



TEXAS CoCoRaHS OBSERVER



Autumn 2023

Vol. 9 - 3



Welcome to

The

Texas CoCoRaHS

Observer Newsletter

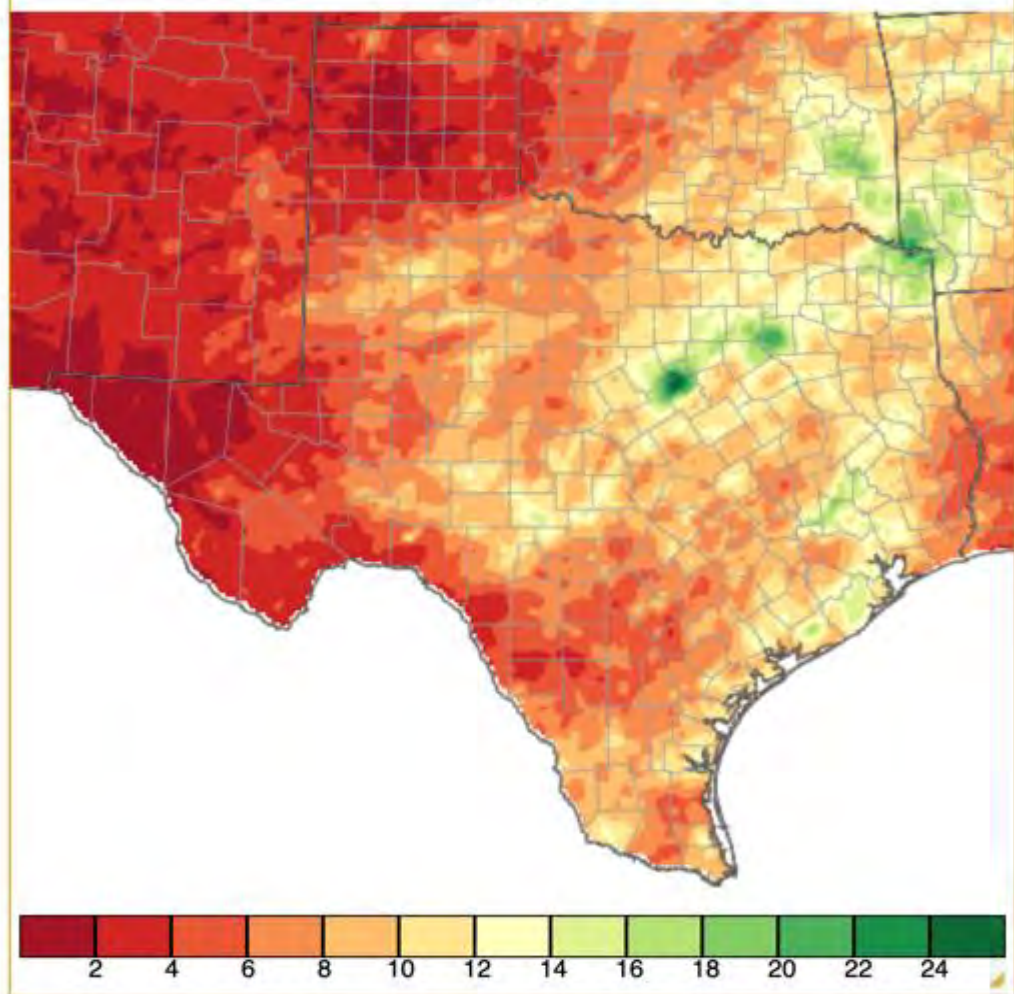
The purpose of this newsletter is to keep observers informed of the latest news, events, training, and happenings related to the CoCoRaHS program here in Texas, as well as news about the latest weather patterns affecting each region of Texas seasonally.

Texas Autumn Weather Summary

John Nielsen-Gammon, Texas State Climatologist

Figure from the PRISM group, Oregon State University, generated using SC-ACIS

Total Precipitation - September 1, 2023 through November 30, 2023



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The Atlantic hurricane season officially came to a close on Nov. 30. Was it an active season or a quiet one? It depends on your point of view.

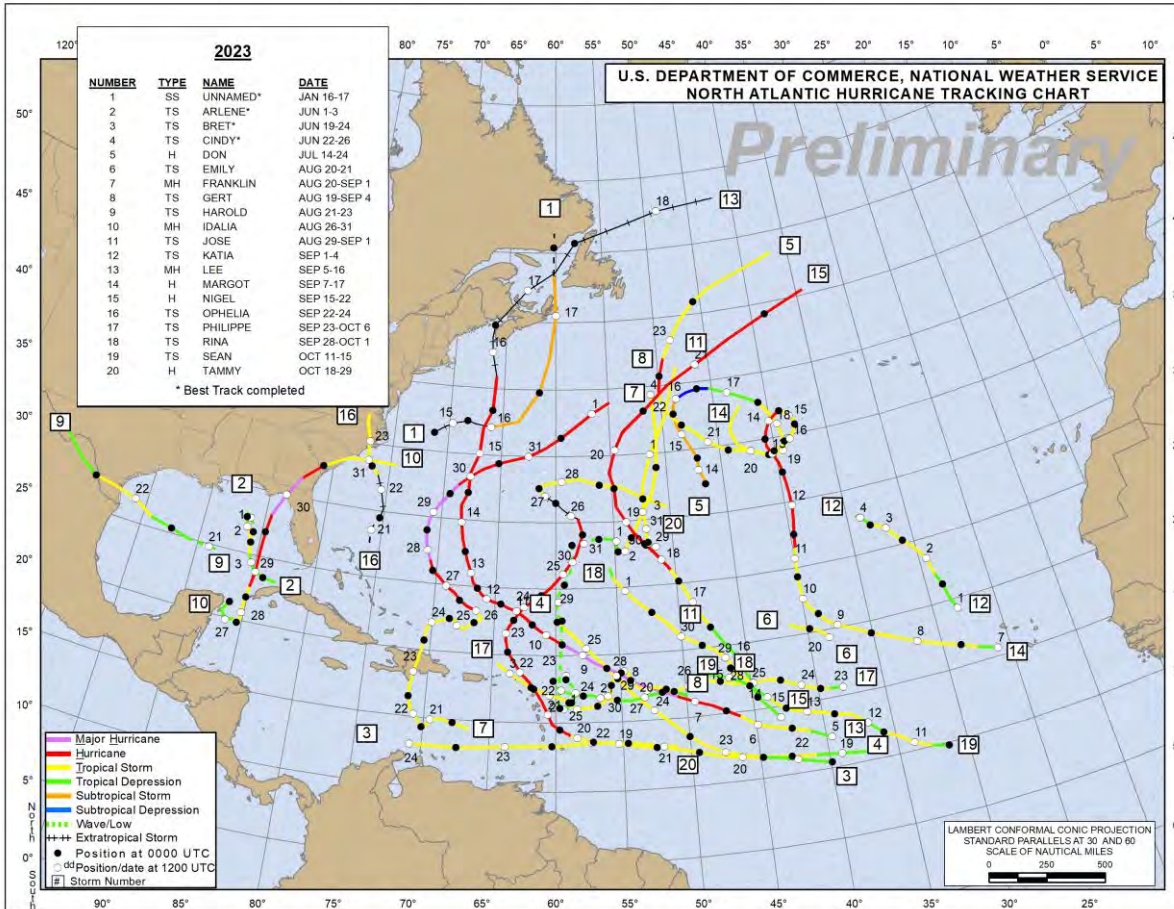
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"Because Every Drop Counts, As Do All Zeros"

Texas Autumn Weather Summary (continued)

In terms of named storms, it was a very active hurricane season. There were twenty named storms, which is fourth largest on record. On the other hand, there were seven hurricanes and three major hurricanes, both of which align with a normal hurricane season. So most of those named storms were wimpy little tropical storms that never made landfall.

One of the named storms was an unnamed storm. Can somebody please tell me how a storm can be named and unnamed at the same time? The storm in question was a subtropical storm in January, and apparently NHC didn't realize they had a nameable storm on their hands until it was too late.



Only four storms, including one hurricane, found themselves west of 75°W. Just a single storm, Harold, reached the western Gulf of Mexico, making landfall in Texas as a tropical storm. So from a Texas perspective, it was a very quiet hurricane season.

The difference in perspectives mirrors the difference in opinions going into the season. On one hand, an El Niño was developing, and the vertical wind shear associated with El Niño would be expected to reduce the number of Atlantic storms well below normal. On the other hand, the Atlantic Ocean was at record or near-record warm temperatures, and unusually warm sea surface temperatures usually lead to coastal storm activity. On the other hand, it was unusually warm just about everywhere this past summer. The problem with all this conflicting evidence is not that nobody has three hands, it's that nobody knew which effect would win out. Turns out it was a compromise: storms were suppressed in the Gulf and Caribbean where the winds were strongest, and storms were enhanced over the central and western Atlantic where shear was less but sea surface temperatures were still nice and warm.

Austin/San Antonio Weather Summary

Summer Heat Finally Wanes as October Rains Bring Some Drought Improvement

By Keith White – WFO Austin/San Antonio

After one of the hottest summers on record with widespread extreme drought in place across much of South-Central Texas, we all had high hopes for the changing of the seasons to bring cooler weather and rain. Especially as we entered our first El Niño fall since 2018, which typically begins to tilt our odds in favor of above normal precipitation by late Fall. Ultimately, most of our region did receive much needed rainfall and some improvement to the drought situation, however long-term drought impacts continue and are unlikely to abate prior to spring. Let's look back at how our weather fared, including several significant events.

Meteorological Fall began where the summer left off: with a string of 100+ degree days and no rainfall. A pattern shift arrived around the 9th which allowed for slightly cooler high temperatures mainly in the 90s, as well as numerous weather disturbances crossing South-Central Texas during the middle portions of the month. By the morning of the 17th, light rain amounts fell across a sizable portion of the area with locally higher amounts near 3-4" across portions of the Hill Country and southern Edwards Plateau as well as in portions of the northern Austin Metro area. Some locations in our southern counties received no rain from these rounds. Temperatures would then warm again for another week or so with little to no rain as subtropical high pressure ridging again took control of the weather over much of TX.

Additional rainfall would return on the 24th, but would bring more than we bargained for. A very strong supercell developed and strengthened as it pushed south across Williamson County, and would produce a swath of 0.5-1.75" of rain into central Travis County. However it also dropped a lot of very large hail ranging from golf ball (1.75") to nearly softball (3.75") size across portions of Georgetown, Round Rock, and north Austin, causing significant damage to homes, businesses, and vehicles. A few more isolated instances of large hail and damaging wind gusts occurred across portions of the Hill Country. There, more beneficial rainfall amounts of 1-3" fell in portions of Gillespie, Kerr, Llano, and Kendall counties. Temperatures would remain above normal through the end of the month, and September 2023 was the warmest September on record for portions of the region. Only isolated to widely scattered showers and storms occurred the rest of the month, but a few lucky locations did get some much-needed rain to wet the soils. Nonetheless, below normal September rainfall was observed across the majority of the region, except for across our northern Hill Country areas and near the Travis/Williamson County line.

Seasonally warm and humid conditions would continue into October. Record highs were set in many areas on the 4th. Bergstrom Airport recorded a high of 100, the latest triple digit day ever recorded in Austin. A cold front arrived early on the 5th and brought relief from the heat and some notable rain of 1-3" for parts of the Hill Country, Austin area, and Coastal Plains. Dry weather would follow for several days. The southeastern half of the region saw rainfall return on Oct. 10th, aided by some moisture pushing into the region from the remnants of Eastern Pacific Hurricane Lidia. The highest rainfall amounts came in Frio County where 2-3" was observed, but most areas saw less than 0.33". Scattered drizzle and light rain would continue on the 11th and 12th, with a cold front moving through slowly on the 13th and helping to bring a drier air mass to the region in time for the Annular Eclipse on the 14th. Although some locations in the path of annularity would see some cloud cover, it was generally thin enough not to ruin the experience.

Dry conditions then dominated for the next 8-9 days. Though temperatures fluctuated during early to middle portions of the month, another warming trend would take hold after the 17th and highs were back in the mid and upper 90s in many areas on the 20th. Above normal temperatures continued for another 9 days with the first true chilly day of the fall arriving on the 30th. In the meantime, a significant event unfolded on the evening of the 25th into the 26th.

Austin/San Antonio Weather Summary (continued)

That's when the combination of a slowly moving cold front and remnants of Hurricane Otis combined over South Central Texas to produce a prolonged period of heavy rainfall. Swaths of 5-7" occurred from the southern Edwards Plateau into the portions of the Hill Country (Figure 1). One CoCoRaHS observer west of Llano reported a 2-day amount of 7.92". Another swath of 2-4" occurred near the I-35 corridor from southeast of San Antonio through San Marcos and eastern portions of Travis and Williamson Counties. In addition to areas of flash flooding, the Llano River briefly reached Moderate Flood Stage, and flooding was also reported on the Nueces River. And as the rain was ongoing on the morning of October 26th, just enough low-level instability and low level wind shear developed to support low-topped mini-supercells, several of which went on to produce 5 EF-0 tornadoes between 630 and 9am. The most notable of these was a 5-mile track through eastern portions of San Antonio, including Fort Sam Houston, with estimated peak wind speeds near 80 mph.

The strongest cold front of the season pushed through the region on October 29th. Rainfall amounts immediately behind the front were rather paltry, but an upper-level disturbance would bring better rains later that evening through the early morning on the 30th. Although most areas only saw 0.25-0.75" of rain during this round, a few lucky spots picked up over 1". With strong winds behind the front, wind chills were in the 20s in the Hill Country, and highs on Oct. 30th remained mired in the 40s across the region.



Figure 1: Estimated rainfall from 7am October 25, 2023 to 7am October 27, 2023.

On the morning of November 1st, after clouds finally cleared out and winds died down, some lower-lying areas of the Hill Country and Austin Metro Area saw their first freeze with lows right around 32 degrees, give or take. This is around average for Kerrville, but a bit earlier than average for some other locations. A gradual warming trend would bring temperatures back into the 80s for a few days, with dry conditions through the first week of November. The next cold front arrived on the 9th, and brought with it widespread rainfall of 0.25-1". Some weak disturbances would allow for additional scattered, mainly light rain amounts over the next few days, but very little in the way of notable rainfall occurred for most of the rest of the month. Another cold front late on the 20th would bring a cool snap that would stick around for over a week. As a result, November was only the second month this year in many areas that ended with below normal average temperatures.

Austin/San Antonio Weather Summary (continued)

All told, our secondary wet season was a bit of a disappointment for an El Niño fall for most locations. Only our northernmost regions from Juno and Rocksprings to Llano and portions of the Austin Metro area received notably above normal rainfall over the past 3 months (Figure 2). Still, the rains we did receive were enough to limit short term drought impacts and put at least a small dent in some of the longer-term impacts. The U.S. Drought Monitor depiction of our drought status has improved significantly over the past 3 months across much of the Hill Country and Coastal Plains, although there were some degradations along the Rio Grande (Figure 3). We're now entering a climatologically drier period for the winter and so we expect low reservoir and aquifer levels as well as low streamflow volumes to persist until at least the spring.

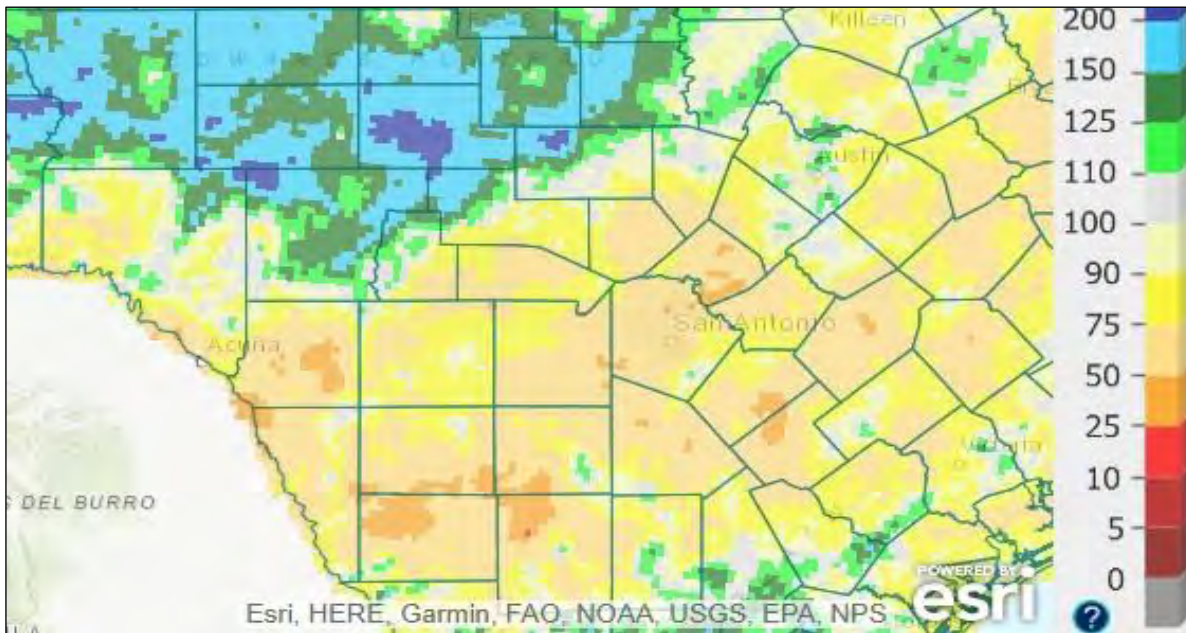


Figure 2: Percent of normal rainfall for the 90 days ending 7am December 1, 2023.

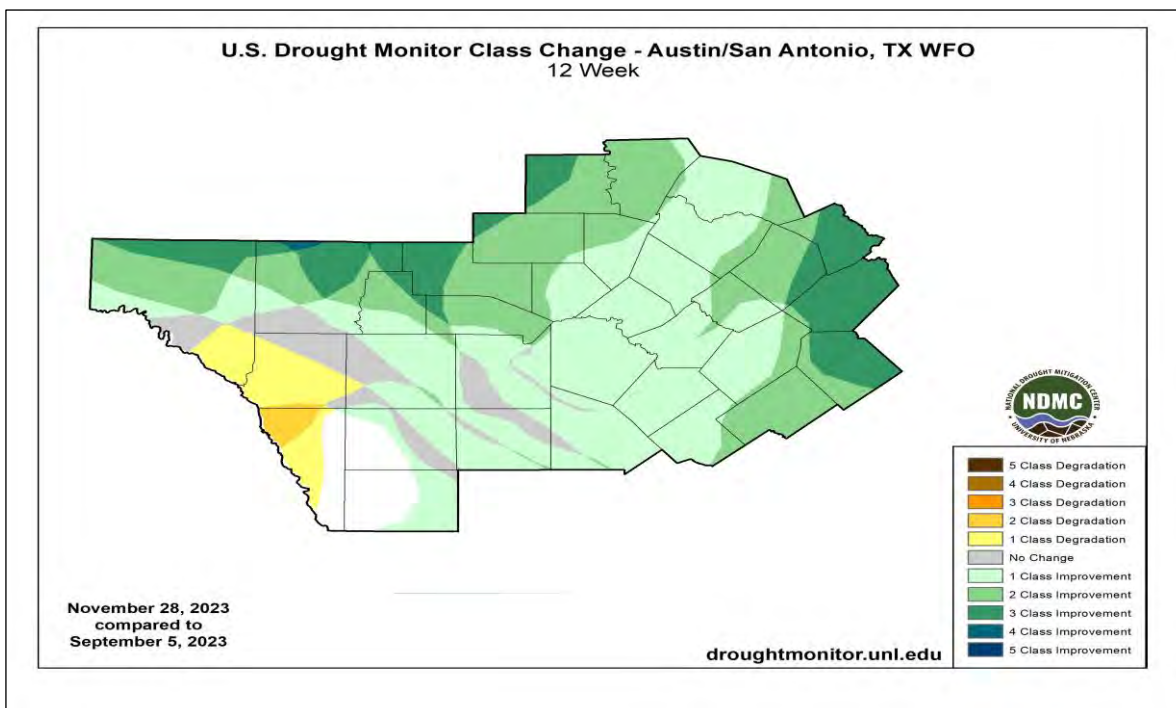


Figure 3: U.S. Drought Monitor 12 week change map between September 5 and November 28, 2023.

Brownsville/Rio Grande Valley Regional Summary

Record Heat Dominates September, but the Rains Came by November

By: Barry Goldsmith

Warning Coordination Meteorologist
NWS Brownsville/Rio Grande Valley

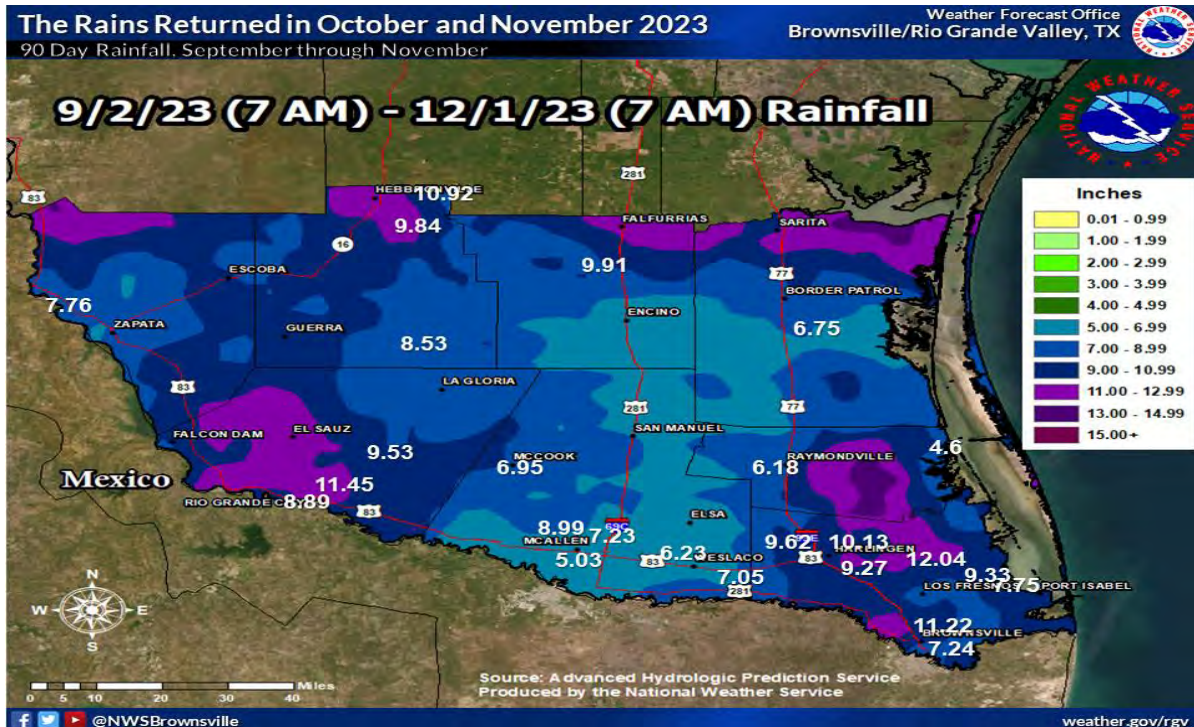


Figure 1. After a searing hot summer, which stretched into meteorological autumn (September and early October), the rains finally came in multiple events – first, thunderstorms east and west on October 5th, and more definitively, on Veterans Day Weekend (Nov. 10-14) .

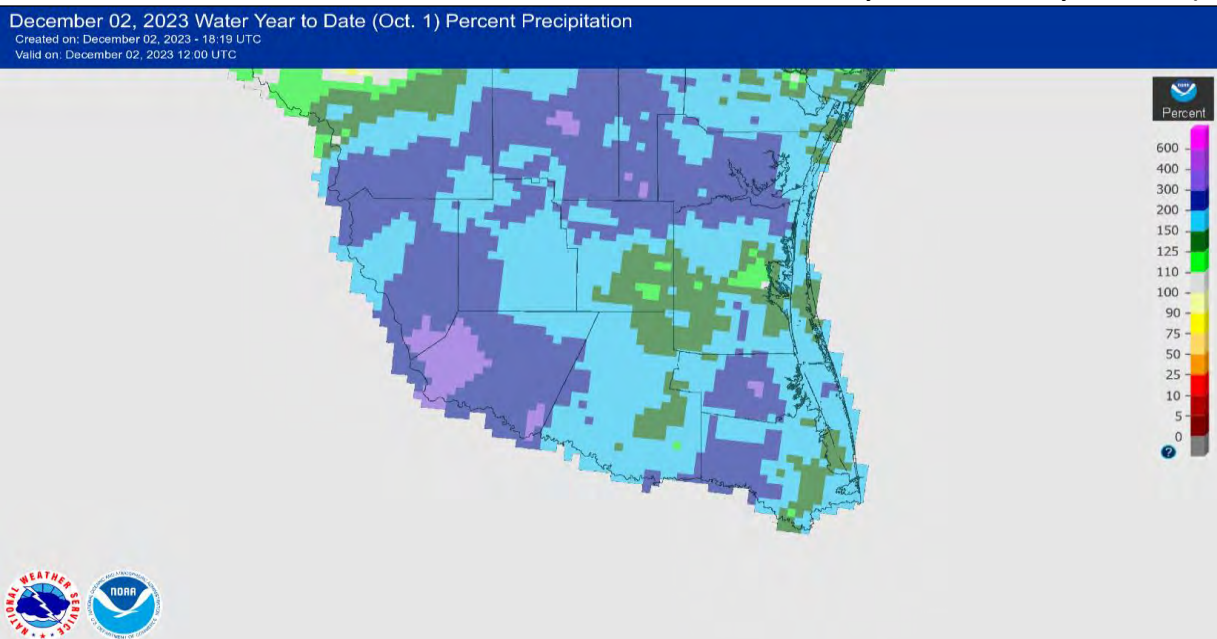


Figure 2. From the start of the water year (October 1) through the end of November, all regions of the Rio Grande Valley/Deep S. Texas Brush/Ranch country saw above average rainfall. The highest departures, two to more than four times average, occurred across the upper Valley/Rio Grande Plains, the lower Valley, and along SR-285 from Riviera to Hebbronville

Brownsville/Rio Grande Valley Regional Summary (continued)

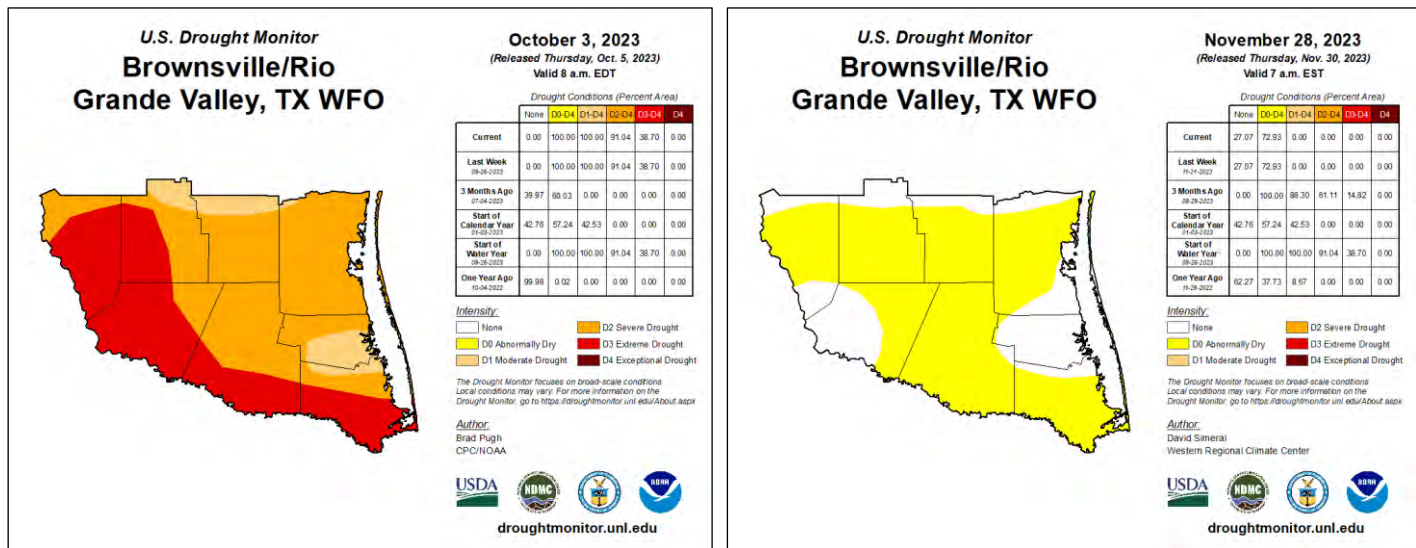


Figure 3. Severe (Level 2 of 4) to Extreme (Level 3 of 4) Drought covered the region to begin October – and had combined with record heat to severely impact livestock, late summer harvest dryland crops, and early winter-season planting by early October. A series of welcome rain events began on October 5th, and culminated in widespread 3 to 6” of rainfall between November 10 and 14. Additional rainfall around Thanksgiving and on the 30th was enough to remove drought, but dryness continued as much of the November rains were absorbed by thirsty top soil layers, with virtually no runoff.

Month-by-Month Summary

September picked up where the searing meteorological summer [link here] left off. In fact, locations with near-record heat from June 1 through August 31 become new records – in some cases by more than a full degree (F) – for the commonly understood Julian (astronomical) summer (June 21 through September 22). September alone shattered heat records at most locations across the Valley, and the continuation of “La Canícula (The pattern of the “Dog Days of Summer”)” through the start of October brought new September heat records to every location with available comparative data (Figure 4). That same pattern severely limited rainfall, with most areas at 10-25 percent of the monthly average (Figure 5). This was a huge factor in worsening drought impacts, as September is the wettest month of the calendar year, with 4.5 to 6” of rainfall on average. The record heat into early October allowed annual rankings (through the 5th) to soar into the top five at nearly every location, with Brownsville and Harlingen about 1 degree or more above prior year-to-date records. By the end of the searing heat (early October), new records of 100 degree days were shattered at most locations across the region (Figure 6).

Rain was limited to a single notable event on the 15th, where strong to near-severe thunderstorm clusters scraped the ranch towns in Zapata and Jim Hogg County – and more than 4.5” fell near Hebbronville. Heaviest rain, measured and estimated at 4 to 6”, fell along the Rio Grande just above Falcon International Reservoir and provided a brief but only temporary boost to the near-record low levels for this time on the calendar. Unfortunately, these rains missed the basin headwaters that feed Amistad International Reservoir, which continued to fall to record lows for early autumn.

Brownsville/Rio Grande Valley Regional Summary (continued)



Figure 4. September 2023 heat obliterated prior records at all locations of the Lower Rio Grande Valley, in some cases more than 3 degrees above prior monthly records!

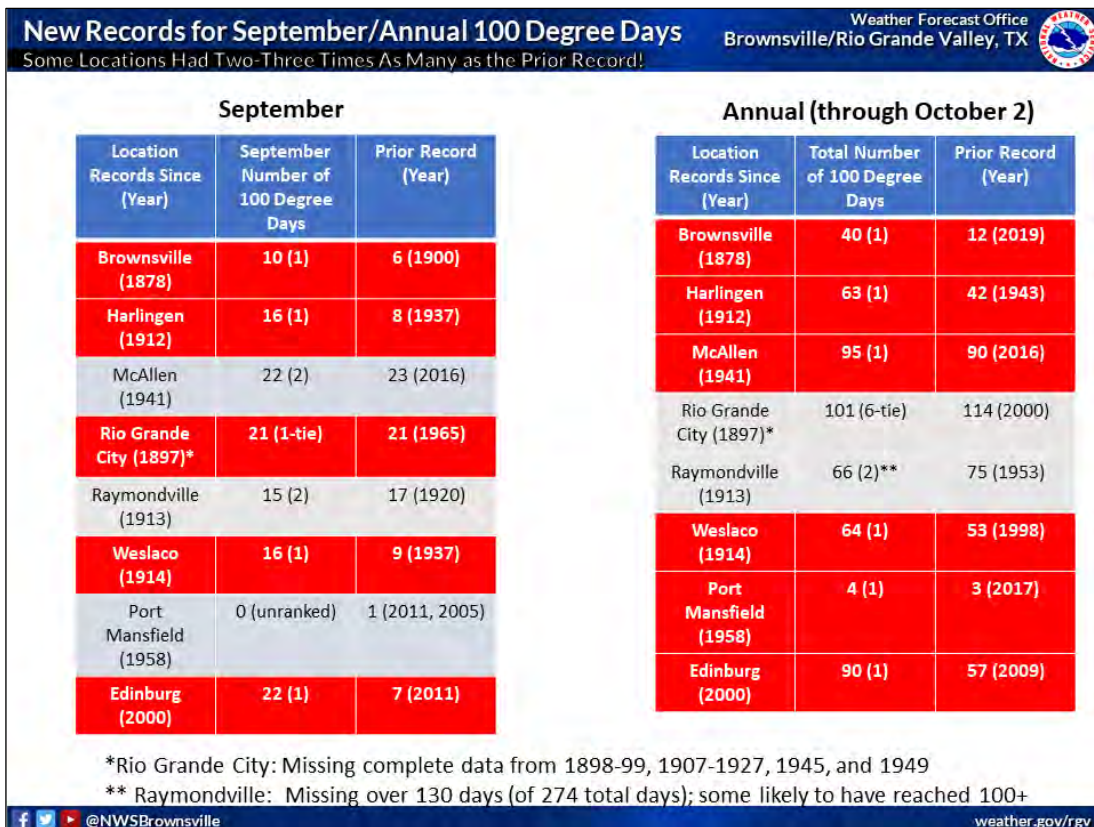


Figure 5. Most locations across the Rio Grande Valley shattered their prior annual number of 100 degree days, through October 2, 2023. McAllen fell just short of 100 for 100, reaching 97 days a few days into October 2023.

Brownsville/Rio Grande Valley Regional Summary (continued)

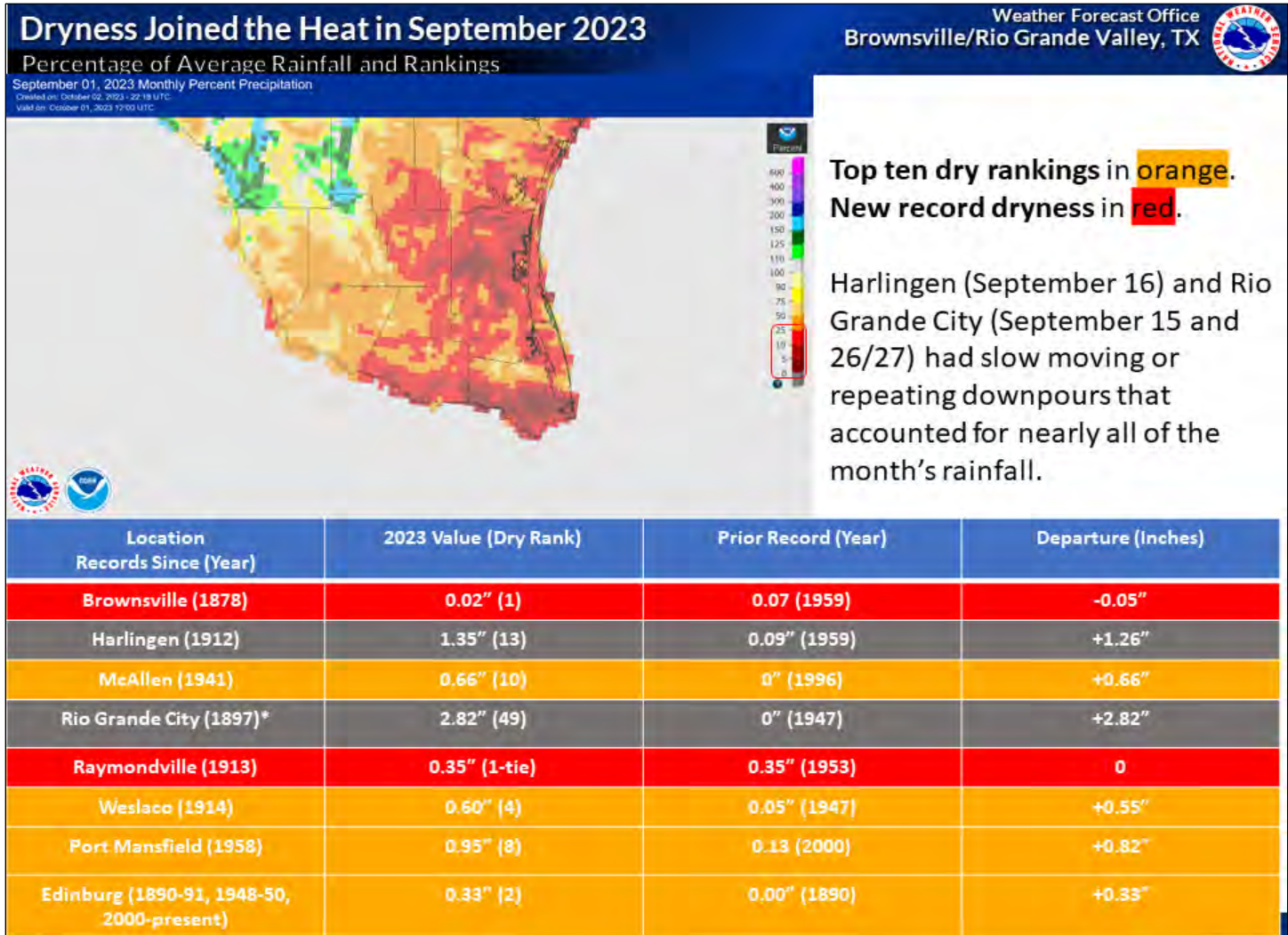


Figure 6. Most locations across the Rio Grande Valley ended up in the top ten driest Septembers, with Brownsville and Raymondville reaching or tying new dry records in 2023.

October saw the continuation of searing heat until the 5th, when an upper level disturbance and outflow boundaries combined with the sea breeze to create torrential rains of 2 to 4"+ and local flooding in Cameron and Willacy County (Figure 7), with later evening heavy rains draping the Rio Grande Plains and upper Valley/Brush Country with 1-2" prior to the season's first cooling front. Additional rains October 10th dropped between 0.5" and 1.5" across the entire region. The season's first "big" front arrived just before Halloween, and temperatures plunged more than 30 degrees between the afternoons of the 29th and 30th. Halloween Day set new "cold maximum" temperatures for most locations in the Valley, as readings struggled into the 50s. Light rain joined the party on the 30th.

For the month, the periodic cooling helped reduce heat-departure from average, but near-record warmth through the 5th and again between the 20th and 29th was enough to maintain another month with slightly above the 1991-2020 temperature averages by about a degree.

Rainfall departures varied across the region, with above average estimates across Zapata and Starr County and a pocket of Willacy County (due to estimates near 5" east of the populated areas there) – but still 50 to 90 percent of average in between.

Brownsville/Rio Grande Valley Regional Summary (continued)

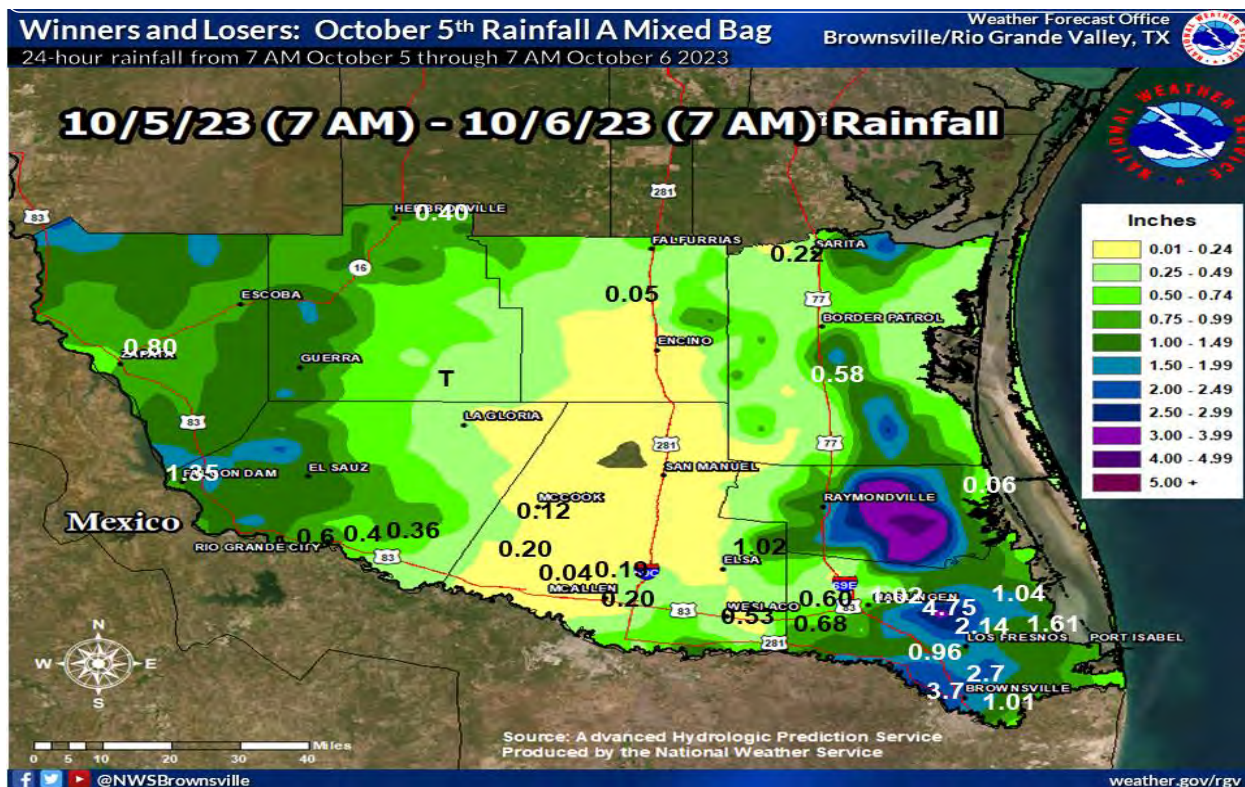


Figure 7. Torrential rains soaked eastern Willacy County, then moved into Cameron – pockets of more than 5" likely fell (not sampled by CoCoRaHS or ASOS/AWOS) near Los Fresnos and east of Raymondville/Lyford. Brownsville's 3" to estimated 4" fell in a little more than an hour, with notable flooding in poor drainage locations on the west side of downtown.



Picture 1 & 2. A known poor drainage location on Mexico Blvd. near the B&M International Bridge just west of downtown had an estimated 3+ feet of water depth, which partially submerged a few vehicles trapped in the high water. A CoCoRaHS observer reported 3.7" nearby, likely in just over an hour based on radar estimates. Photos credit: Cameron County Emergency Management.

Brownsville/Rio Grande Valley Regional Summary (continued)

November temperatures initially recovered following the Halloween cold snap, with seasonably warm readings and no rainfall. A flat upper-level high pressure ridge than was overtaken by a mid-latitude energy impulse which had a “tap” into the eastern tropical Pacific – the “classic” El Niño pattern (Figure 8). At the surface, a cold front passed through and the aforementioned disturbances set up a coastal low – a “Texas Nor’easter” – which set up three days of beneficial stratiform rainfall that eventually totaled 3” to more than 6” across the entire region (Figure 9), and ultimately cleared out the last of the drought conditions that remained from late October. The steady nature of the rain allowed water to be thoroughly soaked into thirsty soil, with urban ponding – not flooding – the primary impact in populated areas.

A period of seasonably warm weather arrived by mid-month, followed by a pre-Thanksgiving front that returned below average temperatures to the region, along with a period of modest rainfall during the overnight of Thanksgiving Eve into the early morning of Thanksgiving Day. A reinforcing front arrived at the end of Thanksgiving Weekend, which was followed by a relatively vigorous embedded upper level disturbance that dropped more than an inch during the late evening and pre-dawn hours of the 29th and 30th, primarily in Cameron County.

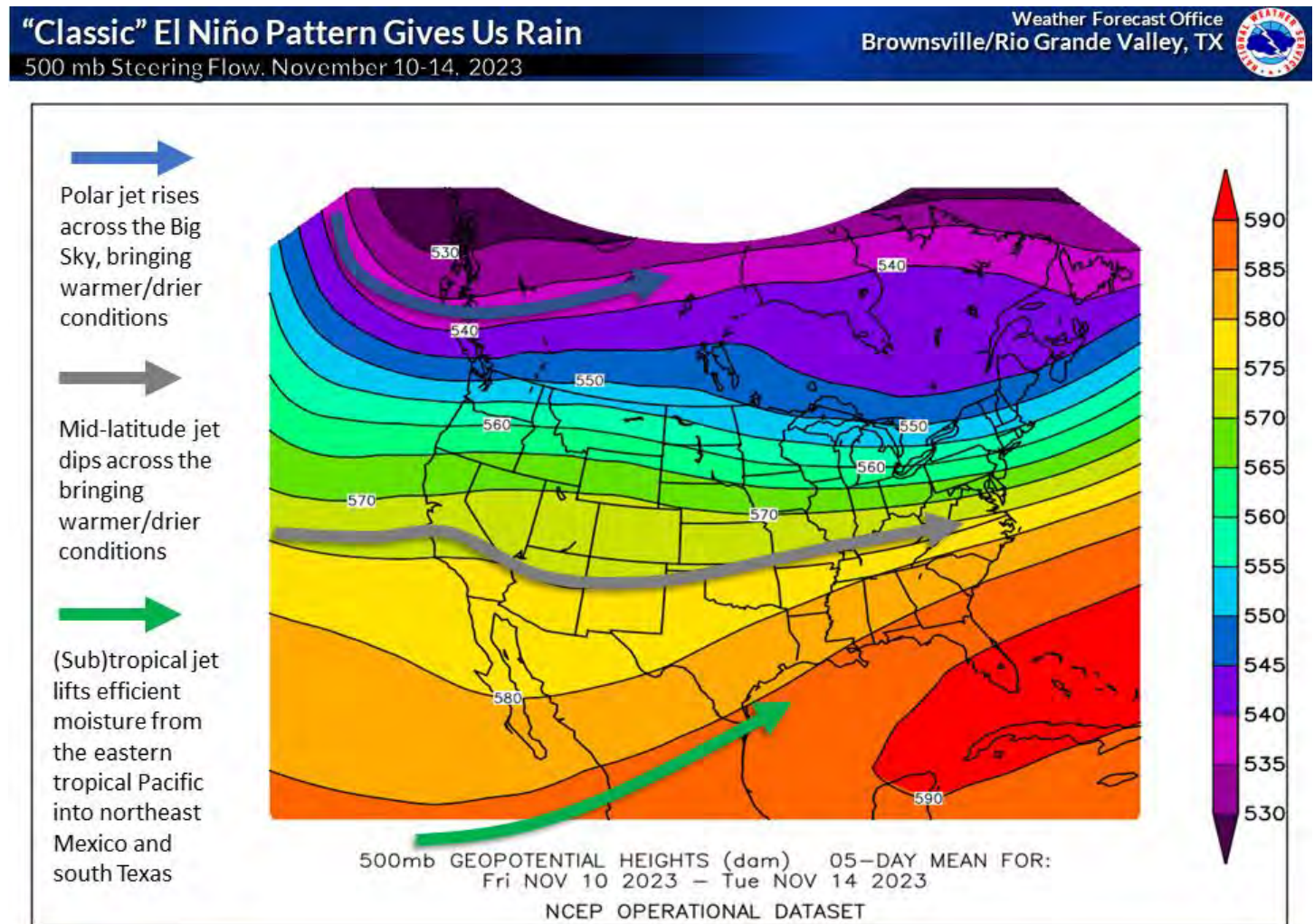


Figure 8. An early season example of the classic El Niño pattern arrived on Veterans Day Weekend 2023, combining with a developing coastal low to create the ideal conditions for prolonged, steady rainfall that accumulated to values between two and four times the monthly average across the Rio Grande Valley and Deep South Texas ranchlands.

Brownsville/Rio Grande Valley Regional Summary (continued)

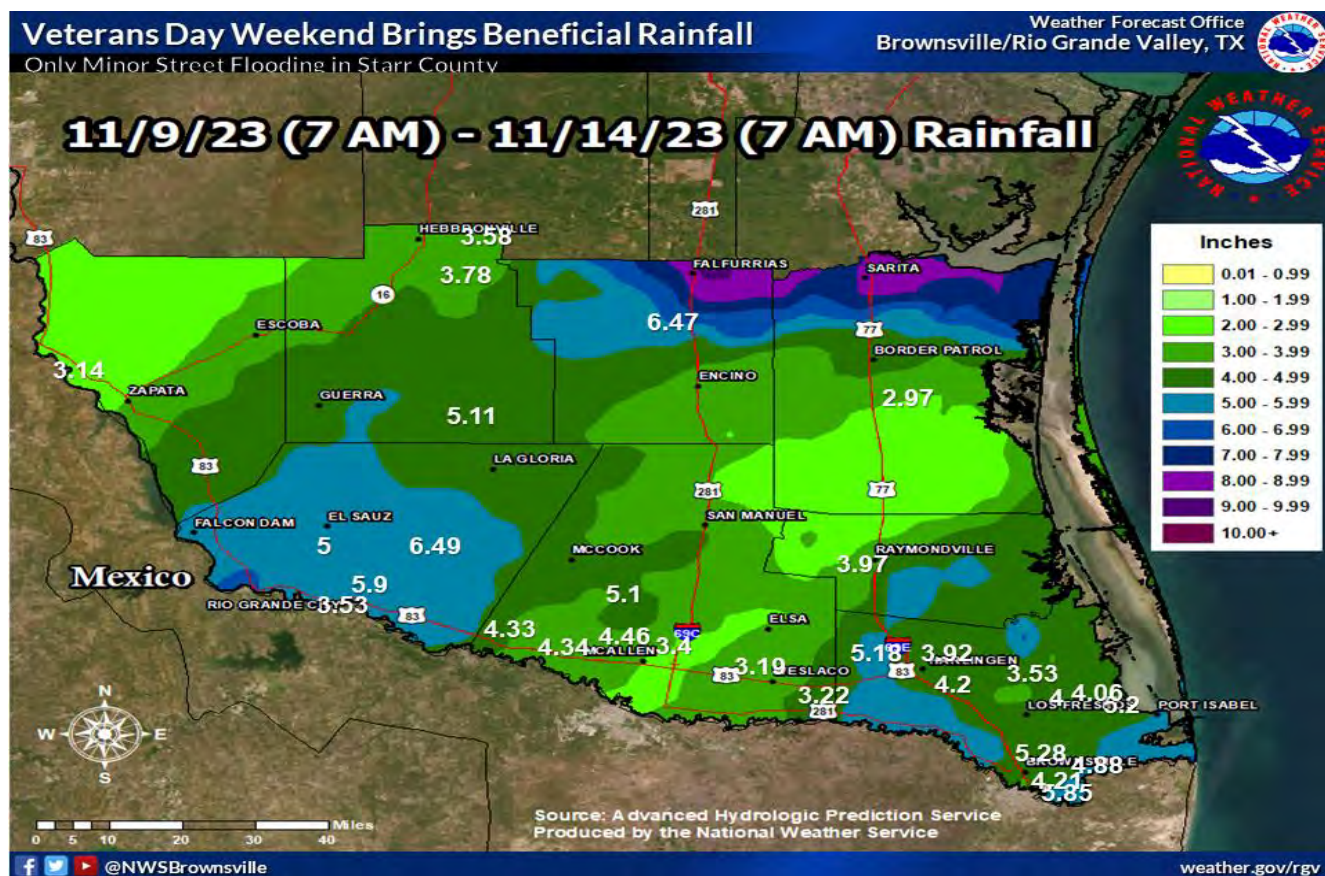


Figure 9: Measured and estimated rainfall from early November 9th through early November 14th, 2023. Values across SR 281 between Sarita/Riviera and Falfurrias recorded more than four times the monthly rainfall for November; elsewhere, many areas received two to three times the monthly rainfall average – mostly between November 10 and 12.

Autumn Overall saw the transition from late summer searing heat – sometimes a feature of a moderate to strong El Niño – to the more traditional El Niño pattern through much of November that turned heat and drought into green (for most) and temperatures ranging from cool to mild, rather than hot and oppressive. Unfortunately, rain that fell across the rich agricultural region of the Rio Grande Valley was only sufficient to be completely absorbed and not “stored” on top of the soil – hence, abnormal dryness remained at the start of December despite November ranking among the top ten wettest on record at most sites.

While the rainfall was beneficial to the Valley, filling up detention ponds and reducing the need for yard watering and additional early-planting season irrigation, none of it fell into the headwaters of the middle Rio Grande basin that feeds Amistad International Reservoir, and amounts that fed into Falcon International Reservoir were only sufficient to bring levels back to the 30-year low point. Stage 2 water restrictions – often issued when the U.S. share of water conservation between Amistad and Falcon is below 25 percent – remained in place to begin winter 2023/2024. At the start of December, Amistad’s total water conservation share was just 27.3 percent, a continued new record low for this time of year. Falcon’s level had risen from a low of 13.2 percent in early October to 17.3 percent at the start of December – still far below comfortable values for residents and agricultural land/livestock managers alike.

While there remained hope for additional rain, under more clouds than sunshine, through winter – that rain was no guarantee for the Rio Grande Valley, and more likely than not to miss the watershed. This would prolong the concerns of municipalities and growers/livestock managers alike, and require continued vigilance through water conservation headed toward spring.

Brownsville/Rio Grande Valley Regional Summary (continued)

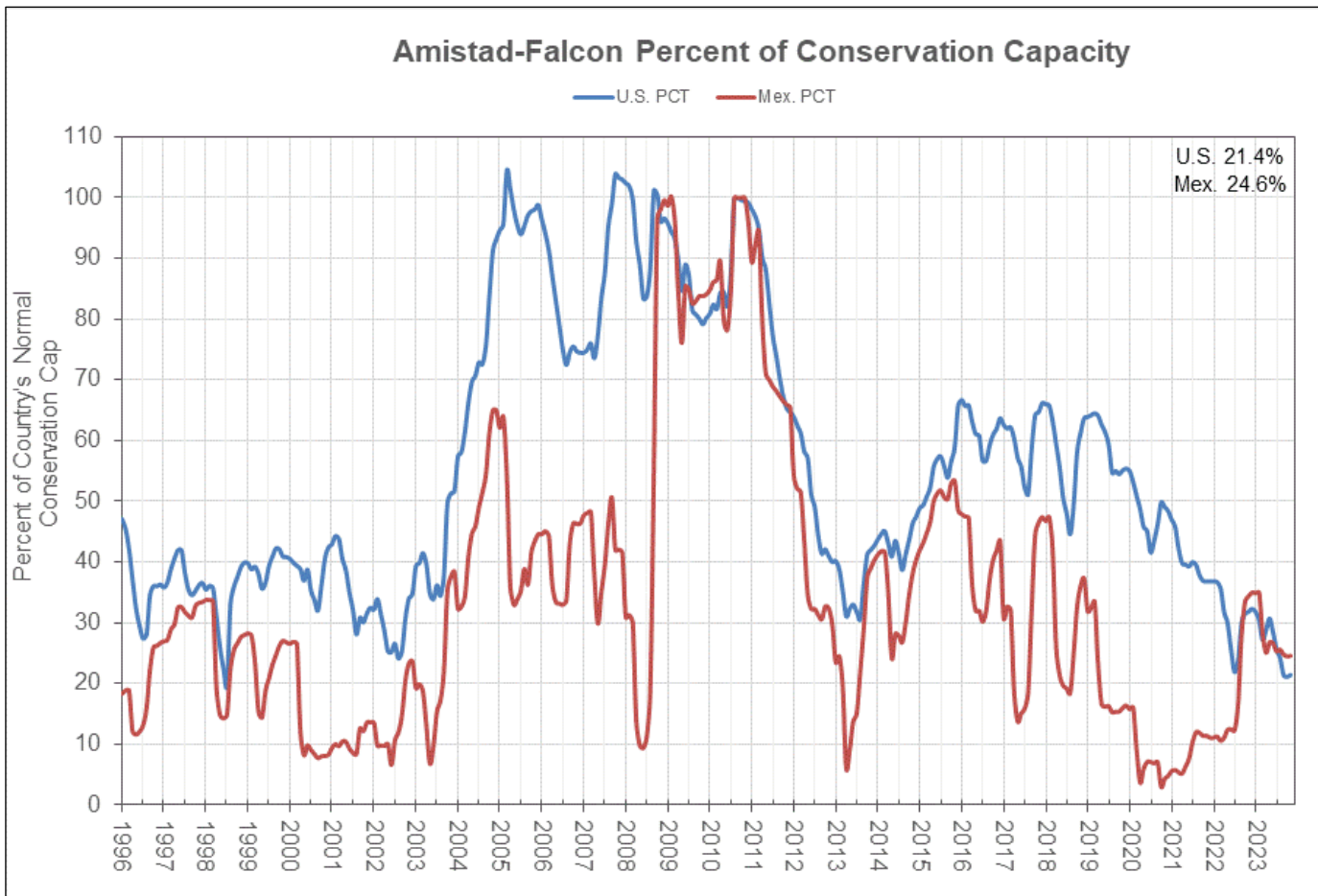


Figure 10. Percent of Conservation (ownership) Capacity for the US and Mexico, Amistad minus Falcon International Reservoirs. Since mid-summer, the US percentage remained below 25 percent, maintaining Stage 2 water conservation rules in more than a half-dozen Valley communities. The value of 21.4 percent was only slightly higher than the minimum of 20.9 percent in early October, and remained among the lowest values in the past 25 years. Data courtesy of the International Boundary and Water Commission.



Picture 3. Green-up in north Brownsville on November 13th, following the steady, beneficial rains through the Veterans Day 2023 weekend.

West Texas/Southeast New Mexico Regional Summary

An uptick in rainfall as the triple-dip La Nina finally gave way to a developing El Nino.

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

September

The skies finally opened up in September, as the synoptic pattern finally began breaking down the upper-level ridge, allowing disturbances to move through West Texas and Southeast New Mexico.

On September 13th, thunderstorms developed over the Rio Conchos watershed, and sent a flood wave into Presidio during the late afternoon/overnight, sending the Rio Grande into minor flood at the international crossing for a few hours.

Early morning on the 16th, thunderstorms moved over Colorado City in Mitchell County, producing heavy rainfall that closed streets and stranded vehicles. Thunderstorms then flooded several streets in Gardendale in Ector County.

Otherwise, despite the abundant rainfall in September, no other flood events were reported.

Monthly radar rainfall estimates ranged from nothing in west central Brewster County to up to 8" in south Mitchell County. However, the highest observed rainfall was 3.60" in Big Spring in Howard County. The average of rainfall reported across West Texas and Southeast New Mexico was 1.32". Reservoir levels averaged 47.2% of conservation capacity as of October 1st:

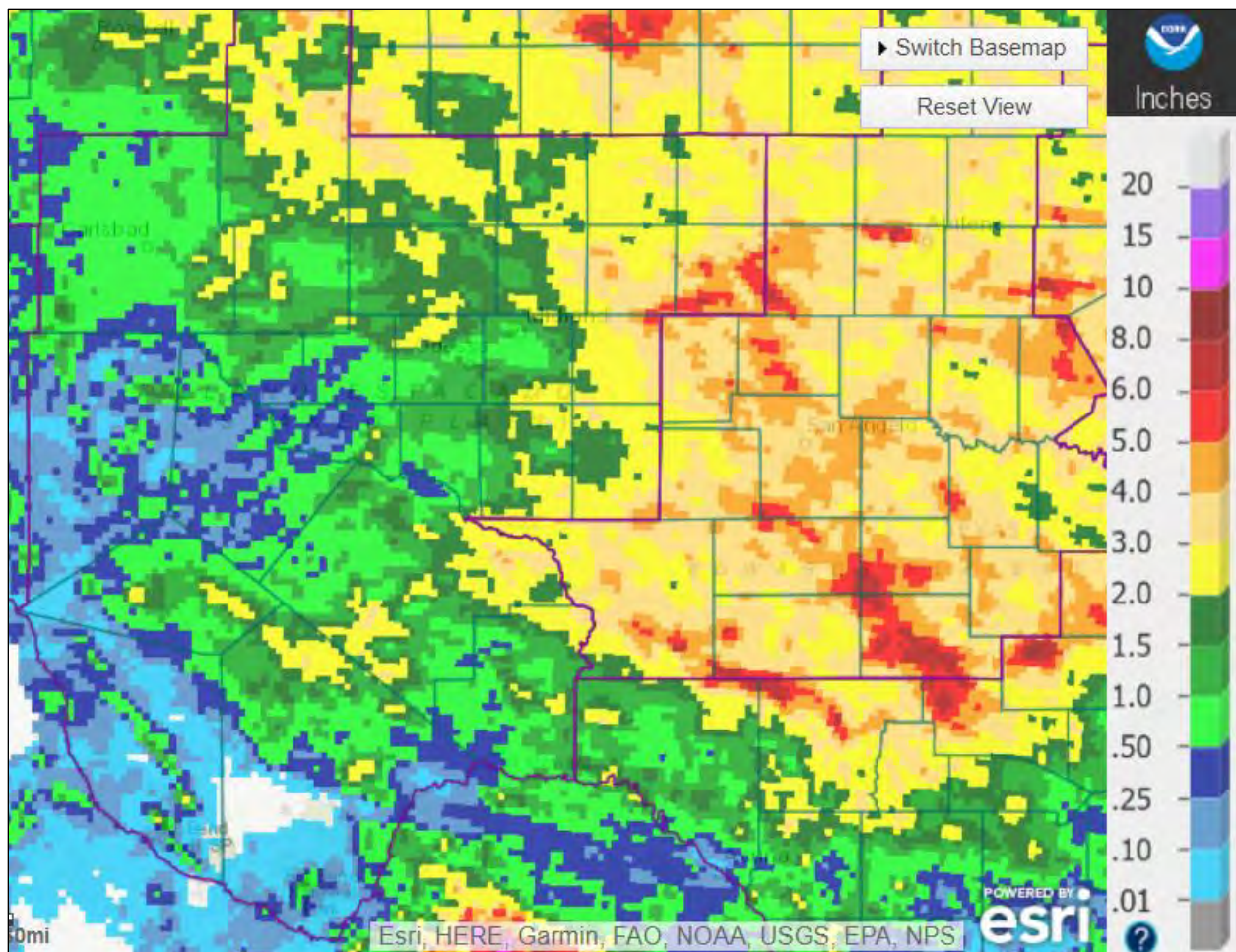


Figure 1: September Precipitation

West Texas/Southeast New Mexico Regional Summary (continued)

October

October was fairly uneventful until the latter part of the month, when a couple of events brought relatively abundant rainfall to the HSA, especially the Permian Basin. On October 24th, remnants of Hurricane Norma moved into West Texas and Southeast New Mexico from the southwest, and the very tropical airmass that accompanied it produced very efficient rain showers across the eastern half of the HSA. Many locations reported 2" or more of rainfall, especially in the Permian Basin. Little flash flooding was reported, as the rain rates were low, but the event was long.

On the 25th-26th, an upper-level trough plowed through the area, trailing a line of thunderstorms that produced another 0.5-1" across much of the area. The strongest part of the line dumped 2-3" just above the confluence of Independence Creek with the Pecos River, briefly sending Independence Creek (SFIT2) into minor flood.

Monthly radar rainfall estimates ranged from nothing along the Rio Grande in Presidio County to up to 10" in the upper Colorado River Basin and on the lower Trans Pecos. The highest observed rainfall was 6.86" at Gail in Borden County. The average of precipitation reported across West Texas and Southeast New Mexico was 2.04".

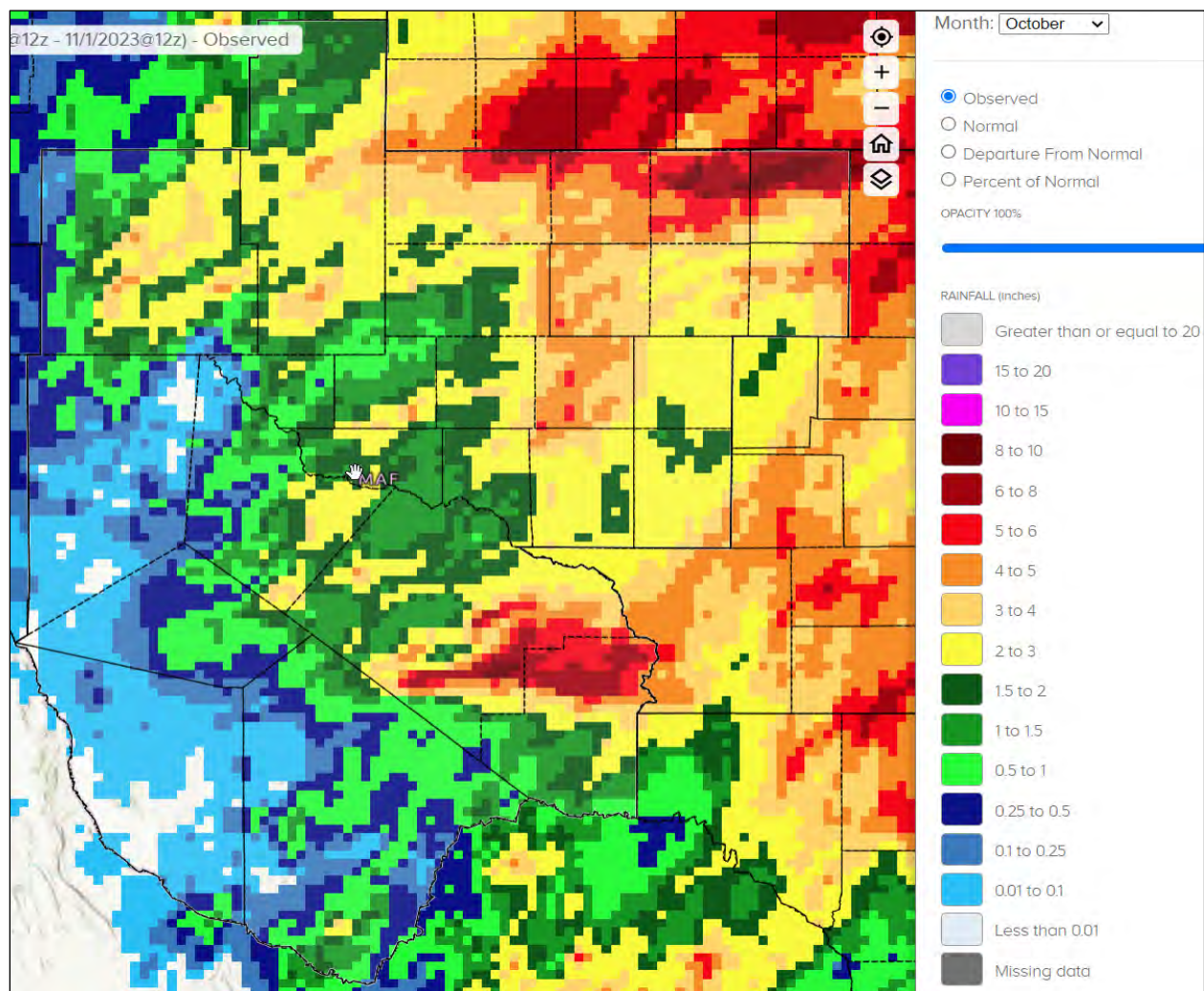


Figure 2: October Precipitation

West Texas/Southeast New Mexico Regional Summary (continued)

November

November was hydrologically uneventful other than near-normal rainfall for most locations. No notable hydrologic events were reported, and rivers remain at base-flow.

Monthly radar precipitation estimates ranged from nothing over parts of Southeast New Mexico to up to 3" in southeastern Terrell County. The highest observed rainfall was 2.26" at Persimmon Gap in Brewster County. The average of precipitation reported across West Texas and Southeast New Mexico was 0.72".

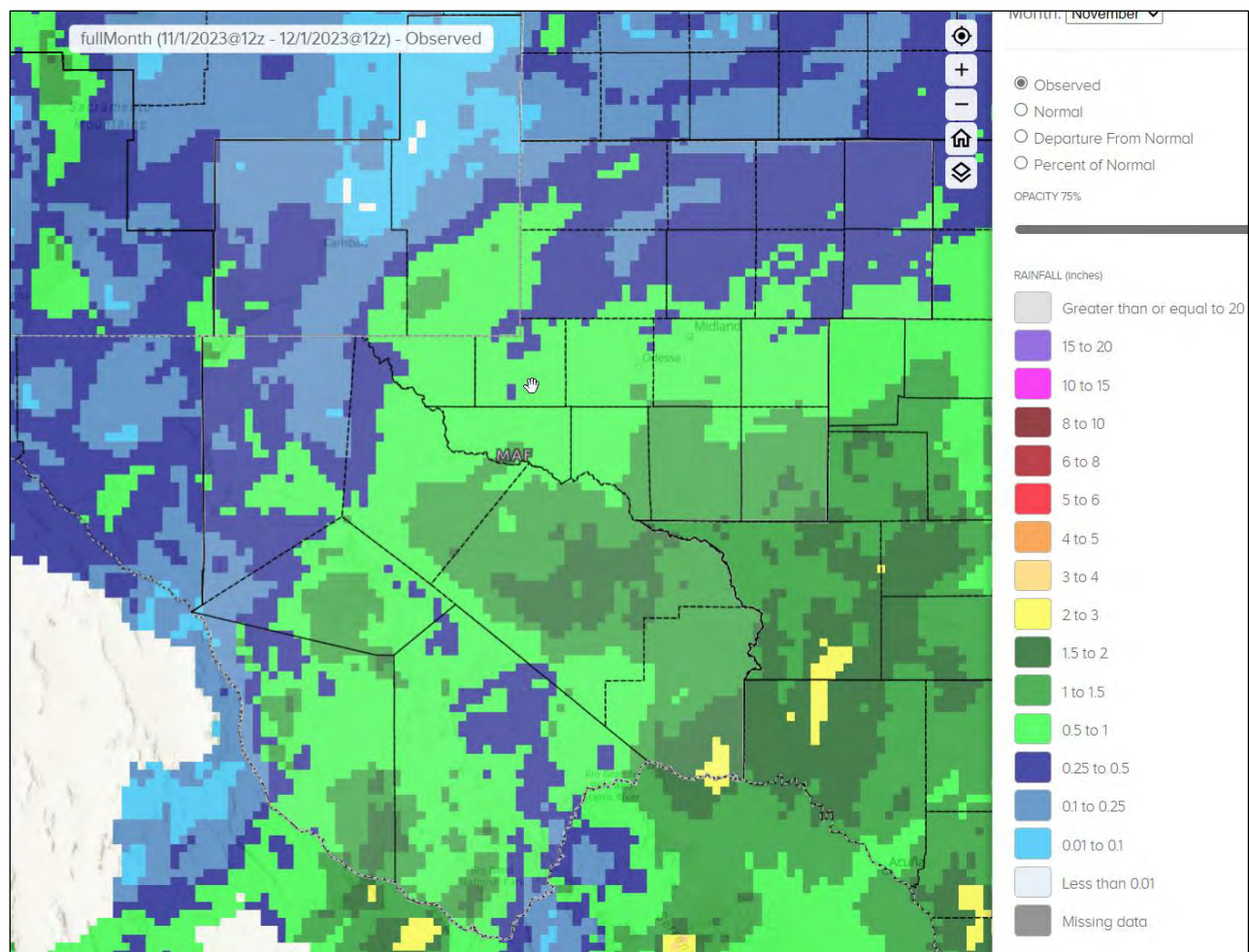


Figure 3: November Precipitation

West Texas/Southeast New Mexico Regional Summary (continued)

Autumn Summary

Overall, fall 2023 was dry for West Texas and Southeast New Mexico.

As of November 28th, the higher terrain of West Texas and Southeast New Mexico were in severe to exceptional drought. Conditions improve considerably to the east.

Area reservoirs are at 46.6% of conservation capacity as of December 1st.

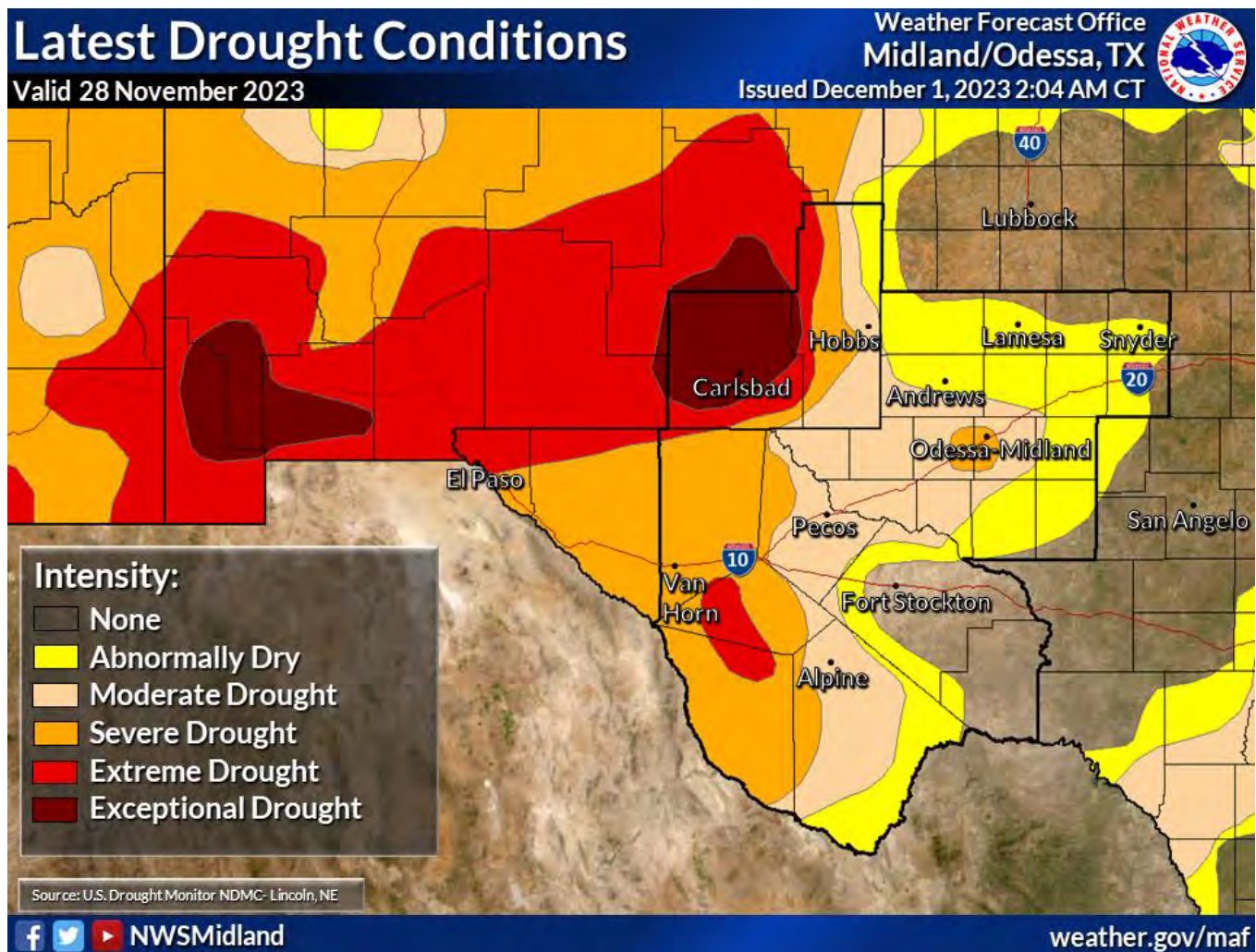


Figure 4: Drought conditions as of December 1, 2023 for the region.

North Texas Regional Summary

Rains return to North Texas in October followed by dry November

By: Greg Story, North Texas CoCoRaHS Regional Coordinator

Greetings CoCoRaHS observers from the North Texas Regional Coordinator! I want to give a special welcome to our newest CoCoRaHS observers who have joined over the past couple months. In this newsletter article I like to review the weather from the past several months, emphasizing the importance of your weather observations. The variability of the rainfall over North Texas stresses the need for your rainfall reports. Why? They help in determining the areas which may flood, as well as determining drought locations, which certainly was the case this past summer. 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, in April the weather pattern turned wet with near to above normal rainfall over the southeast half of Texas and near to below normal over the northwest half, with much below normal rainfall over far West Texas. In May it was dry over North Texas, but the rainfall was near to above normal over the remainder of the state. In June most of the state had near to below normal rainfall. However, a couple scattered places had above normal precipitation, such as Northeast Texas as well as west central and Southwest Texas. In July most of Texas had below normal rainfall. In August below normal rainfall was noted just about everywhere in Texas. In September it was dry over a good part of Texas. There was an area of above normal rainfall noted over western Texas from the Concho valley to near Lubbock. But near to below normal precipitation occurred elsewhere. Some spots of south central and Southwest Texas had much below normal rainfall. In October the weather pattern shifted, as above normal rainfall occurred from western into north central and northeast Texas. Much above normal precipitation was noted over the Dallas/Fort Worth metroplex. However, parts of Southeast Texas, Far West Texas and the Texas panhandle received below normal precipitation. In November, much of Texas experienced below normal rainfall. However Deep South Texas and parts of Southwest Texas had above normal rains.

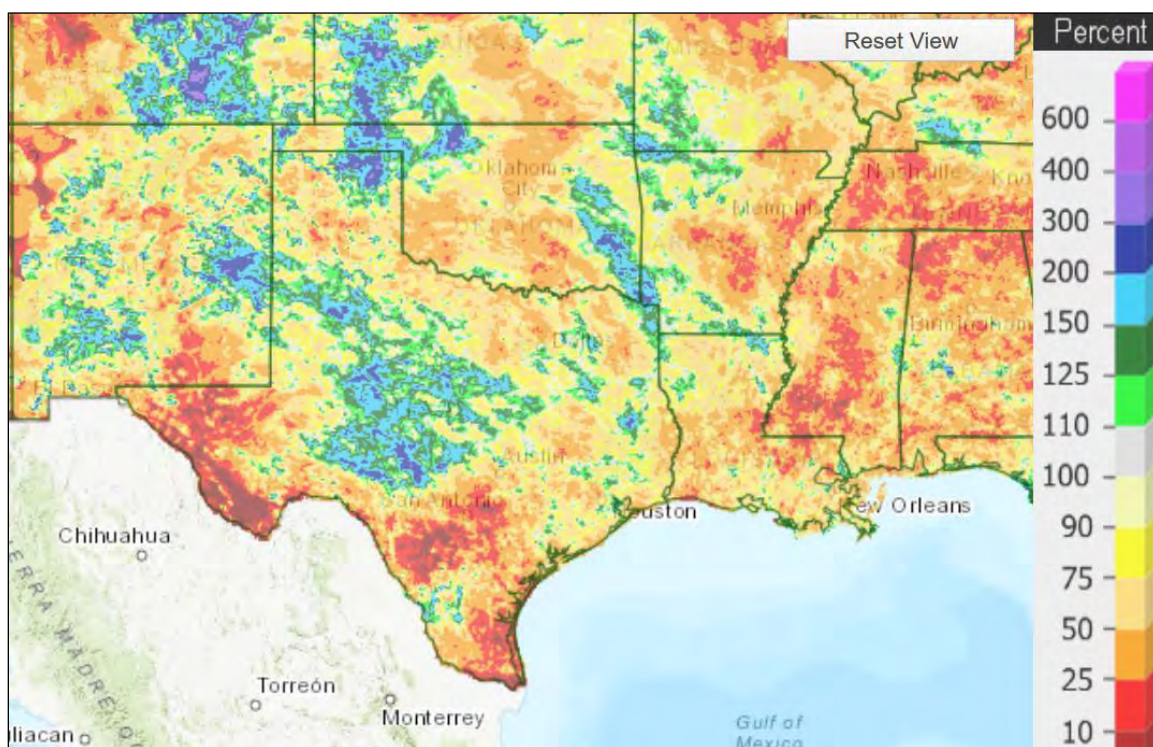


Figure 1: Percent of Normal Precipitation map for September 2023. The dark green, blue and purple colors indicate above normal precipitation; the beige, yellow and light green colors indicate near normal, while the orange, red and dark red colors indicate below normal precipitation.

North Texas Regional Summary (continued)

In September it was dry over a good part of Texas. There was an area of above normal rainfall noted over western Texas from the Concho valley to near Lubbock. But near to below normal precipitation occurred elsewhere. Some spots of south central and southwest Texas had much below normal rainfall. At DFW airport in September 0.83" of rain was received. The normal amount of precipitation in September is 2.72" so DFW was -1.89" below normal for the month. In Waco for September, 3.34" of precipitation was received. The normal amount of rain in September is 2.87" so Waco was +0.47" above 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 six storm systems which affected our weather in September. Here are the highlights of the weather for the month.

September 3 - 4:

A small upper level low pressure system over north Texas produced some showers and thunderstorms during the morning of the 3rd. Additional scattered thundershowers developed during the afternoon. The heaviest rainfall, of those lucky enough to receive it, was 1.91" west southwest of Bells, 1.74" just south of North Richland Hills, and 1.68" north northwest of Waxahachie. Some new showers and thunderstorms developed further east over eastern Texas on the 4th as the upper low moved away. The maximum rainfall amounts on the 4th were 1.71" northeast of Kountze and 1.08" at Lufkin.

September 8 - 9:

A cold front moved across Texas from the north. This front produced some showers and thunderstorms across especially northern and eastern Texas late on the 8th into the 9th. In North Texas the heaviest rain was west southwest of Arlington with 1.84" and east southeast of Burleson with 1.42". The maximum rainfall amount in the state on the 8th was 2.21" at Nacogdoches Arbor Oak. On the 9th the heaviest rainfall was further south over Central and West Texas. Rainfall amounts were 1.69" northeast of Fredonia and 1.21" north northeast of Comanche.

September 11 - 16:

A slow moving upper air low pressure system advanced slowly toward Texas which pushed minor upper disturbances across the state for several days and produced several rounds of rainfall. The first disturbance produced showers and thunderstorms across West Texas early on the 11th. The heaviest rain before dawn on the 11th was 1.44" at Tarpley and 1.16" north of Cisco. More showers and thunderstorms developed during the afternoon and evening of the 11th over West Texas. The heaviest rainfall was 2.65" west southwest of Sterling City and 2.58" southwest of Knickerbocker. The rain became lighter on the 12th and was focused more on Southwest Texas into New Mexico. On the 12th rainfall amounts were 0.85" south southeast of Santa Anna and 0.72" southwest of Marathon. On the 13th the rainfall spread eastward across western, Central and Northeast Texas, and was heavy in spots across Central Texas. The heaviest rain was 3.88" west of Leander and 3.79" north of Pflugerville. The rain continued into the 14th, especially between DFW, Abilene and Waco. The maximum rainfall amounts on the 14th were in the western parts of North Texas where northwest of Walnut Springs 4.98" fell and west northwest of Kopperl 3.44" fell. Outside of North Texas 4.00" fell south southeast of Missouri City. The rain shifted eastward to southeast and Deep South Texas on the 15th. The rain was very heavy around Houston where 6.09" was measured east northeast of Nassau Bay and 5.51" was observed northeast of League City. Over Deep South Texas on the 15th 4.55" fell east northeast of Hebbronville. During the morning of the 16th an MCS moved from western into Central and Southeast Texas before moving out of the state late in the day. The heaviest rainfall on the 16th was 2.78" north northwest of Smithville and 2.38" at Lampasas.

North Texas Regional Summary (continued)

September 19:

A short wave trough passed north of Texas but caused a complex of thunderstorms to form across Oklahoma and North Texas. The maximum rainfall amounts were 1.78" west northwest of Carrollton and 1.74" northeast of Flower Mound.

September 21:

A few thunderstorms developed along and near the Red River over north central and northeast Texas on the 21st. Some flash flooding occurred over Grayson County. The maximum rainfall was 3.90" east northeast of Denison and 1.72" west northwest of Sherman.

September 24 – 25:

A short wave trough passed north of Texas, but as it moved it pushed a cold front into Texas. Showers and thunderstorms developed during the late afternoon and nighttime hours across northern and Central Texas. Large hail occurred with the stronger thunderstorms. In North Texas the heaviest rainfall was north of Palestine with 3.62", and east southeast of Kaufman where 3.35" was measured. Over Central Texas the maximum rainfall was 4.15" west northwest of Junction and 3.89" at Lufkin. On the 25th the showers and thunderstorms sagged southward ahead of the front. The heaviest rainfall on the 25th was 2.40" north northwest of Edna and 2.32" at Alice.

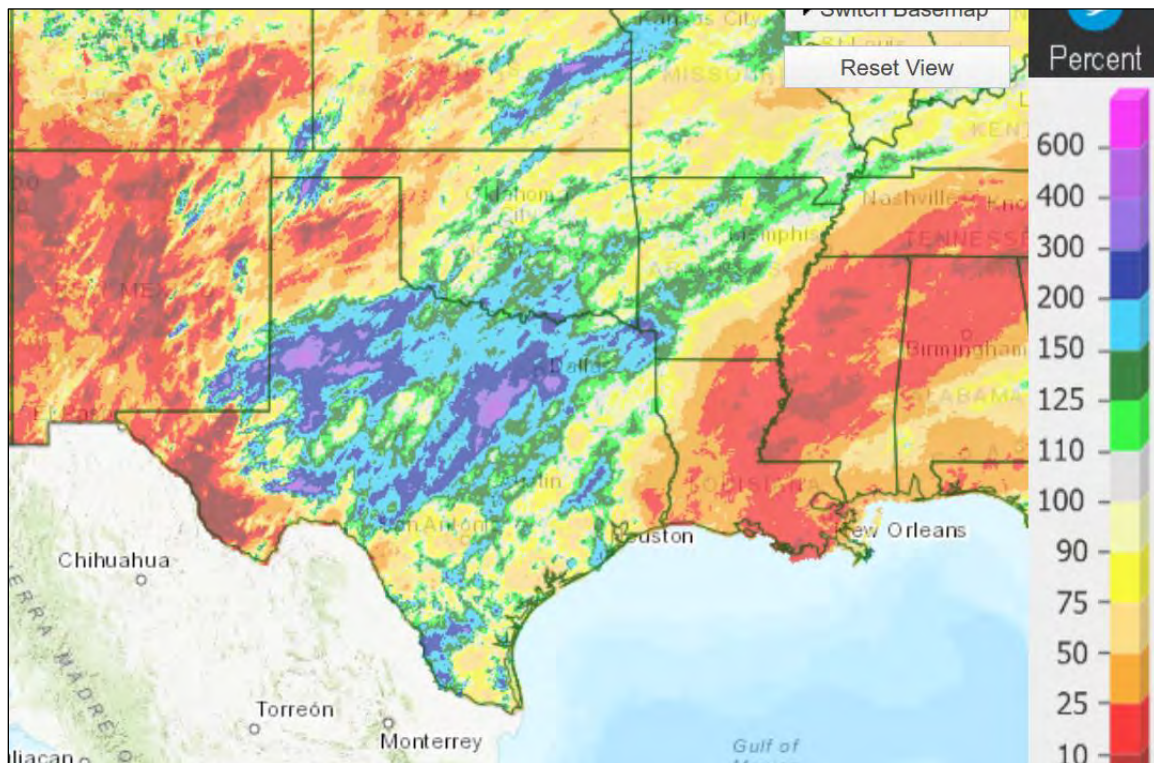


Figure 2: October 2023 Percent of Normal Precipitation map. The dark green, blue and purple colors indicate above normal precipitation; the light yellow and light green colors indicate near normal, while the orange, red and dark red colors indicate below normal precipitation.

In October the weather pattern shifted, as above normal rainfall occurred from western into north Central and Northeast Texas. Much above normal precipitation was noted over the Dallas/Fort Worth metroplex. However, parts of Southeast Texas, Far West Texas and the Texas panhandle received below normal precipitation.

North Texas Regional Summary (continued)

At DFW airport in October 9.63" of rain fell. The normal amount of October precipitation in October is 4.37" so DFW was +5.26" above normal for the month. As a side note, I had over 12" in my gauge in northwest of Watauga for the month.

In Waco for October, 4.91" fell of precipitation. The normal amount in October is 4.41" so Waco was +0.50" above normal for the month. DFW had the 4th wettest October of record in 2023 with the 9.63". The late October stretch of rainy weather was amongst the longest of record. At DFW the stretch of 8 days was the 7th longest on record (October 23-30), while at Waco the 8 consecutive days was the 6th longest of record.

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

October 4 - 5:

A strong upper level trough lifted out over the Plains on the 4th and into the 5th which assisted a cold frontal passage through the area. Well out ahead of this trough, locally heavy rains fell over Southeast Texas prior to dawn on the 4th. They received 5.29" east of Lake Jackson and 3.59" southwest of Angleton. Extremely heavy rainfall occurred over extreme Northeast Texas the morning of the 4th. Rainfall amounts were 10.76" west southwest of Texarkana and 10.08" north northeast of New Boston. Then both severe weather and locally heavy rainfall occurred beginning late on the 4th in Northwest Texas and through the entire region into the 5th. In North Texas (outside of the Texarkana region) the maximum rainfall amounts were 5.00" west of Quitman at Lake Fork and 4.05" northeast of Sachse. Elsewhere in Texas on the 4th 6.57" was measured at Bay City and 6.36" measured south southeast of Austin. The showers and thunderstorms continued to advance closer to the Texas Gulf coast and Deep South Texas on the 5th. The maximum rainfall amounts were 4.75" south of Lozano and 3.70" west northwest of Brownsville.

October 10 - 11:

While no significant rainfall occurred over North Texas on these days, a river of atmospheric moisture from Mexican hurricane Lidia combined with a developing low pressure system over the Gulf of Mexico to produce widespread rainfall over southern and eastern Texas. Overnight on the 10th and prior to sunrise on the 11th, the maximum rainfall was 2.83" northwest of Pearsall and 2.00" northeast of Galveston. The rain continued over Deep South and Southeast Texas on the 11th, but ended later in the day. The heaviest rainfall on the 11th was 1.20" southeast of Brownsville and 0.75" southeast of La Marque.

October 23 - 26:

The remnants of Pacific hurricane Norma moved northeast toward West Texas on the 23rd and 24th. Associated with abundant moisture, a predecessor rainfall event began on the 23rd. Before dawn on the 23rd, the rain began over South Texas where 2.88" of rain fell northeast of Bertram and 1.65" southwest of Anderson Mill. Then the rainfall became fairly widespread over Texas during the day on the 23rd. The heaviest rainfall in North Texas on the 23rd was south of Sanger where 1.65" was measured and west northwest of Justin where 1.45" fell. Elsewhere in Texas 3.13" fell southwest of Sweetwater and 3.10" north of Water Valley. More rain continued over the state on the 24th as the upper disturbance passed through. In North Texas the maximum rainfall was south of Sanger where 2.51" was observed and west southwest of Mullin with 1.75" observed. Elsewhere in Texas 2.73" fell at Fort Lancaster and 2.33" fell east of Sheffield. The rain continued into the 25th as an area of showers moved from west to east across the state. This area of rain blossomed into an excessive rainfall event as moisture from Pacific hurricane Otis was ingested into this storm complex. Widespread reports of 4 to 8" were noted on the 25th, with the maximum amounts being 8.22" northwest of Walnut Springs, 7.87" at Glen Rose, and 7.60" west of Llano. The rain area shifted into eastern and southern Texas on the 26th and moved out of Texas by midnight. The rainfall on the 26th was heaviest north of Montgomery with 9.23" being measured, south southeast of Huntsville with 6.82" being measured, and 5.33" measured north of Thorndale.

North Texas Regional Summary (continued)

October 27 - 30:

Two strong cold fronts moved across Texas from the 27th through the 30th. The first one moved into Texas on the 27th and stalled across Central Texas late on the 27th into the 28th. The fronts had plenty of low level moisture to work with, so showers and a few thunderstorms developed. Due to the slow movement of the rain, some locations had extremely heavy rain on the 27th. The maximum rainfall on the 27th was 10.59" south southwest of Terrell, 10.00" east of Ferris, 8.10" at Rosser, and 8.05" west northwest of Kopperl. The rain continued into the 28th, but it became lighter late in the day. The maximum rainfall amounts were 3.62" southwest of Dallas, 3.07" west of Rockwall, and 2.99" at Granbury. The second, stronger cold front moved through Texas on the 29th. Some light rain and a few thunderstorms continued along and behind the front across Texas. The heaviest rainfall on the 29th was east northeast of Rockdale with 2.48" and just south southwest of De Kalb with 1.91". The rain became light and shifted into southern and eastern portions of the state on the 30th. The maximum rainfall was 0.90" at Jacksonville and 0.84" west northwest of Belton.

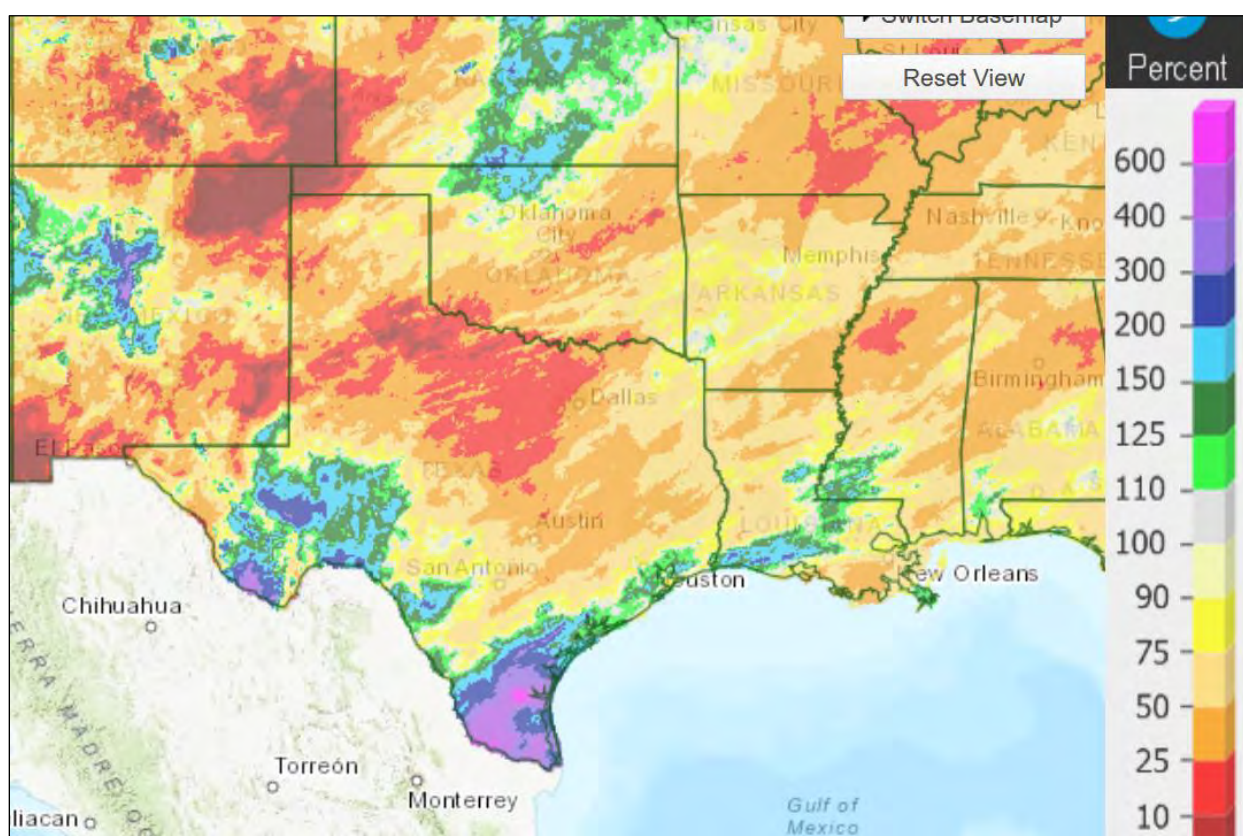


Figure 3: Percent of Normal Precipitation map for November 2023. The dark green, blue and purple colors indicate above normal precipitation; the beige, light yellow and light green colors indicate near normal, while the orange, red and dark red colors indicate below normal precipitation. Most of Texas experienced below normal rainfall. However Deep South Texas and parts of Southwest Texas had above normal rains.

At DFW airport in November 0.47" of rain fell. The normal amount of precipitation in November is 2.53" so this is -2.06" below normal for the month. In Waco for November, 1.95" of rain fell. The normal amount of precipitation for November is 2.71" so Waco was -0.76" below normal for the month.

North Texas Regional Summary (continued)

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

November 9 - 11:

A strong cold front moved across Texas, starting early on the 9th. This front combined with an upper level disturbance to produce widespread showers prior to dawn on the 9th with the rainfall light and totaling 0.33" or less. During the day on the 9th the heaviest rain over North Texas was over the eastern parts. East of Lindale measured 2.13", while north of Bullard received 1.79". Elsewhere in Texas, locally heavy rain fell over the south. Rains of 5.27" southwest of Victoria and 4.10" south southwest of Premont. The front's southward progress slowed on the 10th so the rain continued from Deep South Texas to the Texas Gulf coast. The heaviest rain on the 10th was 3.49" at San Benito and 2.84" west of Harlingen. Some rain continued on the 11th across Deep South Texas. The maximum rainfall was 1.84" southeast of Brownsville and 1.33" just east southeast of Palito Blanco.

November 12 - 13:

A large upper level low pressure system lifted out from Baja California to produce more widespread rainfall across the southern half of Texas on the 12th. The maximum rainfall was 3.06" at Rio Grande City and 2.85" south southeast of Hebbronville. The rainfall seemed to shift to the Gulf coastal region on the 13th, as well as over the center of the state. The largest rainfall amounts from the 13th were 2.07" west southwest of Fredericksburg and 1.35" northwest of Ingram.

November 19 - 20:

A strong upper air disturbance moved from west to east across Texas. Rainfall began ahead of this system on the 19th. Rains of 0.51" fell east southeast of Fairview and 0.26" fell east southeast of Blue Ridge. Showers and thunderstorms developed along and ahead of a cold front on the 20th, primarily over eastern Texas. The maximum rainfall amounts were 1.57" east of Alto and 1.45" at Center.

November 30:

A rather strong short wave trough approached Texas from the west on the 30th. Light showers developed ahead of this trough the morning of the 30th. Prior to dawn the heaviest rainfall was over Deep South Texas where 1.46" was observed west southwest of Harlingen and 1.17" occurred at Buena Vista. Showers and thunderstorms increased over primarily East and Southeast Texas during the day on the 30th, but ended by midnight. The largest rainfall totals in North Texas on the 30th were Cooper with 1.67" and the area north northwest of Josephine with 1.47". Elsewhere, extremely heavy rainfall fell over extreme Southeast Texas into southwest Louisiana. The area south southwest of Lake Charles LA received 7.70", while in Texas the maximum rainfall was 6.01" northeast of Galveston.



North Texas Regional Summary (continued)

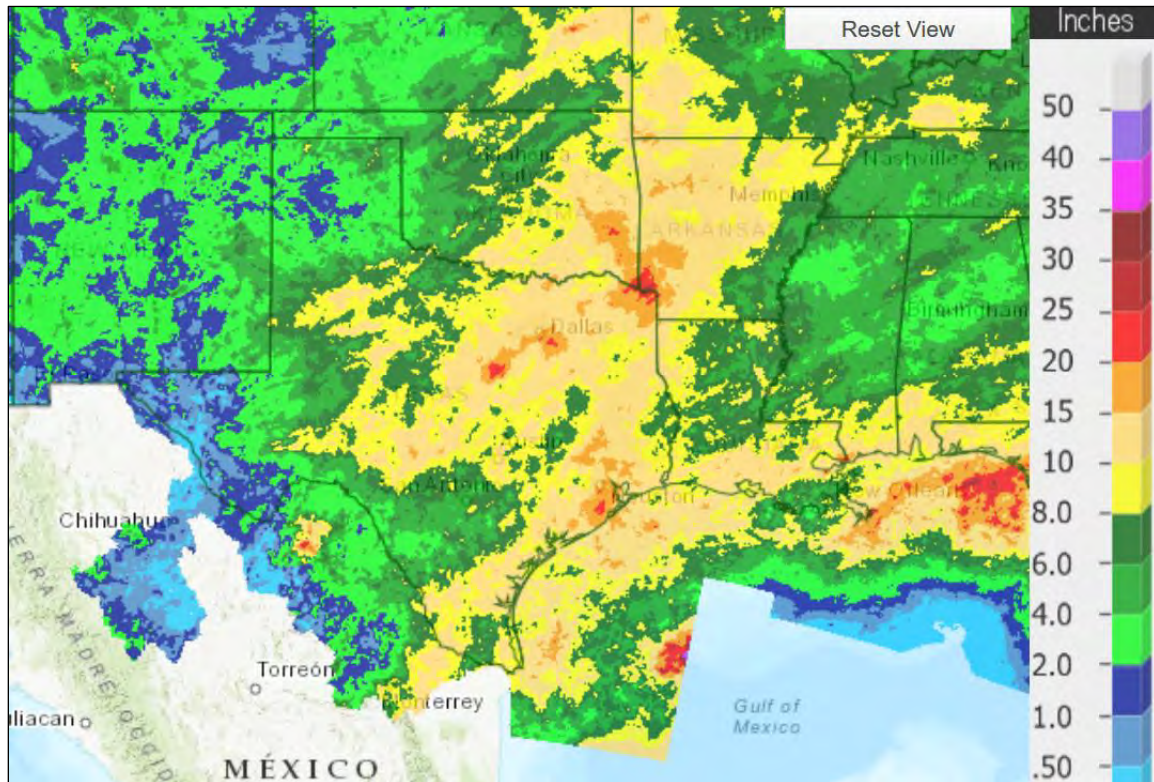


Figure 4: Fall season Precipitation for 2023. The brown, orange and bright red colors indicate the largest precipitation totals, while the light green and blue colors show the lightest amounts.

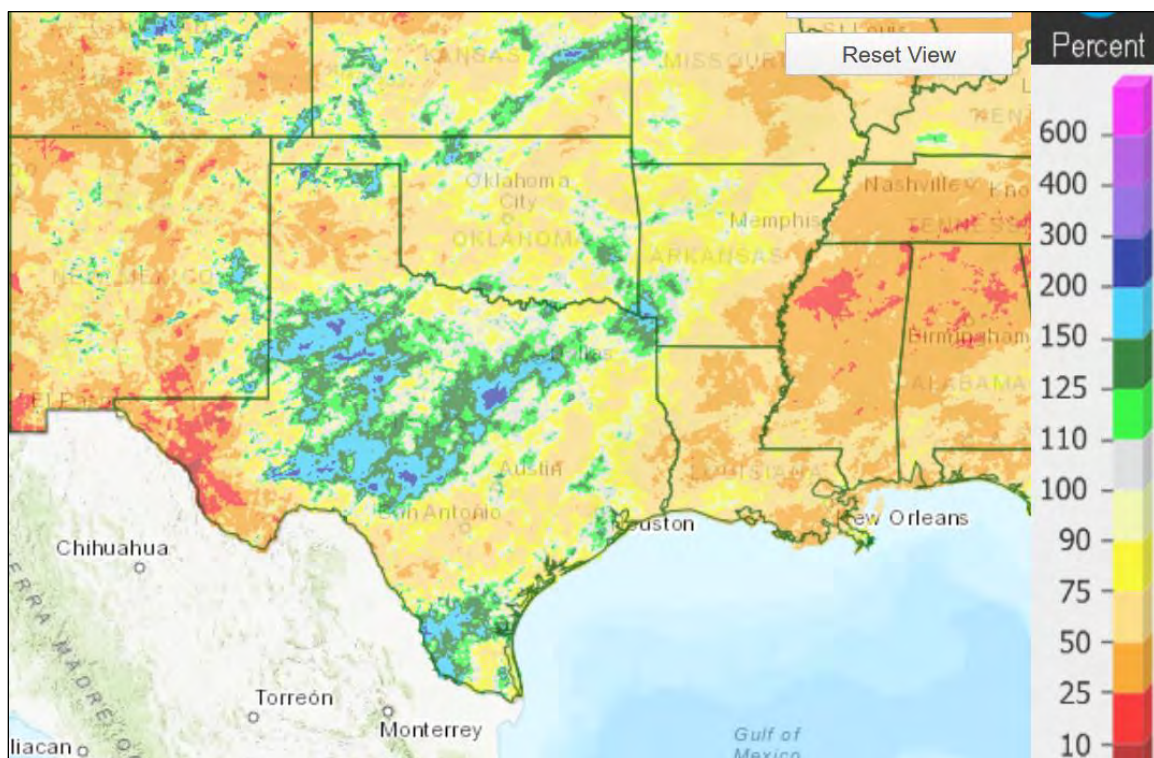


Figure 5: Percent of Normal Precipitation for fall 2023. The purple, blue and dark green colors indicate above normal precipitation. The brown, orange and red colors indicate below normal amounts.

North Texas Regional Summary (continued)

In spite of September and November being dry months, western and northern Texas ended up with near to above normal precipitation for the season because of the wet October (Fig.5). Meanwhile, it was drier than normal for much of eastern Texas, the San Antonio area, and far West Texas. For the fall season DFW airport received 10.93" of precipitation. The normal amount for autumn at DFW is 9.62" so this is +1.31" above normal for the season. In Waco for the fall season, 10.20" of rain fell. The normal amount for autumn is 9.99" so Waco was pretty close to normal at +0.21" for the season.

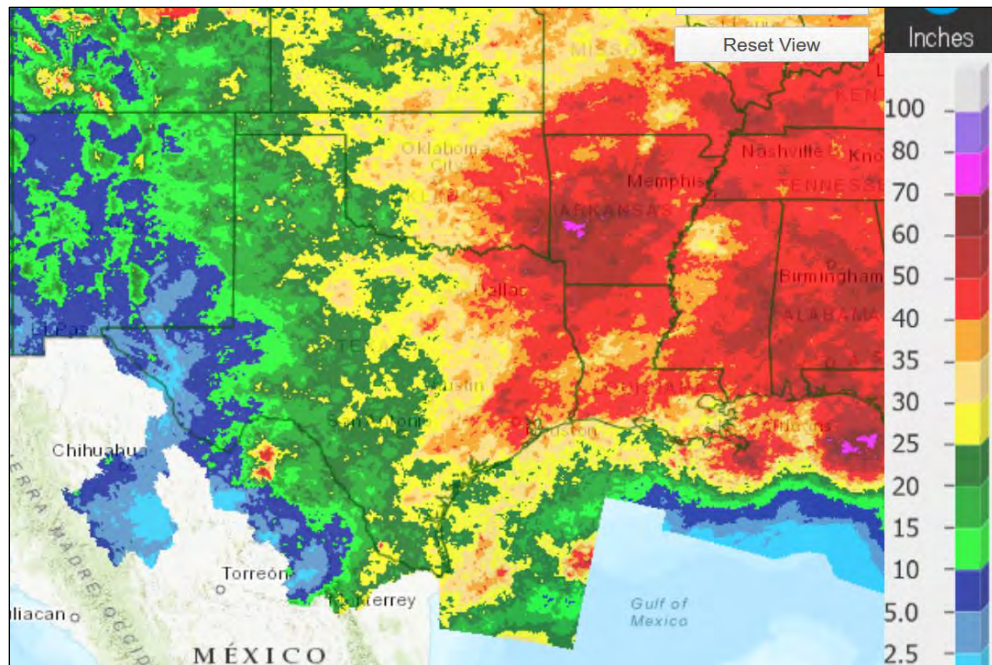


Figure 6: Precipitation Total so far in 2023 (January through November).

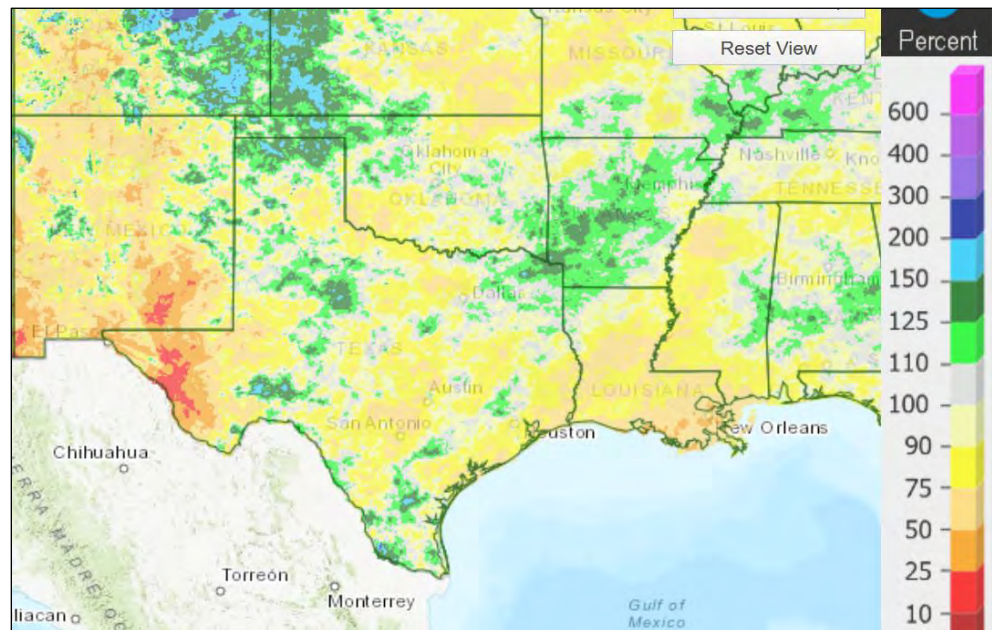


Figure 7: Percent of Normal Precipitation so far in 2023 (January through November).

In 2023 as of November 30, DFW airport has received 25.76" of precipitation. The normal amount from January through November is 34.17" so DFW is -8.41" below normal for 2023. So far in 2023, Waco has picked up 26.20" of precipitation. The normal amount from January through November is 33.53" so Waco is -7.33" below normal for 2023.

North Texas Regional Summary (continued)

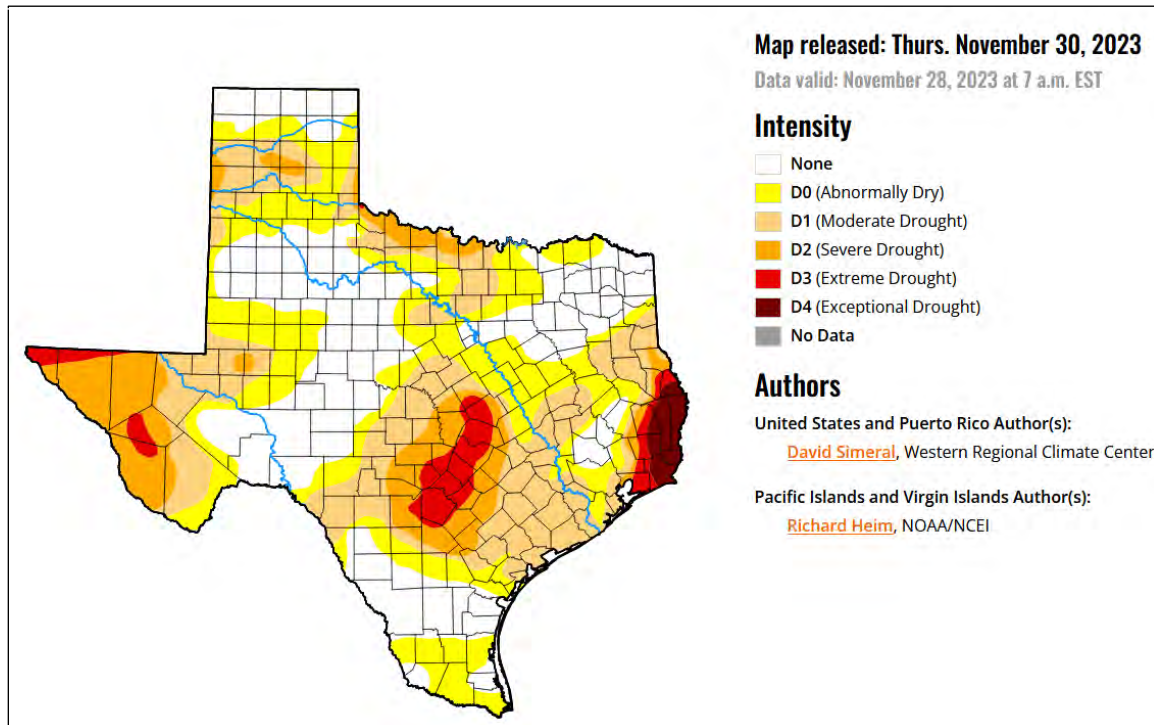


Figure 8: Current Drought Monitor for Texas as of November 30.

The results of the dry weather of the past several months show up well on the drought monitor map (Fig.8), as well as those locations that received higher rainfall amounts. There are more parts of Texas that are free from drought now than there were three months ago, nevertheless two thirds of the state is still experiencing abnormally dry conditions or worse. Exceptional drought is occurring over southeast parts of the state. Parts of north central and northwest Texas continue to be abnormally dry or in moderate drought, while Central Texas is in severe to extreme drought.

Thanks again for your dedication in making all your weather observations! And don't forget that on days you are not home or unable to report your 24-hour rainfall observation for any reason, you can make a multi-day accumulation report upon your return. That data is used, too. There is now a link on the CoCoRaHS reporting page you can use for this purpose. And did you know there is a group at CoCoRaHS that quality controls the data each day? There is, and the intent is for us to recognize reporting errors that may occur. So, one of us may contact you one day in case we have any question about one of your reports. If you have difficulty making your observations or have questions on how to report them, please feel free to contact me or your county coordinator.

In case you were wondering if anyone uses your rainfall 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 continue to report, and consider inviting your neighbors, relatives and friends to join CoCoRaHS (a CoCoRaHS rain gauge would make a great Christmas present to someone)! The more rainfall observers we have, the better our chances are of determining the highest rainfall totals during rainfall events, and on the flip side, the exact location of drought when it doesn't rain. We appreciate it when you report zero rainfall daily on the dry days (which we had so many of this past summer). Why? Because if you go a month or longer without measurable rainfall, that tells us a lot, too!

Have a merry Christmas holiday season and a great winter!

Greg Story

East Texas Regional Summary

Quiet start to Autumn with Heavy Rain on a Few Days in October

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

It was generally a quiet start to fall 2023 across East Texas. Although there were a couple days of rainfall during the first week of the meteorological fall, many locations still managed to climb into the triple digits for high temperatures. By the 8th of the month, widespread showers and thunderstorms moved across the region with a cool front. A few of these storms prompted warnings across the area, and there was even a public report of 1.5" hail in the city of Clarksville in Red River County. A few more disturbances and frontal boundaries produced additional rainfall during the middle of the month, but outside of a few locations, most of the CoCoRaHS sites reported around 1" or less of precipitation. The weather started to ramp up between the 22nd and 25th of the month, when a warm front stalled across the region ahead of another cold front, which finally swept through the region on the 25th. The public reported quarter size hail in the Annona community in Red River County on the 22nd. Storms also produced widespread wind damage during the morning and evening hours on the 24th. In fact, a 70-mph wind gust was reported at Lake Striker in Rusk County at 11:30 pm. Despite the severe weather, this system brought much needed rainfall to help mitigate the ongoing drought conditions across the region. Some CoCoRaHS sites reported as high as 3" to 4" of rainfall, specifically across Bowie, Cass, and Marion in Northeast Texas, as well as Angelina and Nacogdoches Counties in Deep East Texas. The National Weather Service reported a daily record rainfall of 2.53" at Lufkin, TX on the 25th. Unfortunately, the much-needed rainfall went away, as dry conditions returned for the remainder of the month of September.

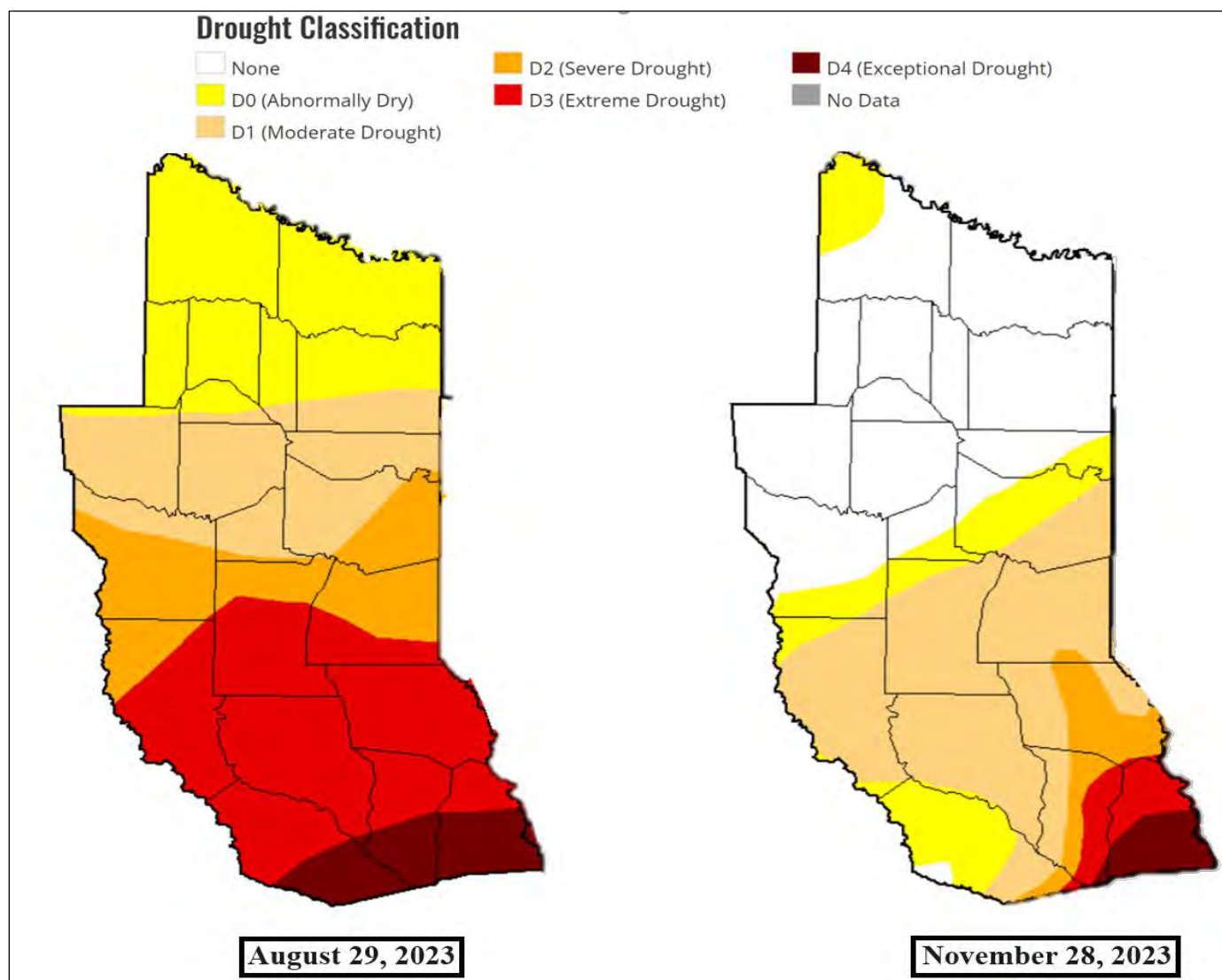
Dry conditions lingered into the first few days of October, before rain returned in a big way. Another warm front stalled north of Interstate 20 across Northeast Texas ahead of a cold front on the 4th and 5th. Rainfall amounts of 5" plus was reported at CoCoRaHS sites in Bowie, Cass, and Titus Counties. A couple of sites in Bowie County in the Texarkana area reported between 9" to 11" of rainfall. This coincides with a record rainfall report of 7.49" in Texarkana on October 4th from the National Weather Service. There were several reports of flash flooding during this timeframe, especially in Bowie County in the Texarkana area. These storms also produced several reports of downed trees in Smith, Upshur, and Wood Counties, including a 58-mph wind gust in the city of Tyler in Smith County. An extended period of mostly dry conditions settled across the region for the remainder of most of the month, until another upper-level disturbance and stalled frontal boundary brought another beneficial 2" to 4" of total rainfall between the 26th and 30th of the month.



Fig.1 – October 4th Flooding, Texarkana, TX
Image Courtesy of Texarkana, TX Police Department

East Texas Regional Summary (continued)

Another extended period of dry weather settled across East Texas during the first portion of November, until a frontal boundary moved across the region on the 9th. Rainfall amounts of 1" to 2" were generally reported by most of the CoCoRaHS sites. But there was very little rainfall reported during the remainder of the month, except for the 20th and 30th, where some CoCoRaHS sites reported 1" to 1.5" of precipitation on each of those dates. The good news is that we received enough rainfall during the fall months for drought conditions to improve across most of the region. Unfortunately, drought conditions still remain on locations south of Interstate 20, including Extreme to Exceptional Drought across portions of Deep East Texas. This could continue to improve, as the Climate Prediction Center continues to forecast above normal precipitation for the upcoming winter months for our area.



**Fig.2: Drought Monitor
Comparison Map (Aug.29 to Nov 28, 2023)
Image Courtesy of NDMC/USDA/NOAA**

Wichita Falls Regional Summary

Drought Improves Despite Very Warm Fall

By Charles Kuster

NSSL

Our region experienced well-above normal temperatures this fall, but near normal precipitation resulted in a slight improvement in drought conditions (Fig. 1, 2). September and October had 10 and 9 wet days (at least one CoCoRaHS station reported 0.05" or more) respectively and heavy rain occurred on multiple days.

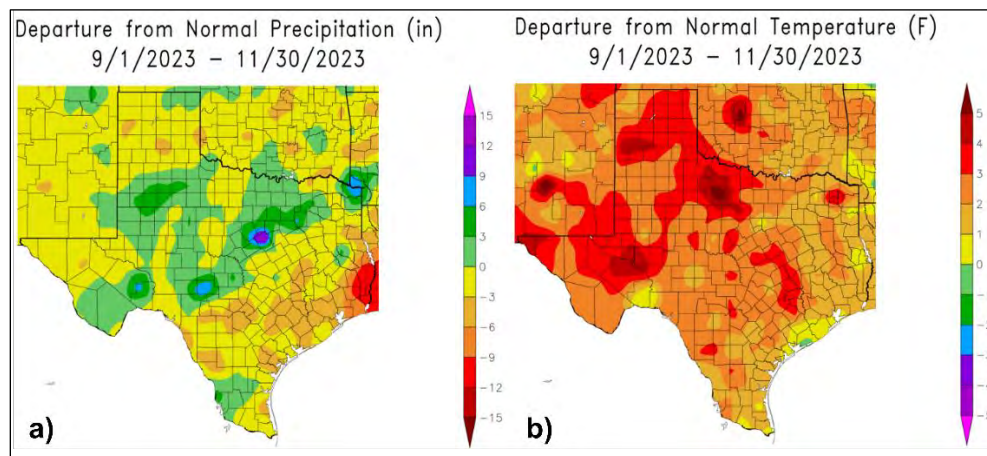


Figure 1. Departure from normal a) precipitation and b) temperature for the beginning of September through the end of November. Warm colors indicate below normal precipitation (a) and above normal temperatures (b), while cool colors indicate above normal precipitation (a) and below normal temperatures (b).

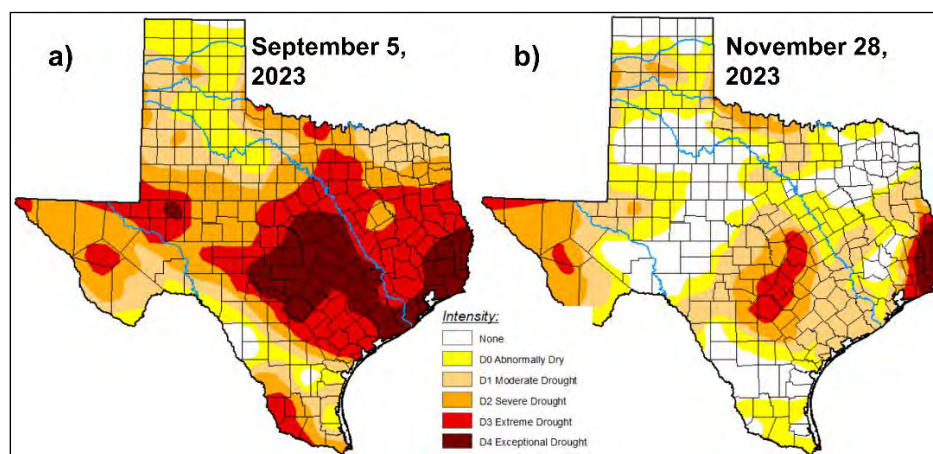


Figure 2. Changes in drought conditions over the fall according to the U.S. Drought Monitor (available at <https://droughtmonitor.unl.edu/>) for Texas on a) September 5, 2023 and b) November 28, 2023.

The heaviest rainfall occurred in the 24-hour period ending the morning of October 5th. All active CoCoRaHS volunteers reported at least 1.0" of rain and our entire region generally received 0.5" of rain or more (Fig. 3). November was much drier than September and October, but despite the dry November, drought conditions did improve slightly in our region and substantially improved across much of Texas (Fig. 2). In total, our region experienced 69 dry days (all CoCoRaHS stations reported less than 0.05") and 22 wet days. For comparison, the region experienced 74 dry days and 17 wet days last fall.

Wichita Falls Regional Summary (continued)

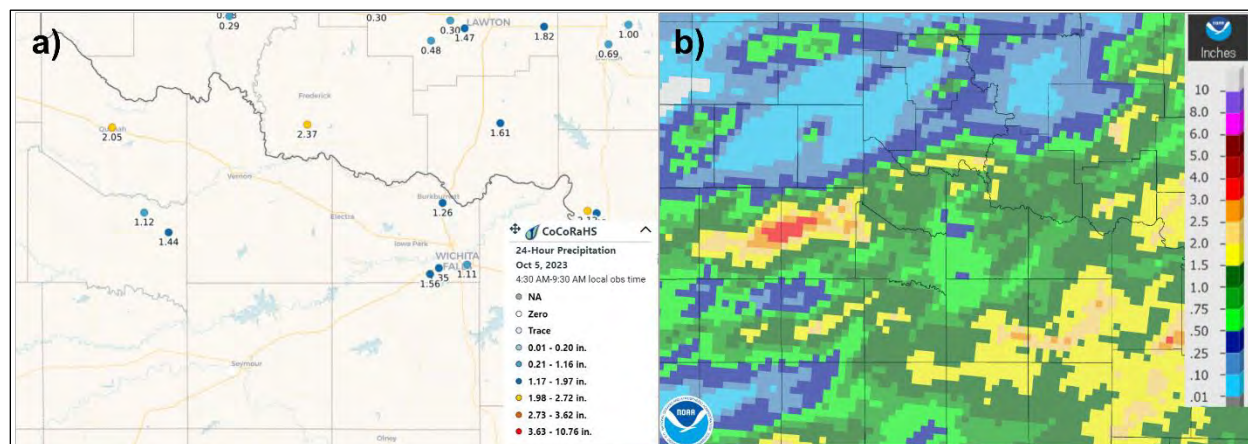


Figure 3. Rainfall for the 24-hour period ending the morning of October 5, 2023 as observed by a) CoCoRaHS observers and b) rain gauge and weather radar estimates. In b), warmer colors indicate higher rainfall amounts.

Our region may not experience a lot of wintry precipitation each year, but with the arrival of winter, now is a good time to review how to measure wintry precipitation to be ready if and when it does occur. Figure 4 below summarizes where to enter different aspects of winter precipitation on the CoCoRaHS data entry form, and a lot of good review material can be found at:

https://media.cocorahs.org/docs/WinterPrecipitationMeasurements_V3.0_Nov2022.pdf.

Always remember to be safe in slippery, winter conditions!

Snow Measurement Review

- Melt any snow/ice in your rain gauge, and report this (Gauge Catch) as your Daily Precipitation.
- Measure the 24-hr accumulation of new snow on your snowboard.
- For the 24-hr SWE, take a core from your snowboard, melt, and report in the "New Snowfall" section (optional). **If you do not cut a core, leave this "NA"**
- Measure Snowpack Depth (the total snow on the ground, new snow plus old snow and ice).
- Report the Snowpack Snow Water Equivalent (optional)

Precipitation Report Form

Station Number: _____ Station Name: _____

* Denotes Required Field

1/14/2022 *Observation Date

1:02 AM *Observation Time

0.58 in *Gauge Catch: Rain and Melted Snow to the nearest hundredth inch that has fallen in the gauge during the past 24 hours, or T for trace, or NA for unknown.

24-hr Snowfall

4.2 in Snowfall: Accumulation of new snow in inches to the nearest tenth

0.57 in Snowfall SWE: Melted value from core to the nearest hundredth

Total Snow and Ice on Ground at Observation Time

4.5 in Depth of total snow and ice (new and old) in inches to the nearest half inch

0.93 in Melted value from core to the nearest hundredth

Far West Texas/El Paso Regional Summary

Severe Drought Plagues El Paso Region This Fall

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

After a summer of record-heat and a disappointing monsoon season, the autumn months were not that much different in El Paso, TX and surrounding communities. Drought conditions worsened over the past few months, with much of the region now in an Extreme (D3) to Exceptional (D5) Drought Status, according to the U.S. Drought Monitor. Precipitation totals were consistently below normal, with sporadic periods of light rain. Much of the area recorded seasonal totals an inch or more below the already low seasonal normal of **2.54"**.

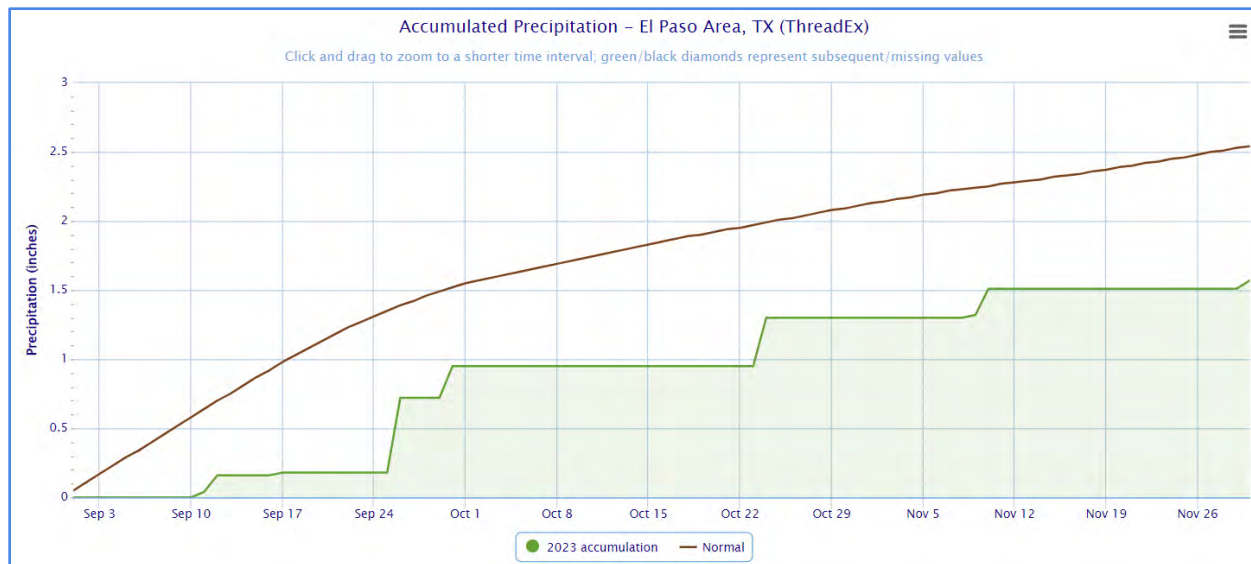


Figure 1: 2023 autumn precipitation in El Paso, TX compared to climate normals (1991-2020).

The month of September began with yet another record-setting heat wave. An all-time monthly record temperature of 106 degrees occurred at El Paso International Airport on September 8th. Light rains fell over much of El Paso and Hudspeth County from September 11-12 with the heavier rains falling to the north over New Mexico. The region remained primarily dry until the final week of the month. One final surge of monsoon moisture and scattered thunderstorms brought nearly half of the entire seasonal rainfall. Most notably on September 26th, when a thunderstorm moved up out of Mexico that evening into El Paso County. Heavy rain and small hail occurred in downtown El Paso, with one CoCoRaHS observer recording a daily rainfall total of **1.39"**. Strong storms also occurred on September 30th with a few storms producing large hail and blowing dust.

October was a very dry month as abnormally warm temperatures continued. The only mentionable period of rain occurred on the 23-24th of the month as a Pacific low moved across the region. 48-hour rain totals of **0.25-0.50"** were observed, however a few observers in central El Paso surpassed **1.00"** over those days.

Far West Texas/El Paso Regional Summary (continued)

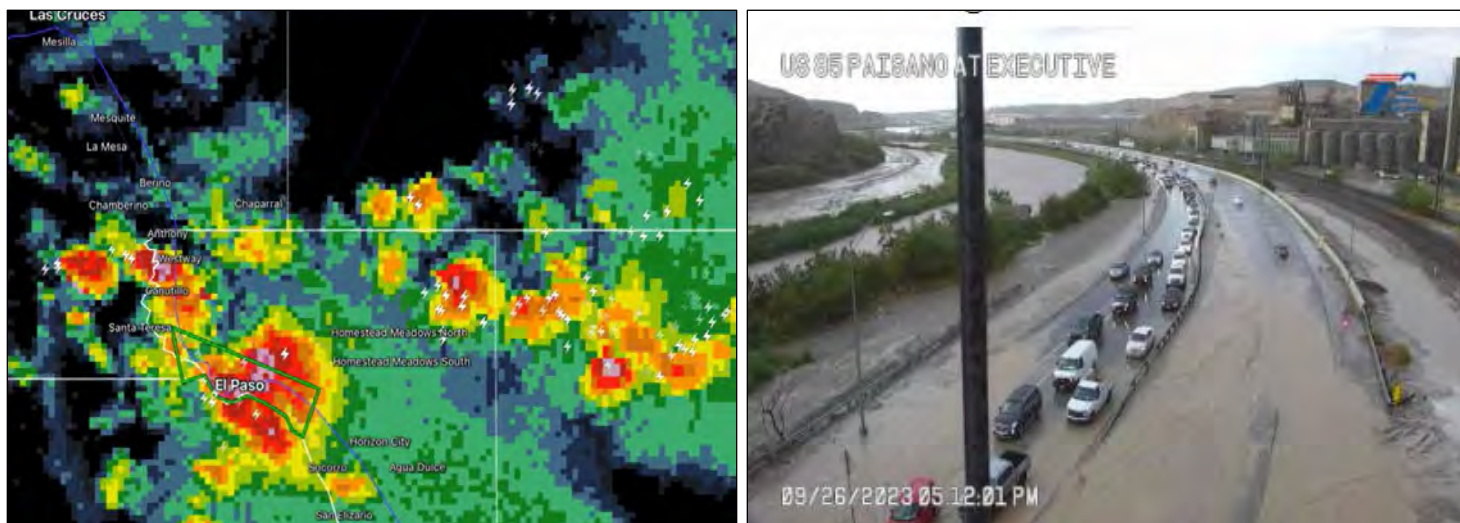


Figure 2: Radar reflectivity of a strong thunderstorm over downtown El Paso, TX on September 26th which resulted in the flooding of several roadways including Paisano Drive.

Very little to note for the month of November, either. Precipitation totals ranged from **0.15-0.35"**, just below the monthly normal of **0.43"**. The majority of this rainfall occurred on November 10th. No snow has been recorded over the Texas mountains yet as we head into the winter. We are hopeful for some winter weather the next few months as global teleconnection and the onset of a moderate-to-strong El Niño suggests better chances for Pacific storm systems across the U.S. Southwest in the coming weeks. Drought conditions are expected to linger through the winter season, however.

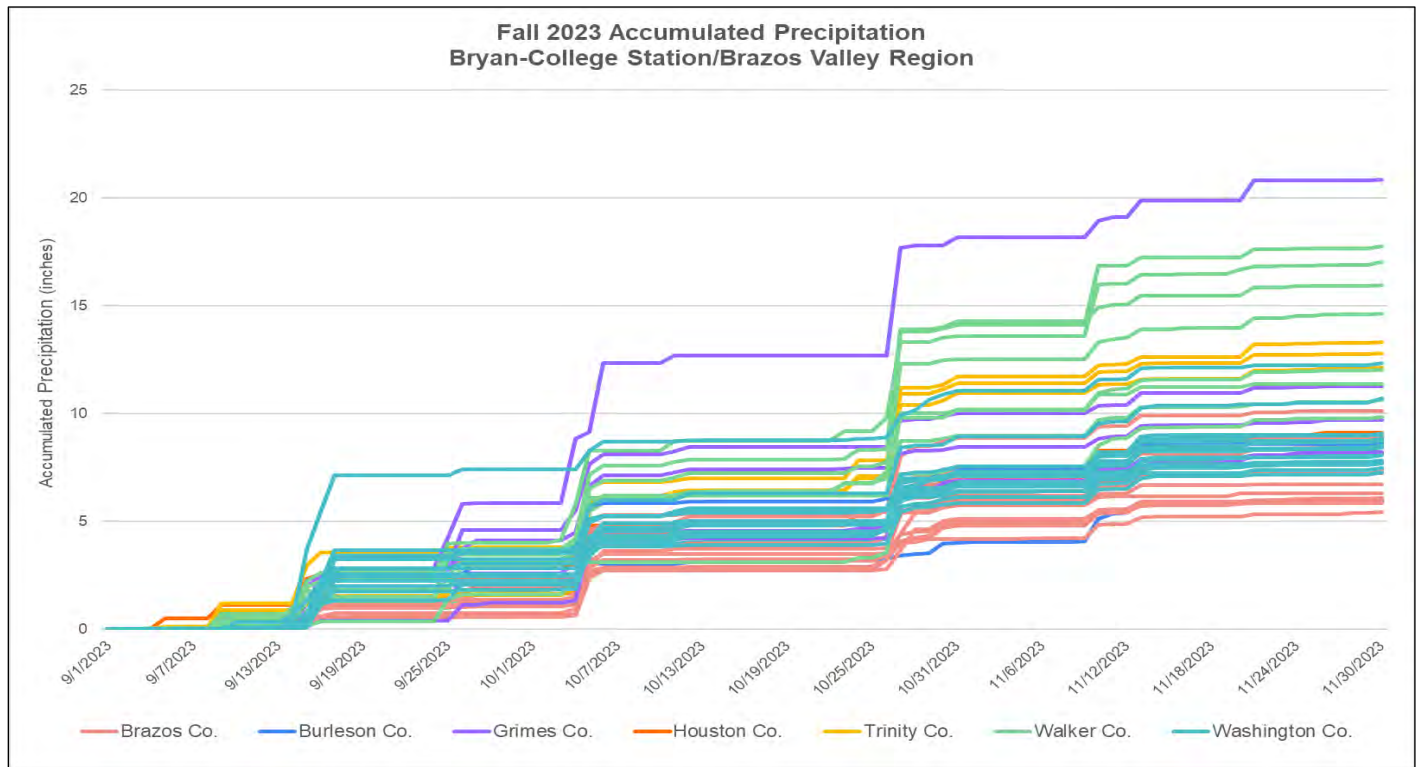
90-day precipitation totals of **1.00-2.00"** were consistently below normal in El Paso and Hudspeth Counties. We would've been close to record-low rainfall if it had not been for the late September thunderstorms. The fall season featured 35 active observers in El Paso County, and 2 in Hudspeth County. A total of 1,810 daily reports were submitted, along with 52 multiple-day reports. Only 14% of total reports had measurable precipitation, which means our regional observers continue to do a great job reporting days with 0.00". No Condition Monitoring or Significant Weather Reports were submitted. Thanks again to all our local observers who participated in the 2023 autumn season!



Brazos Valley Regional Summary

Fall 2023 Precipitation Summary

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



Summary:

Fall 2023 offered some relief to our region after the brutal summer we had. Throughout the quarter, rain consistently fell across the Brazos Valley with roughly two-week-long periods of no rainfall broken up by rain events spanning a few days. The overall average rainfall accumulations for our region was 10.25" while the normal seasonal amount is 10.78". As a result, we were 0.54" below what is normally expected for fall in our area. On a county level, precipitation anomalies varied. The driest anomaly was Brazos County at 3.26" below normal, followed by Burleson (-2.75"), Houston (-1.95"), and Washington (-1.69"). The wettest anomaly was Walker County at 2.55" above normal, followed by Trinity (1.37") and Grimes (0.83"). Following such a dry summer, near-normal precipitation for the whole region throughout the fall helped drastically improve the serious drought conditions. Above-normal rainfall is expected for the winter season, so this should continue to help us out.

Observer Statistics:

Throughout the fall season, we had 63 active observers reporting their precipitation totals with 32 observers missing no more than 10 days of reporting. Of these, 9 did not miss a single day! Overall, 48 stations were used to calculate this season's records. We thank you for your vital contributions!

Season Statistics:

Wettest Day: 6.82", October 27, Walker County

Wettest Seasonal Total: 20.83", Grimes County

Driest Seasonal Total: 5.42", Brazos County

Soggy Socks Award: (longest spell with measurable rain): 7 days, October 26-November 1, Burleson County

Dusty Soles Award: (longest spell without measurable rain): It's a tie! - 20 days

October 6-25, Brazos County

October 7-26, Walker County

Abilene/San Angelo Regional Summary

A very Hot Autumn with a Downward Temperature Trend in November

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

September

Meteorological autumn began on the first day of September. Yet, there was no noticeable difference between the first third of the month and the rest of summer, as afternoon high temperatures continued to reach and exceed 100°F. Finally, during mid-September, as seen in the chart below, the high temperatures drop off as showers and thunderstorms develop in the area. Generous amounts were reported across most of West Central Texas. Some areas, such as Junction, reported totals in excess of 100% of their normal rainfall for September.

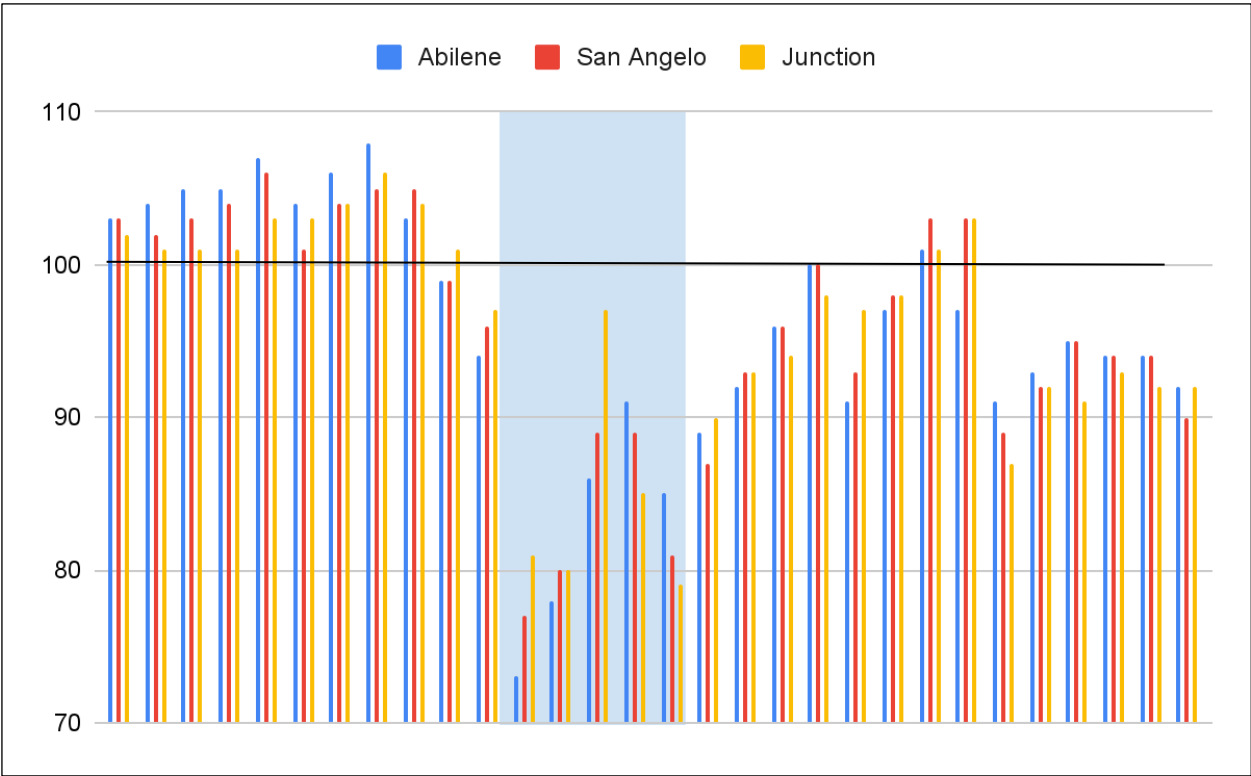


Chart 1 - High temperatures for Abilene, San Angelo, and Junction. A black horizontal line representing the 100°F mark, and a blue shaded area representing days that experienced rainfall.

How does this September compare to past years? Below is a table showing the 30-year normal for Abilene, San Angelo, and Junction, along with the average temperature for the month and how it ranks within the period of record.

Station	Normal	Average Temperature	Ranking (warmest)
Abilene	76.9°F	84°F	1 (since 1885)
San Angelo	77°F	82.3°F	3 (since 1907)
Junction	76.6°F	82.8°F	2 (since 1948)

Table 1 - A comparison between the 30-year normal temperature for the month of September and the average temperature experience during September 2023.

Abilene/San Angelo Regional Summary (continued)

Abilene experienced its warmest September on record, while San Angelo and Junction experienced their 3rd and 2nd respectively. Despite the cool-off mid-month, the above-normal temperature conditions dominated the area.

October

Climatologically, October is the second wettest month of the year. This is mainly due to the jet stream becoming more active and breaking down the relentless high pressure that dominates West Central Texas during summer. A distinctive characteristic of this past October was the delayed onset of rainfall, with precipitation making its presence felt mainly after the 23rd and persisting until the end of the month.

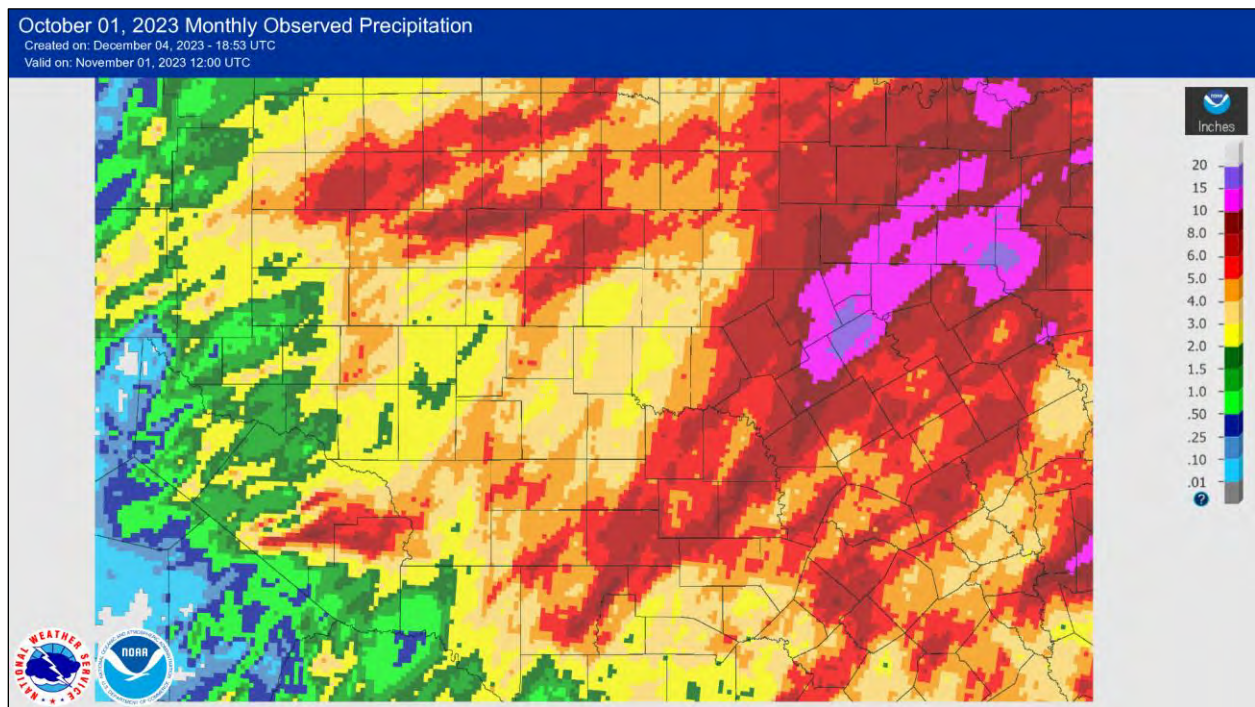


Image 1 - Monthly observed precipitation from the month of October

The majority of the area encountered precipitation levels that exceeded the 30 year normals by more than 100%. However, exceptions to this trend were observed in the Concho Valley and southeastern Big Country, where, despite decent rainfall, remained drier than usual.

Abilene/San Angelo Regional Summary (continued)

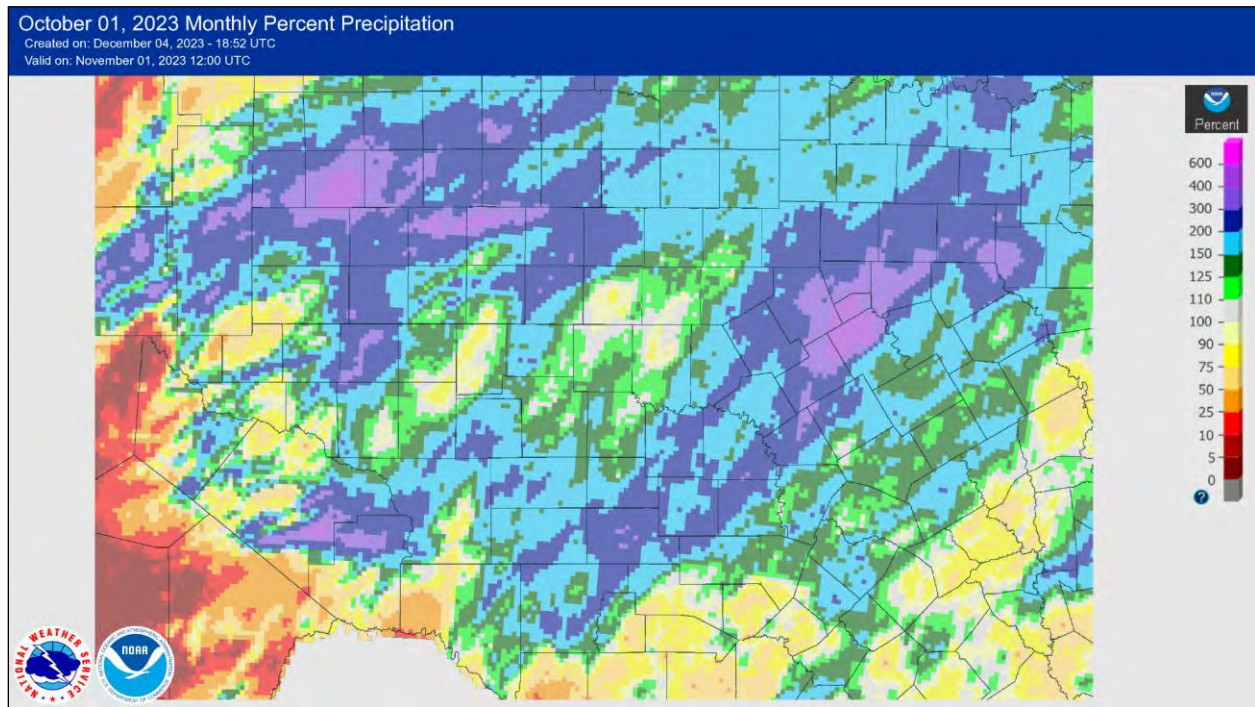


Image 2 - Monthly percent of normal from the month of October

The average temperature experienced a continuous decline, driven by the increasing frequency of cold fronts and reduced sunlight hours. Despite this cooling trend, the month concluded with temperatures that, on average, were warmer than the established norms. Yet, October never approached the top 3 warmest months on record as September did, and after a notably hot summer, afternoon highs in the 80s and 90s were a welcome change. To add to the rollercoaster of temperatures, the first freeze of the season, typically around the 11th of November for Abilene, and November 10th for San Angelo, occurred on the 31st of October. Nearly two weeks early.

Station	Normal	Average Temperature	Ranking (warmest)
Abilene	67°F	68.2°F	30th (since 1885)
San Angelo	67.1°F	68.2°F	28th (since 1907)
Junction	67.2°F	68.6°F	12th (since 1948)

Table 2 - Comparison between the 30-year normal average temperature and the observed average temperature for October 2023.

November

November brought diverse weather patterns to the region, marked by notable temperature fluctuations and varying precipitation levels. The previous month ended with an unusually early first freeze, creating a temporary chill before temperatures rebounded above seasonal normals in early November. However, this warmth proved transient, giving way to a downward temperature trend as the month progressed.

Despite November technically concluding with the average temperature slightly above normal, the disparity in normal temperatures and observed average temperatures has continued to decrease, as can be seen in the graph below. Notably, Abilene faced a significant rainfall deficit this month, contributing to drier conditions and ultimately warmer temperatures in that region. Thus, Abilene is the only city on the graph pg. 37 to see a higher departure from normal in November than in October.

Abilene/San Angelo Regional Summary (continued)

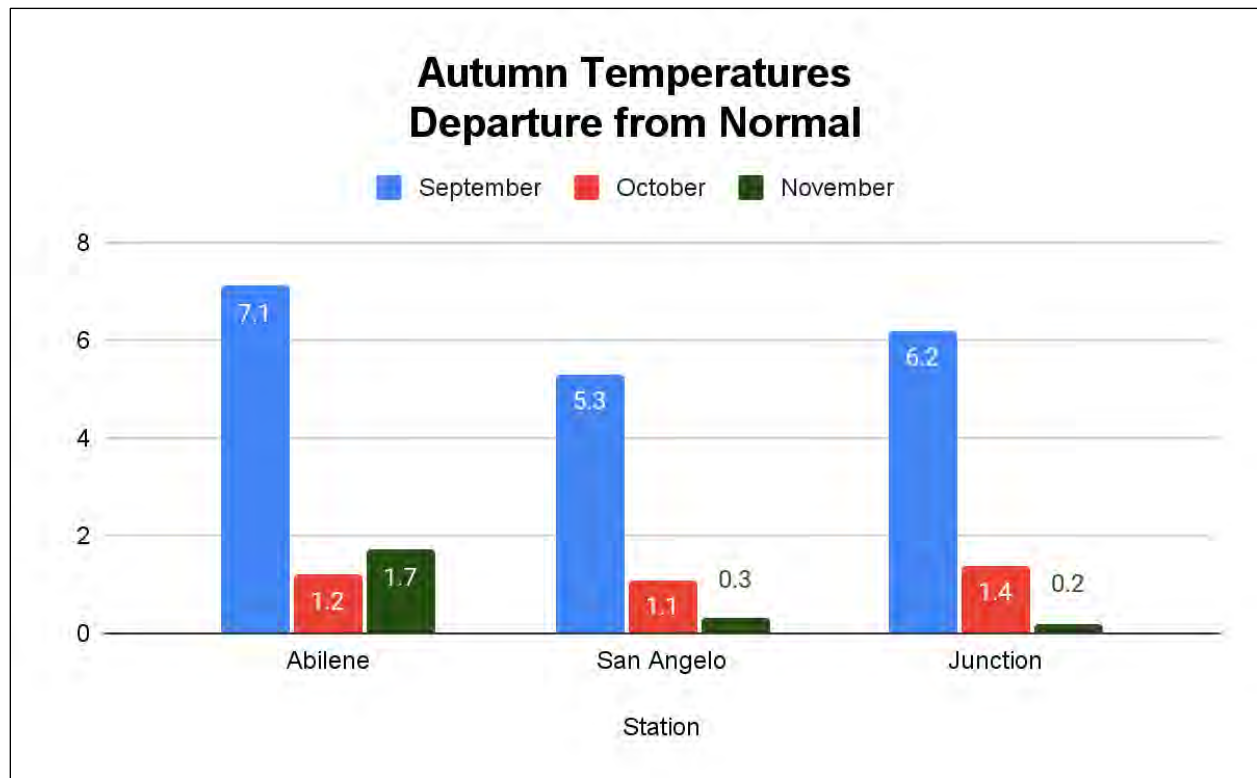


Chart 2 - A comparison of the departure from normal temperatures between September, October and November.

A geographical divide in rainfall patterns was evident, with areas south of Interstate 20 receiving higher rainfall totals. The Northern Edwards Plateau, and Irion County, stood out with the highest rainfall accumulations, contrasting sharply with drier conditions observed in areas outside this region. As a result, the month ended with a notable disparity in precipitation levels across the Northern Edwards Plateau and surrounding areas, leaving some locales drier than usual.

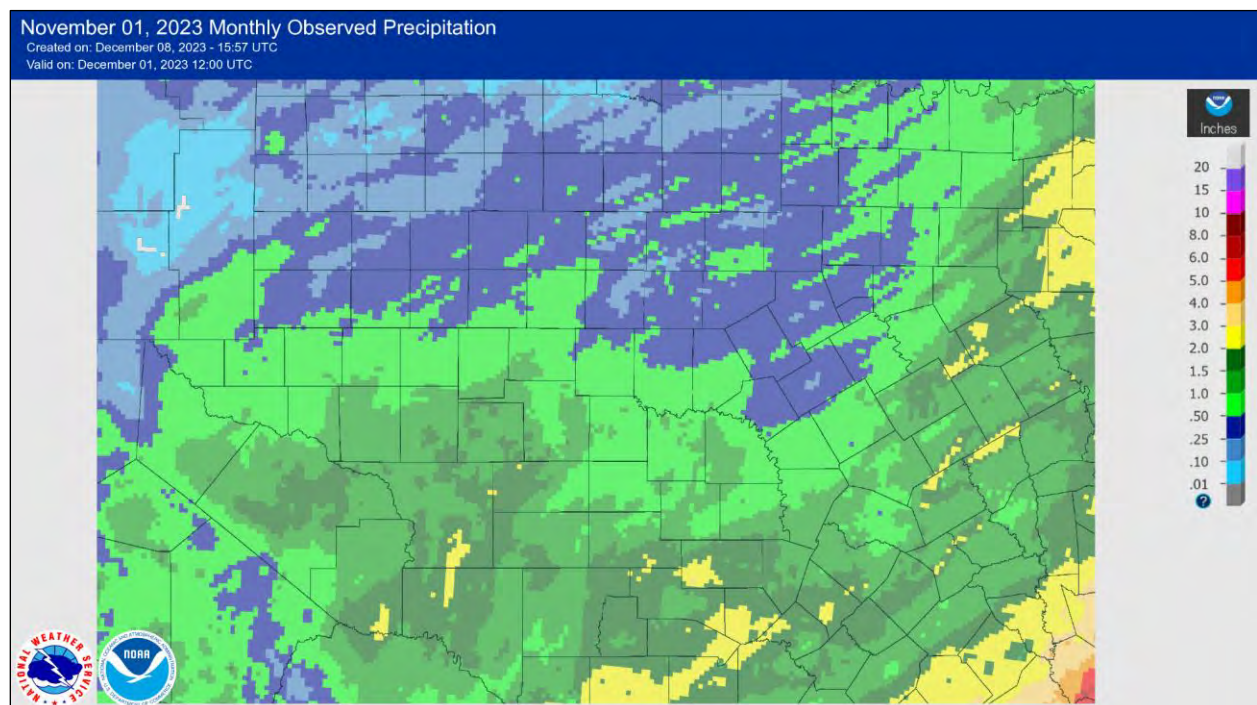


Image 3 - Monthly observed precipitation from the month of November

Corpus Christi Regional Summary

Near Normal Rainfall through Much of the Fall

By: Nicholas Price, Meteorologist, NWS Corpus Christi

The fall season this year began similarly to last season. Below average rainfall was observed during September causing dry conditions for the month before returning to near average rainfall by October. The introduction of an El Niño pattern caused the area to see warmer than normal temperatures while seeing above normal rainfall totals through the month of November. Though September started out dry, October saw above average rainfall per NOAA Climate Prediction Center.

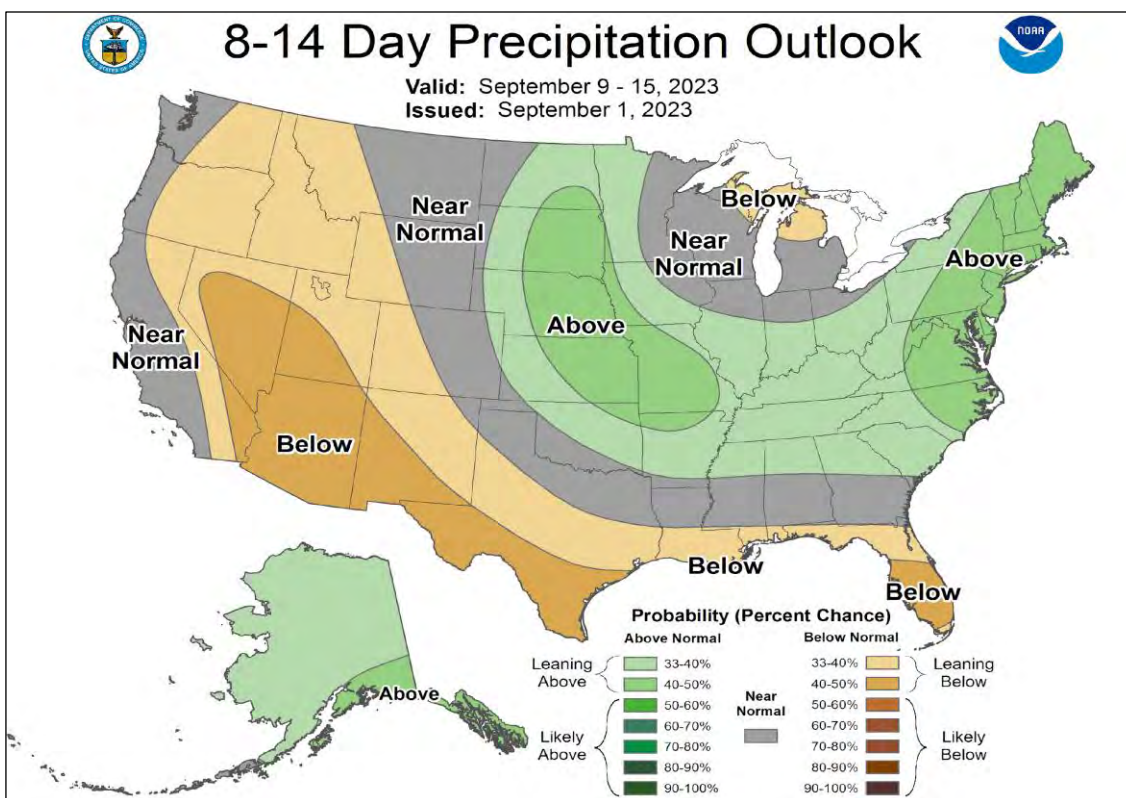


Figure 1: NOAA Climate Prediction Center 8-14 Day Precipitation Outlook for September 9-15th

Fall commenced with a reiteration of the hot and dry summer that we had experienced this year. The NOAA Climate Prediction Center (CPC) issued an outlook forecasting a 50-60% chance for below average rainfall shown in Figure 1. This was evident across much of the area as large portions of the Coastal Plains and Brush Country saw from 1.10-2.40", shown in Figure 2. This caused South Texas to see rainfall deficits up to 3.70" with the highest shortages along the Coastal Bend and across northern locations, as shown in Figure 3. The highest accumulation occurred in Freer, TX with 4.43", with isolated high totals of over 3.00" across parts of South Texas. A few severe storms that trained over the Webb and Duval counties attributed to the higher rainfall accumulations and thus the above normal rainfall. Rainfall was above normal in those areas shown with values up to 1.82" Estimated Departure from Normal Rainfall in that portion of the Brush Country and Rio Grande Plains.

Corpus Christi Regional Summary (continued)

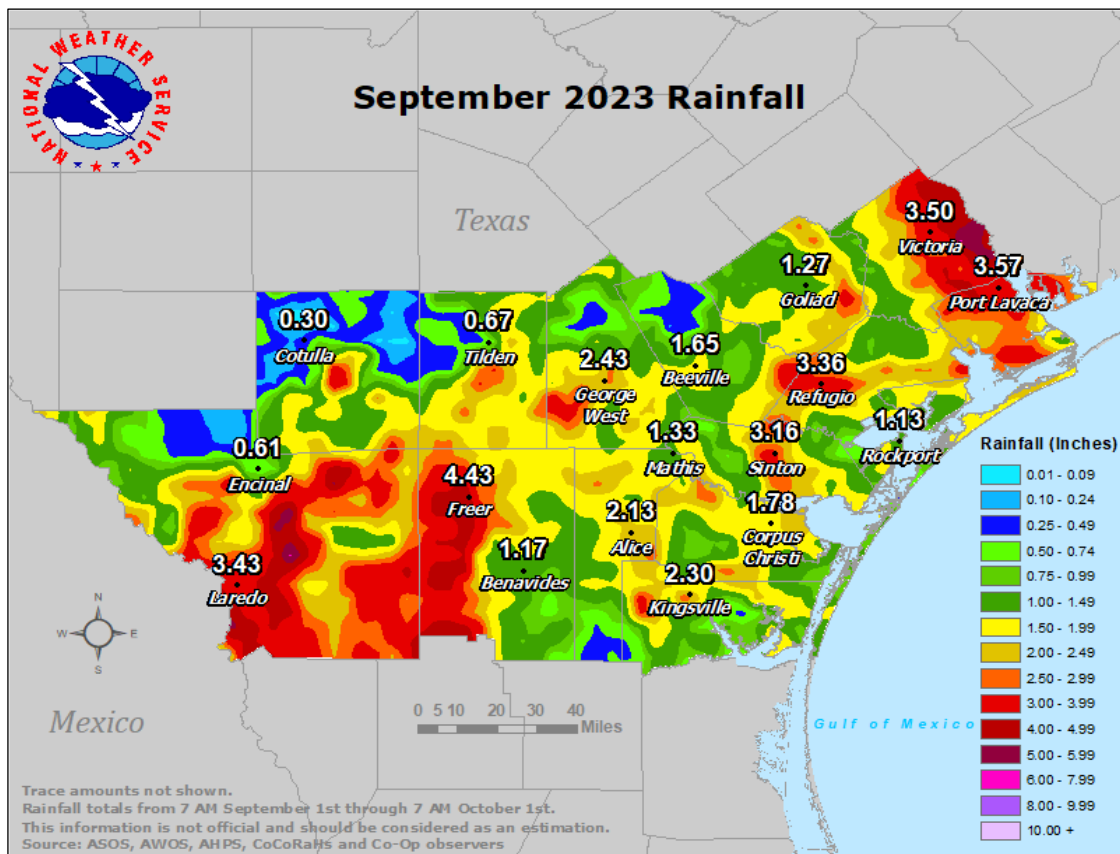


Figure 2: September 2023 Estimated Rainfall Totals

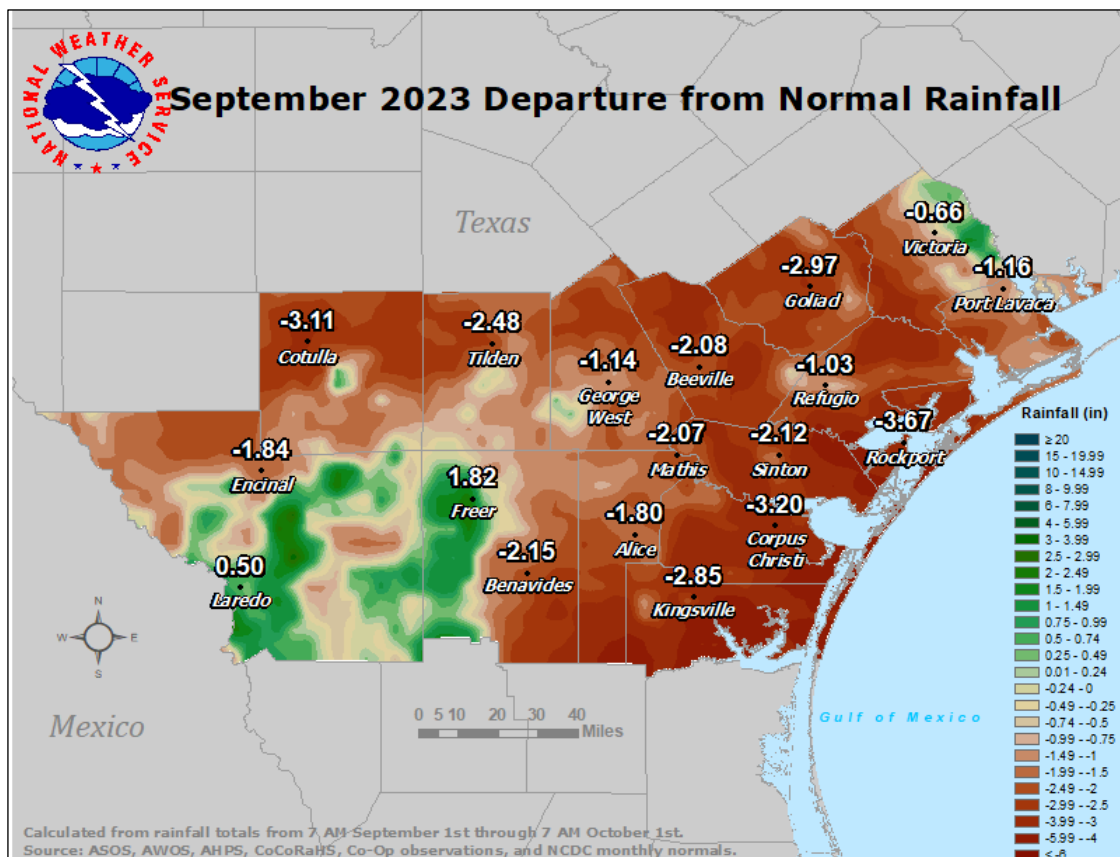


Figure 3: September 2023 Estimated Departure from Normal Rainfall

Corpus Christi Regional Summary (continued)

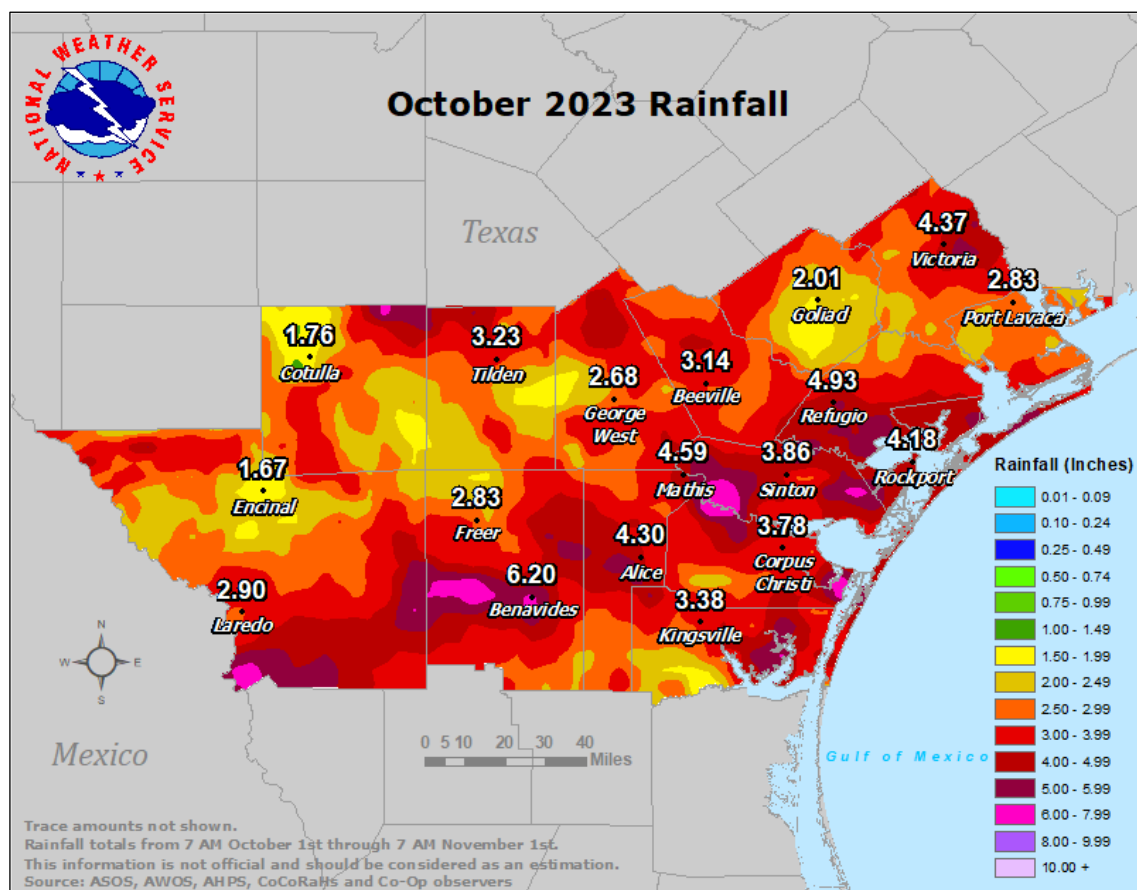


Figure 4: October 2023 Estimated Rainfall Totals

October featured more widespread rainfall across much of South Texas with multiple areas receiving accumulations of over 4.00", as shown in Figure 4. Copious amounts of moisture aided numerous weather systems that produced showers and thunderstorms that lingered throughout the month. This prompted the NOAA Weather Prediction Center (WPC) to put portions of the area in risks for Excessive Rainfall on a few occasions throughout the month. Some of this accumulation resulted from our first real cold front at the beginning of the month which can be seen in Figure 5. The trend of being included in risks for Excessive Rainfall continued through the end of the month due to the persistent pattern of ejecting cold fronts from the Desert Southwest. Observers from the central portions of our CWA in the Coastal Plains, Brush Country, and Rio Grande Plains also saw isolated areas of 6.00" of accumulation. This was about 3.50" above normal rainfall expected for this time of year which can be observed in the October 2023 Estimated Departure from Normal Rainfall Graphic per Figure 6. A couple of areas in the Victoria Crossroads and Brush Country missed some of the benefiting rainfall that fell across the area. Observers in Goliad and Port Lavaca saw below 3" of accumulation during the month, while the lowest accumulation occurred in Cotulla and Encinal at below 2". As the month of October concluded, the area saw more of a transition into a stronger El Niño pattern going into November as represented in Figure 7. As shown in the graphic the value of the Monthly Sea Surface Temperatures for the August-October period was around 1.7°C which is considered "strong" criteria for El Niño per CPC. This often leads to wetter conditions in the south especially in the Texas area. This can be better observed in next month's rainfall totals.

Corpus Christi Regional Summary (continued)

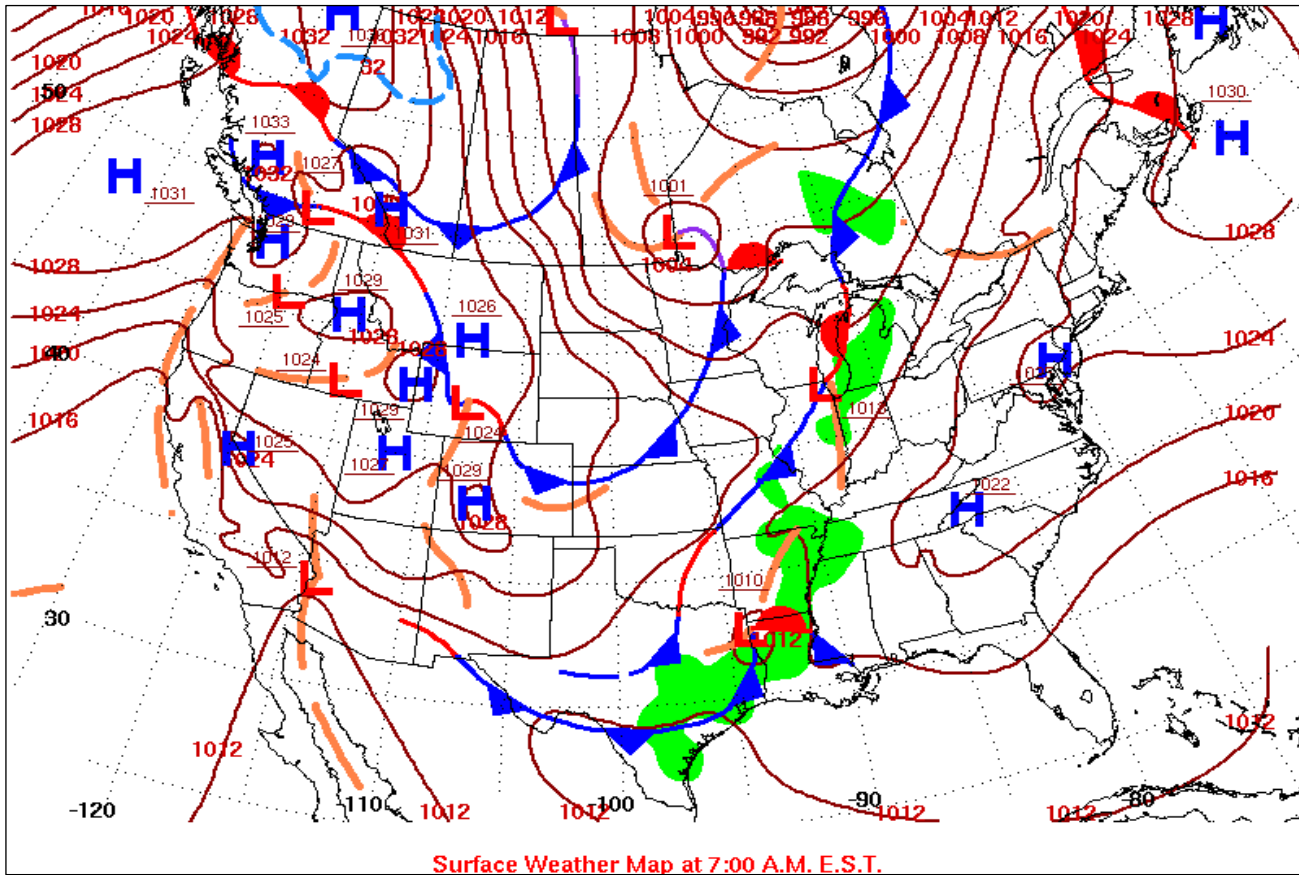
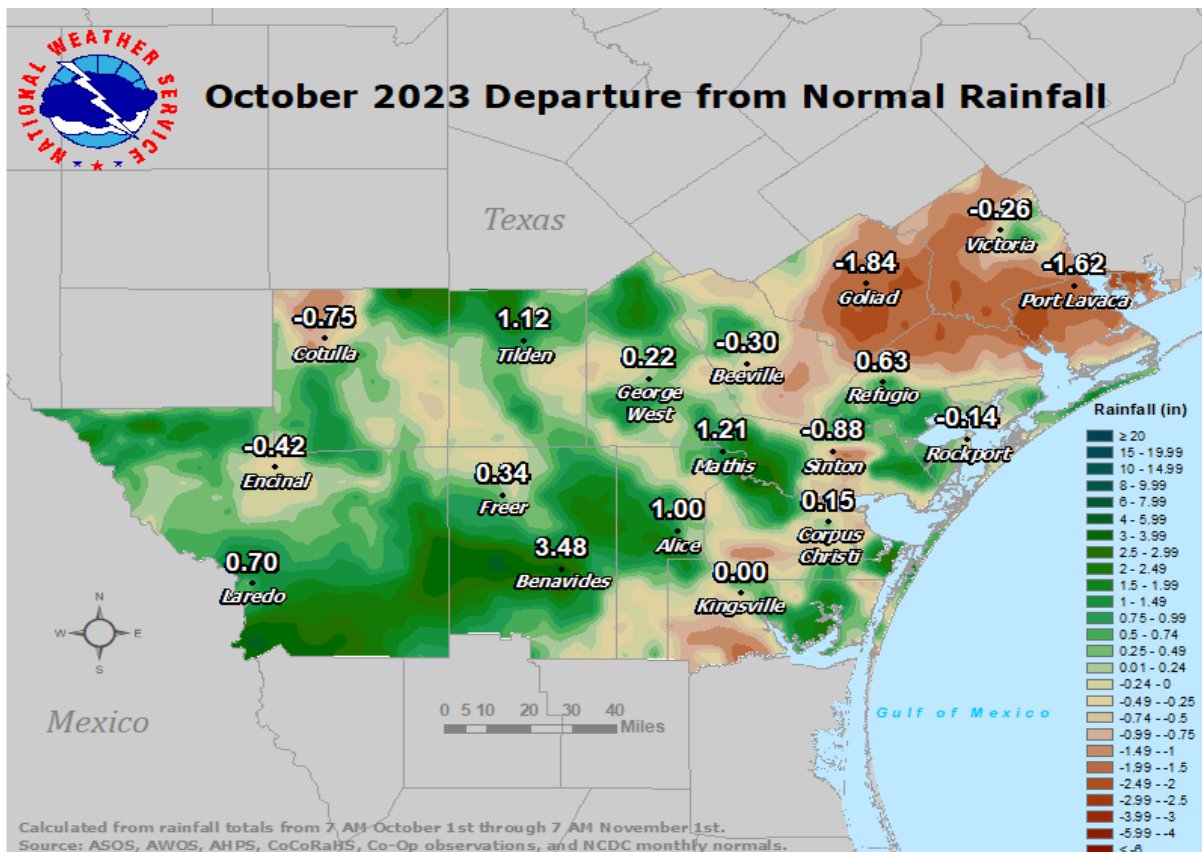
Figure 5: Surface Map from October 5th 2023

Figure 6: October 2023 Estimated Departure from Normal Rainfall

Corpus Christi Regional Summary (continued)

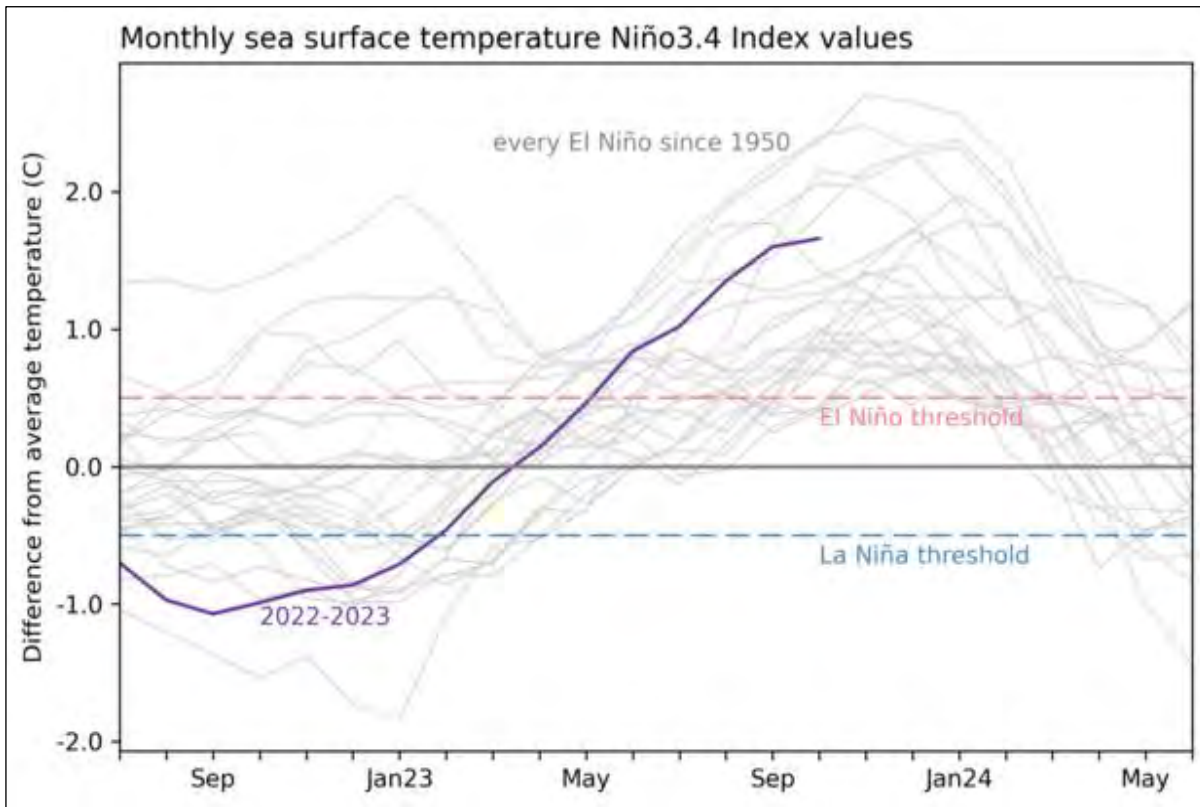


Figure 7: The Oceanic Niño Index is the primary metric for ENSO (El Niño/ Southern Oscillation)

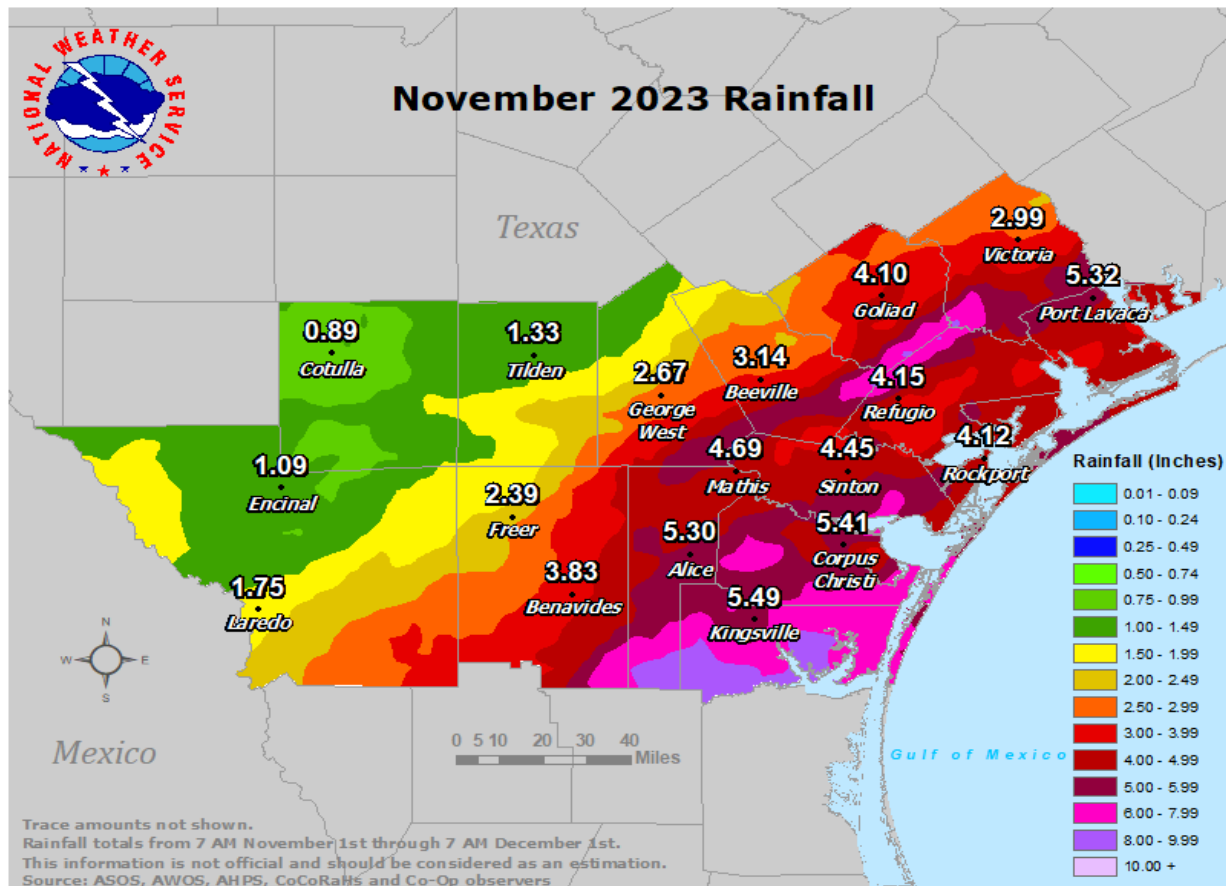


Figure 8: November 2023 Estimated Rainfall Totals

Corpus Christi Regional Summary (continued)

November continued with the pattern of recurring fronts ejecting from the west that would track into our area. Excessive Rainfall risks also returned for the month of November in portions of South Texas with the numerous showers and thunderstorms that were produced by these systems. The moisture ahead of the events that occurred from November 6th through about November 12th was sufficient to allow for larger accumulations of rainfall to be seen around areas of the Southern Coastal Bend as well as the Victoria Crossroads. Some observers saw upwards of about 2-3" with the November 12th weather system alone. These factors contributed to some elevated values of 6.00"-8.00" of rain in those portions of the Southern Coastal Bend and Victoria Crossroads seen in Figure 8. That is about 3.00"-6.00" above the normal rainfall expected for this month, shown Figure 9. Areas out west and some areas to the north weren't as fortunate to receive as much rainfall with observers seeing just under 3.00" of accumulation. Though, this is normal for this time of year in the region. The stronger El Niño pattern among other factors allowed for a much-needed relief to the area after enduring the scorching summer this year.

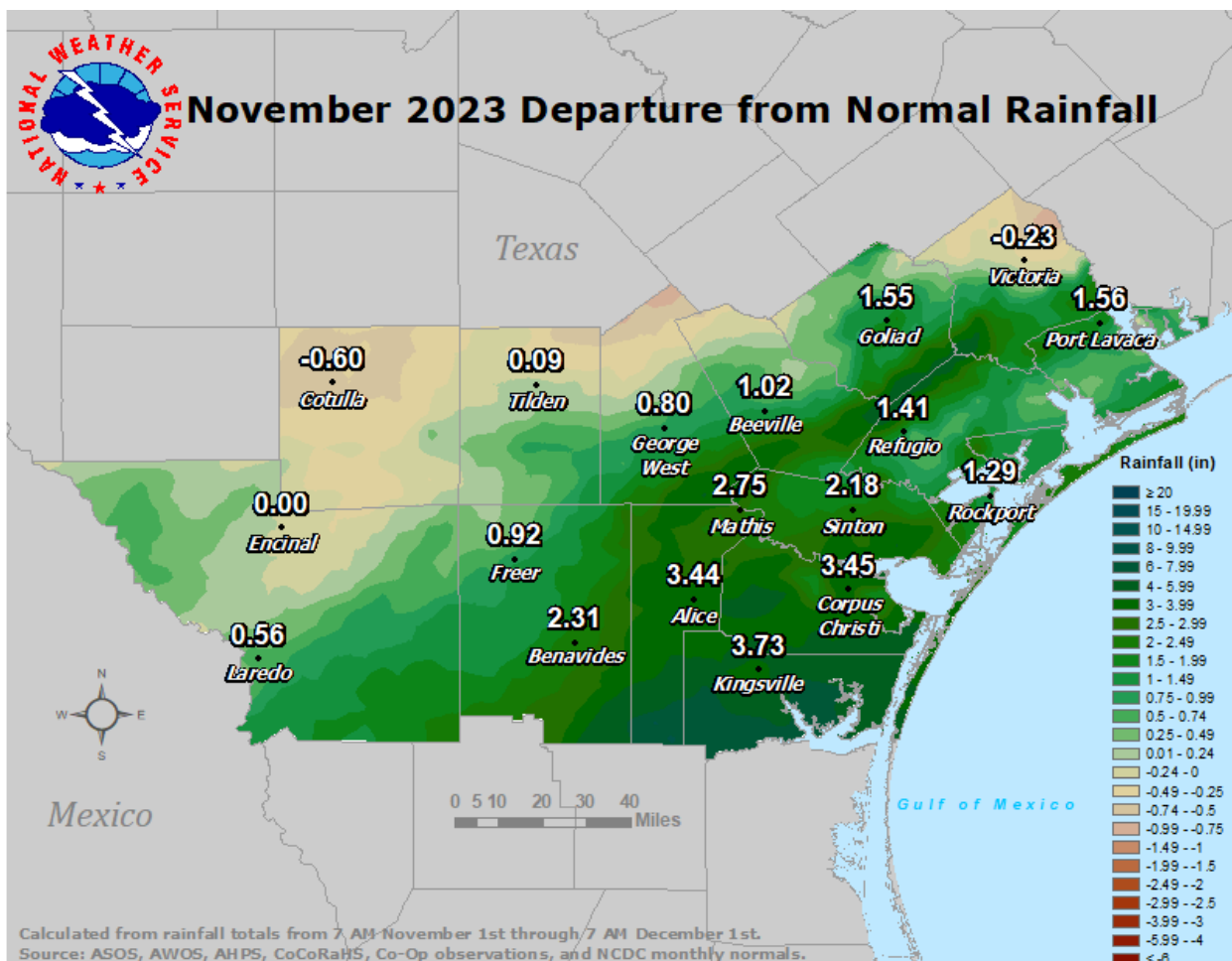


Figure 9: November 2023 Estimated Departure from Normal Rainfall

Southeast Texas Regional Summary

Drought Improvements and Cooler Temperatures, more Rain Needed

By: Ron Havran, Southeast Texas CoCoRaHS Regional Coordinator, HCFC

September

The month was a continuation of a very hot and extremely dry summer. Temps were 3.5° to 6.0°F above normal. Very dry weather prevailed all month with a few spots getting some much needed rains. Most locations saw their hottest Septembers on record, or at least within the top three hottest. This heat and general lack of precipitation led to the expansion of Exceptional Drought (D4) to expand across almost the entire region. Please refer to Tables 1 & 2 and Charts 1 & 2 for all the details of temperatures and precipitation across all of Southeast Texas for the autumn season.

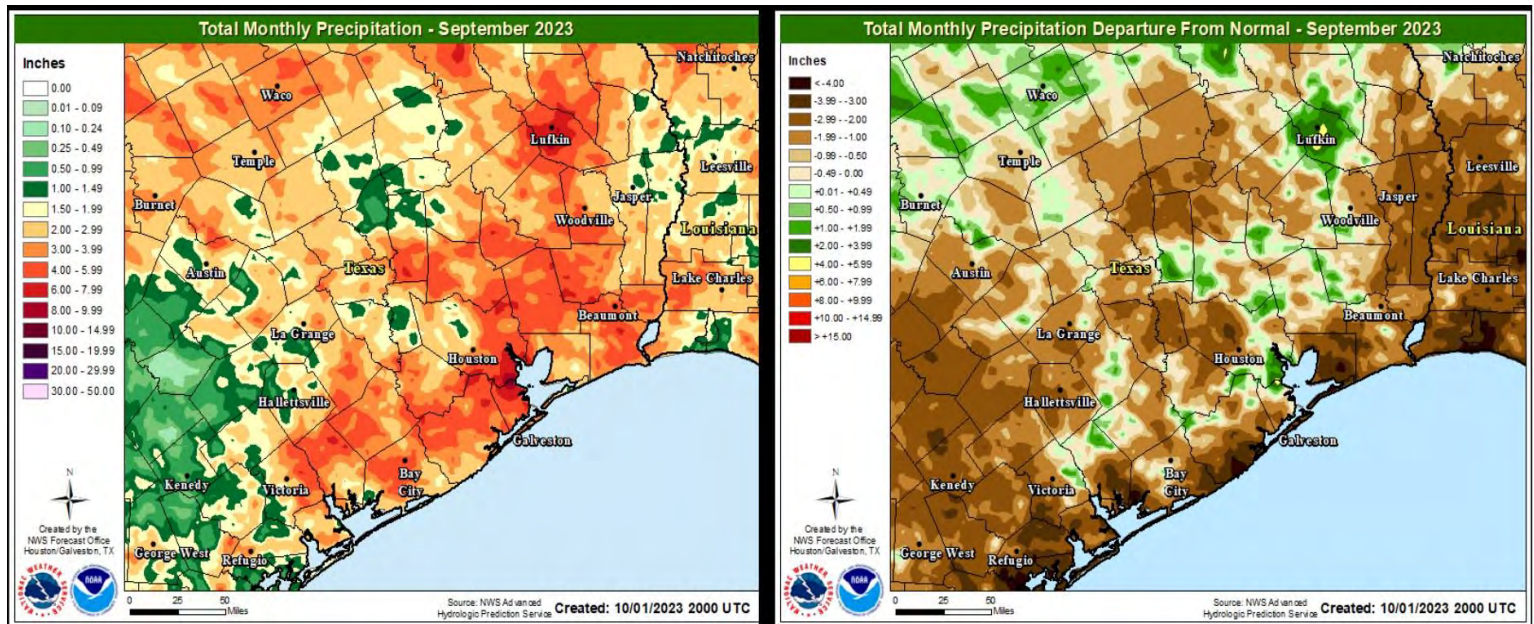


Figure 1: September Monthly Precipitation and Departure from Normal Maps for Southeast Texas

October

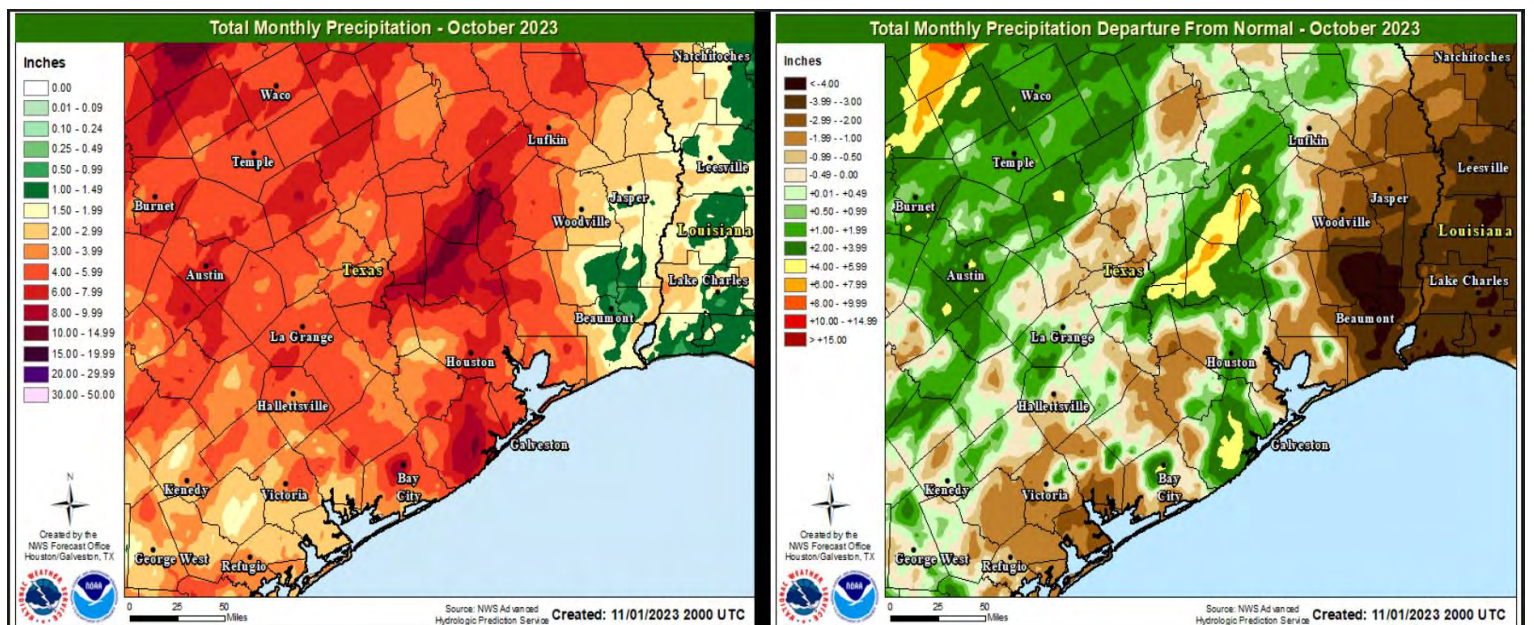


Figure 2: October Monthly Precipitation and Departure from Normal Maps for Southeast Texas

Southeast Texas Regional Summary (continued)

After months of extremely hot and dry conditions, October finally broke the streak. The start of the month was near to slightly above normal temperatures, but then the season's first strong cold front at the end of the month brought below normal temperatures. There were multiple days of scattered showers and thunderstorms producing locally heavy downpours. Most of the area generally saw three to six inches of rainfall. The heaviest rains for the month were in Montgomery, San Jacinto, and Brazoria counties. Temperatures were closer average across the region and rainfall depended on the locations of heavy rainfall as to whether an area was above or below normal for the month. See figure 2 for details of rainfall variability in October. There were still a large number of places that didn't receive that much rain in October such as the Golden Triangle counties and southwestern counties such Jackson and Wharton.

November

Multiple cold fronts moved through the area during the month of November leading to near to slightly below cooler than normal temperatures. The coolest temperatures were experienced along the coastal counties (See Tables 1 & 2) where the highest rainfall totals fell. See figure 3. Areas along and south of I-10 received around three to six inches of rainfall, while areas to the north ranged from one to three inches. By looking at figure 3 and comparing that data to Chart 1 & 2, that shows only CoCoRaHS observer rainfall data, it is clear to see there is a large amount of rainfall variability across the region this autumn season. This is one reason why the more CoCoRaHS observers we have the better defined the rainfall patterns are to see. We still need many more observers in Southeast Texas. Please try to recruit a friend who is interested in measuring precipitation. A CoCoRaHS approved 4-inch diameter manual gauge makes a great gift this season for that special someone who likes recording precipitation.

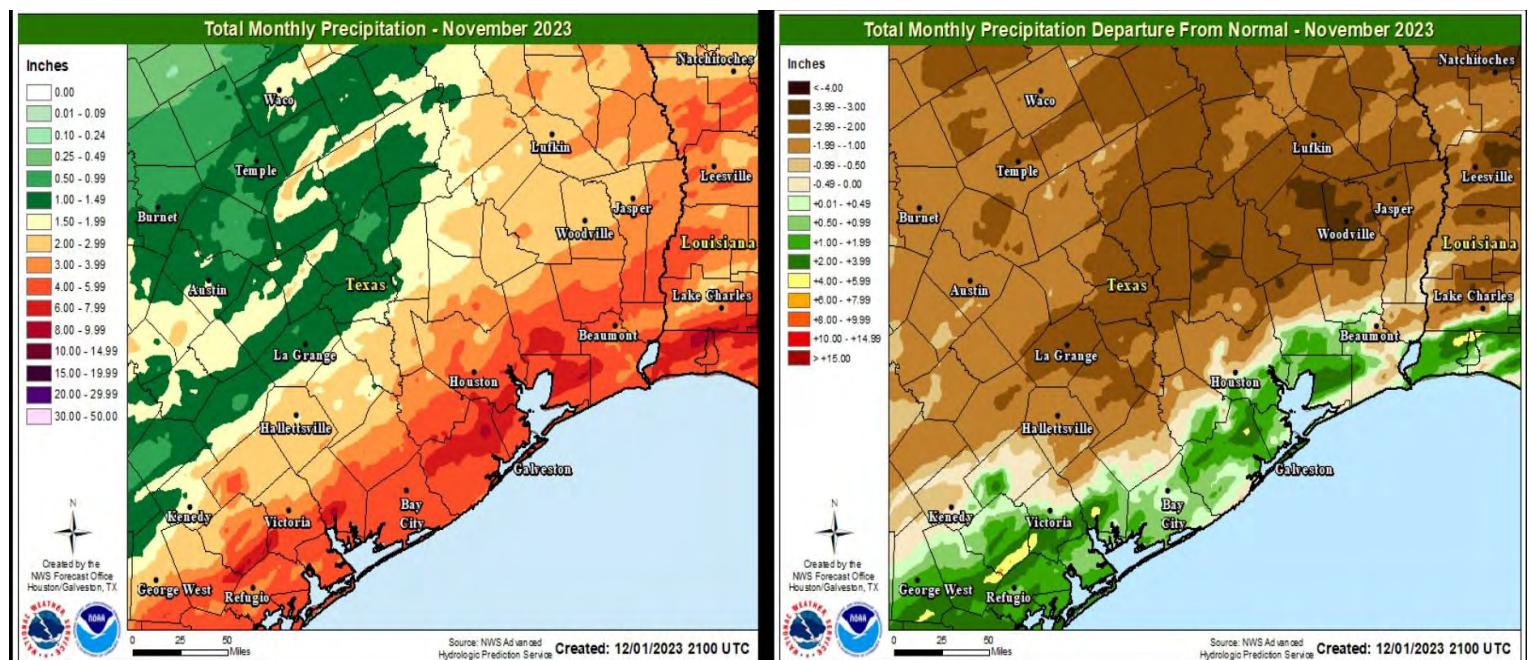


Figure 3: October Monthly Precipitation and Departure from Normal Maps for Southeast Texas

Southeast Texas Regional Summary (continued)

Houston/Galveston Temperature & Rainfall Data for 2023 Autumn Season

September Climate							
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	96.7	73.9	85.3	4.8	2.77	4.71	-1.94
Hobby Airport (1930)	95.9	76.9	86.4	5.3	3.31	5.76	-2.45
Galveston (1871)	91.5	79.9	85.7	3.3	2.01	6.65	-4.64
Sugar Land (2000)	98.0	73.5	85.8	5.2	1.09	4.42	-3.33
October Climate							
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	82.1	62.3	72.2	0.4	4.07	5.46	-1.39
Hobby Airport (1930)	82.3	65.5	73.9	0.9	5.35	5.78	-0.53
Galveston (1871)	80.6	69.0	74.8	-0.5	2.74	5.15	-2.41
Sugar Land (2000)	83.3	63.1	73.2	0.5	3.15	4.65	-1.50
November Climate							
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	70.8	51.8	61.3	-0.7	2.36	3.87	-1.51
Hobby Airport (1930)	70.9	55.0	62.9	-0.4	4.36	3.90	0.46
Galveston (1871)	69.6	58.7	64.2	-1.3	5.37	4.28	1.09
Sugar Land (2000)	71.8	51.9	61.9	-1.2	3.11	3.78	-0.67

Table 1: Southeast Texas monthly climate data for the Houston/Galveston Section

Golden Triangle Temperature & Rainfall Data for 2023 Autumn Season

September Climate							
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	95.7	73.1	84.4	4.4	4.20	6.69	-2.49
Beaumont Research Center	94.3	71.8	83.1	4.1	4.43	6.55	-2.12
Orange 9N	92.8	68.7	80.8	3.8	1.73	6.44	-4.71
October Climate							
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	82.6	63.2	72.9	1.3	0.62	5.47	-4.85
Beaumont Research Center	81.6	61.4	71.5	0.9	1.89	5.30	-3.41
Orange 9N	82.5	57.7	70.1	2.0	2.84	5.96	-3.12
November Climate							
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	71.0	51.9	61.5	-0.5	4.01	3.89	0.12
Beaumont Research Center	69.0	50.0	59.5	-1.4	2.85	4.68	-1.83
Orange 9N	68.9	47.1	58.0	-0.3	1.94	4.71	-2.77

Table 2: Southeast Texas monthly climate data for the Golden Triangle Section

Southeast Texas Regional Summary (continued)

Autumn 2023 CoCoRaHS SE Texas Houston/Galveston Section Rainfall				
CoCoRaHS Station measured county rainfall averages in inches per month				
County	September	October	November	Autumn Total
	AVG.	AVG.	AVG.	Sep. - Nov.
Austin	1.79	4.73	2.52	9.04
Brazoria	3.96	7.12	5.32	16.40
Chambers	3.71	3.21	5.31	12.23
Colorado	2.23	4.19	2.42	8.84
Fort Bend	1.92	3.89	3.66	9.47
Galveston	4.93	3.79	6.04	14.76
Harris	3.38	4.11	4.20	11.69
Jackson	3.37	2.79	3.14	9.30
Liberty	4.26	5.61	5.14	15.01
Matagorda	4.84	5.22	4.55	14.61
Montgomery	3.42	7.96	2.44	13.82
Polk	2.54	5.64	3.07	11.25
San Jacinto	2.53	7.91	2.02	12.46
Wharton	2.75	2.87	2.89	8.51
Region Totals	3.26	4.93	3.77	11.96



 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 Section of SE Texas CoCoRaHS Observer County Average Rainfall

Autumn 2023 CoCoRaHS SE Texas Golden Triangle Section Rainfall				
CoCoRaHS Station measured county rainfall averages in inches per month				
County	September	October	November	Autumn Total
	AVG.	AVG.	AVG.	Sep. - Nov.
Hardin	3.06	1.17	4.89	9.12
Jasper	2.43	1.40	3.52	7.35
Jefferson	3.91	1.11	4.77	9.79
Newton	NA	NA	NA	NA
Orange	3.74	1.83	4.35	9.92
Tyler	3.30	2.38	3.00	8.68
Region Totals	3.29	1.58	4.11	8.97



 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 2: Golden Triangle Section of SE Texas CoCoRaHS Observer County Average Rainfall

Southeast Texas Regional Summary (continued)

Below is a comparison of drought conditions across Southeast Texas at the start of fall and at the end of fall. Significant improvements were made across the region in 90 days. Although things have improved the region still needs abundant rainfall in most areas to get back to normal levels of soil moisture. This will take some time to get back to normal conditions even with the strong El Niño pattern in place and forecast to last for several months as we go into 2024.

U.S. Drought Monitor Houston/Galveston, TX WFO

September 5, 2023
(Released Thursday, Sep. 7, 2023)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	100.00	45.68
Last Week 08-29-2023	0.00	100.00	100.00	100.00	99.99	35.28
3 Months Ago 06-06-2023	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 01-01-2023	84.11	15.89	6.96	0.00	0.00	0.00
Start of Water Year 09-27-2022	32.19	67.81	21.97	4.76	0.83	0.00
One Year Ago 09-06-2022	28.95	71.05	35.72	4.76	0.00	0.00

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

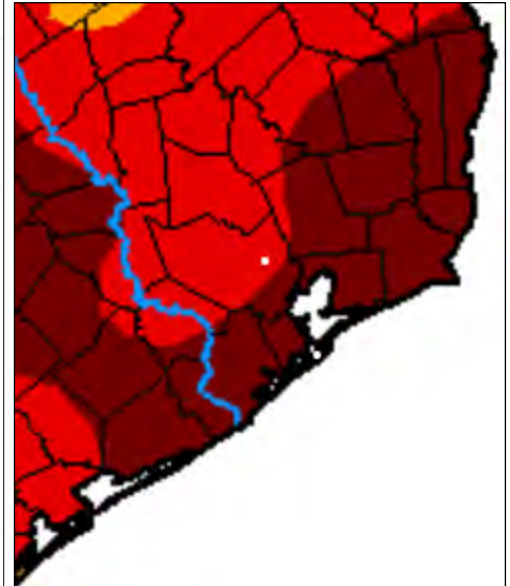
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:

Richard Tinker
CPC/NOAA/NWS/NCEP



droughtmonitor.unl.edu



U.S. Drought Monitor Houston/Galveston, TX WFO

December 5, 2023
(Released Thursday, Dec. 7, 2023)
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
Current	20.72	21.86	53.75	3.20	0.47	0.00
Last Week 11-28-2023	13.76	24.64	55.83	2.47	3.31	0.00
3 Months Ago 09-05-2023	0.00	0.00	0.00	0.00	54.32	45.68
Start of Calendar Year 01-01-2023	84.11	8.93	6.96	0.00	0.00	0.00
Start of Water Year 09-26-2022	0.00	0.00	0.00	0.02	44.17	55.82
One Year Ago 12-06-2022	47.92	36.76	10.92	4.40	0.00	0.00

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

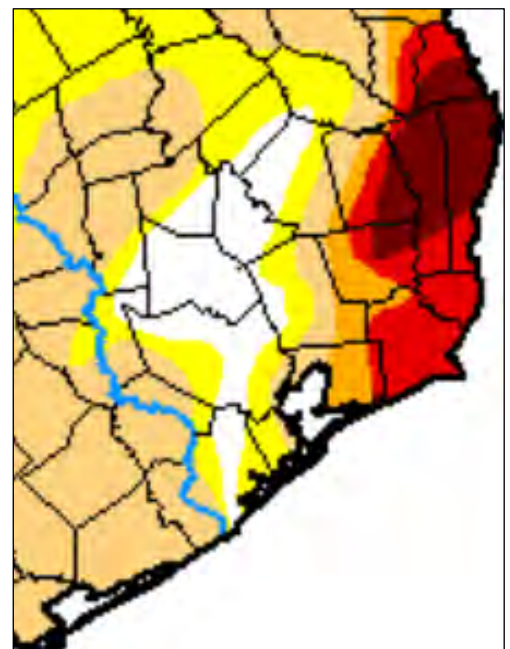
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Author:

David Simerali
Western Regional Climate Center



droughtmonitor.unl.edu



Texas Winter Outlook for 2024

Strong El Niño Pattern in Place for this Winter Season

By: Bob Rose, Meteorologist, Lower Colorado River Authority

This year it seemed like summer would never end. The unbearable heat lasted all the way into October. But fortunately, summer and the triple digit temperatures did finally fade and now winter is upon us. Even though winters in Texas are relatively short, they often can cause numerous challenges with sustained cold and dangerous wintry precipitation. And after having memorable winter weather events in 2021 and 2023, its obvious Texas winters can sometimes be quite impactful and at times dangerous.

This winter, forecasts call for Texas to get several tastes of winter's cold winter. But overall, the winter is not shaping up to be either unusually cold or unusually mild. In addition, we should see more periods of rain compared to the past couple of winters, with indications rain totals will be above normal.

Although many factors go into predicting the winter pattern, the primary driver for this winter will be a strong El Niño. El Niño occurs when the waters in the tropical Pacific located between the west coast of South America and the International Date Line turn unusually warm. The warm waters influence the atmosphere over the central and eastern Pacific, and in turn cause the winter jet stream to shift southward and extend eastward over the southern U.S. The southerly position of the jet typically brings frequent periods of rain and storms and above normal rainfall, along with cool, but not necessarily extremely cold temperatures. During El Niño, the coldest air is most often found across eastern Canada and the northeastern U.S.

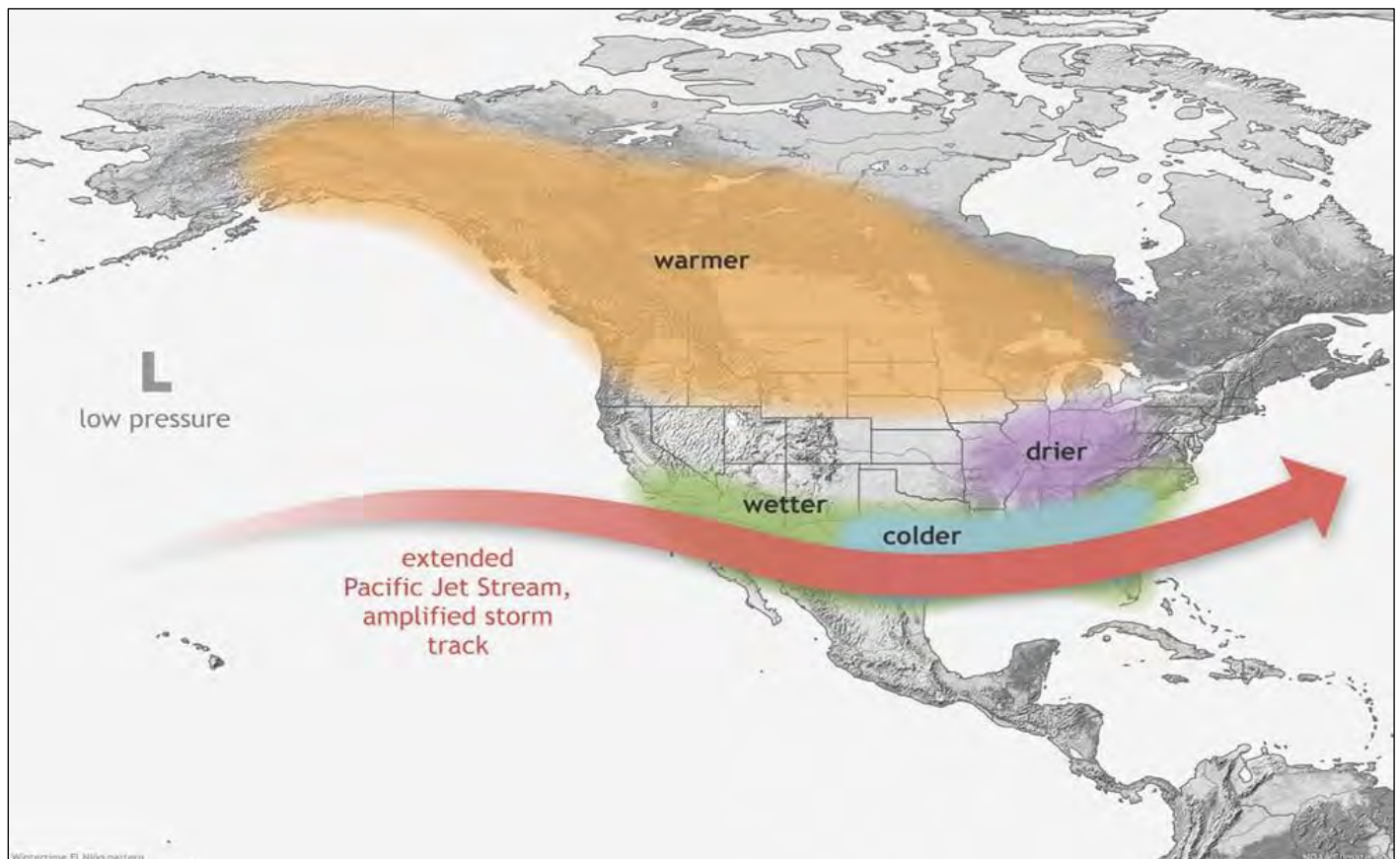


Figure 1: El Niño causes the Pacific jet stream to move south and spread further east. During winter, this leads to wetter conditions than usual in the Southern U.S. and warmer and drier conditions in the North.

Texas Winter Outlook for 2024 (continued)

Forecasters have found the stronger the El Niño the more likely that the actual winter pattern will match the typical response as indicated in the graphic figure 1. With a “strong” El Niño currently in place, forecasters have increased confidence this winter’s weather will generally follow what we’ve seen during previous El Niño’s.

The Climate Prediction Center’s outlook for this winter shows increased odds temperatures will average near normal across North, East, and Northwest Texas. No clear trend in the temperature is indicated for the rest of the state. The outlook also shows increased odds precipitation will average above normal across the eastern two thirds of Texas.

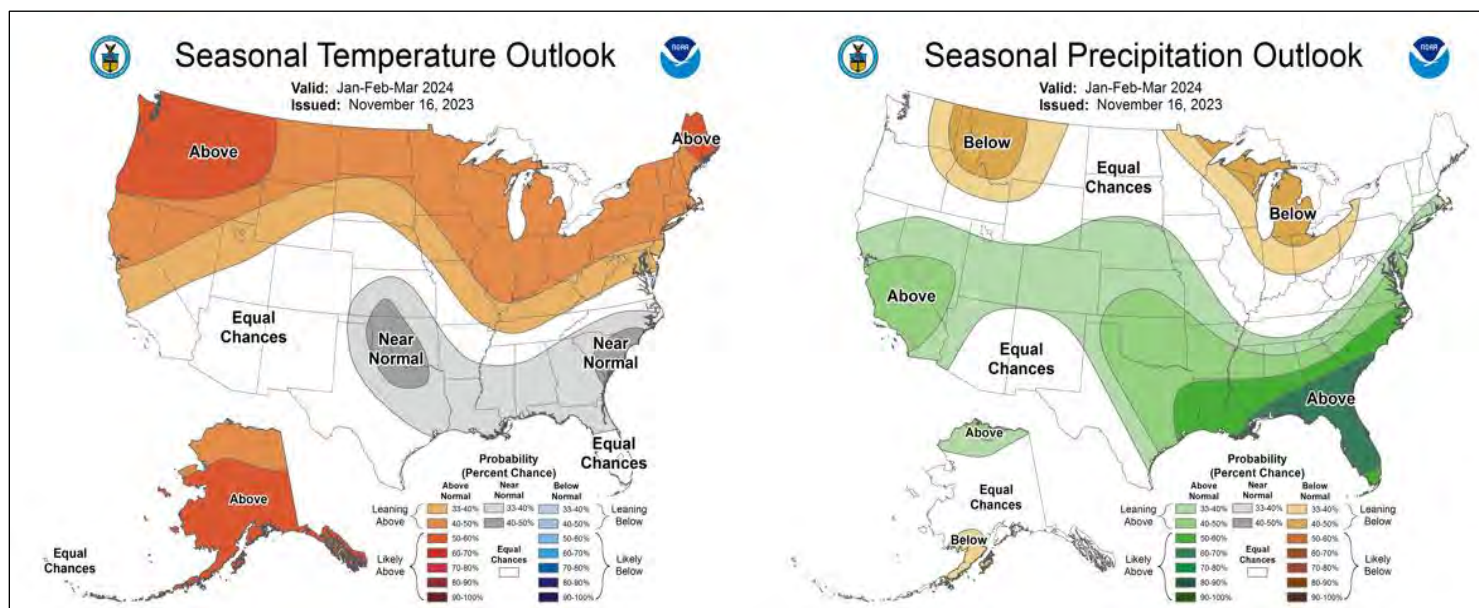


Figure 2: Climate Prediction Center outlook for January-February-March

There will likely be some periods this winter when the cool and wet El Niño signal will be temporarily overwhelmed by unpredictable, chaotic atmospheric features. These features could lead to short-term periods of extreme cold or extreme warmth and little rain. But due to the strength of the El Niño, these periods of weather should not be long-lasting. Some wintry weather will be possible from time to time, but most of this winter’s precipitation should be in the form of rain.

Hopefully, El Niño will be kind to Texas this winter, with no big extremes in the weather. But again, this is Texas and we can’t ever let our guard down from Mother Nature.

CoCoRaHS Observer Training Section

Most Common Type of Errors found by CoCoRaHS Quality Assurance and Quality Control

Most errors we find in CoCoRaHS data are **reporting** errors, not measurement errors. Here are some of the most common types of errors in no particular order:

**Typo/Decimal*

Observer mistypes the amount into the precipitation field, or misplaces the decimal point. **Solution:** Always check your observation on the View Data section for Daily Precipitation Reports for your county and make sure you typed in the correct amount. Observers entering data by an I-phone make these kind of errors the most. Please be careful to type data in correctly. Please look at the maps by link on your processed report each day to make sure the amount you measured is correct on the map.

**False Zero*

Observer entered zero but evidence suggests value should be >0. **Solution:** Make sure you read your gauge every day to see if rainfall is in your gauge or condensation collected in it, and always empty any condensation out of the gauge every day. Always empty your gauge everyday so you know for certain if any rain falls over the next 24 hours that the amount is for only 24 hours. Please don't record fog condensation as precipitation. Two different processes.

** Incorrect date*

Observer enters the incorrect date for the observation. These usually occur when the observations are entered one or more days after the observations were made, and often occur in pairs, i.e. ob1 is entered for date2, and ob2 is entered for date1. **Solution:** Please remember to make a Multi-Day Report if you didn't make a Daily Report the previous day. This is best way to avoid this type of error.

**Multi-day Accumulation Entered as a Daily Amount*

Observers often forget that a different entry form (**Multi-Day Report Form**) is needed to enter accumulations occurring over a period of 24 hours or more, and enter the amount using the Daily Report Form. **Solution:** Please remember to make a Multi-Day Report if you didn't make a Daily Report the previous day. CoCoRaHS I.T. personnel have added an easy clickable link to a multi-day report on the default Daily Report page. Just follow the link to the page for a Multi-Day report. Very simple to enter your reporting dates and times plus precipitation totals for those days and times.

A significant storm item such as heavy rainfall well after the 7am daily reporting time usually in the afternoon or evening* being entered as a Daily Report in the afternoon or evening for the observation time of 7am that morning when the observer hadn't yet entered their normal Daily Report. **Solution: Please use a **Significant Weather Report** for those type of storms or events. Please remember a **Significant Weather Report** is a real time report that goes directly to the National Weather Service for **storm warning purposes only** and is a separate report by itself. A Daily Report is for rainfall since the last mornings Daily Report and should be made at the normal 7am observation time each morning covering rainfall over the previous 24 hours. You still make this report every day.

An observer is using an automated tipping bucket rain gauge which archives rainfall per a 24 hour day at midnight.* This observer will enter these amounts by back dating in rainfall amounts in daily reports per day for long periods of time which do not match their 7am reporting time. **Solution: CoCoRaHS DOES NOT ACCEPT RAINFALL DATA FROM TIPPING BUCKET AUTOMATIC GAUGES. Please use your **official 4-inch diameter CoCoRaHS rain gauge** for all your measurements. You will find it is far more accurate than a tipping bucket rain gauge which must be calibrated and maintained to have any kind of reliable data. Automatic tipping bucket rain gauges have limitations during heavy rainfall and will have issues measuring rainfall correctly thus they will not compare well to a manual gauge reading.

CoCoRaHS Observer Training Section (continued)

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. **Please contact us at texas@cocorahs.org for any of the above mentioned items.**

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.

Snow Measuring Reminders:

Texas may not experience a lot of wintry precipitation each year, but with the arrival of winter, now is a good time to review how to measure wintry precipitation to be ready if and when it does occur. The figure below summarizes where to enter different aspects of winter precipitation on the CoCoRaHS data entry form, and a lot of good review material can be found at https://media.cocorahs.org/docs/WinterPrecipitationMeasurements_V3.0_Nov2022.pdf. Always remember to be safe in slippery, winter conditions!

Snow Measurement Review

- Melt any snow/ice in your rain gauge, and report this (Gauge Catch) as your Daily Precipitation.
- Measure the 24-hr accumulation of new snow on your snowboard.
- For the 24-hr SWE, take a core from your snowboard, melt, and report in the "New Snowfall" section (optional). **If you do not cut a core, leave this "NA"**
- Measure Snowpack Depth (the total snow on the ground, new snow plus old snow and ice).
- Report the Snowpack Snow Water Equivalent (optional)

Precipitation Report Form Submit Search

Station Number: _____

Station Name: _____

Observation Date: 1/14/2022 * Denotes Required Field

Observation Time: 1:00 AM * Denotes Required Field

Gauge Catch: 0.00 in * Gauge Catch: Rain and Melted Snow to the nearest hundredth inch that has fallen in the gauge during the past 24 hours, or T for trace, or NA for unknown.

24-hr Snowfall

Snowfall: 0.2 in Snowfall: Accumulation of new snow in inches to the nearest tenth

Snowfall SWE: 0.01 in Snowfall SWE: Melted value from core to the nearest hundredth

Total Snow and Ice on Ground at Observation Time

Snowpack Depth: 4.5 in Depth of total snow and ice (new and old) in inches to the nearest half inch

Snowpack SWE: 0.93 in Melted value from core to the nearest hundredth



Amarillo & Lubbock Regional Autumn Total Rainfall Maps

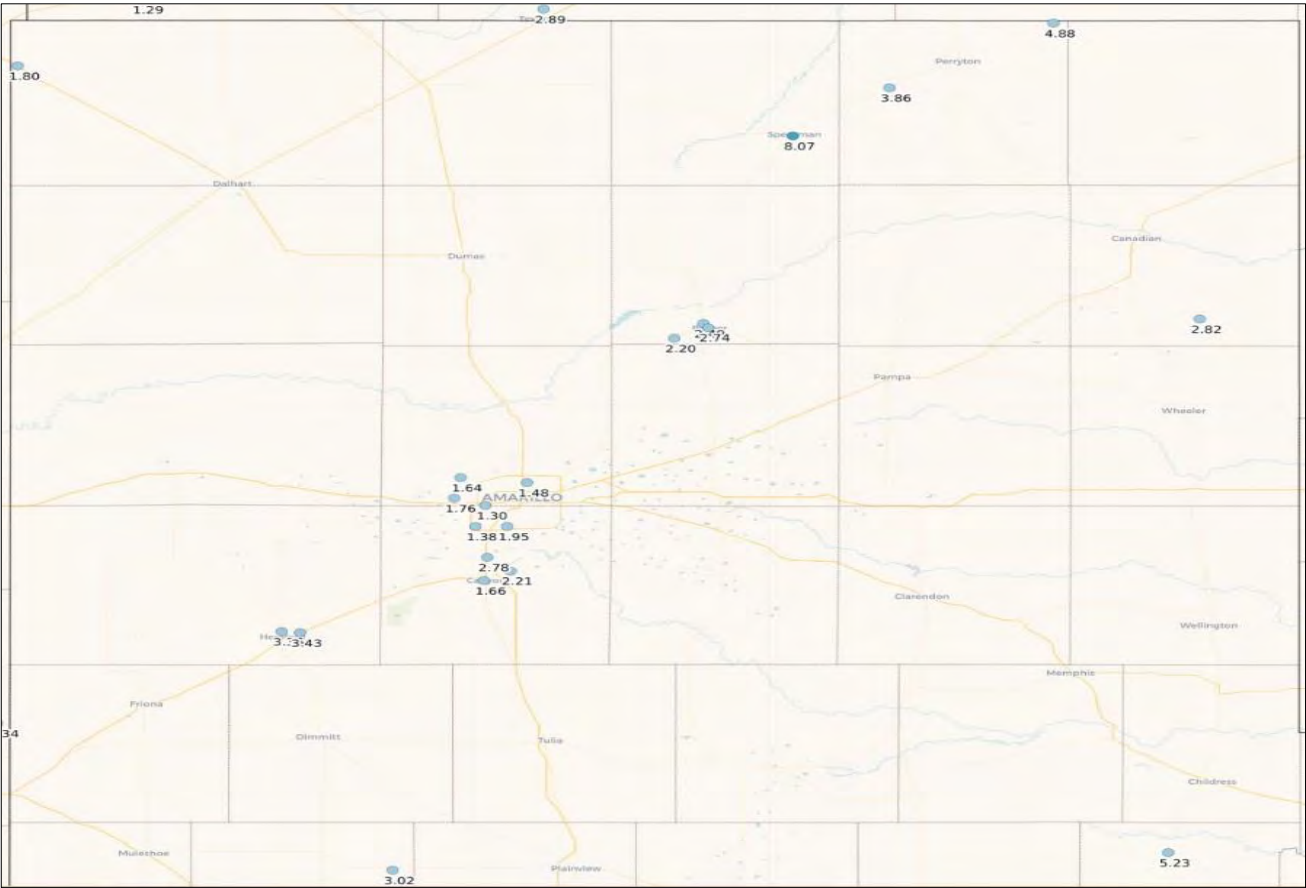


Figure 1: Amarillo 90 day seasonal rainfall maps for the autumn months.

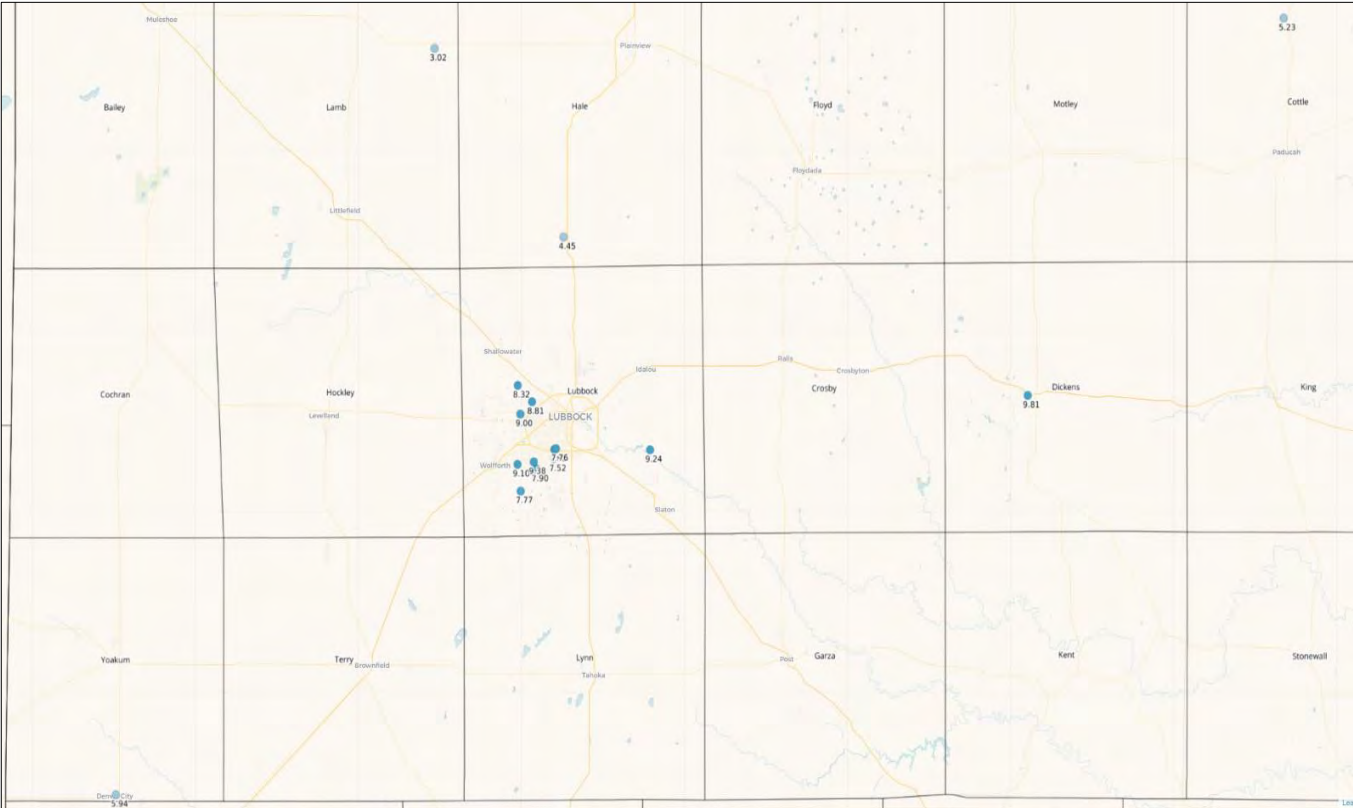


Figure 2: Lubbock Regional 90 day seasonal rainfall maps for the autumn months.

Scheduled CoCoRaHS Webinars & Information

SPECIAL WEBINAR - January 17, 2024

"A Review of Significant Weather Events Occurring in 2023"

Greg Carbin

NOAA/Weather Prediction Center
College Park, MD



"Greg will present an overview of hazardous weather episodes impacting life and property within the United States during 2023. Selected events will be presented in quasi-chronological order and described with photos, maps, and loops of satellite and radar data. While many of the events selected for this talk captured the attention of the media and public, some of these "meteorological memories" may have been forgotten as more substantial weather events occurred throughout the year. This review will highlight some of the "big stories", as well as smaller short-term events. The presentation will include descriptions of significant and deadly weather events of the past year including winter storms, tornadoes and floods. Along with the meteorological set-up for each event, an impact summary will also be provided.

Webinar #89 - Thursday, March 2024

So you want to be a meteorologist - 2024 update

Victor Gensini

Associate Professor
Northern Illinois Univ.
DeKalb, IL



Dave Changnon

Professor Emeritus
Northern Illinois University
DeKalb, IL



This webinar will provide an updated overview on what you should consider as you think about becoming a meteorologist. Whether you are in high school, thinking of a second career or have always wondered what it takes to become a meteorologist, this webinar is for you.



Texas CoCoRaHS Observer

The official newsletter of Texas CoCoRaHS

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Texas CoCoRaHS



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