavala counties on the evening of May 4th before dissipating near Dilley. Although CoCoRaHS observers are sparse in the region, one in Crystal City reported 1.82" of rain. Hail up to baseball size (2.75" in diameter) was reported in the city as well. More severe weather occurred the next evening, this time mainly over Llano and Burnet Counties. Rainfall amounts up to 3.55" were reported SW of Burnet, with storms weakening as they moved though the north Austin/Round Rock area and into Lee County before dissipating. Then, we really ramped up the wet weather beginning on the 7<sup>th</sup> and continuing through the 20<sup>th</sup>, with only some brief reprieves on the 10<sup>th</sup>-11<sup>th</sup> and 17<sup>th</sup>-18<sup>th</sup>. The Coastal Plains bore the brunt of the impacts.

The active pattern was driven by moist southwesterly flow off the Pacific aloft, moist southeasterly flow off the Gulf of Mexico at low levels, and frequent disturbances aloft, with drylines and weak fronts providing lift in the atmosphere. Single day rainfall totals of 3" or greater were reported by CoCoRaHS observers somewhere in South Central Texas on the mornings of the 8<sup>th</sup>, 9<sup>th</sup>, 10<sup>th</sup>, 13<sup>th</sup>, 14<sup>th</sup>, 16<sup>th</sup>, 17<sup>th</sup>, and 20<sup>th</sup>! The most widespread heavy rains came on the late afternoon of May 12<sup>th</sup> through the mid-afternoon on the 13<sup>th</sup>, with well over half of the region seeing 1.5" or more, several areas of 2-4", and isolated totals approaching 6". Flash flooding was reported in the cities of Austin and San Antonio as well as portions of the Coastal Plains, and river flooding there lasted for several days. Some real-time reports from CoCoRaHS observers helped confirm the intense rain rates approaching 4"/hr. at times that were indicated by radar estimates and aided in our decisions to issue Flash Flood products.

In the 30 days ending the morning of May 20<sup>th</sup>, 10" or more of rain was recorded by observers in an area of eastern Bandera County, a small patch in NW Bexar County, in north-central Travis County, and in much of the Coastal Plains, as well as by a single observer in Dilley. Some observations in Lavaca, Fayette, and DeWitt counties exceeded 14" during this time! Additional days of beneficial, rains occurred through the end of the month, with amounts mainly less than 0.5" over eastern areas and widespread 1-2" amounts out west with isolated 2-3+" amounts.

Looking at the entire spring, there were still some areas in the Hill Country and near Austin that saw slightly below normal rainfall. But even there, it was much wetter than at this time last year, which should help set us up for a slightly milder but more humid start to summer. As a result of the areas of heavier rain elsewhere, drought was eliminated from most areas east of I-35, except for in eastern Bexar County and western Guadalupe County including near New Braunfels. Improvements were seen everywhere else as well, although long term drought impacts continue over much of the Hill Country and San Antonio area (Figure 3). Looking at the change in drought classification over the past 12 weeks (Figure 4), most of the region saw improvements, and these were as much as 3 categories over a few small swaths. However, some long-term drought impacts remain, particularly with respect to aquifer and reservoir levels. While we'll soon be entering a climatologically drier period this summer, the burgeoning El Niño will lead to increased chances for cool, wet weather by late Fall into Winter.

## Austin/San Antonio Regional (continued)



Figure 3: U.S. Drought Monitor valid 7am May 30<sup>th</sup>



Figure 4: U.S. Drought Monitor 12 week change map valid 7am May 30<sup>th</sup>

### **North Texas Regional Summary**

### Variable Precipitation Pattern Remained from Last Season By: Greg Story, CoCoRaHS North Texas Regional Coordinator

Greetings CoCoRaHS observers from the North Texas Regional Coordinator! It's time to go back and see what the weather has been doing the past three months, particularly in North Texas. That is the goal of this newsletter article. This past winter season was quite dry to start out, followed by some significant precipitation in February. Then the spring season turned out to be wet over southern and eastern Texas while north central Texas was dry. The variability of the rainfall over North Texas reminds me how important your rainfall reports are. Why? They help in determining the areas which may flood, as well as determining drought locations. 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).

Reviewing the past several months, a dry weather pattern persisted into October for Central and East Texas. However, West Texas started seeing some precipitation. Below normal rainfall occurred over much of Texas, especially around San Antonio. In November the weather pattern turned more favorable for precipitation. Most of the state had near to above normal precipitation. Only far West Texas was below normal. In December much of southern, central, and western Texas saw below normal precipitation. However, above normal rainfall was noted over Southeast Texas, and over a small area north of San Angelo. Much of North Texas saw near to below normal precipitation. In January, extreme East Texas and all Southeast Texas saw above normal rainfall. Elsewhere in Texas the precipitation was near to below normal. In Pebruary much of north Texas saw above normal precipitation, while most of south Texas was below normal. In March most of the state had below normal rainfall. Only a few small locations saw near to above normal precipitation, including the Red River valley, parts of East Texas, Deep South Texas, and over the Texas Big Bend region. There was much below normal rainfall over far West Texas. In April the weather pattern turned wet with near to above normal rainfall over the southeast half of the state. Meanwhile the precipitation was near to below normal rainfall over far West Texas. In May it was dry over North Texas. However, the rainfall was near to above normal over the remainder of the state. The rainfall was much above normal over the Texas Big Bend.



Figure 1: Percent of normal precipitation for March 2023. In March most of the state had below normal rainfall. Only a few small locations saw near to above normal precipitation, including the Red River valley, parts of east Texas, the Rio Grande valley of Deep South Texas, and over the Texas Big Bend region. There was much below normal rainfall over far West Texas.

At DFW airport in March 2023, 2.76" of precipitation fell. The normal amount of precipitation in March is 3.30", the observed amount for DFW was -0.54" below normal for the month.

In Waco for March 2023, 1.38" of rainfall was measured. The normal amount of precipitation in March is 3.31", the observed amount for Waco was -1.93" below normal for the month.

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 to look at a particular day each month to see what happened. Which days did you report your heaviest precipitation amounts? You can read about those days here and 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.

March 1:

A weak upper air disturbance combined with the return of moist air to produce showers and thunderstorms over North Texas. Prior to sunrise the rainfall amounts were all less than 0.15". But rainfall intensities really increased after sunrise. The heaviest amounts were 1.23" north northeast of Mansfield and 1.12" south southeast of Mesquite.

#### March 2 - 3:

A very potent upper-level low pressure system moved out of the southwestern U.S. on the 2nd through Texas into the mid-Mississippi River valley on the 3rd. There was widespread showers and severe thunderstorms broke out ahead of this storm. Thunderstorms produced very high winds and some tornadoes as they moved through. Rainfall-wise the heaviest rain was over extreme North Texas where 3.94" was measured east southeast of Denison and 3.14" fell north northeast of Gordonville. The rain moved out of the state early on the 3rd.

#### March 7 - 10:

A couple upper air disturbances interacted with a slow-moving surface front to produce some showers and isolated thunderstorms. The rain began over West Texas late on the 7th. The rainfall prior to dawn on the 8th was heaviest over West Texas and near the Red River in North Texas. The maximum amounts were southeast of Truscott with 2.67", 1.92" fell northwest of Seymour and 1.01" fell northwest of Greenville. During the day on the 8th the rain was quite heavy along the Red River over extreme North Texas. Rain totals were 3.63" west northwest of Pottsboro and 3.42" northwest of Sherman. More showers and a few thunderstorms redeveloped on the 9th. The maximum rainfall over North Texas was south southeast of Athens where totals were 2.50" and southwest of Waxahachie where totals were 2.07". Elsewhere in Texas 2.52" fell west of New Salem and 2.19" fell east of Alto. The rain moved out of the state on the morning of the 10th.

#### March 16 - 19:

A fast-moving short-wave trough passed north of Texas on the 16th, but it pushed a dryline and a cold front through Texas. Some showers developed the morning of the 16th as low-level moisture returned. Then, additional showers and thunderstorms developed along the dryline and front in the afternoon. The rain continued across the state late on the 16th into the 17th. Some locally heavy rain fell over the DFW metroplex. The area north northwest of Arlington received 2.28", while just southwest of North Richland Hills totals were 2.20". The largest rain amount over Texas was 3.74" west southwest of Lufkin. The rain pretty much ended over North Texas late on the 17th into the 18th, but light to moderate rain continued along and behind the frontal boundary across South Texas. The maximum rainfall in Texas was 1.34" at Johnson Ranch and 1.04" at Del Rio. Light rain persisted on and off across South Texas on the 18th and even into the 19th. During the day on the 18th another 0.99" fell in Del Rio while 0.84" was measured at Johnson Ranch. On the 19th all the rainfall readings were 0.50" or lower.

#### March 23 – 24:

A rather vigorous upper air disturbance formed over the southwestern US and moved slowly eastward. Showers and thunderstorms initially developed the afternoon of the 23rd over the western Red River valley into Central Oklahoma. The upper-level trough lifted out on the 24th, and as this occurred it pushed a cold front south and east across Texas.

Showers and thunderstorms developed along and ahead of this front, initially over West Texas late on the 23rd. These thunderstorms then spread east across especially North Texas on the early morning of the 24th. The maximum rainfall through dawn on the 24th was 2.00" west southwest of Burkburnett, 1.66" just west northwest of Gordonville and 1.65" north northeast of Stephenville. As the showers and thunderstorms continued to move east on the 24th, the heaviest rain was over Northeast Texas. Arthur City measured 2.43", while south of Powderly 2.33" was observed, and Monkstown measured 1.45". The rain finally moved east of Texas very late on the 24th while tornadoes occurred further east over Mississippi.

#### March 26 - 28:

Showers and thunderstorms formed over East and Southeast Texas on the 26th in the vicinity of a stalled out frontal boundary. The maximum rainfall was 1.72" at San Augustine and 1.70" west southwest of Woodville. The following day, showers and thunderstorms formed over the Concho Valley on the 27th which then moved east and north. While the rainfall over North Texas was light (under 0.75"), heavier amounts of 2.05" fell just south of San Leon in Southeast Texas and 1.55" fell north northeast of Mertzon. Then on the 28th, as the frontal boundary started moving south, heavy rainfall occurred over Deep South Texas. Rain amounts of 4.75" fell west southwest of Mission and amounts of 3.32" fell at McAllen.

#### March 31 – April 1:

A strong short-wave trough formed over the intermountain region the morning of the 31st and moved eastward into the central plain states. A couple lines of showers and thunderstorms began forming during the afternoon over east Central and Northeast Texas, and these storms moved out of the state by the morning of the 1st. Due to the speed of the thunderstorms, the rainfall amounts were not excessive. Only 0.96" east of Bullard and 0.88" north northwest of Huntsville. The thunderstorms were much worse over Arkansas where damaging tornadoes occurred.



Figure 2: Percent of normal precipitation for April 2023. In April the weather pattern turned wet with near to above normal rainfall over roughly the southeast half of the state. Meanwhile the precipitation was near to below normal over the northwest half, with much below normal rainfall over far West Texas.

At DFW airport in April 2023, 3.12" of rainfall was measured. The normal amount of rain in April is 3.22", the observed amount for DFW was very close to normal at -0.10" for the month.

In Waco for April 2023, 3.90" of rainfall was measured. The normal amount of rainfall in April is 3.30", the observed amount for Waco was +0.60" above normal for the month.

There were about nine storm systems which affected our weather in April. Here are the highlights of the weather for the month.

#### April 1:

Isolated thunderstorms formed along the old frontal boundary on the 1st which produced isolated locally heavy rain over South Texas. Observed amounts of 5.91" at Midfield and 2.56" east southeast of Victoria were measured by observers.

#### April 2:

A strong short-wave trough formed over Arizona on the early morning of the 2nd. This trough moved rapidly east across North Texas late on the 2nd. The trough caused a warm front to move northward which generated showers and thunderstorms across Central and North Texas during the afternoon, which moved east and out of the state late on the 2nd. The heaviest rain over North Texas was northeast of Bonham where 2.38" was measured. But further east, 3.27" fell North of Karnack and 3.15" occurred west southwest of Harleton.

#### April 4 - 5:

A deep trough of low pressure formed over the southwestern US on the 4th which moved into the central plain states on the 5th. A few showers and isolated thunderstorms developed on the 4th, but as a strong cold front started to move across Texas early on the 5th more widespread showers and thunderstorms developed. The rainfall prior to sunrise on the 5th was heaviest over North Texas where 1.32" was observed north northwest of Wills Point and 1.25" was observed south southwest of Itasca. During the day on the 5th the heaviest rainfall shifted southward as the cold front moved. Locally heavy rainfall occurred, where 5.12" was observed north of Campbellton and 4.95" fell northwest of Livingston.

#### April 6 - 7:

The cold front stalled across Deep South Texas on the 6th. In addition, an upper air disturbance moved out of northwest Mexico and across Texas on the 7th. The combination of these systems produced more rain across South and East Texas through the 6th and into the 7th. On the 6th locally very heavy rainfall was noted over South Texas. A total of 6.43" fell south southeast of Gonzales and a total amount of 4.86" fell northeast of Smiley. Rain continued over mainly the southeast half of Texas on the 7th. The maximum rainfall amounts were over Deep South Texas where 2.10" was registered southwest of Realitos and 1.95" fell north of Seven Sisters. The rain moved out of the state late on the 7th.

#### April 15:

A strong cold front moved across Texas. A line of thunderstorms developed along the front over eastern and southern Texas. The heaviest rainfall was 2.00" southeast of Warren and 1.96" north of Beaumont.

#### April 20 – 21:

A cold front moved slowly across Texas on the 20th and 21st. Showers and thunderstorms developed along and ahead of the front and became widespread by the evening of the 20th, especially across eastern and southern Texas. Locally very heavy rainfall occurred, as some locations received 4" in 2 hours. The maximum rainfall amounts were 5.23" at Wells Branch and 4.85" north northwest of Gause. While the widespread rainfall ended prior to dawn on the 21st, some rain continued over South Texas. The heaviest rain was 0.78" east northeast of Mission and 0.77" at the Santa Anna National Wildlife Refuge.

#### April 22 – 23:

A secondary cold frontal boundary combined with a short-wave trough to produce showers and thunderstorms, especially over the Hill Country into South Texas. The heaviest rainfall on the 21st to prior to dawn on the 22nd was measured over South Texas where 5.09" was measured northwest of Quesada and 4.79" fell southeast of Comstock. The thunderstorms continued through the morning of the 23rd over Deep South Texas. Rain amounts of an additional 3.64" just north northwest of Alice and 3.61" at the Corpus Christi Botanic Garden occurred.

#### April 25 – 27:

A rather strong upper air disturbance passed to the north of Texas on the 26th and 27th. Plus, a warm front advanced northward across the state. As a result, some rain developed as the moisture returned on the 25th well out ahead of the upper disturbance. Rainfall amounts prior to sunrise on the 26th were heaviest just east and southeast of the DFW metroplex where 2.44" was measured northeast of Cottonwood and 2.12" fell northeast of Eustace. Showers and thunderstorms became widespread by the afternoon of the 26th and continued all night. By the morning of the 27th the rain was confined to Deep South and Southeast Texas. The heaviest rainfall ending the morning of the 27th was over east Texas where 4.59" was observed north northeast of Crockett and 4.17" was measured west southwest of Lufkin. The largest rainfall reading in the DFW metroplex was just south of North Richland Hills with 2.05". On the morning of the 27th the largest rainfall readings were 1.18" northwest of Corpus Christi and 1.10" west northwest of Brownsville.

#### April 28 – 29:

A strong cold front moved quickly across Texas. Showers and some severe thunderstorms developed on the afternoon of the 28th and finally moved out of Texas on the morning of the 29th. The rainfall was heaviest over southern and eastern Texas, with maximum rainfall amounts of 3.32" east of Brownsville and 2.50" north northwest of Wills Point. Residual rainfall the morning of the 29th was very light and less than 0.10".



Figure 3: Percent of normal precipitation for May 2023. In May it was dry over north Central and Northeast Texas. However, the rainfall was near to above normal over most of the remainder of the state. The rainfall was much above normal over the Texas panhandle, as well as over parts of the Texas Big Bend.

At DFW airport in May 2023 2.35" of rainfall fell. The normal amount of rain in May is 4.78", the observed amount for DFW was -2.43" below normal for the month.

In Waco for May 2023, 5.26" of rainfall was measured. The normal amount of rainfall in May is 4.44", the observed amount for Waco was +0.82" above normal for the month.

There were about eight significant storm systems which affected our weather in May. Here are the highlights of the weather for the month.

#### May 4:

A short-wave trough interacted with the dryline to produce showers and thunderstorms the afternoon of the 4th over the western half of Texas from the Red River south to the Rio Grande. The storms moved east into the I-35 corridor before weakening. The heaviest rainfall was over the southern parts of North Texas where 2.54" fell northwest of Lorena and 2.20" was measured west southwest of McGregor.

#### May 5 - 8:

A large low-pressure system over the western US pushed a couple upper air disturbances across Texas starting on the 5th. Each disturbance, along with daytime heating, caused the dryline to be active across especially the western parts of North Texas. Some showers and thunderstorms developed by late afternoon on the 5th over the Big Country, which moved east during the evening. The heaviest rainfall on the 5th was over Central Texas into the Hill Country where 3.55" fell west southwest of Burnet and 3.24" occurred north northwest of Tow. More showers and thunderstorms developed the afternoon of the 6th over the western parts of North Texas, which moved east into the evening. The heaviest rain in North Texas on the 6th was northeast of Glen Rose with 2.70" and north northeast of Cleburne with 2.44". Elsewhere in Texas 2.70" fell at Burkett. On the 7th the heaviest rain shifted into South Texas, while lighter amounts occurred over North Texas. The maximum rainfall was 4.29" south of Cuero and 3.75" west southwest of Falls City. A few lingering thundershowers redeveloped on the 8th as, yet another short-wave trough moved across North Texas. While some rain occurred over North Texas, the thunderstorms were heaviest over Southeast Texas. In North Texas on the 8<sup>th</sup> 1.16" of rain fell northwest of Greenville.

#### May 9 - 10:

A slow-moving upper air disturbance developed over Central Texas and produced rain over primarily South Texas on the 9th. The rainfall continued over South Texas, but also spread into East Texas on the 10th. The heaviest rainfall on the 9th was 5.95" west southwest of Nordheim and 5.30" at Point Comfort. The heaviest rain in North Texas was south southeast of Thorndale with 1.58". The maximum rainfall over North Texas on the 10th was north northeast of Dallas with 1.11". But further southeast 6.42" fell south southwest of Henderson and 5.08" fell west of Gary City. The rain moved into Louisiana the morning of the 11th as the next storm system began to develop to the west of Texas.

#### May 11 - 15:

A major long wave trough of low pressure set up across the western US during this period. Upper air disturbances moved out of this trough for several days and produced periods of rain. The first disturbance moved east over New Mexico and Colorado on the 11th and moved slowly northeast through the 12th. Some showers and thunderstorms occurred on the 11th, mainly over the western parts of North Texas and extreme East Texas. The heaviest rain was 3.48" at Logansport on the Texas/Louisiana border and 1.00" west of Gary City. On the 12th showers and thunderstorms developed along the dryline over West Texas, which moved east through the evening. Additionally, showers and thunderstorms developed over Mexico which moved over South Texas through the 12th and into the 13th. The maximum rainfall amounts over north Texas were southeast of Stephenville with 1.85" and northeast of Breckenridge with 1.78". But further south 4.87" fell northeast of Smiley and 4.64" fell south of El Indio along the Rio Grande. A new upper air disturbance moved over Texas on the 13th and produced more rainfall, some of which was heavy. In North Texas 2.25" was measured east southeast of Weatherford and 2.02" was measured northwest of Springtown. But over Southeast Texas 4.83" fell northwest of Jersey Village and 4.81" fell southeast of Hallettsville. Rain continued the 14th over primarily the eastern half of the state, but as this latest upper air disturbance moved north the rain pretty much ended by midnight. The rainfall on the 14th in North Texas was heaviest southwest of Blooming Grove where 1.75" fell, while northwest of Rowlett an observer measured 1.55". Elsewhere in Texas the maximum rainfall was 3.11" north northeast of Mason and 2.90" southeast of Livingston. The rainfall redeveloped from one final upper air disturbance over primarily South Texas the morning of the 15th, with additional showers and thunderstorms developing during the afternoon and evening across northern and central parts of the state. The heaviest rainfall on the 15th was 3.34" east northeast of Denison and 3.32" northeast of Canyon Lake in Central Texas.

May 16:

A cold front moved across South Texas and produced some showers and thunderstorms along and ahead of it on the 16th. The maximum rainfall amounts were 3.90" west of Dickinson and 3.44" east southeast of West Columbia.

#### May 19 – 20:

A storm system passed off to the north of Texas, but it was strong enough to push a cold front across Texas. Showers and thunderstorms developed during the afternoon of the 19th over North and Central Texas and continued along and ahead of the front through the evening and into the morning of the 20th over south Texas. The heaviest rainfall on the 19th in North Texas was north of Hamilton with 3.49" and west southwest of McGregor with 2.80". Elsewhere in Texas 3.85" fell south of Burkett and 3.62"fell south southeast of Natalia. Residual rainfall on the 20th was heaviest over Southwest Texas where 1.19" fell southwest of Brackettville and west southwest of Eldorado.

#### May 22 – 24:

A mesoscale convective system (MCS) developed over the Texas panhandle and the western parts of North Texas later in the day on the 22nd. This rainfall diminished overnight, but some rain continued over East Texas on the 23rd. The maximum rainfall amount in North Texas on the 22nd was north of Cisco with 1.11" and west southwest of Joshua where 0.74" fell. Further west 1.91" fell northwest of Rule and 1.64" fell north northwest of Haskell. A second MCS formed over West Texas later in the day on the 23rd, and the rain moved east across North Texas into the morning of the 24th. The maximum rainfall in North Texas was northeast of Bridgeport with 2.25" and northwest of Springtown with 1.74". Elsewhere in Texas 2.20" fell north of Burnet and 1.95" fell at Stamford. Residual rainfall on the 24th was heaviest and most widespread over West Texas where 2.26" fell southeast of Littlefield and 2.14" occurred northeast of Amherst.

#### May 29 – 30:

A short-wave trough crossed Texas and produced showers and thunderstorms over numerous parts of the state. The heaviest rainfall on the 29th was over North Texas where 3.20" was reported east southeast of Blue Ridge and 3.14" occurred east southeast of Kaufman. Over South Texas 3.02" fell west southwest of Boerne. On the 30th, some showers and thunderstorms developed along the outflow boundaries left over from the previous days' convection. The heaviest rain in North Texas was southeast of Collinsville with 2.07" and at Venus with 1.87".



Figure 4: Spring season precipitation for 2023.



Figure 5: Percent of Normal Precipitation for spring 2023. It was a drier than normal spring over North Central Texas and the far western portions. There was some prolonged dryness over the middle Texas Hill Country and West Texas. But also of note was the spots over South Central and East Texas, the Texas Big Bend, and over Deep South Texas, that received above normal amounts.

At DFW airport, for the spring season March through May, 8.23" of precipitation was observed. The normal amount for spring is 11.30", the observed amount for DFW was -3.07" below normal for the season.

At Waco for the March through May spring season 10.54" was recorded. The normal amount of precipitation for spring is 11.05", the observed amount for Waco was -0.51" below normal for the season.

For the first 5 months of 2023 DFW airport received 13.58" of precipitation. The normal amount from January through May is 16.59", the observed amount for DFW is -3.01" below normal for the year.

Waco has received 15.26" through May. The normal amount of precipitation through May is 16.32", the observed amount for Waco is -1.06" below normal so far this year.



Figure 6: Current Drought Monitor for Texas as of June 1. The results of the wet weather of the past few months show up well on this drought monitor, as well as those locations that received lower rainfall amounts. Much of East Texas and Deep South Texas is free from drought. But over most of the western half of the state everyone is experiencing abnormally dry conditions or worse. Exceptional drought is occurring over parts of the Hill Country, while improvement in the exceptional drought conditions has been seen over the far northern Texas panhandle. Also note that parts of North Texas continue to be abnormally dry or in moderate drought.

I want to give a special hello to those who are new to CoCoRaHS, Welcome! In case you were wondering if anyone looks at your weather reports after you enter them, rest assured; someone is! As one example, each day CoCoRaHS data is carefully examined and incorporated by the National Weather Service at the West Gulf River Forecast Center for use in their soil moisture accounting flood forecasting models. So 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, and the location of drought when it doesn't rain. And if we can help you with your observations or reporting in any way, please let us know! Either I or your county coordinator would be glad to help you.

Thanks again for your dedication in making all your weather observations! And we appreciate it when you report zero rainfall daily on the dry days. Why? Because if you go a month or longer without measurable rainfall (as someone probably will this summer), that tells us a lot, too! And don't forget that on days you are not home (we understand it is vacation season) or unable to report your 24-hour rainfall observation for any reason, you can make a multi-day accumulation report upon your return.

Have a great summer season!

Greg Story

# El Paso/Far West Texas Summary

### West Texas Misses Out on Unseasonably Wet May

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

Springtime in El Paso, TX is typically the driest time of the year. Rain gauges are neglected, plants stay thirsty, and the danger of wildfires reaches its yearly peak. This season was no exception for far west Texas, despite an unseasonable surge of moisture that brought a period of daily rain chances in mid-May. A few high wind events were recorded, particularly during the first week of March and first week of April with wind gusts of 50 to 60 mph and blowing dust recorded at El Paso International Airport. El Paso only recorded one more low temperature below freezing (31F) one cold morning of March 19th. La Niña quickly dissipated in the east-central Pacific at the end of last winter, with ENSO conditions rapidly shifting toward Neutral and look to reach El Niño status by the end of summer.



Figure 1: Morning snowfall in El Paso, Texas after the winter weather on March 2nd.

Monthly precipitation totals were quite low, but near normal for March in El Paso. The official station at the airport only recorded a **trace**, but many observers in town saw monthly totals of **0.10-0.25**". Light snow in the morning of March 1st and 2nd did provide a dusting over the Franklin Mountains and even a few locations in El Paso County. CoCoRaHS observers in Northeast El Paso recorded new snowfall totals of **0.5-1.0**", which quickly melted by midday. Light rain also occurred on March 16th and 17th due to the passage of an upper low and intrusion of cold air from the east.

No measurable precipitation was recorded in April for all local CoCoRaHS stations. Typically, our driest year of the month, 2023 was the fourth time in six years that no rain was recorded at El Paso International Airport in April. This month was part of a 57-day streak of no recorded precipitation. Despite this, we're happy to report that 35 observers submitted daily observations of **0.00**".

### El Paso/Far West Texas Summary (continued)

May was unique in a few ways, particularly the week of May 14-21, where a surge of Gulf moisture moved in from the east and lingered across far west Texas and southern New Mexico for several days, allowing for daily rounds of scattered thunderstorm activity. This is quite unseasonable for this time of year, considering the dryline usually sets up across the Texas panhandle with dry air over the southern Rockies. The most notable day occurred the evening the May 14th, with a large convective system developing across southwest New Mexico. Rain totals exceeded **1-2**" over a wide area further west but missed far west Texas completely. El Paso finally got in on the thunderstorm action the evening of May 20th, as a strong storm moved across the metro, bringing pea size hail and minor flooding to the west side of town. Rain totals for that day ranged from **T-0.30**". Monthly CoCoRaHS totals ranged from **0.10-0.40**", which resulted in near normal precipitation. This was disappointing, however, considering the highly above average rain much of the neighboring New Mexico communities received. El Paso International Airport only received **0.11**" over the course of May, this compared to Las Cruces's rain total of **0.76**" just 30 miles to the north.



Figure 2: Sunset peeking under a thunderstorm in El Paso, Texas on May 20th. Photo Credit: Ray Chiarello

Season precipitation totals ranged from **0.25-0.50**", with only a few seasonal totals higher than that due to direct thunderstorm impacts. Even with the forecasted wet weather in May, most of the thunderstorm activity was limited to southern New Mexico and the high terrain around El Paso. Precipitation totals finished generally below normal for the 92-day season but didn't affect the year's annual totals too much due to the typically dry nature of spring in the borderland. El Paso International recorded a season total of **0.16**", falling well short of the climate average of **0.84**" and nearly matching the dry 2022 spring. The majority of far west Texas remains without a drought status, thanks in part to the wet winter. Drought onset will be possible if this year's monsoon season fails to deliver.

The spring season featured 33 active observers in El Paso County, and 2 in Hudspeth County. A total of 1,613 daily reports were submitted, along with 54 multiple-day reports. Only 92 daily reports had measurable precipitation, which means 94% of total reports were **T** or **0.00**". One Significant Weather report was submitted with a real time snowfall measurement in March. No Condition Monitoring reports were posted this season. Thanks again to all our local observers who participated in the 2023 spring season!

### Spring 2023

### El Paso/Far West Texas Summary (continued)



Figure 3: AHPS Observed Precipitation and Percent of Normal for March - May in far West Texas

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## **Southeast Texas Regional Summary**

Significant Rains Return after Dry Start

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

#### March 2023

March was a very warm and dry month across all Southeast Texas (Table 1 & 2). Temperatures ranged from 3.5° to 5°F above normal. Rainfall was in short supply everywhere across Southeast Texas (Chart 1 & 2). Very dry conditions led to the expansion of drought across the region. Extreme eastern and southwest portions of the region were the driest.



Figure 1: Total Precipitation and Departure from Normal for SE Texas March 2023.

#### April 2023

April saw the upper-level patterns change in response to the fading away of La Nina in the Pacific Ocean. Southeast Texas had multiple storm systems pass through during April with several very heavy rain events. The inland areas of Southeast Texas had the heaviest rainfall totals and finished much above normal rainfall for the month. Coastal areas had much less rainfall with just slightly above normals totals. Temperatures finished up near normal region wide to just slightly below normal due to the heavy rains occurring frequently with abundant cloud cover. CoCoRaHS observers saw significant rainfall totals to measure requiring a little time to determine the amount collected in the overflow tube. Thanks to all observers for reporting daily reports every day.



Figure 2: Total Precipitation and Departure from Normal for SE Texas April 2023.



Figure 3: March 2023 CoCoRaHS observer rainfall totals across Southeast Texas.



Figure 4: April 2023 CoCoRaHS observer rainfall totals across Southeast Texas.

#### May 2023

The pattern in May was typical with 9 to 14 days with thunderstorms that produced heavy rainfall at times. Most stations had normal to above normal rainfall for the month. Temperatures averaged to near normal at most stations with a few slightly below normal in the areas with the most rainfall to a few slightly above normal in far eastern Southeast Texas. Heaviest rainfall occurred over western portions of Southeast Texas.

I always like to post CoCoRaHS observer reported rainfall maps. These maps show observer totals from stations that reported at least 95% of days in a month. You can always go to the CoCoRaHS web site and pull up the map to see a zoomed in look at your location to better see your station totals. Go to https://maps.cocorahs.org/.



Figure 5: May 2023 CoCoRaHS observer rainfall totals across Southeast Texas.



Figure 6: May 2023 CoCoRaHS observer rainfall totals across Southeast Texas.

County	March	April	May	Spring Total
	AVG.	AVG.	AVG.	MarMay
Austin	1.70	8.06	6.65	16.41
Brazoria	1.37	4.52	5.91	11.80
Chambers	2.47	6.33	5.48	14.28
Colorado	2.00	8.54	7.05	17.59
Fort Bend	2.28	5.97	6.19	14.44
Galveston	1.93	5.27	4.82	12.02
Harris	1.76	5.34	5.85	12.95
Jackson	1.32	5.29	6.32	12.93
Liberty	2.15	5.87	5.06	13.08
Matagorda	1.25	4.72	6.44	12.41
Montgomery	1.92	6.64	6.79	15.35
Polk	1.63	8.02	5.82	15.47
San Jacinto	1.47	8.89	5.49	15.85
Wharton	0.95	6.72	5.11	12.78
Region Totals	1.73	6.44	5.93	14.10

Color indicates highest avg. rainfall total for a county in a month Color indicates lowest avg. rainfall total for a county in a month Note: Counties without a significant # of observers reporting are not listed on the chart.

Chart 1: Houston/Galveston Region CoCoRaHS observer county rainfall

County	March	April	May	Spring Total
	AVG.	AVG.	AVG.	Mar May
Hardin	1.02	5.10	5.14	11.26
Jasper	2.09	6.06	3.72	11.87
Jefferson	1.61	6.08	6.69	14.38
Newton	NA	NA	NA	NA
Orange	1.55	5.51	6.48	13.54
Tyler	2.33	7.09	4.54	13.96
Region Totals	1.72	5.97	5.31	13.00

Chart 2: Golden Triangle CoCoRaHS observer county rainfall

Houston/G	alveston Ten	peratrure	& Rainfall	Data for 2023	spring Se	ason	
	1		March Clim	ate	1.11		
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	76.8	57.6	67.2	3.4	1.15	3.47	-2.32
Hobby Airport (1930)	77.6	61.2	69.4	4.7	1.78	3.28	-1.50
Galveston (1871)	74.8	63.5	68.1	3.9	2.04	3.02	-0.98
Sugar Land (2000)	78.0	58.5	68.2	3.5	1.61	3.49	-1.88
	1	2.22	April Clima	ate	17		1000
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	77.2	59.1	68.1	-1.9	5.87	3.95	1.92
Hobby Airport (1930)	79.1	62.1	70.6	0.1	4.03	4.08	-0.05
Galveston (1871)	77.4	65.8	71.6	0.1	4.67	2.06	2.61
Sugar Land (2000)	78.7	59.7	69.2	-1.1	5.85	4.26	1.59
			May Clima	ite			
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	85.6	67.7	76.7	-0.7	8.66	5.01	3,65
Hobby Airport (1930)	87.0	71.3	79.1	1.5	5.37	5.42	-0.05
Galveston (1871)	82.7	73.2	78.0	-0.2	3.22	3.04	0.18
Sugar Land (2000)	86.8	68.7	77.7	-0.2	5.20	5.24	-0.04

Table 1: Houston/Galveston first order stations temperature and rainfall data for spring 2023.

#### Golden Triangle Temperatrure & Rainfall Data for 2023 Spring Season

	A COLUMN TWO IS NOT		March Clim	ate			-
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	77.0	58.6	67.8	4.5	1.19	3.63	2.44
Beaumont Research Center	75.3	56.8	66.0	3.6	1.74	3.89	-2.23
Orange 9N	73.5	56.0	64.8	4.5	1.29	3.52	-2.23
			April Clima	ate			
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	78.5	60.1	69.3	0.0	6.71	3.92	2.79
Beaumont Research Center	76.6	59.3	68.0	-0.6	5.29	3.65	1.64
Orange 9N	75.6	57.1	66.4	0.4	6.69	4.18	1.55
			May Clima	ate			
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	87.0	68.5	77.7	1.2	7.15	4.70	2.45
Beaumont Research Center	85.2	67.7	76.4	0.6	6.36	5.06	1.30
Orange 9N	83.8	65.8	74.8	1.3	2.83	5.14	-2.31

 Table 2: Golden Triangle first order stations temperature and rainfall data for spring 2023.

### **Corpus Christi Regional Summary**

### **Rainfall Finally Arrived from March to May**

#### By: Juan Carlos Peña Jr., Meteorologist, Corpus Christie NWS

Despite remaining below normal, rainfall finally returned to South Texas in March. With the arid winter months, soils were extremely dry. The biggest winners were observers across Jim Wells and Duval Counties, with accumulations from 1.50-2.00". Everybody else generally received around an inch or so with only a few locations receiving less than 0.50". Even though we finally to some rain, accumulations for the month of March remained below normal. While only Jim Wells and Duval Counties saw close to their normal rainfall amounts for March, the rest of the South Texas only got about half the amount they normally do for the month. But, with the El Niño Southern Oscillation (ENSO) going into an El Niño neutral phase from La Niña in March, there was hope for more normal rainfall in the upcoming months.



Figure 1: March preliminary precipitation totals for South Texas.

### **Corpus Christi Regional Summary (continued)**



Figure 2: March preliminary percent of normal rainfall for South Texas.

With the new ENSO phase for April, the beneficial rains arrived in South Texas. Not only was the rain beneficial, but for the first time in a while mostly all South Texas saw more rain than normal. Apart from the plentiful moisture across the region, upper-level disturbances and cold fronts played a huge role is producing this efficient rainfall. Areas west of LaSalle and Webb Counties saw from 4.00-10.00" of rain while observers in LaSalle and Webb reported accumulations from 1.00-4.00" for the month. The biggest winner once again was Jim Wells with western Nueces County joining them this time, with monthly rainfall reports up to 8.00-10.00". Elsewhere across the Coastal Bend, Coastal Plains and Victoria Crossroads, observers reported accumulations from 4.00-7.00" for the month. So how much more rain did we get in for the month compared to climatology? The Coastal Bend and Coastal Plains got 350-600% of normal rainfall while the Victoria Crossroads and Brush Country came back at 100-200% and near 100% of normal rainfall, respectively. To put those numbers into perspective, 100% is normal rainfall while 200% is twice as much, so 350-600% comes out to be 3.5-6 times as much rainfall as we normally get for the month of April.

### **Corpus Christi Regional Summary (continued)**



Figure 3: April preliminary precipitation totals for South Texas.



Figure 4: April preliminary percent of normal rainfall for South Texas.

The active weather pattern continued into May with late season upper-level disturbances and fronts moving across South Texas. Most of South Texas (all but the southern Coastal Bend) continued the wet trend observing normal to above normal rainfall for the month of May. The southern counties of South Texas from the Coastal Plains to the Brush Country saw observers reporting monthly accumulations between 2.00-4.00" while the northern counties from the Coastal Plains to the Brush Country

## **Corpus Christi Regional Summary (continued)**

saw from 4.00-8.50". Most observers across the Victoria Crossroads reported accumulations from 4.00-6.00" with only a couple of observers reporting the highest accumulations from 6.00-7.00". Meanwhile in the drier spot of South Texas across the southern Coastal Bend, observers only reported from 1.00-2.00" with isolated amounts up to 3.00". Comparing the observations to climatology, most of South Texas saw 100-200% of normal rainfall for the month except for the southern Coastal Bend who saw 30-90% (below normal) and LaSalle which saw 100-300% of normal rainfall.



Figure 5: May preliminary precipitation totals for South Texas.



Figure 6: May preliminary percent of normal rainfall for South Texas.

## **Amarillo Regional Summary**

### May 18-19, 2023, Supercells in the Texas Panhandle By: Aaron Ward, NWS Amarillo

#### Overview

An upper-level storm system combined with ample moisture, instability, and surface lift in the vicinity of a diffuse boundary to produce severe thunderstorms across portions of the Texas and Oklahoma Panhandles during the afternoon and overnight period of May 18th into May 19th. The atmospheric moisture was well above normal which led to very heavy rainfall rates in the stronger storms, some of which exceeded 4 to 6 inches per hour. This led to some flash flooding and river flooding. Some storms also produced large hail up to tennis ball size along with very strong winds associated with supercell rear flank downdrafts. Finally, one very brief tornado was confirmed in Carson County.



Supercell hail core near Stratford, TX by Kyle Cutler



Picture 1 above

Picture 2: Carson County Supercell

Tornadoes:	
Tornado - 4 SSE Panto Carson County	ex
Date	May 18th, 2023
Time (Local)	10:02 - 10:03 PM CDT
EF Rating	EF-1
Est. Peak Winds	90 MPH
Path Length	0.10 miles
Max Width	25 yds
Injuries/Deaths	0
Summary:	

A brief tornado touched down just east of FM 2373, about 4 miles SSE of Pantex in Carson County. It caused some broken tree limbs and tossed a dumpster several yards back to the south. It damaged an attached garage, collapsing the structure. It also blew some horse trailers over in a nearby field. The tornado lifted in an empty field.

### **Amarillo Regional Summary (continued)**

Flash flooding was reported in Amarillo, Sunray, Cactus, Canyon, and in the Palo Duro Canyon State Park. River flooding was also detected among several river flood gauges across the Texas Panhandle through May 19th. The Canadian River 19 miles north of Amarillo at the U.S. Highway 287 bridge topped flood level early Friday morning (Friday May 19th, 2023). Impacts included flooding of dirt roads near the river from the bridge downstream to Rosita Creek Flats Recreation Area, where primitive camping occurs. The river crested at 8.24 feet. The last time the river was this high was in August of 1996 when it crested at 7.69 feet. The Prairie Dog Town Fork of the Red River crested right at flood stage Friday morning (5/19/23) from runoff from P.D. Canyon State Park. At 10 feet the river will start to overflow its banks and affect adjacent ranch land. The last time the river was above flood stage was last year on July 30th when it reached a stage of 11.25 feet.



This photo shows the Dixon Creek near Borger which feeds into the Canadian River. After some assessment from land owners in the Dixon creek area east and south of Borger they found numerous fences that washed away. Most of these fences were 4 ft deep and concreted in. The Dixon Creek was approximately 20 ft wide before the rain and now it's flowing at over 100 ft wide. The land owner stated that the flood completely changed the topography of the creek.

#### Picture 3: Dixon Creek near Borger



Figure 1: Hydrographs of the Canadian River, Red River, and Palo Duro Creek

## **Amarillo Regional Summary (continued)**





## Wichita Falls Regional Summary

### **Beneficial Rain without Much Severe Weather This Spring**

### **By: Charles Kuster, NSSL**

Generally, our spring brought beneficial rain and a decrease in drought intensity for many areas. We saw slightly below normal precipitation in the northwest portion of our region and slightly above normal precipitation everywhere else (Fig. 1a). We also experienced slightly below normal temperatures this spring (Fig. 1b). The rain and cooler temperatures led to a decrease in drought severity across much of the region, according to the Drought Monitor (https://droughtmonitor.unl.edu/), except in Hardeman and Foard Counties where severe to extreme drought still exists (Fig. 2). In general, there was not much severe weather during the spring, though there were a couple instances of large hail and damaging winds, and we had no preliminary tornado reports in our region this year. In total, the entire spring saw 58 dry days (all CoCoRaHS stations reported less than 0.05") and 34 wet days. For comparison, last spring the region experienced 75 dry days and 17 wet days.



Figure 1. Departure from normal a) precipitation and b) temperature for the beginning of March 2023 through the end of May 2023. 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).



Figure 2. 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) February 28, 2023, and b) May 30, 2023.

### **East Texas Regional Summary**

### Severe Storms across East Texas with Tornados & Hail

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

A very busy start to spring 2023, as widespread severe weather moved into the region by March 2<sup>nd</sup>. Four tornadoes touched down across East Texas, along with several reports of thunderstorm wind damage. Despite the severe weather, several CoCoRaHS sites reported beneficial rainfall, with totals generally around 1" area wide. Another 1" to 2" of rainfall fell across many of the CoCoRaHS sites between the 7<sup>th</sup> and 9<sup>th</sup> of the month, as a stalled cold front slowly drifted south across the region. Severe weather returned to the region on the 16<sup>th</sup>, along with more widespread rainfall. Rainfall amounts were again in the 1" to 2" range, although a few sites in Angelina County reported totals over 3". Quarter size hail was reported in the city of Tyler in Smith County, and about 9 miles southwest of Henderson in Rusk County. More severe weather returned on the last day of the month, with several public reports of hail. Some of this hail was as large as golf ball size, specifically in Titus and Shelby Counties.



**Image Courtesy of Brad Arnold** 

West of Jefferson, TX (Marion County) **Image Courtesy of Brian Emfinger** 

The month of April also started off with severe weather, as a complex of storms produced widespread golf ball size hail on April 2<sup>nd</sup> in Gregg and Harrison Counties between the Longview and Marshall metro areas. Another complex of storms also produced golf ball size hail and hour or so later near Lake O' the Pines in Upshur and Marion counties. Those complexes were also high rain producers, as several CoCoRaHS sites in those counties reported 2" to 3" of rainfall with those storms. More severe weather was reported on the 5<sup>th</sup> and 6<sup>th</sup> of the month with the passage of another trough/cold front. This included a weak EF-0 tornado in Cass County near Linden, quarter size hail in Cherokee & Panola counties, and flash flooding in Angelina & Shelby counties. Generally, quiet conditions for an extended period, before severe weather returned on the 15<sup>th</sup> with golf ball size hail in Shelby and Sabine counties. More severe followed on the 20<sup>th</sup> with a few scattered reports of hail and an EF-0 tornado in the city of Tyler, which was captured by the public and several media outlets. Probably, the highlight of the month occurred several days later the 26<sup>th</sup>, when a cluster of thunderstorms produced a swath of large hail through Smith, Rusk, and Shelby counties. This hail ranged from golf ball to baseball size and completely covered the ground in many areas. Extensive damage was reported, especially in Rusk County in the town of Henderson, where many windshields and skylights were broken from baseball size hail.



Fig.3: Large Hail - April 2, 2023 Kilgore, TX (Gregg County) Image Courtesy of Kayla Nation



Fig.4: Tornado - April 20, 2023 Tyler, TX (Smith County) Image Courtesy of Cyle Brockway



Fig.5 & 6: Hail – April 26, 2023 Left: Henderson, TX (Rusk County), Right: Huxley, TX (Shelby County) Image Courtesy of Jesse Bridges (Left) & Brett Amy (Right)

A quiet start to the month of May. However, another round of severe weather formed across the region, as showers and thunderstorms develop along a warm front. Most of the severe weather occurred in the form of straightline wind damage. This system also brought widespread 1" to 2" across the region. More severe weather was reported on the 8<sup>th</sup> of the month, as thunderstorms produced golf ball size hail in Smith and Wood counties. By the 11<sup>th</sup>, a potent upper-level trough moved across the area producing widespread showers and thunderstorms. These storms became prolific rain producers, resulting in widespread flooding across Nacogdoches, Panola, Rusk, and Shelby counties. Some CoCoRaHS sites in those counties reported between 3" to 6" of rainfall. Fortunately, this was the last severe weather event across the region for the spring months. Overall, the spring of 2023 was very active. Although this resulted in several severe weather events across the region, it also kept the region drought free by the start of the 2023 meteorological summer.



Fig.7: Drought Monitor Image Courtesy of NDMC/USDA/NOAA

### **Brazos Valley Regional Summary**

### Spring 2023 Precipitation Summary Bryan-College Station/Brazos Valley Region, Texas

Victoria Elliott, Texas A&M University, Office of the State Climatologist of Texas



#### Summary:

As the saying goes, March Winds bring April Showers! Throughout the first month of spring, conditions were on the dry side while the start of April reversed this trend. With a sharp increase in accumulations during April 6-8, rain totals continued to steadily climb through the rest of the season. The overall average rainfall accumulation for the Brazos Valley was 15.67" while the normal seasonal amount is around 11-12". As a result, we received 130% of what is normally expected for spring in our area. While all counties in the Brazos Valley exceeded the "normal" threshold, some had higher departures than others. Grimes County had the highest precipitation anomaly at 4.84" above normal, followed by Brazos (4.7"), Walker (4.63"), Trinity (4.12"), Houston (3.53"), Burleson (2.93"), and Washington (2.49"). All this rain was very helpful in stopping the impending drought conditions attempting to encroach on our area during the earlier part of the season, leaving us with no abnormal dryness by the end of May.

#### **Observer Statistics:**

Throughout the spring season we had 62 active observers reporting their precipitation totals, with 40 observers missing no more than 10 days of reporting. Of these, 23 did not miss a single day! Overall, 55 stations were used to calculate this season's records. We thank you for your vital contributions.

#### Season Statistics:

Wettest Day: 5.06", April 7, Walker County
Wettest Seasonal Total: 21.68", Walker County
Driest Seasonal Total: 11.49", Walker County
Soggy Socks Award: (longest spell with measurable rain): 12 days, May 6-17, Grimes County
Dusty Soles Award: (longest spell without measurable rain): 17 days, March 4-20, Grimes County

## Abilene/San Angelo Regional Summary

**Roller Coaster Temperatures & Spotty Precipitation** 

By Joel Dunn, Observation Program Lead, NWS Abilene/San Angelo

Spring 2023 began with a shift in the large-scale oscillation of La Nina and El Nino. During the past three years, La Nina had dominated, leaving our summers hot and dry and our winters with a rollercoaster of temperatures. Yet now, there would be a shift to a neutral pattern followed by El Nino in May - June. The following charts, graphs, and tables will summarize the past three months, and it is evident that the shift occurred in May.

The charts below depict how 2023, under neutral conditions, compares to 2022, under La Nina conditions. Other factors contribute to rainfall amounts, of course, yet a snapshot of spring 2022 and spring 2023 shows an uptick in precipitation, though two of the three months still came in below normal.



Chart 1 through 3 - 2022 to 2023 Precipitation Comparison for Abilene, San Angelo, and Junction

#### March 2023

As mentioned, March, now under the influence of neutral Nino conditions (ENSO-Neutral), remained below average for precipitation despite several rounds of showers and thunderstorms, the totals were not high enough to break even.



Image 1 - Monthly Observed Precipitation for March

The above image shows all West Central Texas experienced at least some precipitation, though clearly, the north and west portions received higher totals overall. Areas such as Brown and Coleman Counties had higher counts, yet those came at a price. Severe weather accompanied many of these storms with hail larger than quarters and golf balls, and even damage from strong straight-line winds. Chart 4 below breaks down the severe weather warnings issued during March.

### Abilene/San Angelo Regional Summary (continued)



Chart 4 – Warnings issued per county during March

#### April 2023

If one were to examine the data from our automated sites at Abilene, San Angelo, and Junction, it appeared as if rainfall had increased, apart from the Concho Valley. However, if one were to view a map of West Central Texas, the picture, as it were, would become clearer.



Image 2 - Monthly observed precipitation for April

While the Big Country, Northern Hill Country, and Heartland saw a slight increase in precipitation, the Concho Valley and Northern Edwards Plateau saw a decrease. The reason for this may have been the availability of moisture during peak heating when most storms began developing. Yet, April's showers weren't only bringing May flowers, they were bringing severe hail, damaging winds, and tornadoes. The increase in precipitation came at a price. A 30% increase in warnings occurred during April. There were forty severe thunderstorm warnings, along with a single Tornado warning and a Flash Flood Warning. The following chart breaks down the number of warnings per county.

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## Abilene/San Angelo Regional Summary (continued)



Chart 5 - Number of warnings per county for April

#### May 2023

On average, May is the wettest month of the year for West Central Texas; combined with the influence of the now-in-place El Nino, you get a very wet month.

City	May Precipitation	Departure from Normal
Abilene	5.36"	+2.15"
Brownwood	8.12"	+3.87"
Haskell	5.50"	+2.15"
Junction	4.08"	+0.92"
San Angelo	4.19"	+1.14"
Sterling City	3.28"	+0.53"

#### Table 1 - May precipitation

Every location received above-normal precipitation, though not every thunderstorm produced severe weather. However, severe hail, damaging winds, flash flooding, and at least one tornado was present and received warnings. May had considerably more warnings than April due to the drastic increase in activating. To better understand, see the image 3 next page.

## Abilene/San Angelo Regional Summary (continued)



Image 3 - Comparison between April and May warnings across the West Central Texas

On the left, are all the warnings issued during April. On the right, are all the warnings issued during May. The increased activity in severe weather is evident. Tornado warnings are included in the list. Eight Tornado warnings were issued in May, though only one tornado was confirmed, in the town of Funston. The assessment team estimated the tornado was a quarter mile wide.

May concluded wet and warm which was a welcome change to the hot and dry conditions West Central Texas has experienced over the last few years.



Image 4 - Observed precipitation for May

## **Rio Grande Valley Regional Summary** Drought...Out! Early March Dryness Erased by Spring Rains

Severe Thunderstorms Cause Repeat Damage in April and May

#### U.S. Drought Monitor March 7, 2023 U.S. Drought Monitor June 6, 2023 d Thursday, Mar. 9, 2023) Valid 7 a.m. EST d Thursday, Jun. 8, 2023) Valid 8 a.m. EDT **Brownsville/Rio** Brownsville/Rio Grande Valley, TX WFO Grande Valley, TX WFO 96.5 3.00 Last Wee ast Week 181 0.00 0.00 01 0.00 0.00 95.51 49.64 0 Start o slend ar 57 24 42.53 0.00 0.00 0.00 0.00 0.00 0.00 10.11 D0 A 03 Extreme Drough D0 A D1 Moderate D Author USDA USDA droughtmonitor.unl.edu nitor.unl.edu droughtn

*Figure 1*: Severe (D2) Drought covered the Lower Rio Grande Valley, with Extreme (D3) Drought covering the South Texas Brush Country/Rio Grande Plains from Zapata through Kenedy County to begin spring 2023. Frequent and locally heavy rains that began March 28<sup>th</sup> in the Lower Valley and eventually covered all Deep South Texas through spring erased the drought and dryness by the start of June 2023.



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

Figure 2: Annotated rainfall map for spring 2023 across the Lower Rio Grande Valley/Deep South Texas region.



Figure 3. Rainfall departure from average, March 13 through June 10, 2023. This includes the balance of spring rainfall, along with additional localized rains across the region from June 3 through 8, 2023.

#### Month-by-Month Summary

**March** picked up where February left off: Warm, breezy to windy, with no rainfall of note. The spring drought peaked in March, with difficulties noted by farmers and ranchers providing water to thirsty crops and livestock as the month wore on. On March 4<sup>th</sup>, a day with low humidity and a modest afternoon sea breeze, two large wildfires were noted: one in southwest Brooks County that burned more than 900 acres, and a second of unknown size but visually reported just west of the Border Patrol Checkpoint along U.S. 77 just north of Armstrong (Kenedy County). Though largely rain-free weather persisted across the Brush Country/Kenedy Brooks County ranches for most of the month, these were the only known large wildfires – a sharp decline in acreage burned between February and April 2022, when more than 30 thousand acres burned mostly across farm/ranch country north of the populated Lower Rio Grande Valley. A strong emphasis on wildfire prevention from NWS and core partners may have been a difference maker – before the onset of late March and especially April rains put an end to the wildfire season later in April, when green-up began in earnest.

A band of torrential-rain producing thunderstorms during the afternoon of March 28<sup>th</sup> developed and moved from southeast Starr County along the IH-2 corridor and along the Rio Grande before winding down in Cameron County. Between 3 and nearly 5" fell across the McAllen metropolitan area, in some cases, double the monthly average in just one day. The rain was a harbinger of weather to come during April and May, which would become the most active severe weather season in the Valley since 2012.

The warm to hot and dry first half of March, which culminated in triple-digit heat on the 12<sup>th</sup> away from the coast set the temperature tone for the month. A St. Patrick's Day Weekend cold snap briefly dented the warmth, as another triple-digit day arrived on the 24<sup>th</sup>. Overall, temperatures ranged from 2 to 4 degrees above the 1991-2020 averages, and ranked around the top ten warmest on record.

The combination of continued warm to hot, dry, and occasionally breezy conditions with increased releases from Falcon International Reservoir to aid agricultural needs in northeast Mexico as well as the Lower Valley resulted in a 20-year low of the total water storage levels at month's end. The rains which soaked the IH-2 corridor on March 28 missed the Lower Rio Grande

basin's headwaters, and values plunged to as low as 11.4% of total capacity. Increased releases would soon follow from Amistad International Reservoir to help backfill some of the lost water into Falcon, but values on rose to 17% of capacity by mid-April – still very low for future water supply needs.

**April** opened dry and warm, before the season's final notable cool front arrived on the 6<sup>th</sup> and was followed by deep southwesterly flow aloft which ultimately produced a widespread and drought-quenching rain event on the 6<sup>th</sup> through the 8<sup>th</sup>. Rainfall across all the eastern half of Texas was "manna", with peak rainfall of 5 to 8 inches between Houston and Austin/San Antonio. For the southern tip of Texas, 1 to 3" of 'cool' rain was quite helpful, with Severe (D2) to Extreme (D3) Drought reduced to mostly Abnormal Dryness (D0) for the populated Lower Valley and D1 (Moderate) for most other areas by April 11.



Figure 4. CoCoRaHS rainfall (50 percent completeness or greater) for the Lower Rio Grande Valley/Deep S. Texas region, April 5 to 8th



Figure 5. Drought monitor changes from prior to the April 6-8 rain event and after. Extreme (D3) Drought was eliminated across the Rio Grande Plains/Brush Country/Kenedy and Brooks ranches with a two-category improvement in many locations. For the entire area, at least a one-category improvement was realized.

Temperatures gradually recovered into mid-April, with drier fronts keeping readings from recovering much; highs in the mid to upper 90s occurred on the 15<sup>th</sup>.

Then the action began.

The persistent and speedy westerly flow aloft which had kept dry air dominant for much of winter through the end of March tilted a bit more southwesterly, coinciding with the natural increase in sun angle and mid-spring warming. At the same time, warm to very warm sea surface temperatures extending from the Gulf through the western Caribbean and coastal tropical Pacific Ocean along the southern Mexico through Central American coast helped "juice" the lower levels of the atmosphere with increasingly unstable air. On April 21<sup>st</sup>, the region saw its first severe weather coverage event – in the form of large to very large hail in several supercell/storm clusters that ripped through the region from northwest to southeast during the Friday afternoon commute. Two days later, a front cruising across south Texas acted on the reservoir of unstable air, with inflow of mid-level dry air providing momentum for wind gusts between 50 and 75 mph across much of the Lower Valley. The strongest winds were noted from Raymondville to Bayview, where some structural damage was noted to substandard/poorly anchored structures exposed to the northerly microburst, as well as hundreds of tree limbs felled.

April saved its worst for last, with another front linking up with a speedy jet streak and running into more unstable air from late evening of the 28<sup>th</sup> through the post-midnight hours of the 29<sup>th</sup>. A break-off cluster of mainly hailstorms in Starr and Zapata County during the mid-evening of the 28<sup>th</sup> organized into a small but potent squall line around midnight on the 29<sup>th</sup>. The squall line accelerated along/near the Rio Grande, across heavily populated Hidalgo County before rolling down the U.S./Mexico border region in Cameron County. Damage "worse than Hanna" struck hundreds of buildings, signs, power lines, trees, and limbs on a line from near Mission/La Joya through McAllen and Pharr, continuing the south side of Donna and Weslaco before hugging the Rio Grande along U.S. 281 in southwest Cameron County. When the damage is fully counted, it is likely that between \$50 and \$100 million in insured and uninsured damage from the 75 to 85-90 mph winds will be realized.

A full story on the events of late April 2023 for the Lower Valley can be found here.

Each event brought more welcome rainfall that joined the unwelcome severe weather. Another 1 to 3+ inches fell across the Lower Rio Grande Valley region (Starr, Hidalgo, Willacy, Cameron) between the 28<sup>th</sup> and 30<sup>th</sup>, ensuring that continued drought improvements seen through mid-month would be able to hold through May. By the start of May, Abnormal Dryness (DO) was all that was left of the former D2 and D3 drought across the Brush Country, with the populated Valley now wet and green. Total monthly rainfall, which ranged from 4 to 8 inches across the southern tip of Texas (with a few pockets of 2 to 3" in northern Hidalgo and northern Zapata), ranked among the top ten wettest all-time for April. This included Brownsville (5.04", 8<sup>th</sup> wettest) and McAllen (5.01", 4<sup>th</sup> wettest).



Picture 1 Left: Large hail up to baseball size blew out this vehicle's rear window near Peñitas on April 21<sup>st</sup>, 2023; large hail >2" in diameter was noted in the Mission/McAllen area as well as across the border in Reynosa, Tamaulipas, Mexico. Picture 2 Right: A flipped Cessna aircraft at McAllen/Miller Airport from the "midnight madness" of April 29<sup>th,</sup> 2023. Surface and top-floor wind gusts in this area were estimated at 80 to 90 mph. Left photo credit: Oscar Sobrevilla, Televisa Noreste (Mexico).

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## **Rio Grande Valley Regional Summary (continued)**

**May** continued the active pattern, with more upper-level disturbances acting on increasingly warm/humid airmasses to create frequent squall line events through the month. While each event brought more helpful rain which would ultimately remove all dryness from the Deep S. Texas ranch country by early June, some of them came with a price that included more damaging winds and hail. The severe weather would persist into early June – rare for the Lower Rio Grande Valley.

A quiet but increasingly "soupy" start to May was rudely interrupted by a rapidly developing squall line that punched through southeast Hidalgo and Cameron County just after midnight on May 9<sup>th</sup>, with 75 to nearly 90 mph winds raking Laguna Madre Bay and South Padre Island. Poorly fastened and exposed structures including an entire roof deck at an older condominium on Laguna Blvd., a partial roof deck at the South Padre Island Convention Center, and two recreational vehicles at Isla Blanca Park were impacted. Just four days later, a squall line raced across the Lower Valley, with outflow possibly impacting a "mini" supercell ahead of it. That supercell dropped an EF1 Tornado on Laguna Heights (near Port Isabel), with heavy impact to life and property. Tragically, one person died, and eleven others were injured when very substandard buildings they resided in were demolished by the 85 to 105 mph wind; a total of 60 buildings sustained varying levels of damage in the community.

Heavy rainfall joined the squall line and attendant mesoscale convective system; the rain would continue through late morning and early afternoon across much of the Lower Valley, with another 1" to 3" adding to the monthly and seasonal total.

Additional rain fell with scattered to locally numerous thunderstorms through the next week, with another round of strong to severe thunderstorms on Memorial Day Weekend that dropped more mentionable hail, and 1.5" to more than 3" in portions of Hidalgo and Starr County.

May 2023, like April, ranked in the higher echelons of the overall period of record; Brownsville landed at 18<sup>th</sup> wettest (5.52") and McAllen at 10<sup>th</sup> wettest (5.28"). Harlingen/Valley International Airport ended at 3<sup>rd</sup> wettest (6.42") – though historical data is spotty at that location. Harlingen/cooperative landed at 23<sup>rd</sup> wettest (4.65").



*Picture 3 Left*: Complete roof decking damage to the El Castile Condominium roof decking on South Padre Island, early on May 9<sup>th</sup>, 2023. Picture 4 *Right*: Demolished very substandard/unanchored structures in Laguna Heights from an EF1 tornado early on May 13<sup>th</sup>, 2023.

**Spring 2023** will go down as a tale of two seasons: A continuation of the warm and dry start to the year as by mid-March temperatures ranked among the top ten warmest and rainfall among the top ten driest. Then, a rather abrupt change too much wetter conditions beginning on March 28<sup>th</sup> and continuing right into early June. The wetter conditions erased the drought/dryness across the far south Texas/Lower Rio Grande Valley region by the end of spring, but it came at a destructive and unfortunately deadly cost in one case (Laguna Heights).

### Spring 2023



Figure 6. General 500 mb steering pattern for the period of March 28 through June 24, when the bulk of the spring rain and thunderstorm events occurred across the Lower Rio Grande Valley region.

Between April 21 and the end of May, there were six individual severe weather episodes – each causing a combination of strong/damaging wind and hail for many locations across the Lower Rio Grande Valley:

- April 21 (afternoon): Large/very large hailstorm that developed originally in Jim Hogg County and moved into two clusters across the RGV, one in the McAllen/Mission metro and the other from west Harlingen south the Santa Maria/Los Indios/La Feria/Mercedes.
- April 23 (afternoon): South-moving squall line that produced welcome rain across the upper and lower Valley, and 47 to 68 mph wind gusts by early afternoon (measured). Strongest storms ripped from near Raymondville through Arroyo City/Rio Hondo, Los Fresnos, and Bayview, where we estimated wind speeds up to 75 mph.
- April 28/29 (overnight): Hail and some strong winds in Starr County morphed into a mini squall line that ripped across southern Hidalgo and southwest Cameron. Strongest winds, 75 to 85+ mph, occurred between 1215 and 115 AM (roughly) from La Joya/Penitas through McAllen, south side of Donna/Weslaco, Progreso, and into Santa Maria-Los Indios.
- May 9 (overnight): Rapidly intensifying mini squall line produced 75 to 90 mph wind gusts mainly on South Padre Island and the lower Laguna Madre nearby.
- May 13 (overnight; pre-dawn): Squall line produced lower wind speeds overall (25 to 37 mph), though higher toward the coast (40-50). Episode known for the Laguna Heights tornado (EF1) occurred just after 4 AM.
- May 29: Memorial Day wind/hailstorms (afternoon)

Total property damage from all events in the period was likely to be well over \$100 million, which would be the most for a season since the legendary 2012 severe weather season, which included a six-week period of predominantly hail events, highlighted by the March 29, 2012, McAllen Hailstorm which alone resulted in several hundred million in property damage.

The good news? Farmers and ranchers had a very welcome reprieve from the water supply issue and drought impacts, and the temporary surplus gave renewed hope for a successful growing season – though an expected summer of dry and hot/very hot conditions could change the outcome from water-dependent dryland crops. The rainfall which continued through June 8<sup>th</sup> ended up high in the overall rankings (below), with Brownsville and McAllen ending up top-five wettest on record for the wet period, and Rio Grande City at 11<sup>th</sup> wettest. Shown is a slide for rainfall rankings through June 4<sup>th</sup>.



Figure 7. Measured rainfall and rankings for the spring into very early June 2023 wet period across the Lower Rio Grande Valley.

Summer 2023 may well revert the green gains to yellowing grass and brush – and a resumption of dryness and moderate (D1) drought. But the end of spring was quite a nice site of lush green landscapes, courtesy of the rainy pattern.



Green Streets: North Brownsville Road bathed in green after multiple April rain events in 2023.

### **Texas Summer Weather Outlook**

### A Typical Texas Summer with Normal Rainfall

#### By: Bob Rose, Lower Colorado River Authority, Chief Meteorologist

Ah, summer. It's the longest of the four seasons. Every year when summer starts to settle in here in Texas, it seems Mother Nature sets the weather on autopilot, and it doesn't get changed until sometime in September or October. The seven-day weather forecast can show hot and dry conditions for each day and rarely be wrong. In all seriousness, summertime weather in Texas often doesn't show a lot of day-to-day change. This comes about as the jet stream retreats up to the north and a subtropical ridge of high pressure sets up across Texas and the southern U.S. But not every summer is the same. Some are noticeably hotter than the typical "Texas hot", while others can be much wetter than what is typical. This begs the question as to what we can expect for summer 2023.

Figuring out the outlook for summer 2023, it's important to look back at a couple of the big weather highlights from spring. This spring, widespread soaking rains developed across most corners of the state, leading to significant drought improvement, and recharging some much-needed moisture into the ground. This is important for two reasons. The moisture from this spring's rains should help moderate down summer's temperatures a small amount. This happens as some of the sun's energy is used to evaporate soil from ground, rather than all of it going to heat up the landscape. In addition, the soil moisture should deter the summer "death ridge", or subtropical ridge of high pressure, from developing directly over the state as it did last year. Ridges prefer to set up over areas that are dry, with little soil moisture.

Also, this spring, the multi-year La Niña finally ended and was quickly replaced by El Niño. This is a huge change and it happened so quickly! A belt of unusually warm water is now in place across the tropical Pacific as opposed to the belt of unusually cool water that was in place last spring and summer associated with La Niña. The reversal of the cold water to warm water can often affect the position of ridges, troughs, and weather patterns around the globe as we go through summer and fall.

Taking El Niño and the spring's soil moisture into account, most computer-forecast solutions call for this summer's heat ridge to set up and hang out more across northern Mexico and the Desert Southwest, rather than across Texas. With the ridge centered to our west, it means summer temperatures will indeed be hot, but not to the extreme level like we saw last summer. In addition, with the center of the ridge positioned to the west of Texas, it will leave open the possibility for occasional atmospheric disturbances to move across the state, producing occasional periods of rain. A clockwise wind flow around the ridge will help to steer potential disturbances southeast out of the southern Plains or westward off the Gulf of Mexico.

### **Texas Summer Weather Outlook (continued)**

Putting all these factors together, it's looking like this will be a typical hot summer across Texas, with slightly above normal temperatures. Fortunately, readings shouldn't be to the extreme like we saw last summer. Rainfall is shaping up to be somewhat variable, with no strong signals for unusually dry or unusually wet weather. Totals should be somewhere close to normal.

The Climate Prediction Center's outlook for July-August-September shows 50-60 percent odds temperatures will average above normal across most of Texas. For rainfall, no clear trend is indicated, with equal chances for above, below, or near-normal rainfall.



Another hot and not so wet Texas summer is on the way. We should see periods of rain from time to time, but nothing unusually wet. Of course, like in any year, the summer pattern could be interrupted or changed by a potential tropical cyclone tracking inland from the Gulf of Mexico or the eastern tropical Pacific. Clouds and rain from a tropical system can potentially cause an extended break from the heat and dry weather, possibly lasting for a couple of weeks.

Be sure to take the all the necessary precautions this summer to keep you and your family cool and safe from the hot Texas sun.

### **Texas Gulf Coast Hurricane Season Outlook**

## Near average number of tropical storms and hurricanes expected for the 2023 Atlantic basin

#### By: Jeff Lindner, HCFCD, Director Hydrologic Operations Division/Meteorologist

This year features a couple of significant competing factors that will influence the Atlantic basin:

Atlantic seas surface temperatures (SSTs) are running well above normal for much of the basin and this supports the formation of tropical storms and hurricanes. Most of the warmth is in the region between Africa and the eastern Caribbean Sea where SSTs are generally 1-2 degrees above normal. This is a function of generally weak trade winds in the deep tropics and a relaxed pressure gradient which allows warming in this region. Elsewhere water temperatures are above average in the Gulf of Mexico and off the US east coast.

cdas-sflux\_ssta\_global\_1.png (1024×512) (tropicaltidbits.com)

The rapid formation of El Nino in the eastern and central Pacific continues with Nino region 3.4 now at the .70C above normal threshold (if this holds for the next month) El Nino will be declared. El Nino tends to produce unfavorable wind shear conditions across the southern Gulf of Mexico, Caribbean Sea, and portions of the deep tropical Atlantic, but generally does not impact formation areas in the sub-tropical Atlantic basin (north of 30N) or in the northern Gulf of Mexico. Given the fact that El Nino is continuing to quickly evolve, it is likely that this will have a significant impact on the Atlantic basin season (especially toward the typical "busy" months of August and September). <u>nino34.png (768×384) (tropicaltidbits.com)</u> The forecast for El Nino continues to strongly point toward El Nino conditions by mid to late summer into the fall months and based on the current sea surface temperatures in the eastern Pacific following the warmer guidance is likely the best forecast with Nino region 3.4 likely going above 1.0C by July or August. <u>figure06.gif (2295×1649) (noaa.gov)</u>

There are few analogs for such a pattern setup in the basin with an oncoming rapid El Nino and warm Atlantic basin SST's. While warm SST's favor thunderstorms in the tropics and lower background sea surface pressures, unfavorable upper-level winds (strong shear) will generally negate formation chances even if everything else is favorable. With that said, this is likely a year where there will be a few weeks where things all line up and a couple of hurricanes...potentially significant could form and track through the basin.

These types of years tend to also favor development close to the US coast northern Gulf of Mexico or off the SE US coast where wind shear is less and conditions more favorable than the deep tropics.... i.e., Arlene over the northeastern and eastern Gulf of Mexico late last week.

#### Atlantic basin 1991-2020 Average:

Tropical storms: 14 Hurricanes: 7 Major hurricanes: 3



## **Texas Gulf Coast Hurricane Season Outlook (continued)**

In addition to NOAA, CSU updated their forecast on June 1 indicating (15 tropical storms, 7 hurricanes, 3 major hurricanes). Interestingly the ECMWF model is forecasting a highly active Atlantic basin season with 17 tropical storms and 9 hurricanes while showing a very strong El Nino. I am leaning more toward the developing and potentially strong El Nino by the heart of the Atlantic basin hurricane season resulting in a near average season and a rapid shut down in the season by mid to late August.



Figure 1: N. Hemisphere Basin (Hurricane/Typhoon) Forecast (ECWMF model

CSU also predicts landfall/impact probabilities across the Atlantic basin. The probabilities for a landfalling tropical storm, hurricane, and a major hurricane along the Texas coast is listed below with (climatological average). Texas has a near average chance of a landfall of a tropical storm, hurricane, or major hurricane in 2023.

Tropical storm: 61% (61%) Hurricane: 36% (36%) Major Hurricane: 16% (16%)

It should be noted that seasonal forecasted number of tropical storms, hurricanes, and major hurricane have little to no bearing on landfall locations nor impacts. Significant hurricanes have occurred during strong El Nino years along the US Gulf coast (hurricane Alicia 1983, the last major hurricane to impact the upper Texas coast occurred in a strong El Nino year). Residents should be prepared each hurricane season for the potential impacts from tropical storms and hurricanes regardless of seasonal forecasts.

# Observer Information & News

### A New CoCoRaHS Approved Rain Gauge

A new approved rain gauge, the Tropo rain gauge from Climalytic Instruments, is now available to CoCoRaHS observers. This is a "premium" alternative to the Stratus gauge manufactured by Productive Alternatives. These are the only two gauges approved for CoCoRaHS (along with the NWS 8" standard rain gauge). The Tropo gauge incorporates many suggestions made by CoCoRaHS observers over the years for improving the overall gauge.

Features of the gauge that differentiate it from the Stratus gauge:

• The Tropo holds about 13" of water vs. 11" for the Stratus. This is something that will be useful in heavy rain-prone areas, like those that frequently affected by tropical systems. And although we prefer daily observations, the higher capacity also allows for heavier multi-day accumulations

- The funnel has pre-drilled holes in the rim for mounting the supplied bird deterrent spikes.
- The funnel and inner measuring tube were designed to make capturing the inner tube with the funnel extremely easy.
- The inner measuring tube has a wide base for stability in the outer tube and on your counter if pouring water into it.
- The funnel cap is deeper to minimize splash-out and locks on to the outer tube to minimize blow-offs.
- The gauges include hardware and a much better designed mounting bracket that easily secures to a post or to a pole.

• The gauge comes with a handle that slides into the mounting bracket to aid in pouring into the inner measuring tube for measurement. A small pouring spout is molded into the outer cylinder as well to prevent spilling while causing negligible impact to snow core sampling.

There are a number of other improvements as well, and you can read about those on the Climalytic Instruments web site.

### Do I Have to Use the Tropo Gauge?

NO. If you are currently using the Standard 4-inch diameter gauge, there is no need to change unless you want to. Below are pictures of the **only two approved gauges** to take observations for reporting data to CoCoRaHS.



Standard 4-inch Diameter Rain Gauge

Tropo Rain Gauge

Texas CoCoRaHS Observer

Spring 2023

## **Observer Information & News (continued)**



The only two gauges that can be used to measure precipitation for reporting to CoCoRaHS

#### What is included with the new Tropo rain gauge?

- · Handle
- · Mounting Bracket
- · Bird Deterrent Rods (x8)
- · Cap
- · Inner Tube
- · Outer Tube
- · Cable Ties (x2)
- · Wood Screws (x2)
- · Adhesive Strip
- · Instruction Manual



### **Observer Tips & Training Material**

### **Important Reminders**

#### Training Animation on CoCoRaHS Quality Assurance and Quality Control

There is a video on the CoCoRaHS YouTube channel, the subject of the animation is CoCoRaHS quality control and quality assurance. CoCoRaHS prides itself on data quality - it's extremely important for our users. This video explains the general process of the quality control of CoCoRaHS data, why data quality is important, and why it is important for observers to respond to inquiries about their observations. There are many times we hear an observer say something like "I didn't know anyone was looking at my data!" mostly in response to an inquiry about their observation. On the other side of the coin, we do have observers who are very miffed that anyone could possibly question their observation. Quality data begins with each observer, but in the event an error creeps in, we have your back! There is a team of people looking at the data each day and a whole list of things that are checked to keep those errors to a minimum. With anywhere from 10,000 to 15,000 observations coming in per day, quality control (QC) is a big task. We encourage all of you to view this 3-minute video when you have some time.

#### If You Move, or Change Your Email Address

If you are moving to a new home and want to continue to participate in CoCoRaHS, please let us know as soon as possible. Your observations are tied to a specific location, so we don't want observations from your new location associated with your previous location.

When you know your new address, let us know. When you are ready, we will close your old station and open a new station at your new address (DO NOT sign up for CoCoRaHS again). Once that's done, you can enter observations from your new location. If you are moving to a different state, we can help you get in touch with that state coordinator so you can get started there.

Let us know if you change your email address so that your record is up to date. You can update your email address in the CoCoRaHS database yourself by logging in and clicking on My Account in the top line menu. Click on Edit in the My Information box. Make any corrections, then click save.

#### Don't Do the Dew!

Since dew is condensation (forms on the surface of an object) and not precipitation (falls from the sky), you do not report dew as Daily Precipitation. Don't report a Trace, either. You can, however, mention heavy dew and what was in your gauge in the comments. Not sure whether or not it rained? If there was rain in the forecast, or you have other reasons to think it might have rained (clouds, overcast), you can enter the amount of water in the gauge as precipitation and include a note about the dew and uncertainty about rain. If you have the means and desire, you can also look online to see what radar is showing. Sometimes being an observer means you might need to do a little detective work!

### **Scheduled CoCoRaHS Webinars & Information**

Webinar #86 - Thursday, June 29, 2023

#### The 420,002,023rd Year of Biomass Burning on Earth

#### Tim Brown

Director, Western Regional Climate Center Desert Research Institute Reno, NV



#### **Timothy Brown**

Wildfires dominate the media through pictures and interviews highlighting, and rightly so, destructive, and impactful events. Yet, there are many nuances about fire, and as far as we can tell, wildfire began on Earth around 420 million years ago. Today, it is a very complex physical and societal integrated system comprised of climate, fuels, and people. Wildfire, prescribed fire, smoke, watersheds, ecosystems, landscapes, traditional lands, and built environments are all interconnected through fire. Some days of the year are especially newsworthy, but every day and night there is something fire. This Webinar will present a narrative and perspective on good and bad fire, and the relationship with society.

Timothy Brown conducts applied research and applications development at the Desert Research Institute (DRI) in Reno, Nevada. His primary academic interests include wildland fire-climate and fire-weather connections; the wildfire environment; applications development for wildland fire management planning, decision-making and policy; the interface between science and decision-making; and user engagement through the deliberate co-production of knowledge. He is Director of the Western Regional Climate Center, and established and directs the Program for Climate, Ecosystem and Fire Applications (CEFA) at DRI. He is graduate faculty in the Atmospheric Sciences Program at the University of Nevada, Reno, and quandom Monash University Adjunct in the School of Earth, Atmosphere and Environment, Science Faculty in Clayton, Victoria, Australia.



Questions, Comments, and Suggestions about this newsletter are welcomed at the above email addresses.