TEXAS CoCoRaHS OBSERVER

Autumn 2022

Vol. 8 - 3

Welcome to The Texas CoCoRaHS Observer Newsletter

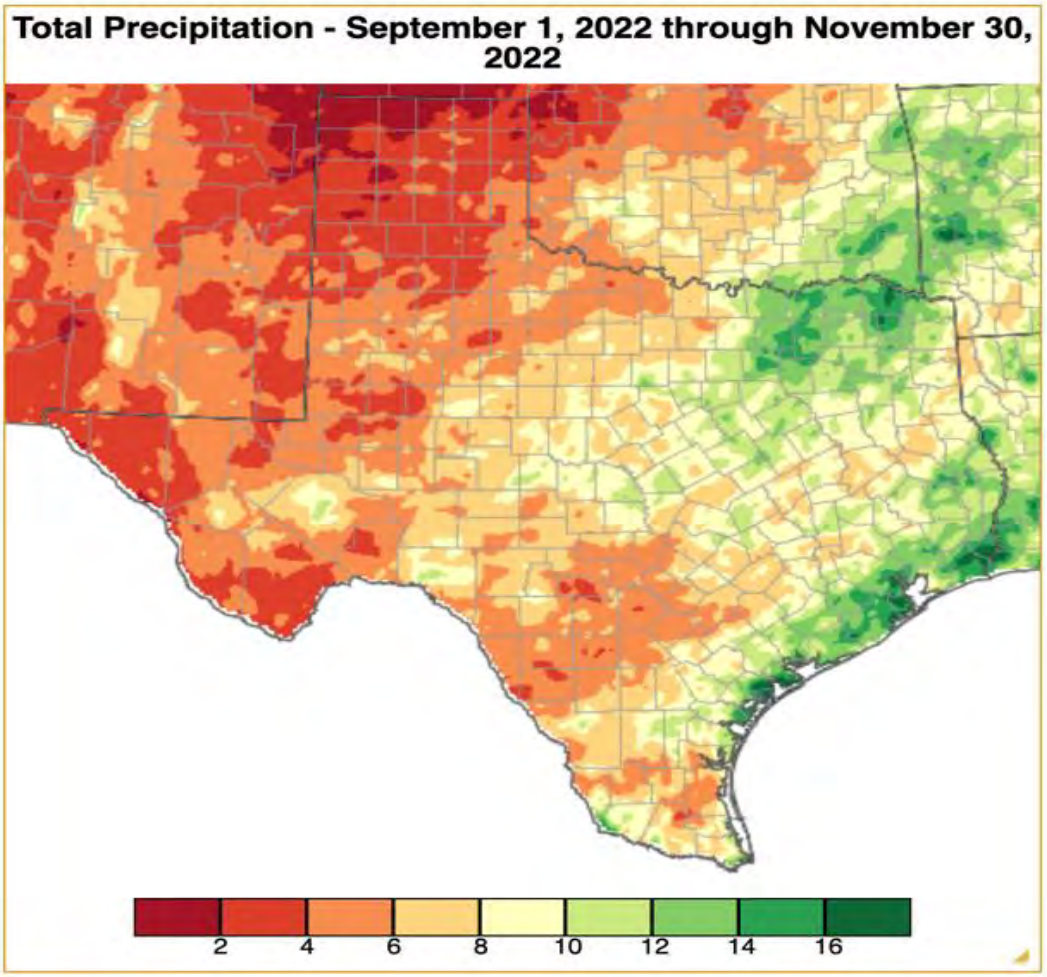
The purpose of this newsletter is to keep observers informed of the latest news, events, training, and happenings related to the CoCoRaHS program here in Texas, as well as news about the latest weather patterns affecting each region of Texas seasonally.

Inside this issue

Texas Weather Summary
Fall, 2022

John Nielsen-Gammon, Texas State Climatologist

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



Fall 2022 was on the dry side across most of Texas. Historically, the statewide average precipitation of 6.45" was 57th driest out of 128 years. This meant that drought conditions pretty much sustained themselves across the state. Temperatures were about half a degree warmer than the 20th century average; all but three of the past twenty falls have been warmer than the 20th century average.

Continued on page 2→

"Because Every Drop Counts, As Do All Zeros"

Texas Summer Weather Summary (continued)

With drought still present in over half of the state, the continued presence of La Niña conditions in the tropical Pacific Ocean remains a cause of concern. This is the third winter in a row with La Niña, as temperatures in the central tropical Pacific remain about 2°F below average. Cooler tropics means less of a difference between tropical temperatures and Arctic temperatures. As a result, the jet stream tends to be a bit weaker and a bit farther north, meaning that Texas misses out on its fair share of cold, rainy conditions. I know, most people don't look forward to their fair share of cold and rainy weather, but tell that to a farmer who needs moisture in the ground to grow the food you're going to eat.

Warm and dry is a good bet, but it's not a safe one. About one year in three, the randomness of the weather overwhelms the influence of La Niña, and Texas gets a wetter than normal winter instead. Focusing on the November-March period when the jet stream is zipping around nearby and La Niña has its largest influence on Texas weather, the 20th century average precipitation for Texas was 8.33". In 2020-2021, the first of these three La Niña winters, Texas averaged 6.75", about 80% of normal. In 2021-2022, the second year, Texas averaged 4.78", about 60% of normal.

Okay, so if you're keeping score at home, you might be saying, "Hmm, one out of three La Niña winters are wet, the last two were dry, so this is going to be a wet one." If so, don't go to Vegas. There's still a 2 in 3 chance that this year will be a dry one also. No guarantees, but you'd certainly rather be looking forward to El Niño than to La Niña if you're trying to get out of drought.

Speaking of which, we're overdue for El Niño, or at least neutral conditions. This is only the third time in the past 75 years or so with three La Niñas in a row. Neither of the other two lasted for a fourth winter. That's not many cases to go on, but fortunately we have something better: computer models. Computer models aren't always better, but when you're trying to extrapolate from two events, you need all the help you can get!

In this case, the computer models are quite insistent. After another month or two, La Niña will start weakening, and she'll be gone by the end of the spring, with possibly an El Niño hot (no pun intended) on her heels. That's true of the models that try to simulate El Niño the way weather forecasting models try to simulate the weather. That's also true of statistical models that don't know how things actually work but just rely on past tendencies. Sort of like me and the stock market.

Anyway, there's good cause for optimism. A side benefit of El Niño, if it develops by the end of summer, would be a tendency for less hurricane activity than normal. And then a wet winter ought to break the back of the drought, if it's not already gone by then. Well, okay, a 2 in 3 chance of breaking the back of the drought. In weather forecasting, there are few guarantees.

West Texas Regional Summary

West Texas and Southeast New Mexico saw a dry, warm fall, courtesy of triple-dip La Nina.

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

September

The month of September began with the Rio Grande in minor to moderate flood from its confluence with the Rio Conchos in Presidio downstream through Boquillas. Monsoonal rains in Mexico resulted in heavy inflows into the Luis Leon Reservoir, which in turn necessitated increased releases from Luis Leon. The rivers were in flood most of the month. Little damage was reported, but several places in Big Bend National Park had to be closed off until the flooding receded.

Otherwise, September started off wet, with thunderstorms developing on the 1st in Big Bend National Park in Brewster County. All dirt roads, backcountry roadside campsites, and at least one paved road were closed due to flooding. Heavy rainfall also continued high flows and minor flooding along the Rio Grande. Later that day, thunderstorms developed near Malaga in Eddy County, and several roads were closed along the Black River.

On September 2nd, thunderstorms developed over the lower Trans Pecos, and over 4" of rain fell in Sanderson Canyon, flooding the canyon with several feet of runoff. The runoff did not overtop the control dams built in the canyon to control floodwaters after the disastrous flash flood of 1965, but evacuations were executed of some local residents as a precaution.

Thunderstorms developed in the Permian Basin on the evening of the 14th. Midland in Midland County, as well as Odessa in Ector County, were inundated with radar estimates of up to 3+" in places, closing numerous roads and stalling vehicles.

Monthly radar rainfall estimates ranged from nothing in north central Eddy County to up to 8" in south central Pecos County. However, the highest observed rainfall was 5.81" southeast of Kent in Reeves County. The average of rainfall reported across West Texas and Southeast New Mexico was 1.07". Reservoir levels averaged 51.5% of conservation capacity as of October 1st.

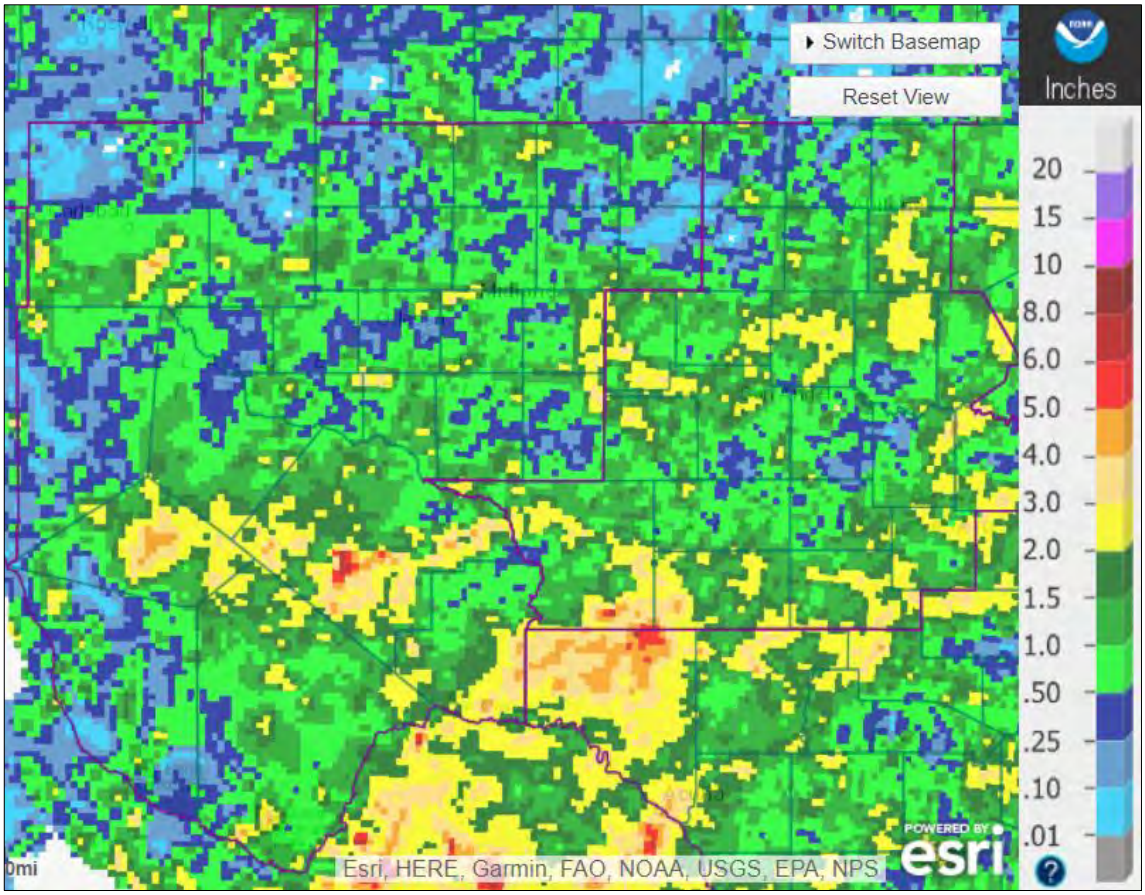


Figure 1: September 2022 Precipitation

West Texas Regional Summary (continued)

October

The synoptic pattern began changing to fall during the month of October. A few hydrologic events were noted.

During the first part of the month, thunderstorms produced heavy rainfall again over the Rio Conchos watershed, as well as the Rio Grande. This resulted in the Rio Grande going into minor to major flood beginning October 10th-11th, from Presidio downstream through Boquillas.

On October 10th, thunderstorms produced heavy rainfall in Fort Stockton in Pecos County, flooding schools and hospitals in town. Several water rescues were needed.

No other notable hydrologic events were reported for the month.

Monthly radar rainfall estimates ranged from a quarter of an inch or less along the Rio Grande in Presidio County to up to 10" in central Mitchell County. The highest observed rainfall was 5.31" at McCamey in Upton County. The average of precipitation reported across West Texas and Southeast New Mexico was 2.31".

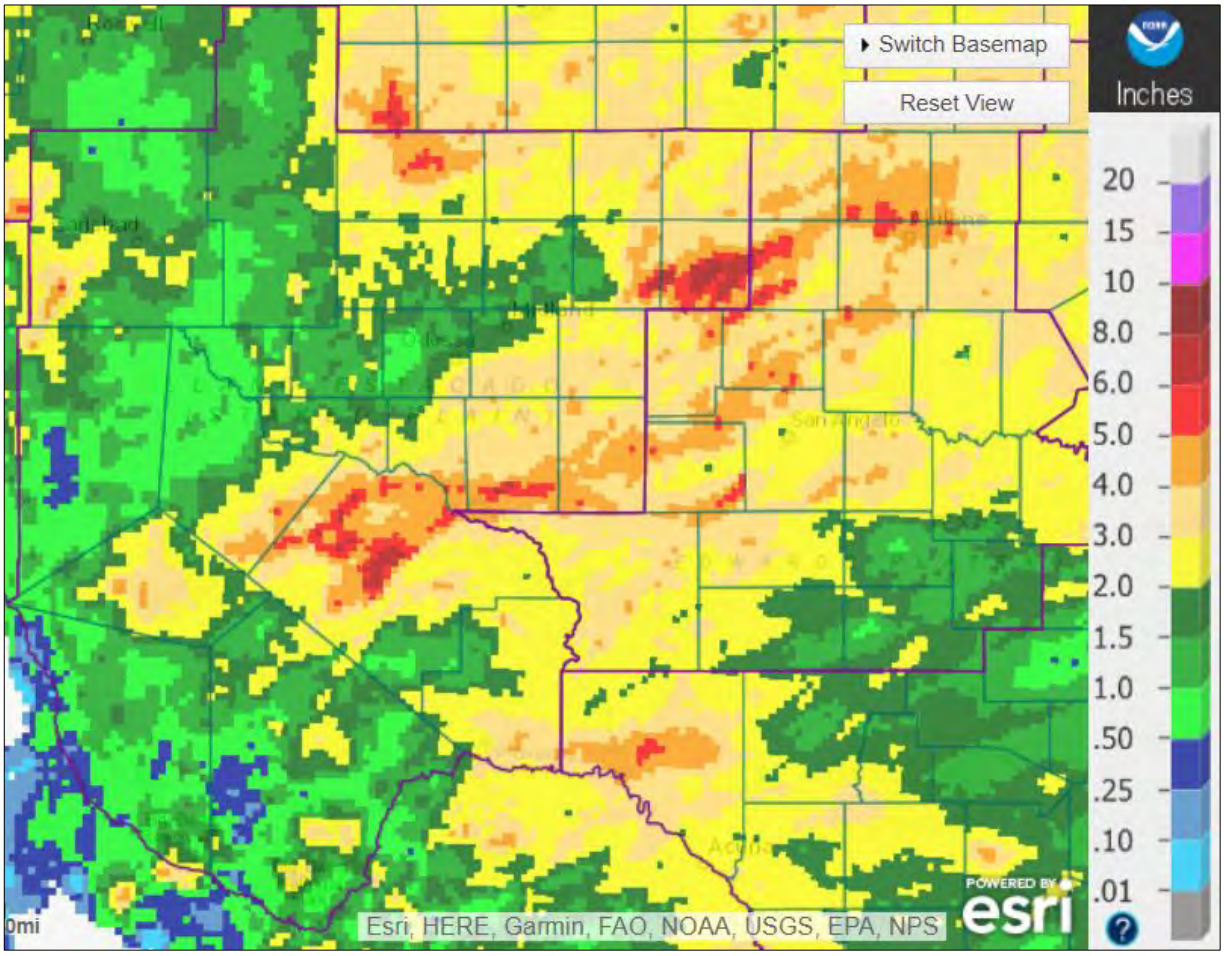


Figure 2: October 2022 Precipitation

November

November was a decent month hydrologically, and the HSA saw its first winter storm of the season, mostly snow and rain, late in the month. The highest snowfall total was 18" in Queen in Eddy County. No flooding was reported for November.

Monthly radar precipitation estimates ranged from nothing over parts of Presidio County to up to 4" in southern Reagan County. The highest observed rainfall was 4.48" at Pine Springs in Culberson County. The average of precipitation reported across West Texas and Southeast New Mexico was 1.18".

West Texas Regional Summary (continued)

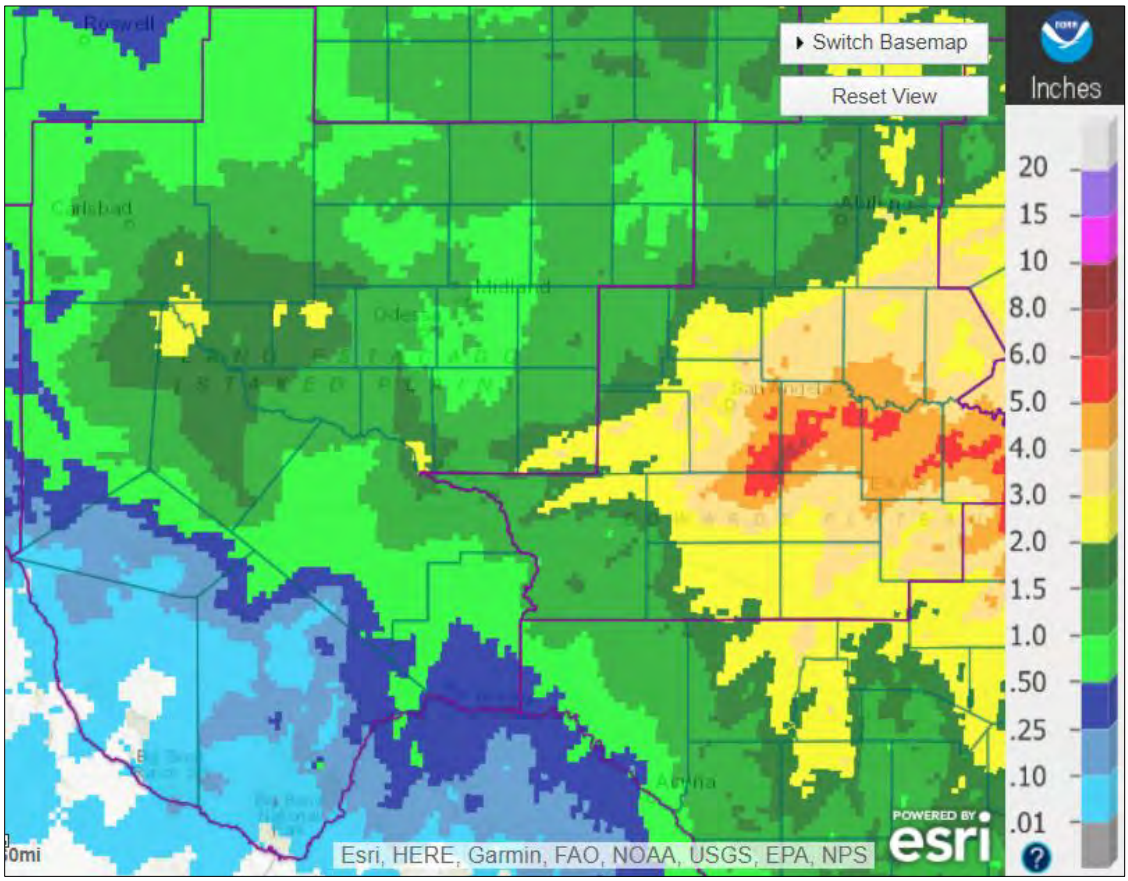


Figure 3: November 2022 Precipitation

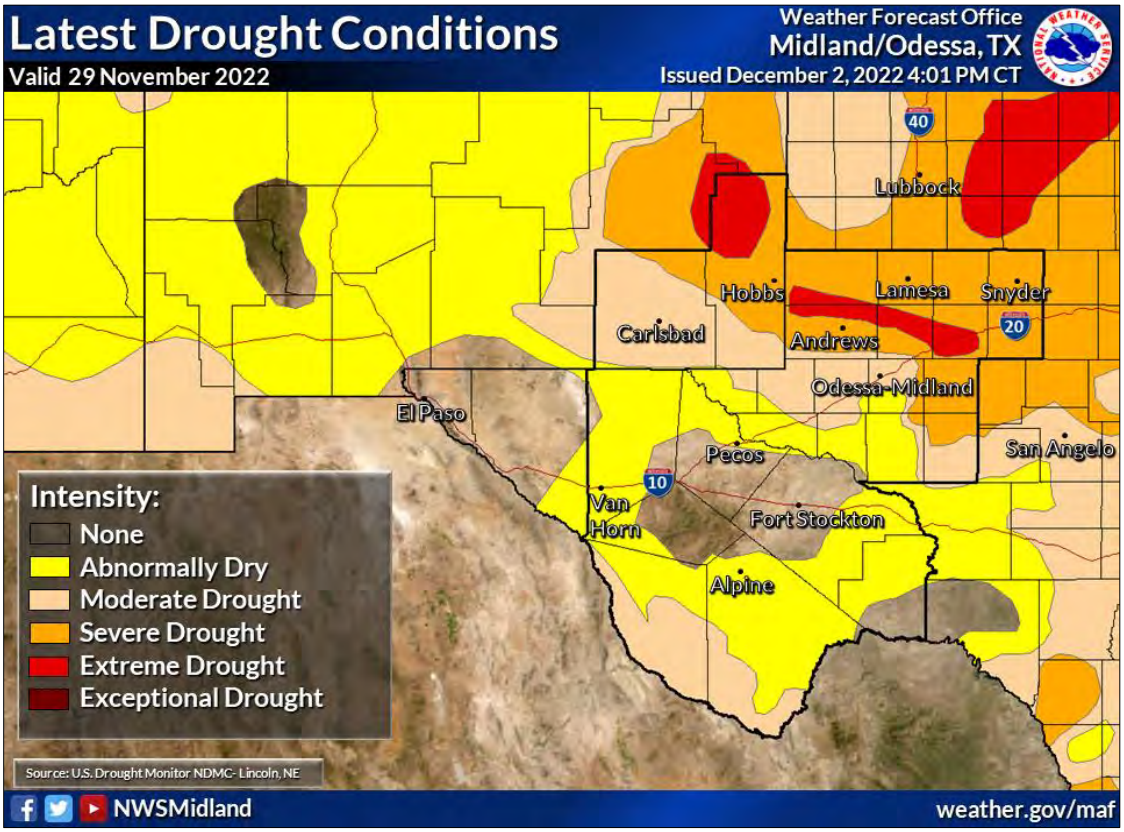


Figure 4: Drought Conditions for West Texas after autumn 2022

North Texas Regional Summary

Below Normal Precipitation until mid-October, Most Precipitation Fell in November

By: Greg Story, North Texas CoCoRaHS Regional Coordinator

Greetings CoCoRaHS observers from the North Texas Regional Coordinator! It's fun to go back and see what the weather has been doing over the past several months. That is the goal of this newsletter article. After a spring that was quite dry, you may recall summer was hot and very dry. But, at least for some parts of North Texas, that all changed at the end of August when it turned wet. You may recall that the DFW metroplex had its wettest August of record. This fall we returned to a dry weather regime until the middle of October and into November, which is when some areas of the region started receiving some significant rainfall. The variability of the rainfall over North Texas reminds me how valuable your rainfall reports are in determining the areas of drought as well as floods. We saw both drought and flooding in the same month last August. Your reports continue to be invaluable to the National Weather Service and other entities (such as the Texas State Climatologist and the National Drought Mitigation Center). I am thankful to each and every one of you for reporting your rainfall via CoCoRaHS!

Reviewing the past several months, in May most of Texas had below normal rainfall. Only the Texas panhandle and the lower Rio Grande valley near Laredo saw above normal precipitation. In June it was dry with below normal precipitation over almost all of the state, with only parts of far West Texas observing above normal rainfall. In July it was very dry with record breaking high temperatures across most of Texas. Some observers had zero rainfall for the entire month. Only a small part of East Texas west of Shreveport, and the Texas panhandle, saw near to above normal precipitation. In August the month started out very dry, but a weather pattern change occurred and parts of Texas turned from drought to flash floods quickly. Much above normal rainfall was noted from the DFW metroplex to Shreveport LA, and over parts of Deep South and southwest Texas. Only the northern Texas panhandle had below normal rainfall, with everyone else seeing near to above normal amounts. In September the weather pattern shifted once again, and after some rain early in the month it turned dry once again. Only a few spots along the Rio Grande had above normal rainfall. Most of Texas had below normal precipitation, with much below normal rainfall over the western parts of North Texas into the Texas panhandle. The dry weather pattern persisted into October for Central and East Texas. However, West Texas starting seeing some precipitation. Rainfall was near to above normal for the western third of the state. There also was some above normal rainfall noted along the Red River of northeast Texas. But below normal rainfall occurred over the remainder of Texas, especially around San Antonio. In November the weather pattern turned more favorable for precipitation. Most of the state had near to above normal precipitation, with the areas around San Angelo and Brownsville seeing much above normal rains. Only far West Texas saw below normal precipitation.

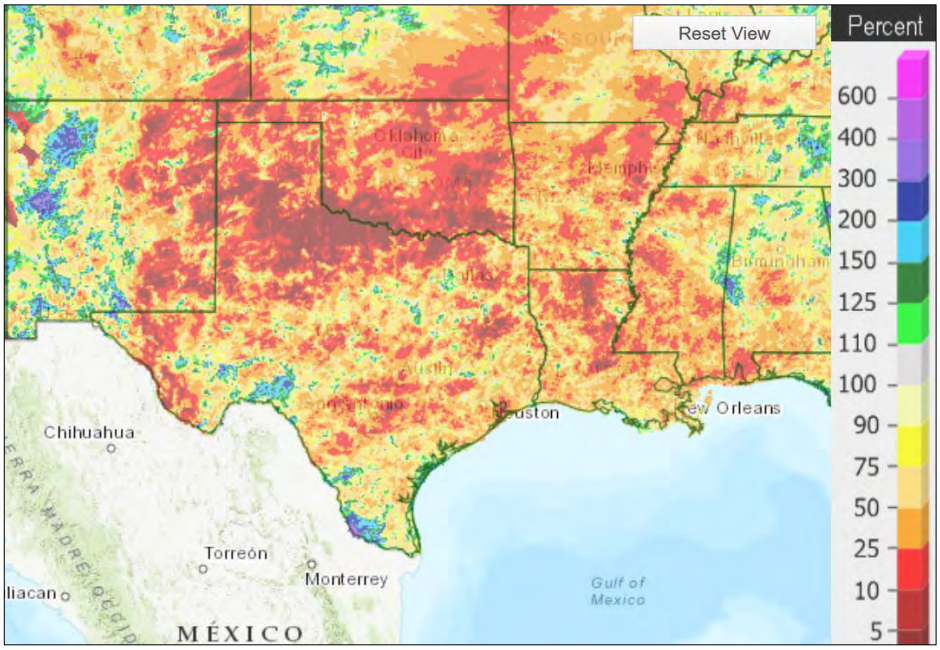


Figure 1: Percent of normal precipitation map for September 2022. *The dark green, blue and purple colors indicate above normal precipitation; the beige*, dark yellow and light green colors indicate near normal, while the orange, red and dark red colors indicate below normal precipitation.

North Texas Regional Summary (continued)

In September, after some rain early in the month it turned dry once again. Only a few spots along the Rio Grande had above normal rainfall. Most of Texas had below normal precipitation, with much below normal rainfall over extreme northern Texas, the western parts of north Texas into the Texas panhandle.

At DFW Airport in September 0.33” of rain was observed. The normal amount of rain in September at DFW is 2.72”. Rainfall was -2.39” below normal for the month.

In Waco for September 2022, 0.41” of rain was observed. The normal amount of rainfall in September is 2.87”. Rainfall was -2.46” below normal for the month.

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

September 1 - 3:
An upper atmospheric low pressure system established itself south of the Texas Big Bend. Widespread rain continued from August, especially over southern and western Texas. In West Texas on the 1st the maximum rainfall was 4.19" east of Kent, while over South Texas the heaviest rain was 3.33" north of Montgomery. The largest rainfall reading in North Texas was 2.01" just northeast of Boyd. A secondary short wave trough moved southeast across Oklahoma, and this pushed the more widespread rain to eastern Texas on the 2nd. Rain also continued over South Texas near the dissipating upper low. The heaviest rainfall over North Texas was 3.27” north northeast of Aquilla and 2.04” northwest of Crandall. Over South Central Texas 4.57” fell west of Tow. The rainfall became more scattered on the 3rd. In North Texas 1.57” was observed at Glen Rose. But over South Texas 5.86” fell at Port Aransas and 4.11” fell south of New Ulm.

September 4 - 5:
Yet another short wave trough moved slowly across the mid-Mississippi River valley, which pushed a cold front out of Oklahoma into North Texas on the 4th. Showers and a few severe thunderstorms resulted. In North Texas the maximum rainfall amounts were 1.84” west northwest of Dallas and 1.66” south of McGregor. Elsewhere they received 3.20” at the Choke Canyon Dam and 2.79” just east southeast of Austwell. On the 5th the rainfall was more scattered as the trough of low pressure moved slowly southeast. A few thunderstorms occurred over the DFW metroplex where they measured 0.83” just west of downtown Fort Worth and 0.74” west northwest of Saginaw. The heavier rainfall occurred over south Texas where 2.81” was observed south southeast of Corpus Christi.

September 25 - 26:
A cold front moved from north to south across Texas on the 25th into early on the 26th and produced some showers and thunderstorms. The heaviest rain was over the western parts of North Texas where north of Richland Springs 2.36" fell and south southeast of Brownwood recorded 1.25". Much further south 1.85" was observed east northeast of Rocksprings. On the 26th the residual rainfall shifted all the way to Deep South Texas where 1.30" fell southeast of Brownsville.

A dry weather pattern persisted into October for Central and East Texas. However, West Texas starting seeing some precipitation. Rainfall was near to above normal for the western third of the state. There also was some above normal rainfall noted along the Red River of northeast Texas. But below normal rainfall occurred over the remainder of Texas, especially around San Antonio.

North Texas Regional Summary (continued)

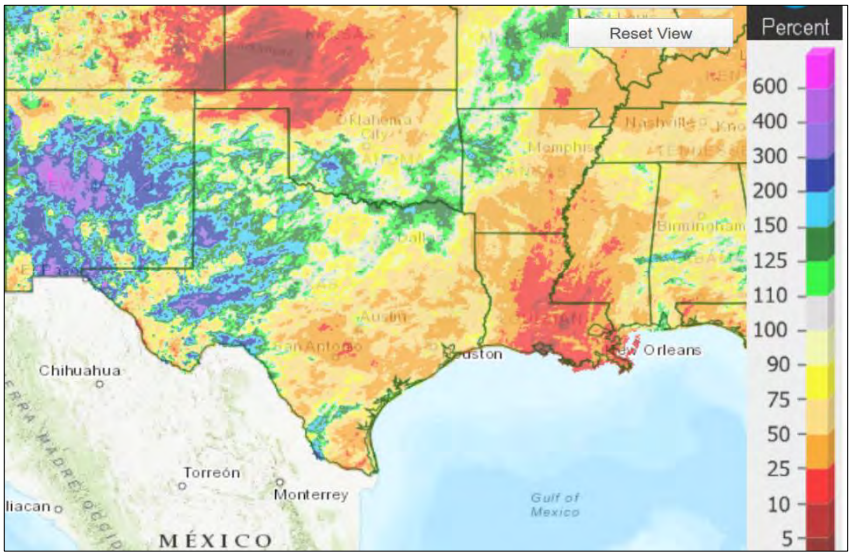


Figure 2: October 2022 percent of normal precipitation map. *The dark green, blue and purple colors indicate above normal precipitation; the light yellow and light green colors indicate near normal, while the orange, red and dark red colors indicate below normal precipitation*.

At DFW Airport in October 4.43" of rainfall was recorded. The normal amount of rain in October at DFW is 4.37". In Waco for October 2.85" of rain was recorded. The normal amount of rainfall in October is 4.41".

There were about six storm systems which affected our weather in October. Highlights of the weather follow for the month.

October 9 - 11:
An upper atmospheric low pressure system approached West Texas from the southwestern US. This began to bring some moisture and rainfall over especially West Texas on the 9th. Girvin received 1.79" northwest of town and 1.49" fell southwest of McCamey. The upper low weakened on the 10th as it moved over West Texas, but not before some good rains were reported over Southwest Texas. Rains were 3.08" southwest of Sweetwater and 2.35" at Fort Stockton. There was some light rain that fell over the western parts of North Texas. Some light rain persisted on the 11th, but all the rainfall reports were 0.30" or less.

October 12:
A strong cold front moved through Texas, which triggered showers and a few thunderstorms. While much of North Texas did not receive significant rainfall, 4.45" fell at Cross Plains and 2.03" fell northwest of Moss Bluff TX.

October 16 - 18:
A strong cold front moved across Texas. The initial rainfall ahead of the front late on the 15th into the morning of the 16th was heaviest over extreme North Texas near the Red River where 2.54" was measured west northwest of Pottsboro and 2.18" fell just west northwest of Gordonville. During the day and evening of the 16th the heaviest rain began to shift to South Texas, but Paris picked up 1.96" northeast of town and 1.60" fell at Midlothian. Over South Texas D'Hanes had 4.05" just north northeast town. On the 17th an upper air low pressure system west of Texas combined with the cold front to produce widespread rain across South Texas. The heaviest rain was 2.21" east northeast of Brownsville and 1.95" at Corpus Christi. The upper air low weakened on the 18th, and the strong cold front continued to advance southward. Some residual rainfall continued on the 18th over Deep South Texas. Most of the rainfall amounts were 0.50" or less.

October 23 – 24:
A strong cold front began to approach Texas from the north on the 23rd, and moved across Texas on the 24th. The front joined up with moisture from the remnants of eastern Pacific Hurricane Roslyn as it weakened and moved northeast from Mexico into Texas, and also combined with a strong upper level low pressure system from the west. Initial rainfall amounts on the 23rd were heaviest over West Texas where 0.88" fell at Stamford and 0.82" was measured just northwest of Rule. Widespread showers and thunderstorms occurred on the 24th. While rain was detected over much of the state, the heaviest rain was over North Texas.

North Texas Regional Summary (continued)

The maximum amounts were 4.25" just east of Van Alstyne, 3.85" west southwest of Richardson, and 3.65" at Grapevine. The rain moved out of Texas in the early morning hours of the 25th.

October 27 – 29:
A strong upper atmospheric low pressure system approached Texas from the west on the 27th and moved slowly across North Texas on the 28th. Showers and thunderstorms initially developed over West Texas on the 27th, and also along the middle Texas Gulf coast. Rains were 3.69" north northeast of Port Aransas and 3.55" northeast of Rockport. Meanwhile, rainfall to 3.00" fell north of Abilene. As the upper low slowly moved across North Texas on the 28th, widespread rainfall occurred. In North Texas the heaviest rainfall was southeast of Ravenna with 3.60", while 3.57" fell south of Sanger and 3.21" was measured just southwest of Powell. Further southeast, 4.92" fell north of Port Arthur. A daily record rainfall of 1.32" was set at Waco on the 28th. That broke the old record of 1.07" set in 1969. The upper low slowly moved away from North Texas on the 29th, with residual rain continuing across the region. While most rainfall amounts were less than a half inch, 0.52" did fall just north northeast of Dallas.

October 31:
A short wave trough began moving across South Texas on the 31st. While no rainfall occurred across North Texas from this storm, rainfall of 3.51" fell southwest of Rockport and 3.50" southwest of Orange Grove.

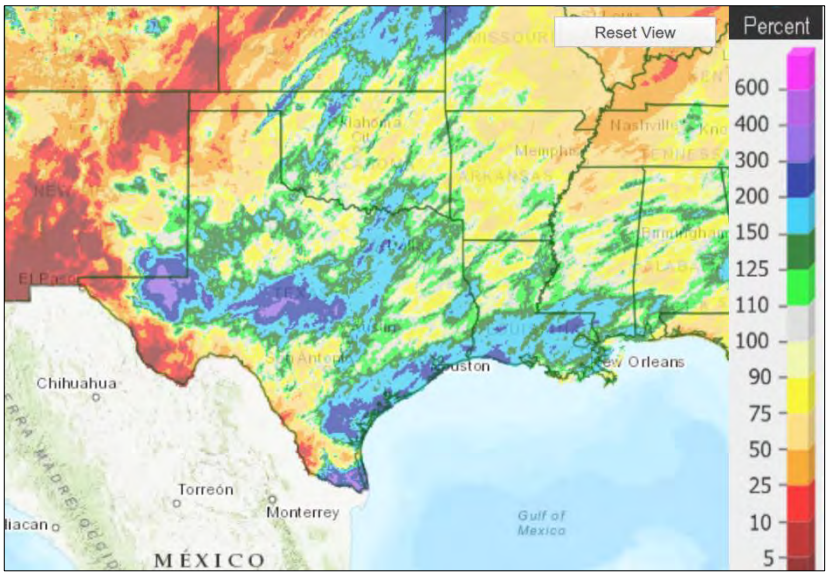


Figure 3: Percent of normal precipitation map for November 2022. *The dark green, blue and purple colors indicate above normal precipitation; the beige, light yellow and light green colors indicate near normal, while the orange, red and dark red colors indicate below normal precipitation.*

In November the weather pattern turned more favorable for precipitation. Most of the state had near to above normal precipitation, with the areas around San Angelo and Brownsville seeing much above normal rains. Only far southwest Texas saw below normal precipitation.

At DFW Airport in November 6.40” of rainfall was recorded. The normal amount of rain in November at DFW is 2.53”. This amount is +3.87” above normal for the month. In Waco for November 2022, 5.55” of rainfall was recoded. The normal amount of rainfall in Waco for November is 2.71”. This amount is +2.84” above normal for the month.

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

October 31 - November 1:
A short wave trough moved out of Texas on the 1st and continued to produce rainfall over primarily Southeast Texas. The heaviest rainfall was 3.14" southeast of Corpus Christi and 2.07" just east southeast of Austwell.

North Texas Regional Summary (continued)

November 3 - 5:
A deep long wave trough developed over the western US on the 3rd and moved eastward toward Texas. Some showers and thunderstorms developed over northwest Texas late on the 3rd into the early morning of the 4th. A few showers also developed over Central Texas. The rainfall amounts were light. As the upper level storm moved eastward, widespread showers and thunderstorms developed on the 4th. During the afternoon and evening, a severe weather outbreak with tornadoes occurred, especially over Northeast Texas (especially near Paris TX and Idabel, Oklahoma). The maximum rainfall over North Texas was south of Gunter with 3.49" and southeast of Collinsville with 3.45". The heaviest rainfall in Texas was 4.43" east southeast of Zavalla. A daily record rainfall of 3.01" was set for the 4th at DFW airport. This broke the old record of 1.77" set in 1956. The rain moved out of the state late on the 5th.

November 6 - 7:
A wave of low pressure moved from southwest to northeast on the 6th and 7th. The rainfall on the 6th was concentrated over Southeast Texas where 1.03" fell north of spring and 1.00" at Garwood. On the 7th the rain spread northward and became fairly widespread. Over North Texas the heaviest rainfall was west northwest of Rosebud with 2.19". Meanwhile, on the south side of Fort Worth 1.60" was observed (west southwest of Edgecliff). Further south, over the Texas Hill Country, amounts to 2.36" fell southeast of Llano.

November 10 - 11:
A very strong cold front moved across Texas late on the 10th through the 11th. Showers and thunderstorms developed over extreme North Texas late on the 10th into the morning of the 11th as the front approached. The heaviest rainfall was 1.32" in Denton and 1.22" north of Shady Shores. Additional showers and thunderstorms formed along and behind the front on the 11th. In North Texas the heaviest rain was measured south of Harker Heights with 2.26" and northeast of Copperas Cove with 2.08". Further south rainfall observed was 4.07" northwest of Rockland and 2.94" west northwest of Lampasas.

November 14:
A potent upper level low pressure system approached Texas from the southwestern US. Rain developed early on the 14th over primarily West Texas. The rain developed further east and became widespread as the upper low moved closer to Texas. Initial rainfall amounts prior to sunrise on the 14th were light and all under 0.25". But during the day on the 14th the heaviest rainfall was southwest of Blooming Grove with 1.15" and west northwest of Pottsboro where 0.97"was recorded. Even heavier amounts of rain fell over Southeast Texas near the Gulf coast where 1.89" fell southeast of Richmond.

November 19 – 21:
A short-wave trough moved from west to east across the southern US. Initially on the 19th no rain fell across north Texas, but light rain fell across central and south portions of the state. Rains totaling 0.57" fell at Bend TX, while further southeast 1.59" fell northeast of Galveston. Widespread light rain developed across the state on the 20th. The rainfall over North Texas was all less than 0.20". But further south 0.67" fell north northeast of Devine and west southwest of Yancey. On the 21st the rainfall was light over North Texas with amounts of 0.30" or less. But over Deep South Texas 4.10" fell southeast of Brownsville. The rain moved out of the state on the morning of the 22nd. An additional 1.65" fell south southeast of Hebbronville before the rain ended.

November 23 – 26:
A couple storm systems began to approach Texas from both the northwest and the southwest on the 23rd. Some fairly widespread rainfall developed from central into northeast Texas. On the 23rd into the early morning of the 24th the heaviest rain was over North Texas where Cooper received 1.97", the area east southeast of Kaufman got 1.94", and northeast of Paris they measured 1.80". On the 24th, the storm systems combined to form one large upper level low pressure system over New Mexico. Widespread rain and a few thunderstorms continued, especially over the eastern half of Texas. On the 24th the maximum rainfall over North Texas was near Waco where 2.84" fell east southeast of Valley Mills. Around the DFW metroplex the heaviest rain was northwest of Rowlett with 2.01". The largest rainfall amount in Texas was 4.04" east northeast of Pearland. By the 25th the upper low moved south of New Mexico. The rain moved out of East Texas early on the 25th, but widespread precipitation formed over West Texas, as well as along and near the Texas Gulf coast. Snow fell over far west Texas. The rainfall spread eastward later on the 25th and became widespread. Over North Texas the heaviest rainfall was just north of May with 2.28". In the Waco area 1.60” was measured just west southwest of the city. In the DFW metroplex the largest rain amount was north northwest of Duncanville with 1.51". The maximum rainfall amount in Texas was 4.00" east northeast of Eldorado. On the 26th the upper level low moved into southwest Texas, then advanced northeastward across North Texas by late in the day. The heaviest rainfall moved north and east of the state by the evening of the 26th. The maximum rainfall amounts in North Texas were west of Truscott with 1.49" and south of Sanger with 1.19". The further south in Texas 1.45"fell east southeast of Colmesneil.

North Texas Regional Summary (continued)

November 29:

A strong cold front passed through Texas. There was no rain with the frontal passage in North Texas, but there were a few showers and strong thunderstorms over east Texas where 1.07" of rain was observed in San Augustine.

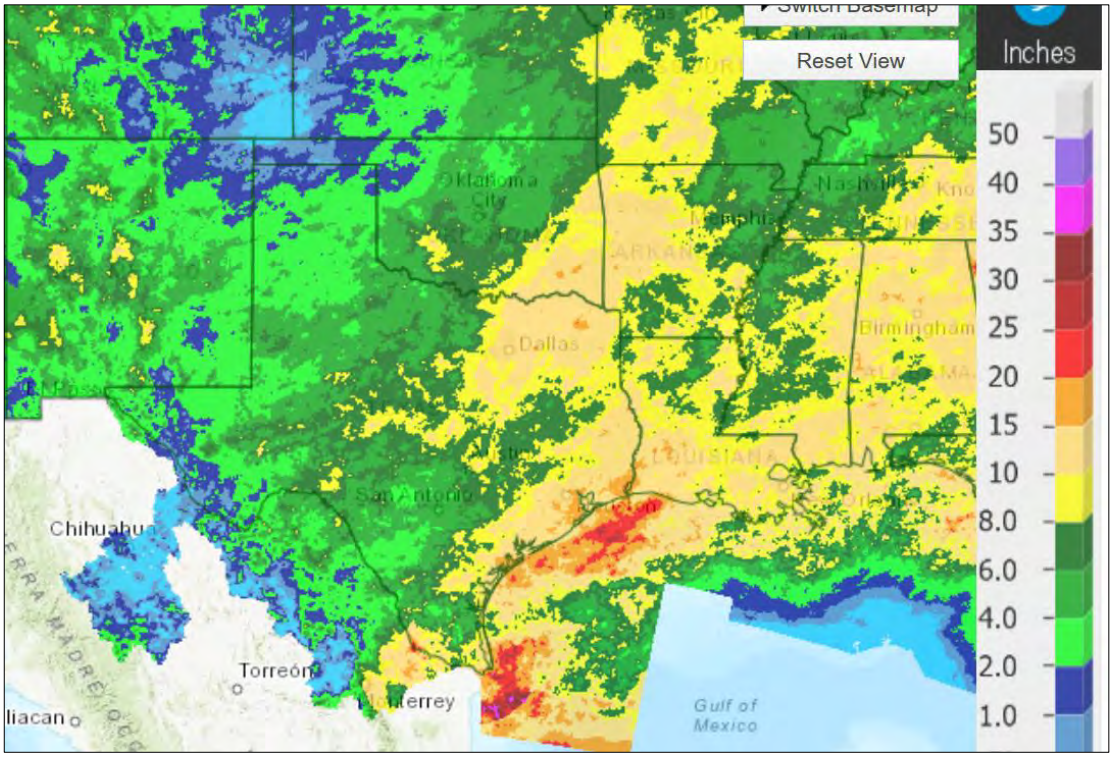


Figure 4: Autumn season precipitation for 2022. *The brown, orange and bright red colors indicate the largest precipitation totals, while the light green and blue colors show the lightest amounts.*

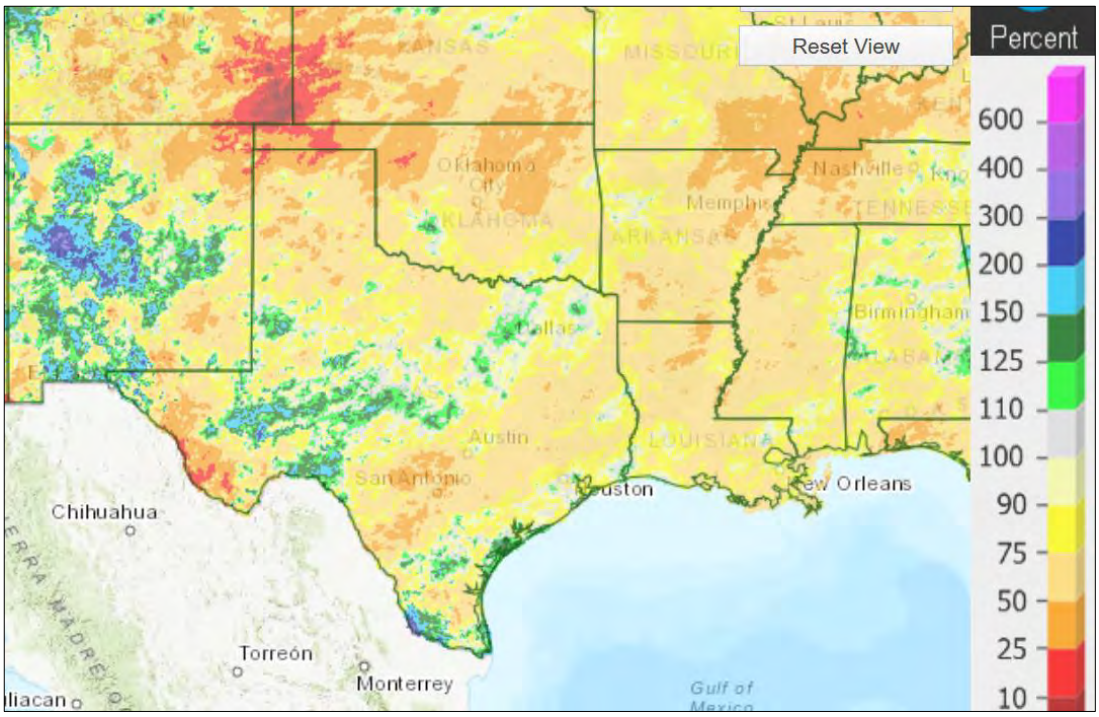
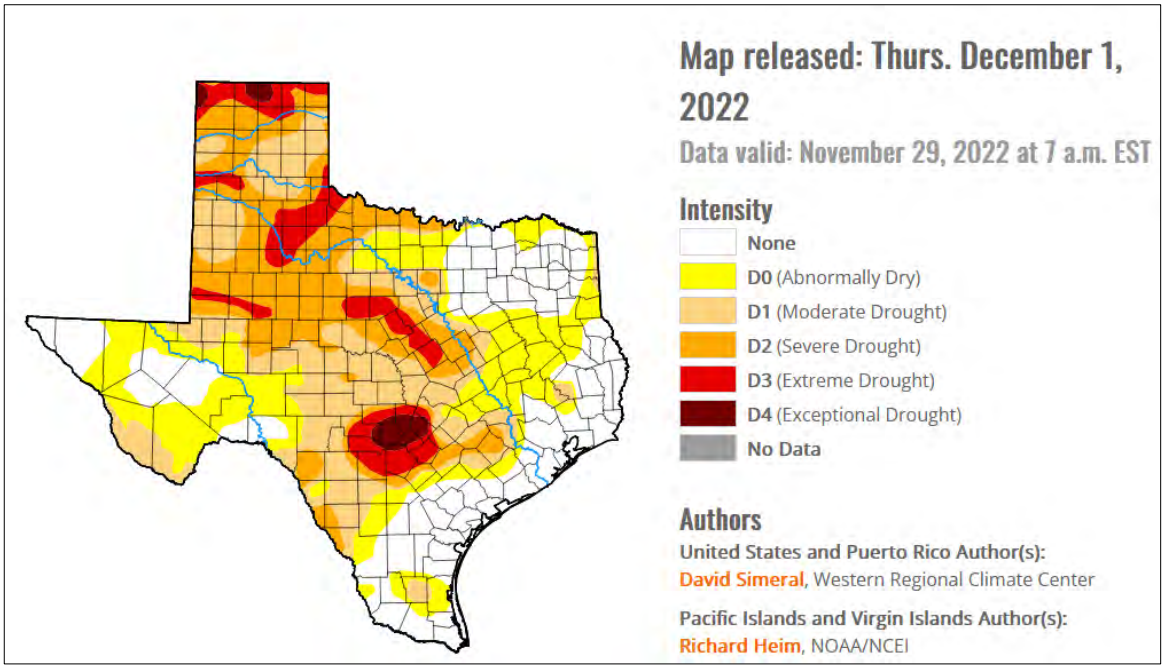


Figure 5: Percent of Normal Precipitation for autumn 2022. *The purple, blue and dark green colors indicate above normal precipitation. The brown, orange and red colors indicate below normal amounts. As you can see, it was a drier than normal fall over a good part of Texas. There was some prolonged dryness over the lower Texas Hill Country and parts of the panhandle and far southwest Texas. But also of note was the isolated spots over north central and northeast Texas, and over much of the Permian basin that received above normal amounts.*

North Texas Regional Summary (continued)

At DFW Airport, for the fall season of 2022 had 11.16" of rain. The normal amount is 9.62" so this is +1.54" above normal for the season.
In Waco, for this fall season of 2022 recorded 8.81". The normal amount is 9.99" so this is -1.18" below normal for the season.

At DFW Airport for 2022 through November 30 observed 34.25" of rain. The normal amount through the end of November is 34.17". This amount is near normal for the season (+0.08"above normal). In Waco for 2022 through November 30 received 20.21" of rain. The normal amount through the end of November is 33.53". This amount is -13.32" below normal for the year so far.



Current Drought Monitor for Texas as of December 1. *The results of the dry weather of this past summer and fall show up well on this drought monitor, as well as those locations that received rainfall. With the exception of the northeast counties, the southeast, a few sections over the far west, and spots over Deep South Texas, everyone is experiencing abnormally dry conditions or worse. Exceptional drought is occurring over parts of the Hill Country, and over a few locations over the northern Texas panhandle. Improving drought conditions were noted over north central Texas.*

Thanks again for your dedication in making all your weather observations! Those reports allow meteorologists and hydrologists to "zero in" on the locations of maximum rainfall and potential sites for flooding. And we appreciate it if you report zero rainfall on the dry days. Why? Because if you go a month or longer without measurable rainfall (as many did this past summer), that tells us a lot, too! 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. This is important information as well. And that includes zero rainfall.

I want to give a special shout out to those who are new to CoCoRaHS. Welcome! You may wonder if anyone looks at your weather reports. Rest assured; someone is! Every day CoCoRaHS data is carefully examined and incorporated by the National Weather Service at the West Gulf River Forecast Center for use in their flood forecasting models.

Everyone, please consider inviting your neighbors, relatives and friends to join CoCoRaHS! A rain gauge would make a great Christmas present! The more rainfall observers we have, the better our chances are of determining the highest rainfall totals during rainfall events, and the location of drought when it isn't. If we can help you with your observations or reporting in any way, please let us know! Either I or your county coordinator are here to help you.

Have a great Christmas holiday season, a happy new year, and enjoy the changeable weather we are blessed with in Texas!

Greg Story

Austin/San Antonio Regional Summary

A Third Consecutive Fall of La Niña Conditions Brought the Expected Impacts…Mostly.

By Keith White – WFO Austin/San Antonio

As most of you are keenly aware, it's been a drier than normal year across south-central Texas, especially for areas from San Antonio to Buda and northwestward into the Hill Country. As of the end of November, rainfall deficits of 12-20" exist over many of these areas since January 1st (Figure 1). However, one of our notably wetter than usual periods of late was ongoing at the beginning of Meteorological Fall. Isolated to scattered showers and storms occurred on the 1st through the early morning on the 3rd, with pockets of heavy rain in excess of 2" over some of our northern counties, including Lee on the 1st and from Val Verde to Llano on the 2nd into the 3rd. The only Flash Flood Warning issued this Fall across our area occurred over eastern Llano County just after midnight as a result of this rain, with radar estimates in excess of 3" and several CoCoRaHS observers reporting amounts around 2.5" the next morning.

Some more widespread rain did occur on the 3rd and 4th, this time including the Interstate 35 corridor and Coastal Plains with isolated 1.5-3" amounts from Canyon Lake to San Marcos, in northern San Antonio, and in Karnes and DeWitt counties. Spotty, mainly light rains continued most days through the 11th with the most notable rains along the I-35 corridor on the 7th where a few lucky folks were able to pick up over an inch of rain. Dry, seasonally warm weather dominated across most of south-central Texas from the 12th-25th. A cold front did bring some needed rainfall to the western Hill Country and southern Edwards Plateau on the 25th and 26th, with dry and cooler conditions elsewhere, but we rounded out the month with high pressure in control, no rain, and temperatures warming back into the above normal category for most of the region.

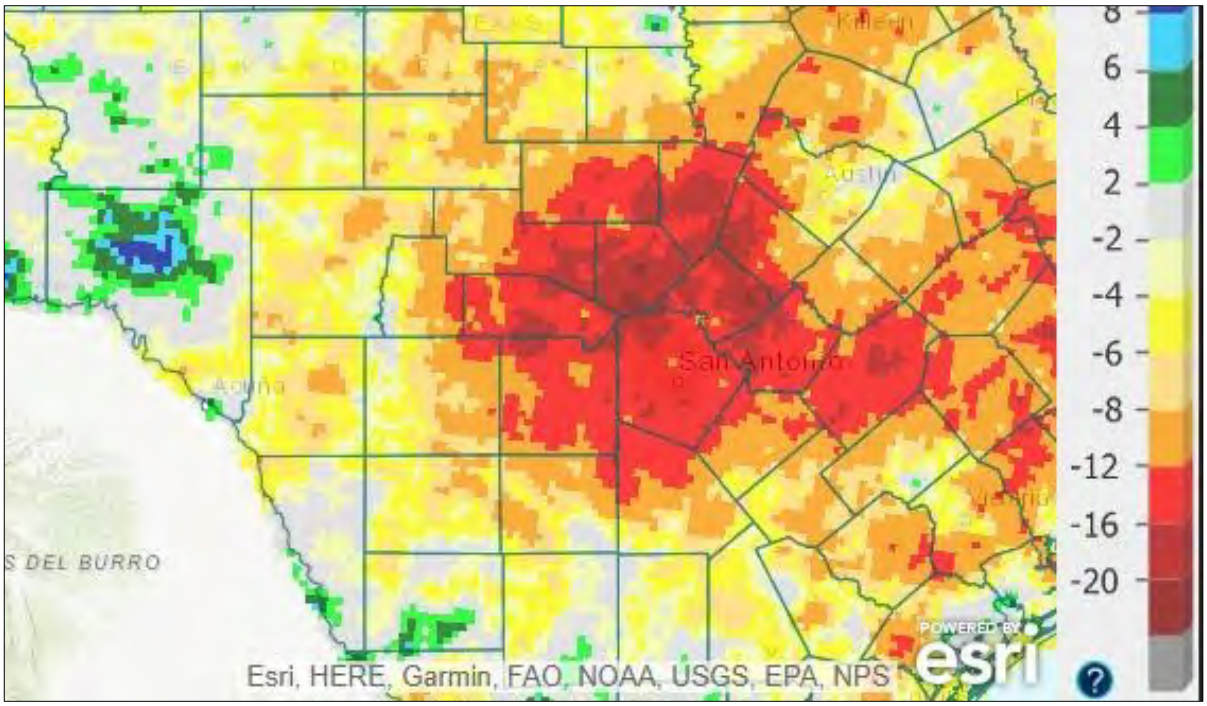


Figure 1: Year to date precipitation departure from normal as of November 29th.

The only areas with above-normal September rainfall were across much of Val Verde County as well as a few spots in the northern Hill Country. In addition to late August rains in these areas, drought improvements resulted in these areas. In fact, Extreme (D3) to Exceptional (D4) Drought was eliminated from these spots by the end of the month, although it continued for locations to the east along the I-35 corridor between San Antonio and San Marcos. Above normal temperatures prevailed across much of the region, except right along the Rio Grande where temperatures were slightly below normal. The lack of rainfall resulted in continued decline in lake and reservoir levels. Amistad Reservoir was an exception, rising due to a combination of reservoir releases in Mexico and above normal rainfall over portions of its basin.

Austin/San Antonio Regional Summary (continued)

The dry spell in the latter two thirds of September carried through the first two weeks of October. Weak cold front passages arrived into South Central Texas mostly dry, with only an isolated pocket or two of heavy downpours over rural Val Verde County and parts of the Coastal Prairies through the first half of the month. Finally, on the night of the 16th, a cold front combined with plenty of moisture and a series of upper level disturbances brought some showers and thunderstorms to most of South Central Texas through the night of the 17th. The heavier rainfall amounts occurred over the Rio Grande Plains and southern Edwards Plateau as well as the northern Austin Metro area where widespread 1-2" amounts were indicated by radar estimates. A few spots across northern Val Verde and northern Maverick County may have picked up as much as 4" of rainfall. Farther east, rainfall amounts tapered off, across portions of the Hill Country and Interstate 35 corridor. The exception to this was across southern Williamson, northeast Travis, and northwest Bastrop counties. Across this area, some 1-2.5" amounts were measured, with one CoCoRaHS observer near Elgin reporting just short of 3.50".

A dry pattern resumed until around the 24th when a storm system moved through the area, bringing spotty rainfall amounts of 0.25-1" across areas mainly east of Highway 281. A second storm system moved through the area on October 28th and 29th, with a more uniform spread of 0.25-1" rains covering all but a few areas along the Rio Grande. Then on October 31st, some late evening showers and thunderstorms brought some 0.25-0.5" amounts generally east of I-35, but also some locally higher amounts of 1.5-2.5" over the Devils River watershed in Val Verde County. The month ended with well below rainfall once again for the vast majority of the region, the exception being near the Rio Grande, particularly in Val Verde County. Temperatures ranged from slightly above normal over the more drought-stricken areas of the Hill Country, I-35 corridor, and Coastal Plains to up to 2 degrees below normal over the Rio Grande Plains, southern Edwards Plateau, and southern portions of the Coastal Plains where it had been wetter this fall. The coldest conditions were over rural Val Verde County.

The first ten days of November were characterized by seasonally warm weather with highs in the 70s and 80s. A coastal low brought some showers to our far southeastern counties on the 1st with amounts up to 1", and a cold front kicked off showers and storms on the 4th that ended in similar rainfall amounts across areas east of US-281. A few lucky folks in Guadalupe County did see 1-2" amounts with that event. The cooler air was short-lived as onshore flow re-established, and a warm front on the 6th led to some isolated to scattered rains, mainly in the mornings, for several more days. The 10th into the 11th was a rare dry day area-wide, but then a strong cold front arrived in the afternoon on the 11th. Most areas received at least some rain behind this front, except along the Rio Grande and from San Antonio to New Braunfels. The highest rainfall amounts came across Burnet County with a few reports over 1.5". We then settled into a cool pattern with a few mornings of drizzle and light rain peppered in, but no significant rainfall events through the middle of the month. On the 19th through the 23rd, each day featured some much needed, widespread rains with amounts mainly less than 0.25" each day. The primary exception was the 21st into the 22nd, with 0.25-0.5" amounts along and east of I-35.

After nearly two weeks of below to well below normal temperatures, we finally warmed back above normal on just in time for Thanksgiving Day on the 24th. Then the heaviest, most widespread rainfall of the season for many areas came on the night of Black Friday (Figure 2). The highest totals were along and east of I-35 to the northeast of San Antonio, with dozens of reports in the 1.5-3" range from New Braunfels to the northern Austin suburbs and east through Bastrop and Caldwell counties. One CoCoRaHS observer in Guadalupe County sent a report of golf ball sized hail that helped us verify a Severe Thunderstorm Warning issued late on Friday evening. A dry pattern returned, along with several more days of seasonally warm afternoons through the 29th. A cold front rushed through early in the morning on the final day of Meteorological Fall, but it brought no additional rainfall along for the ride. Despite the wetter weather in November, Meteorological Fall finished with below normal rainfall across most of our region (Figure 3).

Austin/San Antonio Regional Summary (continued)

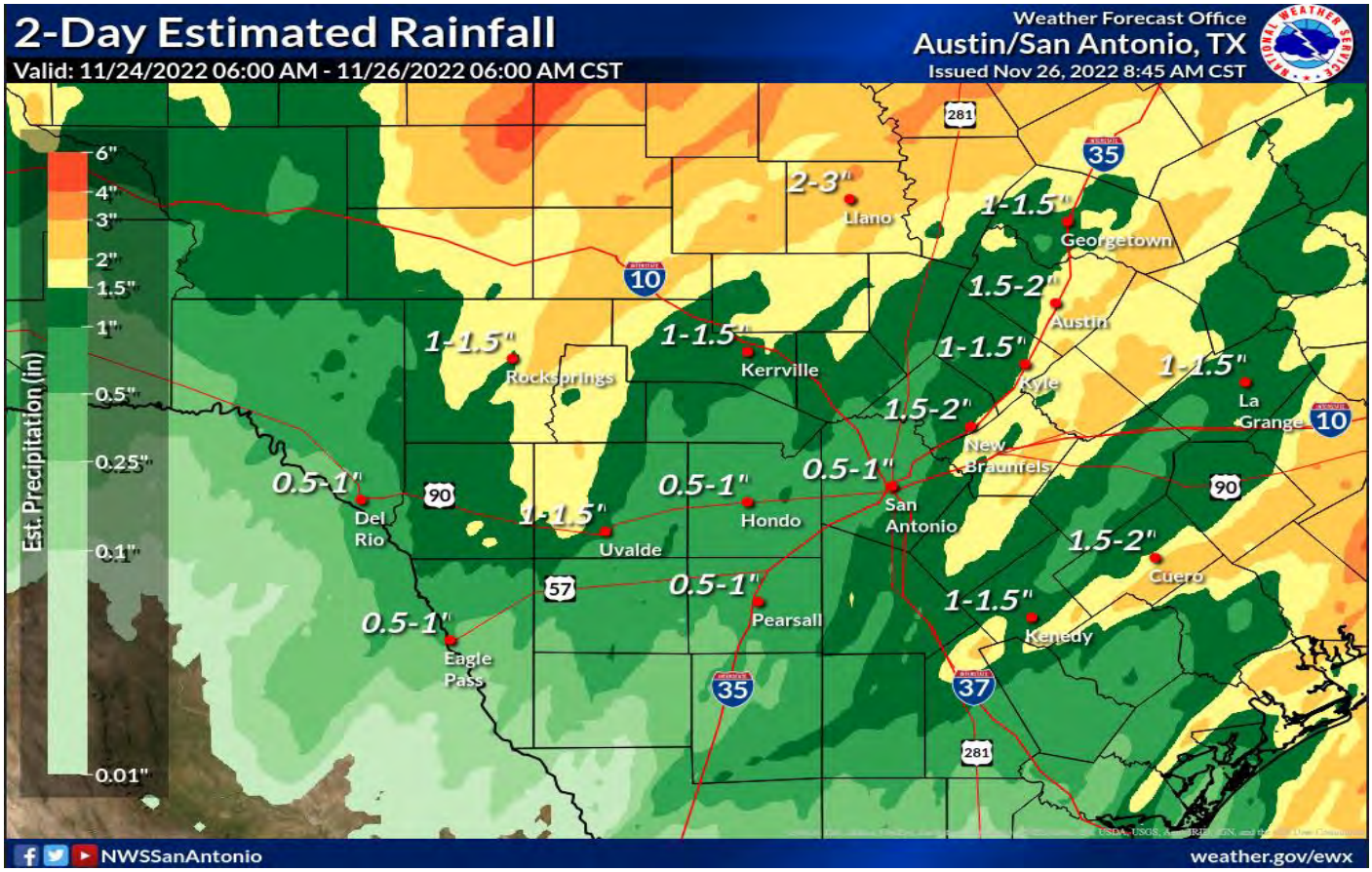


Figure 2: Rainfall estimate for the 48 hours ending 6am November 26th. Including Thanksgiving Day and Black Friday.

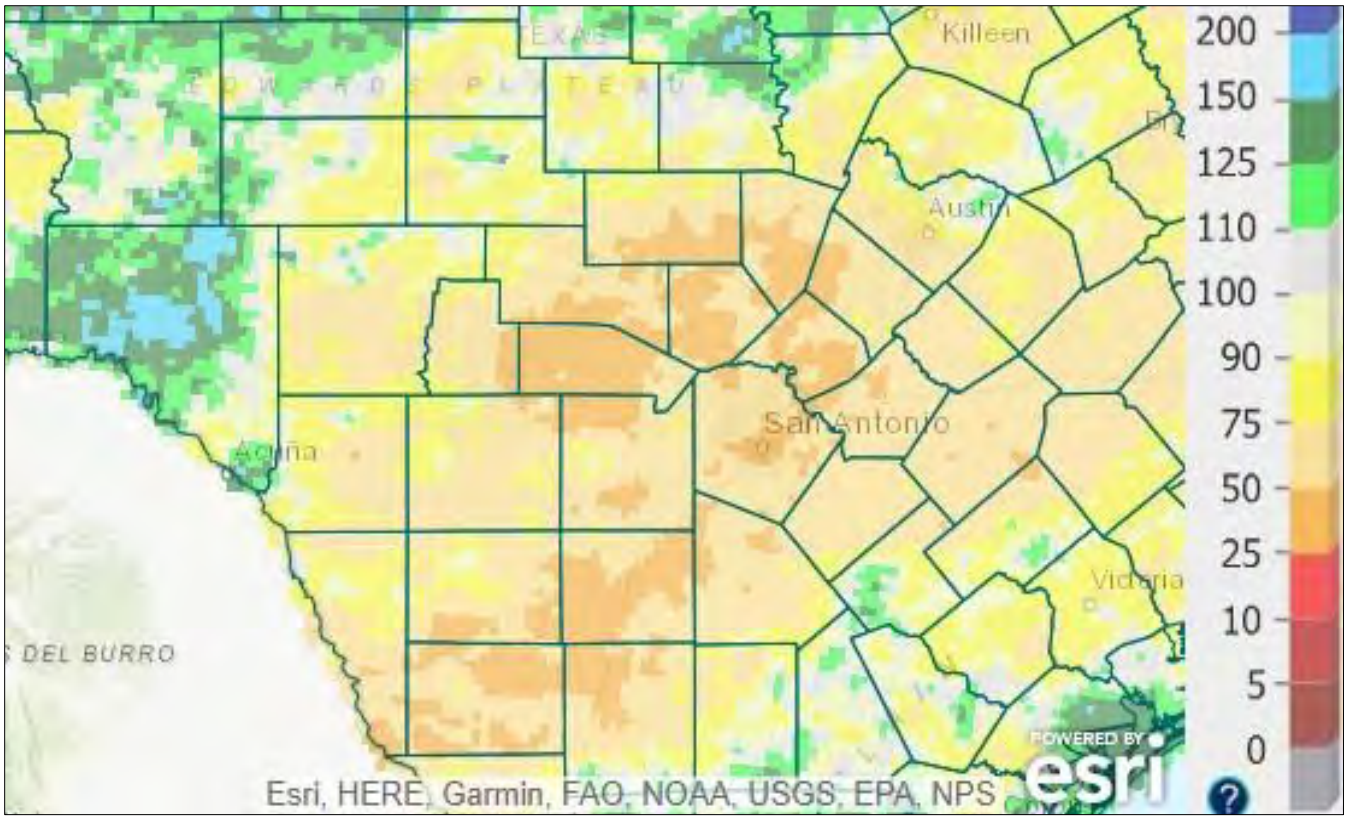


Figure 3: Percent of normal precipitation for the 90 day period ending 6am CST November 30th.

Austin/San Antonio Regional Summary (continued)

November featured a return to fog season in south-central Texas, with 16 days of reduced visibility (below 6 miles) reported in Austin, 12 in San Antonio, and 13 in Del Rio. The cooler temperatures and widespread rains helped to alleviate short term drought impacts such as shallow soil moistures, however long-term deficits continue to dominate the drought story here. Looking at a comparison of the Drought Monitor from Sept 6th to Nov 29th (Figure 4), we can see that some drought improvements have occurred across portions of the northern Hill Country and southern Edwards Plateau, Rio Grande Plains, and Coastal Plains, however the primary area of Extreme (D3) and Exceptional (D4) drought has expanded this fall across central portions of our region who have significant longer term rain shortfalls on top of below normal rain this Fall. The outlook for winter continues to suggest odds tilted towards warmer than normal conditions on average, and precipitation is likely to be below normal overall through the end of February.

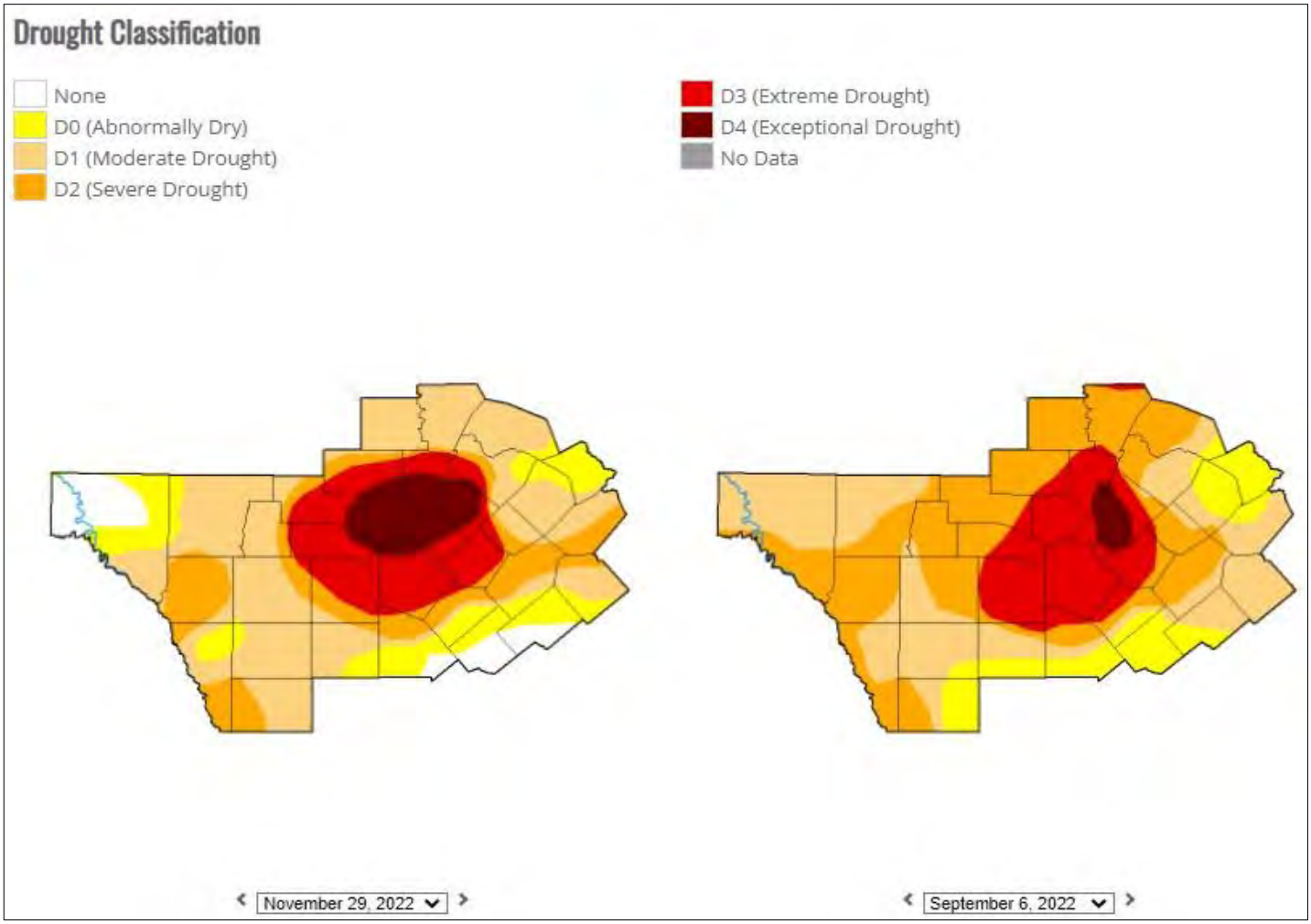


Figure 4: Comparison of the United States Drought Monitor on November 29th and September 6th.

Far West Texas Regional Summary

Seasonable Fall Precipitation in El Paso despite Triple-La Niña

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

Late monsoon thunderstorms shifting into periods of rainy weather highlighting a wetter-than-normal autumn in far west Texas this year. This was unexpected given the previous dry fall seasons and the Climate Prediction Center's forecast of a rare third consecutive La Niña this upcoming winter. Precipitation patterns are quite sporadic in El Paso as Sept-Nov represents a transition from warm season monsoonal precipitation to winter's progressive Pacific lows.

September remained fairly convective, with thunderstorm events bringing rain on the 1st, 12th, and 18th. Scattered thunderstorms continued through much of the month, leading to spotty but near normal rainfall for most of El Paso and Hudspeth Counties. Monsoonal high pressure stuck around over the Gulf Coast, allowing moisture to remain in place through the final week of September.

October also began with an extended period of rainy weather, with measurable precipitation recorded at El Paso International for 8 consecutive days (Oct 3 - Oct 10). CoCoRaHS observers recorded **1.50-2.50"** of rain in that week alone. Rains were fairly uniform across far west Texas, but a few observers in west El Paso surpassed **3.00"** of rain that week, blowing past the monthly average of **0.59"**. A powerful Pacific storm moved across the region on the 15th, bringing strong winds and widespread light showers to most of the area. A few severe thunderstorms were also seen, with small to moderate size hail reported. Another strong Pacific storm system on the 23rd brought strong winds and the first mountain snows of the season to southern New Mexico.

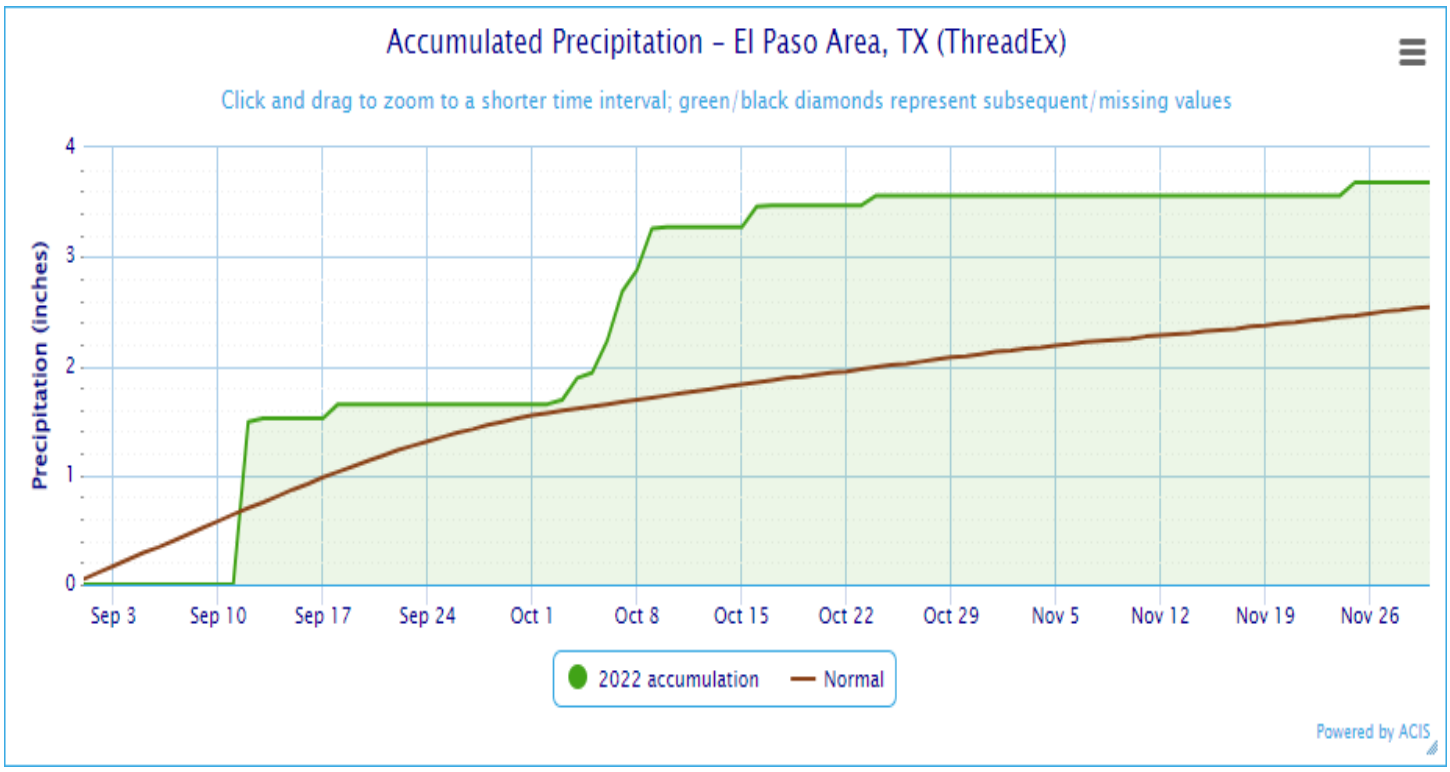


Figure 1: 2022 autumn precipitation in El Paso, TX compared to climate normals (1991-2020).

Far West Texas Regional Summary (continued)

November was the driest month of the season, with precipitation totals ranging from **0.10-0.25”**. The majority of these totals occurred on November 25th, when a winter storm brought light snow to Hudspeth County and a wintry mix to El Paso. This low dove down the southern Rockies, just missing the Rio Grande Valley to the east. Snow accumulated on the Franklin Mountains, but remained mostly rain across the populated areas of far west Texas.

Figure 2: A dusting of snowfall over the Organ Mountains in Southern New Mexico on November 25th, 2022. The Franklin and Hueco Mountains in far West Texas also recorded snow.

90-day precipitation totals of **3.00-4.00”** were above normal in El Paso County, but slightly lower observations in Hudspeth County left those areas near normal for the season. Precipitation events fell in batches, with long periods of dry weather in between. Drought conditions remained non-existent in far west Texas due to the periodic rainfall, with the U.S. Drought Monitor leaving the region out of any drought designation.

The fall season featured 41 active observers in El Paso County, and 2 in Hudspeth County. A total of 1,986 daily reports were submitted, along with 62 multiple-day reports. 25% of total reports had measurable precipitation, which means our regional observers continue to do a great job reporting days with 0.00”. One Condition Monitoring Report was submitted this season highlighting the wet October conditions, and no Significant Weather Reports were submitted. Thanks again to all our local observers who participated in the 2022 autumn season!

Wichita Falls Regional Summary

Drought Continues with Generally Dry Fall Conditions

By: Charles Kuster, NSSL

Generally, our fall was warm and dry this year with many areas getting 1.5–3.0” less rainfall than normal (Fig. 1a). September was especially dry, where 28 dry days (all CoCoRaHS stations reported less than 0.05”) and only two wet days (at least one CoCoRaHS station reported 0.05” or more) occurred. October saw more rainfall and the area experienced 11 wet days, but then only 4 wet days occurred in November. For the entire season, there was a total of 74 dry days and 17 wet days in our region. For comparison, the region experienced 77 dry days and 14 wet days last fall. As a result of the dry conditions, drought continues across the whole region and has intensified somewhat in portions of our region (Fig. 2).

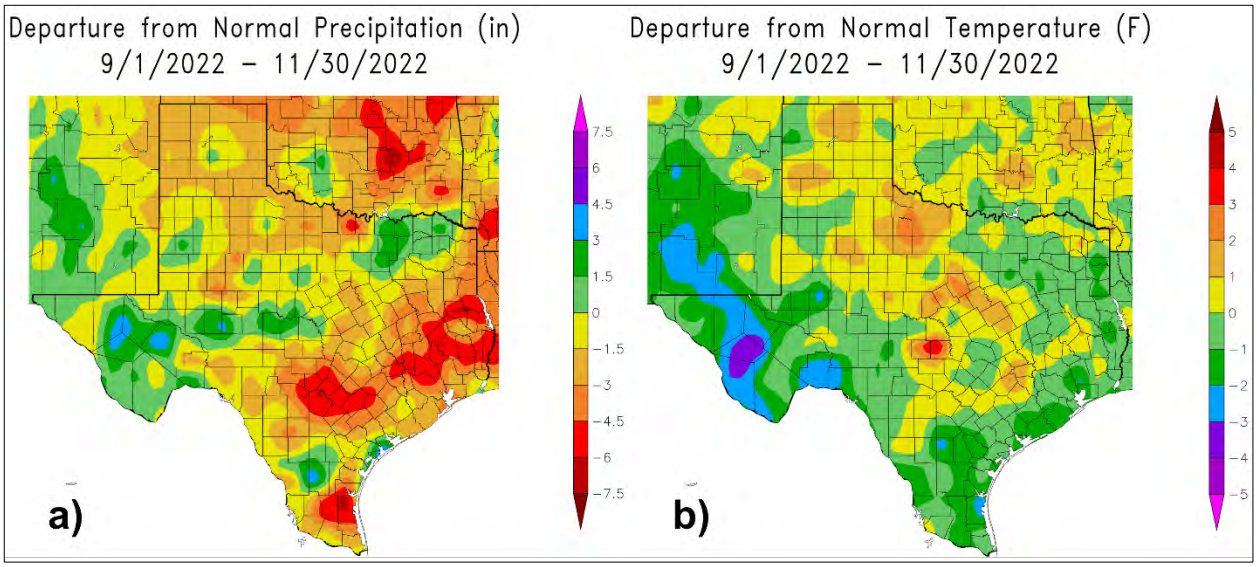


Figure 1: Departure from normal a) precipitation and b) temperature for the beginning of September through the end of November. Warm colors indicate below normal precipitation (a) and above normal temperatures (b), while cool colors indicate above normal precipitation (a) and below normal temperatures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

With the dry conditions, your reports of 0.0” continue to be very important, so thank you to all who continue to submit reports in times of rain and no rain! The supplemental Condition Monitoring reports are also a great way for you to share the local impacts drought is having in your area. These reports can be submitted about once per week and are greatly needed in our area (Fig. 3). More information about these reports can be found at

https://media.cocorahs.org/docs/ConditionReportingGuide_1.4A/assets/player/KeynoteDHTMLPlayer.html#0.

Wichita Falls Regional Summary (continued)

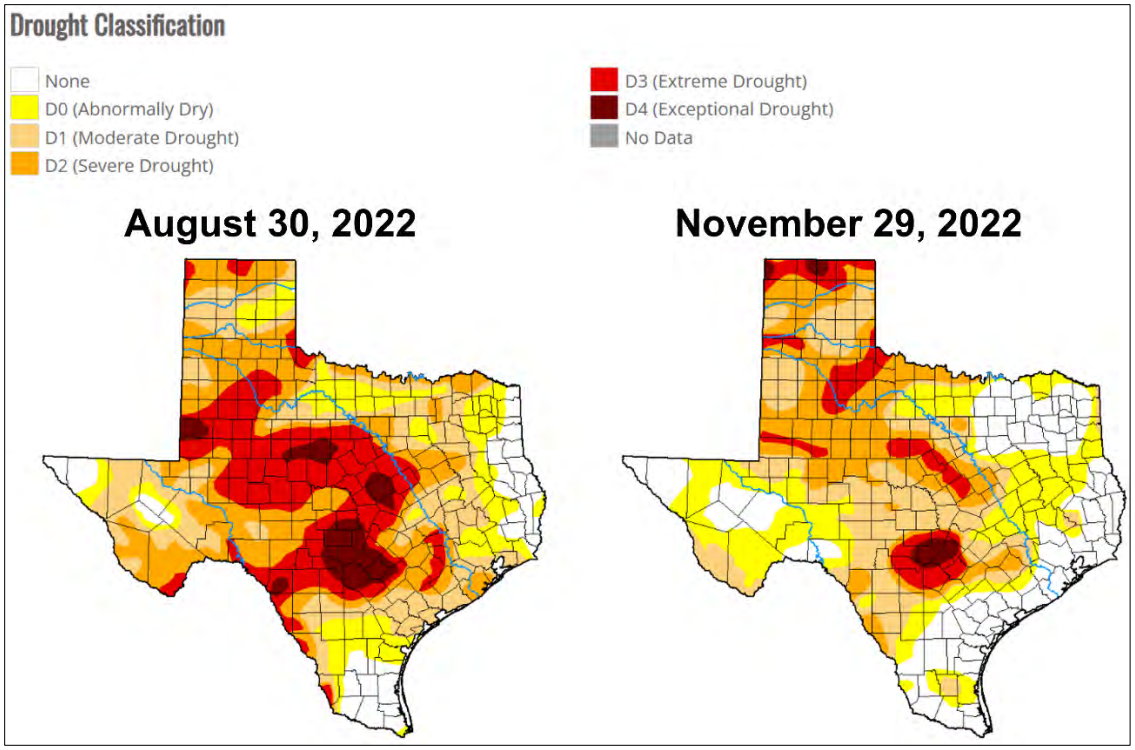


Figure 2. Changes in drought conditions over the fall according to the U.S. Drought Monitor (available at https://droughtmonitor.unl.edu/) for Texas on August 30, 2022 (left) and November 29, 2022 (right).

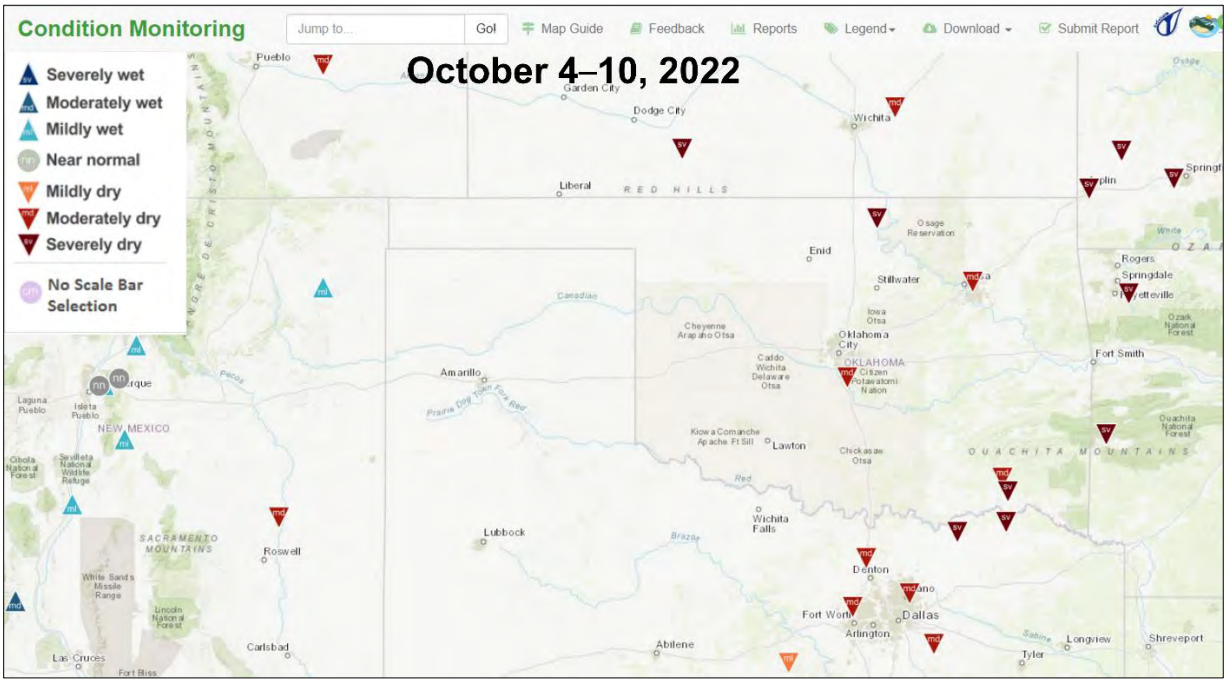
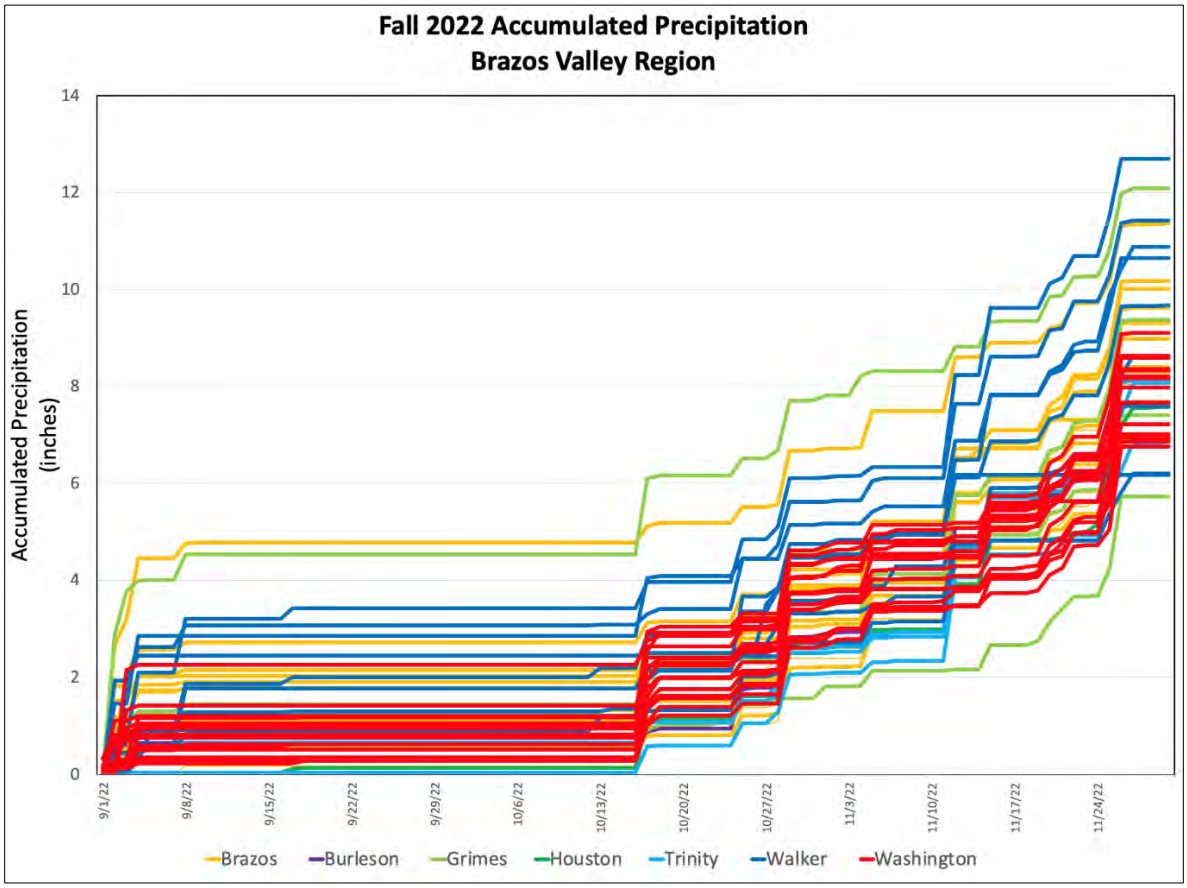


Figure 3. Condition monitoring map for week of October 4–10, 2022. Colored icons are CoCoRaHS volunteer observations.

Brazos Valley Regional Summary

Fall 2022 Precipitation Summary
Bryan-College Station/Brazos Valley Region, Texas
Alison A. Tarter, Texas A&M University, Office of the State Climatologist of Texas



Summary:

After a considerably dry start, overall precipitation this fall ended up totaling slightly below average thanks to late season rains. Late November rain gave much of the Brazos Valley, and most of the state, a large enough soak to boost the seasonal precipitation total to just under 2 inches shy of seasonal average (9.55" fall 2022 total at College Station, 1950-2022 period of record fall average 11.51"). If you're curious about how rainfall this season compares to fall 2011, the 2011 fall average was just 5.61" in College Station. Temperatures this fall were near to but slightly above average (70.9°F fall 2022; 69.9°F average of record; 72.3°F fall 2002).

Observer Statistics:

For the fall 2022 season, 56 observers reported during most or all of the timeframe. Of those stations, 19 had no missing days! A total of 48 stations were used to calculate the season's records: Brazos (14), Burleson (1), Grimes (4), Houston (1), Trinity (3), Walker (9), and Washington (16). Excellent effort, team!!!

Observer Statistics:

Wettest Day: 2.82", September 2, Grimes County
Wettest Seasonal Total: 12.96", Walker County
Driest Seasonal Total: 5.72", Grimes County
Soggy Socks Award: (longest spell with measurable rain): 9 days in late November: Brazos, Houston, and Washington Counties
Dusty Soles Award: (longest spell without measurable rain): 42 days (early September to mid-October), Brazos, Grimes, Trinity, Washington, and Walker Counties (all but Houston Co.)

Southeast Texas Regional Summary

Very Dry Start to the Season then Beneficial Rains in November

By: Ron Havran - SE Texas CoCoRaHS Regional Coordinator, HCFCD

Hot and dry weather continued into autumn across Southeast Texas with drought conditions getting worse as September began. There were a few locations that did get some heavy isolated thunderstorms early in the month, but much below normal precipitation prevailed for the month. See figure 1. Most CoCoRaHS observers had very little rain to measure this month. See figure 2. Rainfall was two to five inches below normal across the entire region. Liberty and Orange counties had the highest CoCoRaHS observer county averages for the two sections in SE Texas. See chart 1 and 2. The lack of rainfall led to above normal temperatures and the redevelopment of the drought in portions of the region. Temperatures were 1° to 2°F above normal. See tables 1 and 2. Thanks to all CoCoRaHS observers that reported daily zeros for Drought Monitor mapping. Very valuable data.

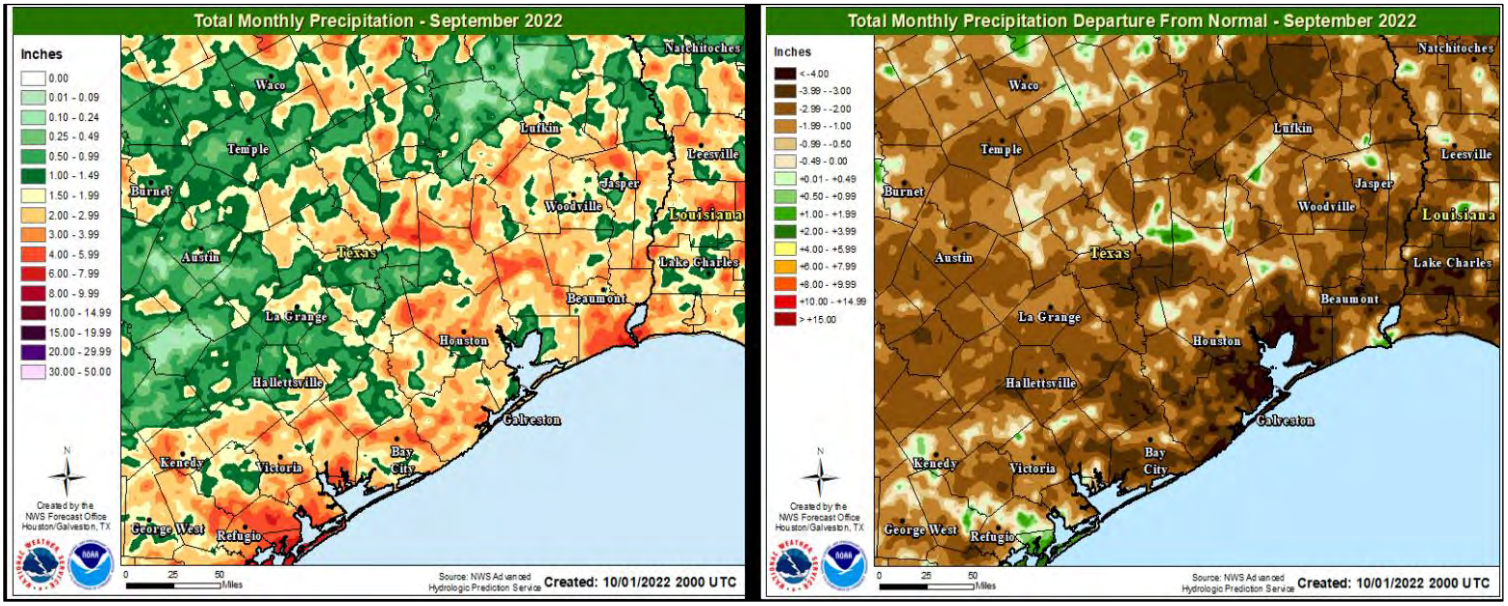


Figure 1: September 2022 Total Precipitation and Departure from Normal Precipitation across Southeast Texas.

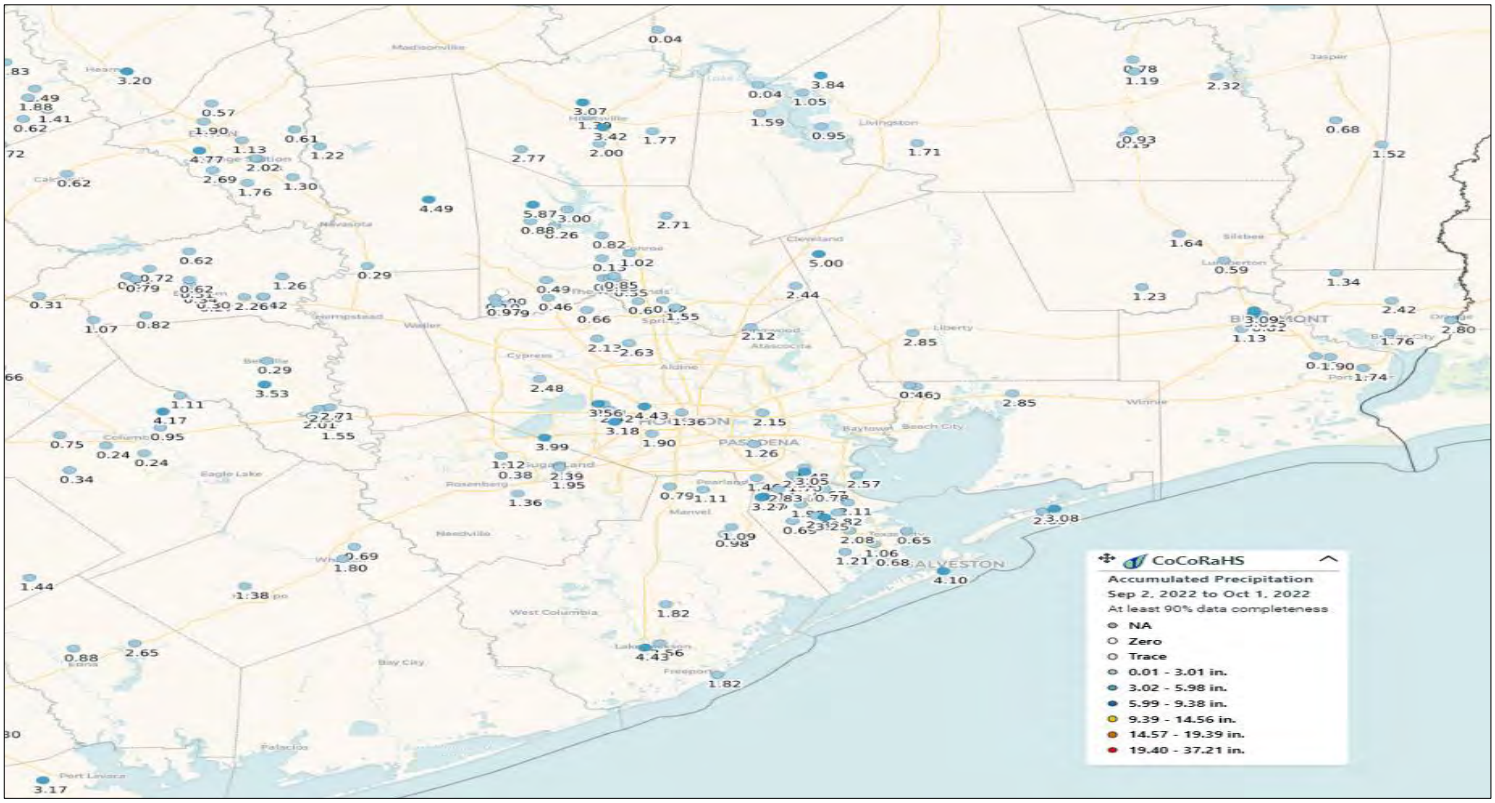


Figure 2: September 2022 Total Precipitation recorded by CoCoRaHS observer reports across Southeast Texas.

Southeast Texas Regional Summary (continued)

Extremely dry conditions continued into October throughout SE Texas. The eastern section of SE Texas had the most CoCoRaHS observer measured rainfall in Jefferson and Orange counties. The western section in SE Texas didn't receive much rainfall for the month until the 28th. Rainfall in the western section of SE Texas was two to four inches below normal. There was several cold fronts the 2nd half of October that resulted in the coldest overnight lows of the season. The entire region of SE Texas was 1° to 3°F below normal for October. Most of the region had many clear to mostly sunny days this month. Daytime highs were near normal but with clear and calm nights, temperatures for the month were below normal. Thanks to all CoCoRaHS observers that report their observations each day. This data (rainfall or zero) goes into forecast models that run every morning. See figure 4.

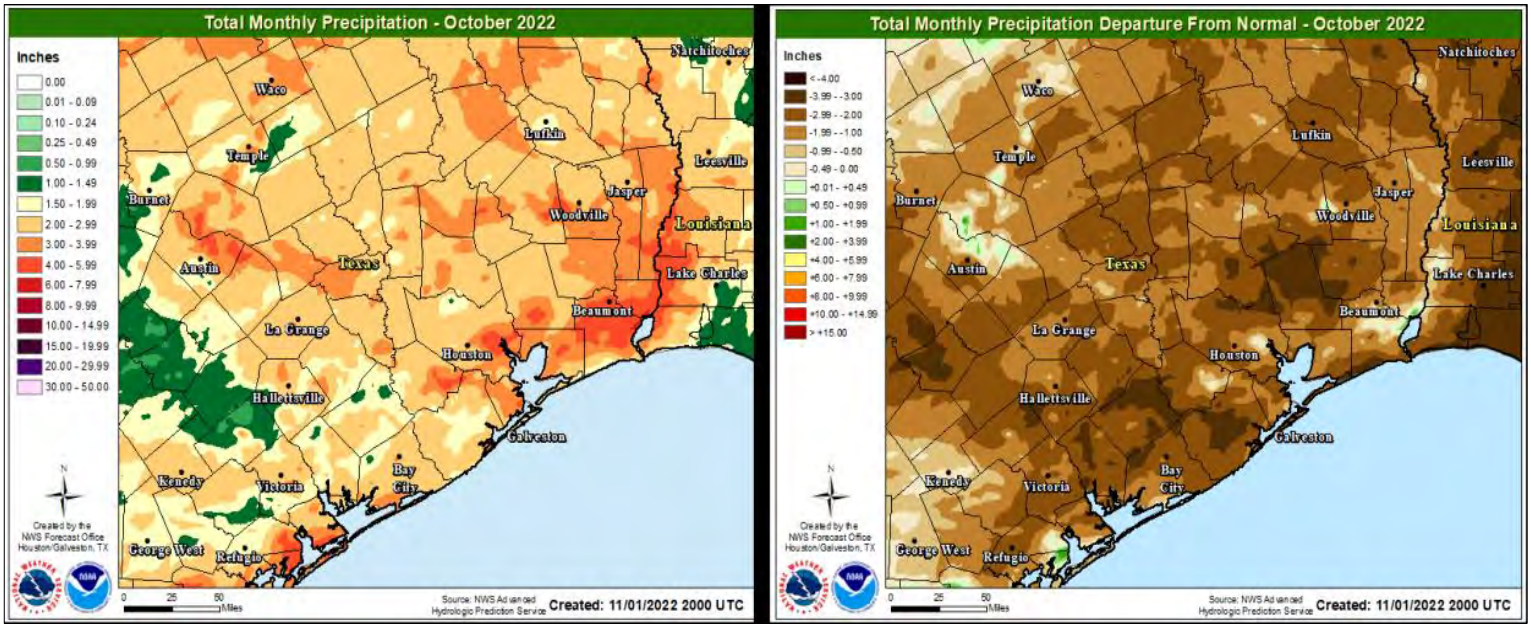


Figure 3: October 2022 Total Precipitation and Departure from Normal Precipitation across Southeast Texas.

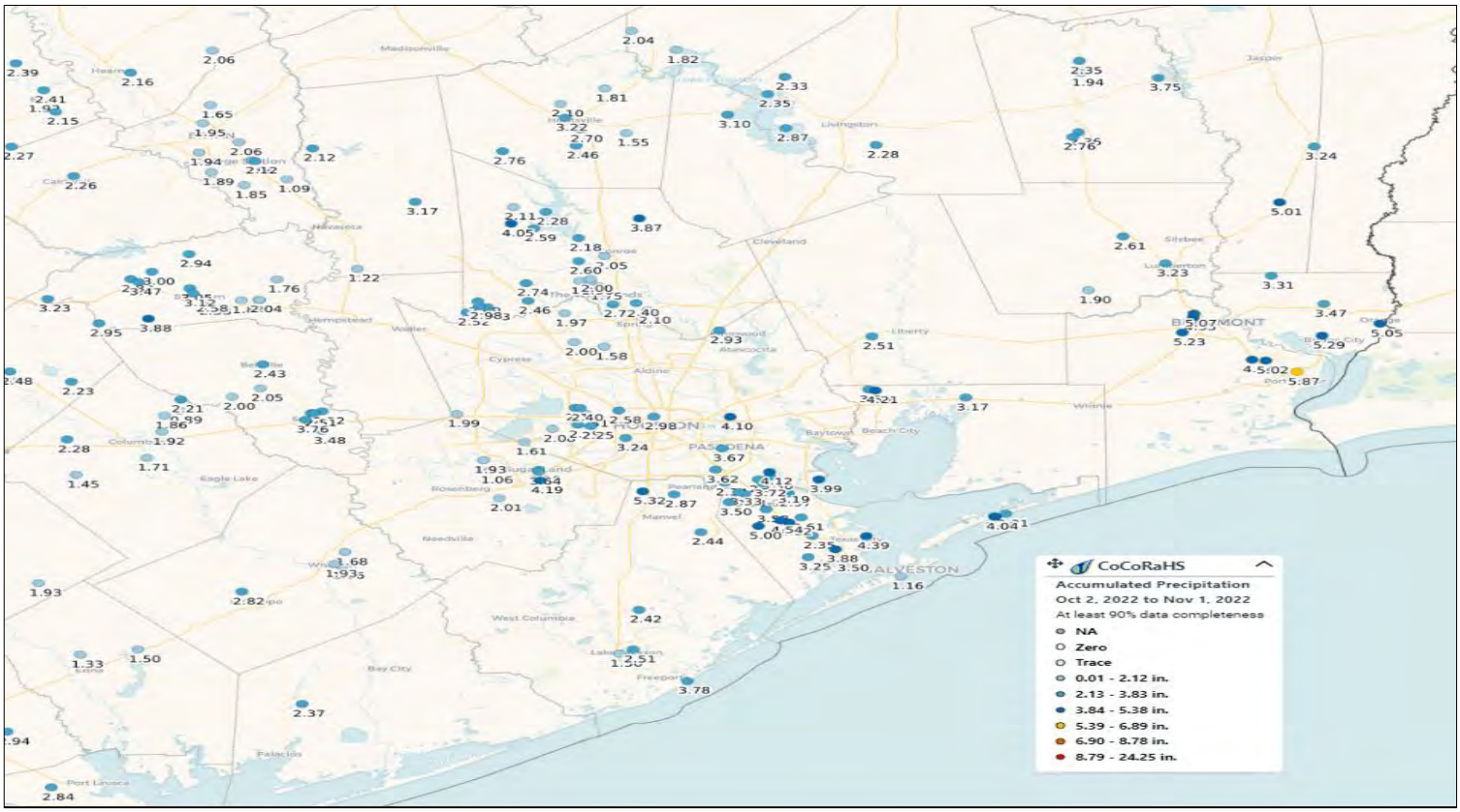


Figure 4: October 2022 Total Precipitation recorded by CoCoRaHS observer reports across Southeast Texas.

Southeast Texas Regional Summary (continued)

November brought much needed rainfall for both sections of SE Texas. The western section of SE Texas had a CoCoRaHS observer county rainfall average of 6.59” while the eastern section had a CoCoRaHS observer county rainfall average of 7.64”. There was several cold fronts that stalled near coastal areas and brought cool and cloudy conditions with rain to all of SE Texas. Rainfall was three to six inches above normal across most of SE Texas. Temperatures were 1° to 2.5°F below average across all of SE Texas. See tables 1 and 2 for more information. The highest rainfall totals for CoCoRaHS stations was along coastal sections. See figure 6. Galveston, Orange, and Jefferson counties recorded the highest CoCoRaHS average county rainfall totals across SE Texas. Thanks to all observers for taking your time every morning to read your 4 inch diameter manual gauge and report your data. Remember to get your morning report submitted quickly and as close to your observation time (7am preferred) as possible in order to have your data entered into computer models at the West Gulf River Forecast Center that morning.

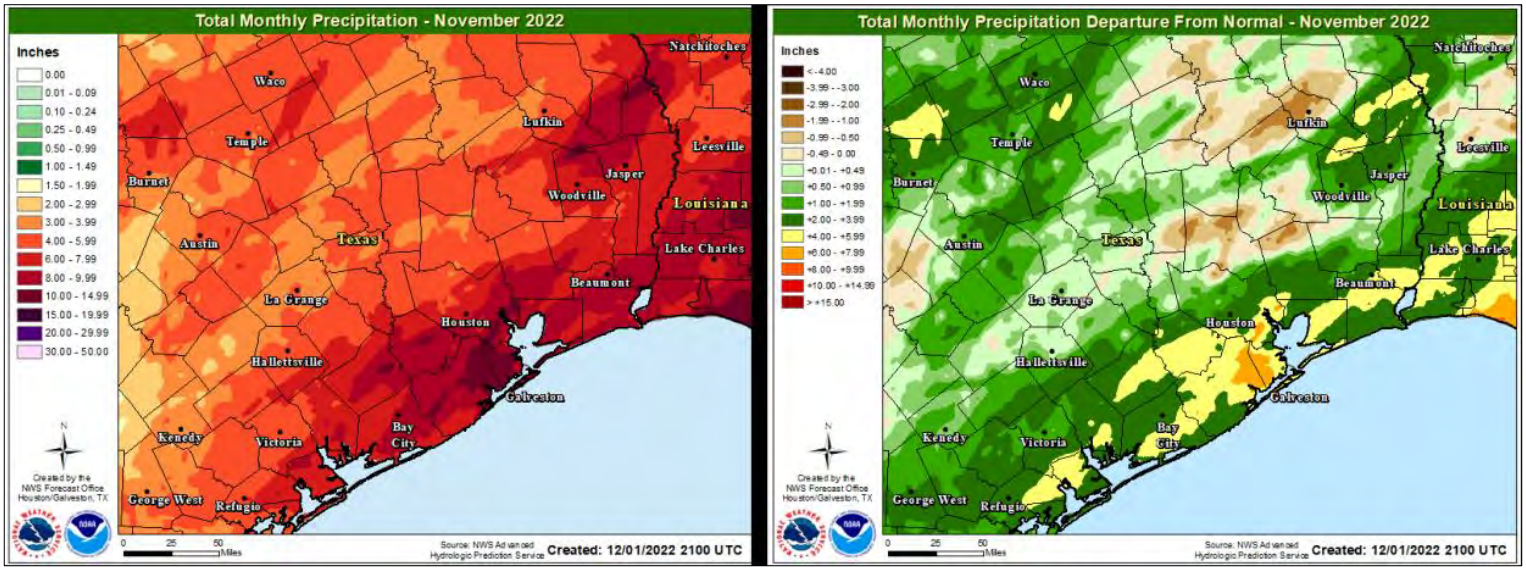


Figure 5: November 2022 Total Precipitation and Departure from Normal Precipitation across Southeast Texas.

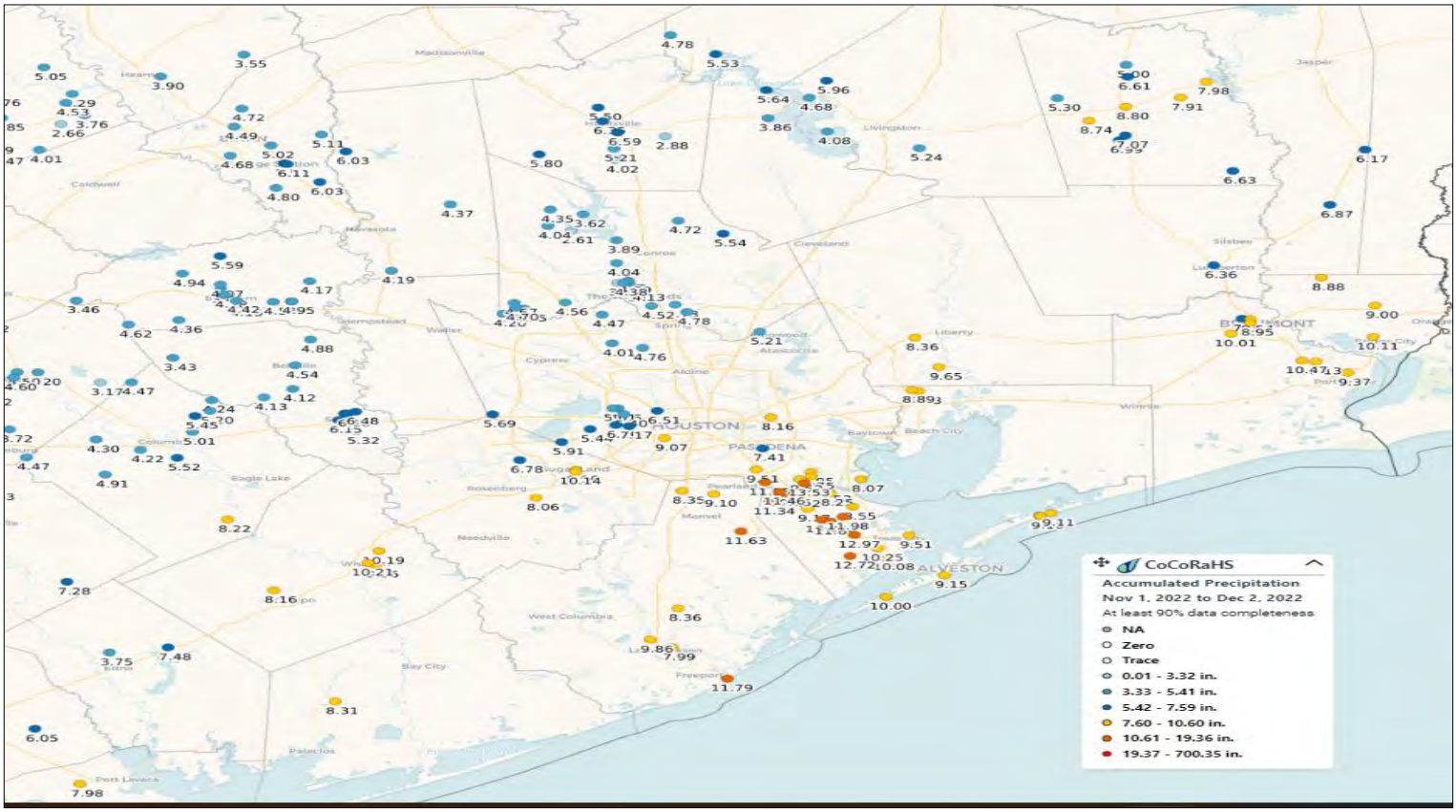


Figure 6: November 2022 Total Precipitation recorded by CoCoRaHS observer reports across Southeast Texas.

Southeast Texas Regional Summary (continued)

Autumn 2022 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	1.77	2.44	4.96	9.17
Brazoria	1.95	2.94	8.46	13.35
Chambers	1.17	3.31	6.31	10.79
Colorado	1.10	1.92	4.51	7.53
Fort Bend	1.33	2.73	8.56	12.62
Galveston	2.15	3.16	9.84	15.15
Harris	2.19	2.41	6.99	11.59
Jackson	1.77	1.42	5.49	8.68
Liberty	3.11	2.31	7.16	12.58
Matagorda	1.65	2.86	8.09	12.60
Montgomery	1.10	2.43	3.99	7.52
Polk	1.87	2.50	4.96	9.33
San Jacinto	1.11	3.12	4.53	8.76
Wharton	1.17	1.98	8.41	11.56
Region Totals	1.67	2.54	6.59	10.80

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 CoCoRaHS Observers average rainfall per county.

Autumn 2022 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	1.15	2.22	6.68	10.05
Jasper	1.63	3.86	6.17	11.66
Jefferson	1.71	4.79	9.14	15.64
Newton	No data	No data	No data	No data
Orange	2.11	4.19	9.21	15.51
Tyler	1.11	2.93	6.99	11.03
Region Totals	1.54	3.60	7.64	12.78

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 CoCoRaHS Observers average rainfall per county.

Southeast Texas Regional Summary (continued)

Houston/Galveston Temperatrure & Rainfall Data for 2022 Autumn Season

	September Climate						
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	91.8	69.7	80.7	0.2	0.75	4.71	(-3.96)
Hobby Airport (1930)	92.1	73.4	82.8	1.7	1.52	5.76	(-4.24)
Galveston (1871)	89.1	77.9	83.5	1.1	2.80	6.65	(-3.85)
Sugar Land (2000)	92.2	69.3	80.8	0.2	1.08	4.42	(-3.34)
	October Climate						
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	82.6	57.5	70.0	-1.8	1.83	5.46	(-3.63)
Hobby Airport (1930)	83.3	62.1	72.7	-0.3	2.82	5.78	(-2.96)
Galveston (1871)	80.7	62.7	74.0	-1.3	1.54	5.15	(-3.61)
Sugar Land (2000)	83.3	62.0	72.7	-1.7	2.27	4.65	(-2.38)
	November Climate						
Site Location (record start)	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Bush Airport (1888)	70.0	51.2	60.6	-1.4	4.97	3.87	1.10
Hobby Airport (1930)	70.2	54.2	62.2	-1.1	7.21	3.90	3.31
Galveston (1871)	68.6	58.0	63.3	-2.2	8.20	4.28	3.92
Sugar Land (2000)	71.1	52.6	61.9	-1.2	7.58	3.78	3.80

Table 1: Temperature and Rainfall for select sites in the Houston/Galveston Section of Southeast Texas.

Golden Triangle Temperatrure & Rainfall Data for 2022 Autumn Season

	September Climate						
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	89.9	69.9	79.9	-0.1	0.53	6.69	(-6.16)
Beaumont Research Center	89.8	68.9	79.3	0.3	1.02	6.55	(-5.53)
Orange 9N	88.1	67.7	77.9	0.9	2.60	6.44	(-3.74)
	October Climate						
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	82.3	57.1	69.7	-1.9	4.91	5.47	-0.56
Beaumont Research Center	81.2	57.0	69.1	-1.5	5.40	5.30	-0.10
Orange 9N	78.9	52.4	65.6	-2.5	3.83	5.96	(-2.13)
	November Climate						
Site Location	Hi	Lo	Mean	Departure	Rain	Normal	Departure
Port Arthur Airport	69.3	51.8	60.5	-1.4	10.12	3.89	6.23
Beaumont Research Center	69.1	52.8	60.9	0	6.66	4.68	1.98
Orange 9N	67.2	49.2	58.2	-0.1	6.11	4.71	1.40

Table 2: Temperature and Rainfall for select sites in the Golden Triangle Section of Southeast Texas.

East Texas Regional Summary

Very Dry Conditions and Damaging Tornadoes this Autumn

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

An active weather pattern during the first week of fall 2022, as several frontal boundaries moved across the region. Most of our East Texas CoCoRaHS sites saw between 1" to 2" of rainfall during this period, although a few locations in Angelina, Bowie, Gregg, and Smith counties reported totals ranging from 3" to 5". In fact, the National Weather Service reported a record daily rainfall of 3.57" at Lufkin, TX on September 2nd, breaking the previous mark of 2" in 1913. Beyond this period, dry conditions and above normal temperatures settled across the region for the remainder of September. The exception being on the 25th, where isolated strong and severe thunderstorms developed along a stalled cool front near the Interstate 30 corridor of Northeast Texas. Hail ranging from quarter to half dollar size was reported by the public in Bowie County near and around the Texarkana area (Figure 1).

Fig.1: Large Hail in the Liberty Eylau area near Texarkana (Bowie County) on September 25th.
Photo Credit: Lesa Hammonds-Brown

Very dry conditions continued into the month of October, as upper-level ridging and surface high pressure dominated the weather pattern. This setup allowed for drought conditions to expand across the entire region, especially during the first half of the month, with Extreme and Exceptional drought conditions developing in portions of Red River County. The weather pattern became a bit more active during the second half of October, as several frontal boundaries moved across the region. A surface low, and associated frontal boundary, brought much needed rainfall across East Texas on the 28th and 29th. Several CoCoRaHS sites along and north of Interstate 20 reported 2" to 3" of rainfall during this period. This rainfall also resulted in a daily record rainfall report on the 28th at Tyler, TX from the National Weather Service, where 2.29" of rain was reported. This beat the previous record of 1.35" in 1969.

East Texas Regional Summary (continued)

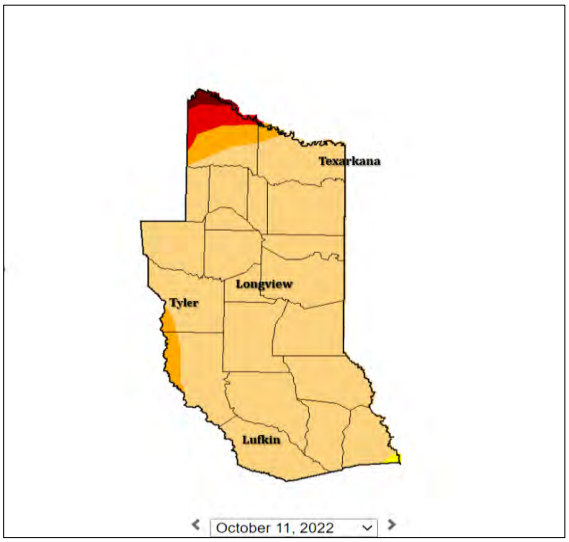


Fig.2: Drought Monitor – Oct.11th, 2022
Image Courtesy of NDMC/USDA/NOAA

The early portion of this past November will likely be very memorable for many residents in East Texas. By the 4th of the month, a warm and muggy atmosphere settled over the region ahead of an approaching cold front. Forecast models showed high PWATs (Precipitable Water) in place along with high low-level and deep-layer shear. This yielded an environment in place that was conducive for moderate to heavy rain and for severe storms in the form of strong tornadoes. The good news is that many locations received beneficial rains, with a couple CoCoRaHS sites in Angelina County reporting over 4". Unfortunately, this rainfall was overshadowed by the strong tornadoes that developed across Northeast Texas. A total of 5 tornadoes were reported, including one with an EF-4 rating and two with an EF-3 rating (Figure 3). The National Weather Service reported one death and several injuries with these storms. The remainder of the month was much quieter in terms of severe weather. A few frontal passages managed to bring additional rainfall to the CoCoRaHS sites during this period, with widespread 1.5" to 2" reported on the 24th and 25th.

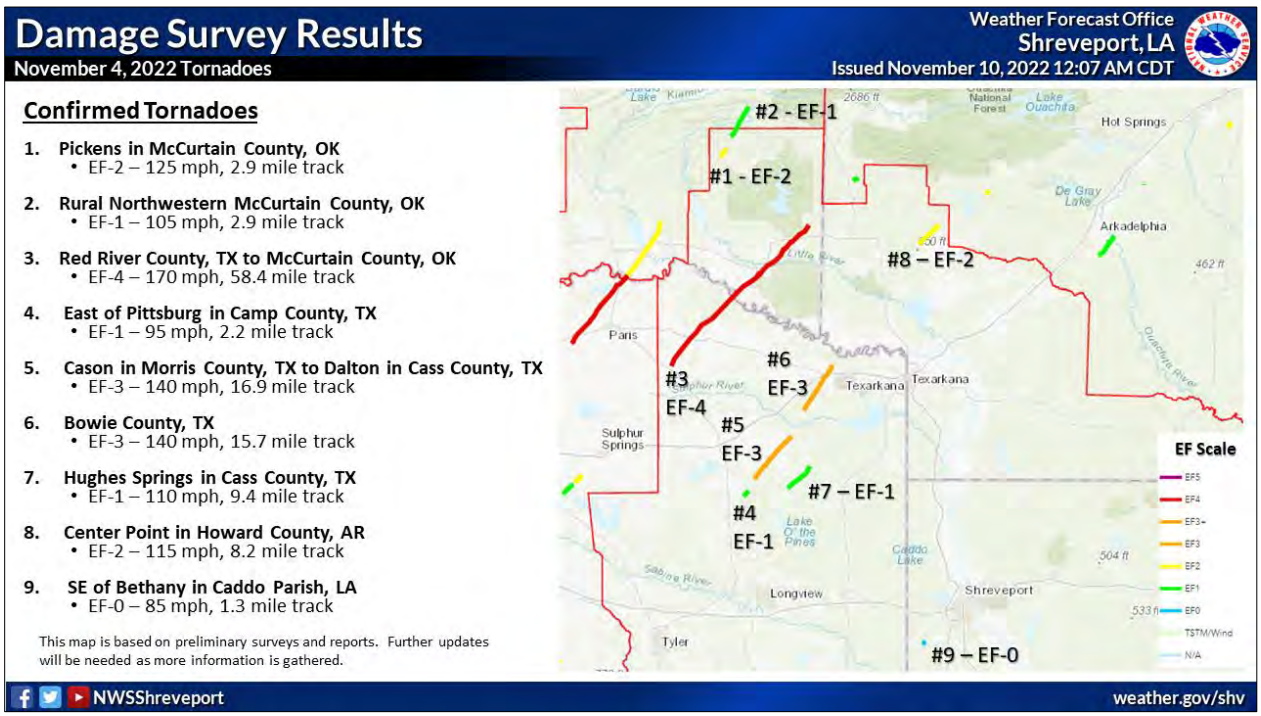


Fig.3: National Weather Service Damage Survey Results (Nov. 4th 2022)
Image Courtesy of National Weather Service Shreveport

East Texas Regional Summary (continued)

Fig.4: EF-4 Damage to home north of Clarksville in Red River County, TX (Nov. 4th 2022)
Image Courtesy: National Weather Service Shreveport

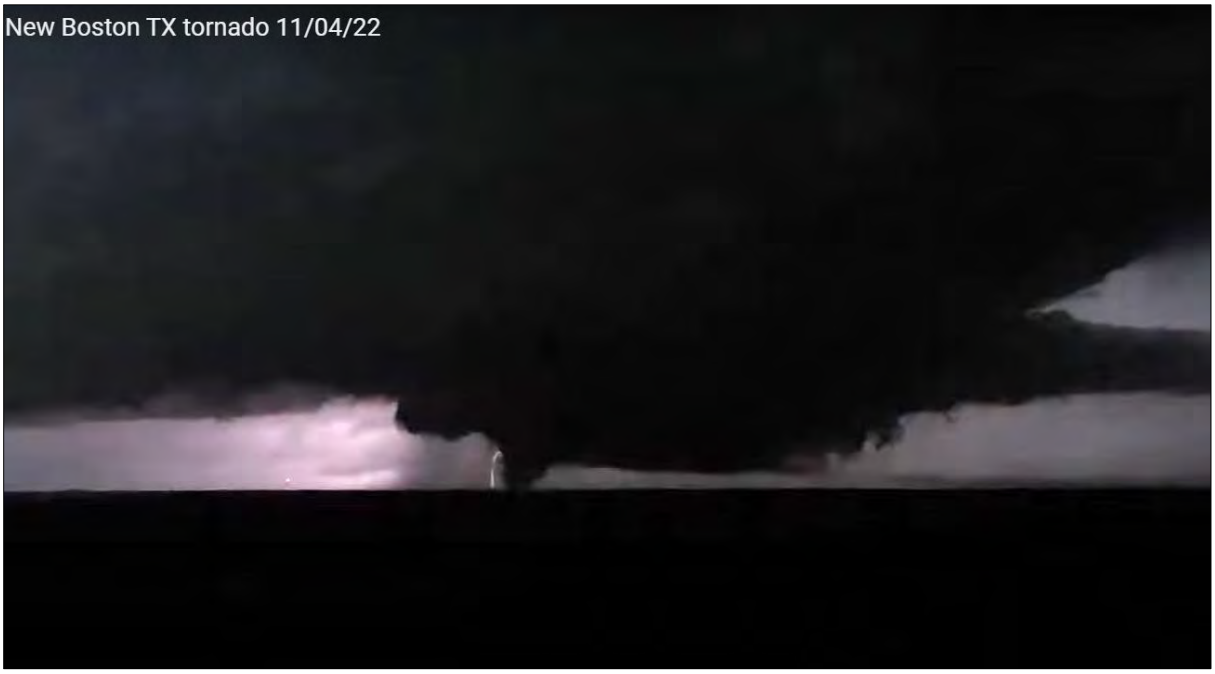


Fig.5: Drone footage of EF-3 Tornado near New Boston in Bowie County, TX (Nov. 4th2022)
Photo Credit: William Frogge

East Texas Regional Summary (continued)

Fig.6: EF-4 Tornado in the Fulbright community in Red River County, TX (Nov. 4th 2022)
Photo Credit: Robert Keith

Although periods of dry weather resulted in Extreme to Exceptional Drought returning to portions of East Texas during the fall, the increased activity in the weather pattern during the season helped to ease the drought, as several frontal boundaries moved across the region. However, abnormally dry conditions remain across portions of East Texas going into the meteorological winter (Figure 7).

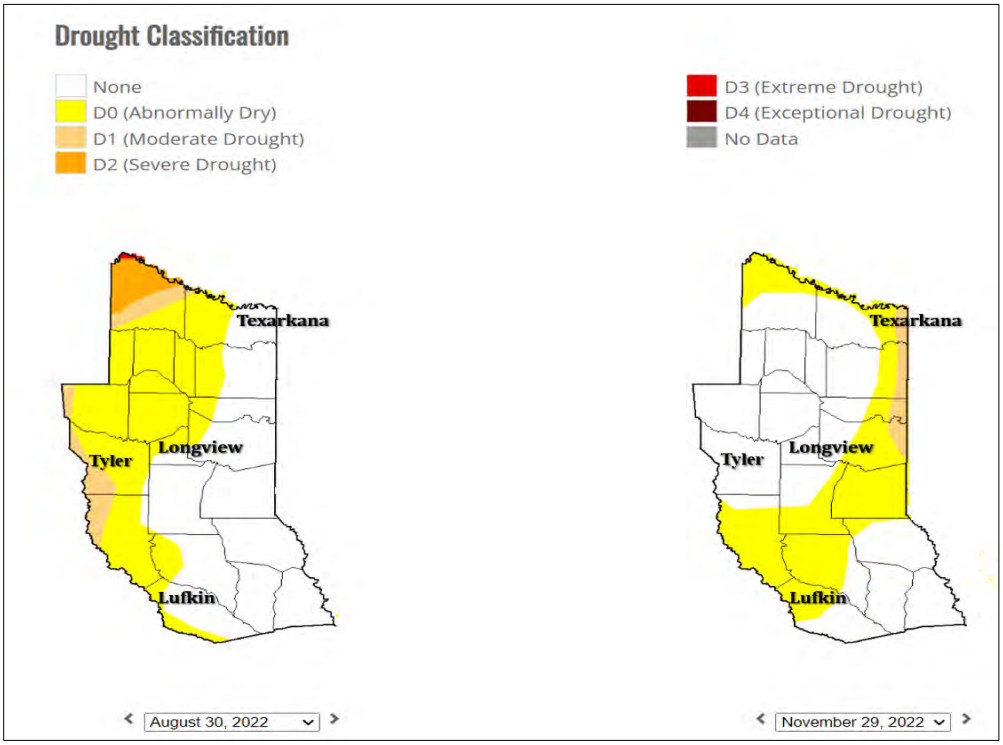


Fig.7: Drought Monitor
Image Courtesy of NDMC/USDA/NOAA

West Central Texas Regional Summary

Better Rains in November after September & October below Normal

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

September

September began wet and active, with a strong upper-level low over far West Texas, which brought moisture in from the Gulf of Mexico and provided lift. Another weaker upper-level low over the coast generated storms during the afternoon hours, while a stationary front was draped across Northwest Texas, providing additional lift. All of these factors contributed to the multi-day severe weather event across West Central Texas. An added benefit of having a moist airmass in place and localized boundaries initiating daily storms was the afternoon high temperatures remained below normal, a welcome change, though short-lived. The image below is the observed monthly rainfall for September, and given the aforementioned event provided the lion's share of the rainfall, it is a good representation of what fell during that time. The image shows a decent spread of rainfall across West Central Texas, with a few isolated areas seeing higher precipitation than others.

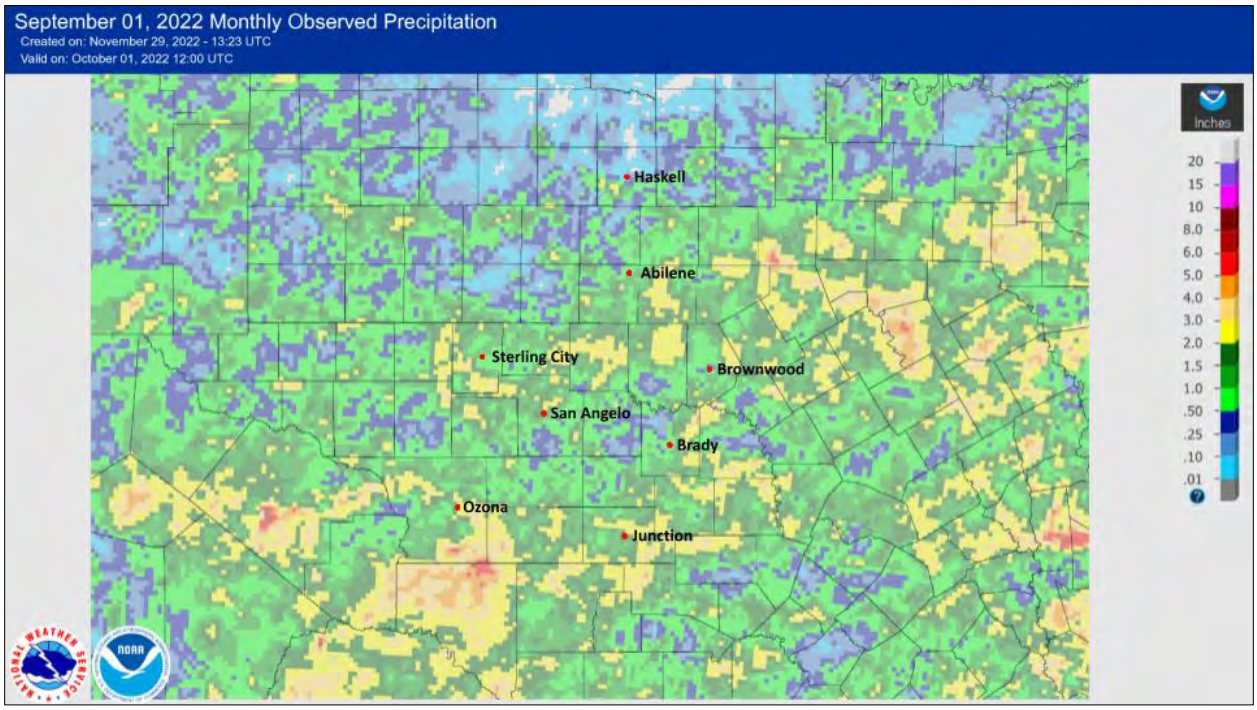


Image 1 - Observed September Rainfall

Once the storms departed and the sun returned, the afternoon high temperatures rebounded to the 90s. Sadly, despite the generous rainfall totals, the month still ended drier than normal. The table below shows the climate sites and their respective monthly rainfall and departure from normal.

Station	September Rainfall	Departure from Normal
Abilene	1.03"	**-1.64"**
San Angelo	1.77"	**-0.74"**
Junction	1.11"	**-1.30"**

Table 1 - September rainfall compared to normal rainfall for the month

West Central Texas Regional Summary (continued)

The following image reflects the percent of normal across the area, clearly depicting drier portions across the Concho Valley and northwest Big Country.

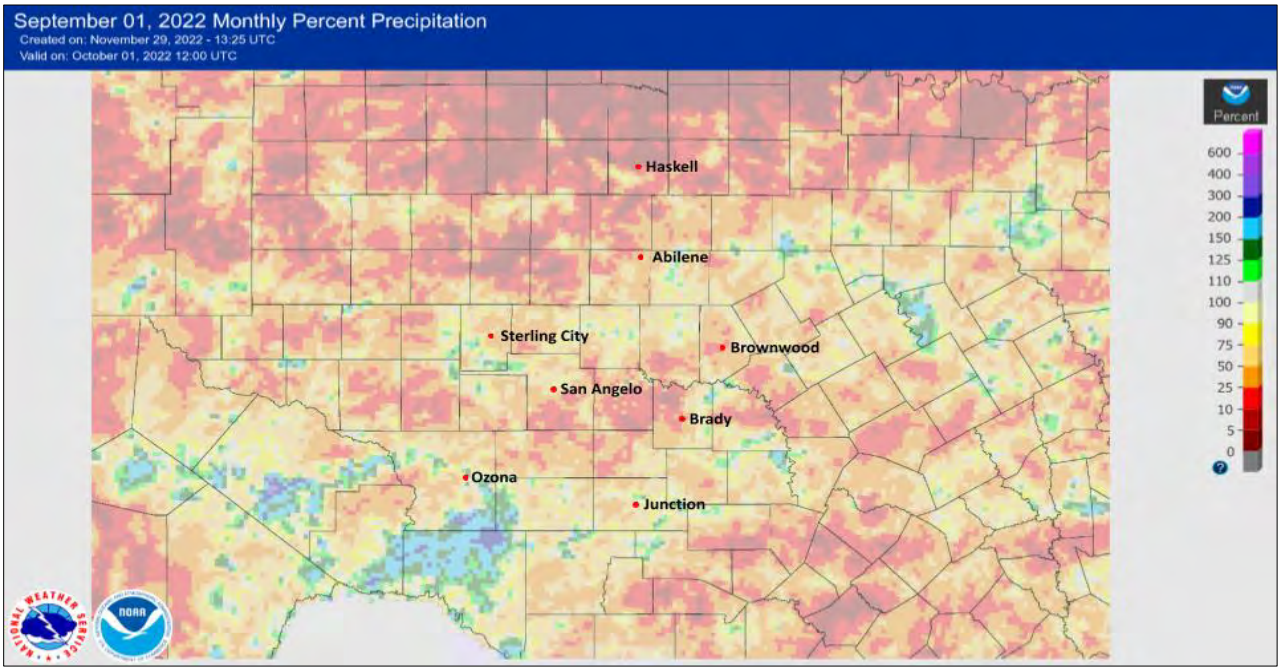


Image 2 - September Precipitation Percent of Normal

October

Across West Central Texas, May and June are the primary months for severe weather, the secondary is October. With the jet stream once again active, and dense cold airmasses providing lift across the surface, it's not uncommon to see a few rounds of storms during the month.

The first round occurred between the 8th and 11th of the month. These storms were supported mainly by upper-level low pressure and kicked off by surface fronts. As depicted in the image below, one upper-level low was located over northern Mexico, and southern Arizona. This served to keep the forecast area in southwest flow aloft. The second, an upper-level trough, was moving across the eastern portion of the US and pushing a cold front south across the area. Showers developed across the area and continued off and on through Tuesday.

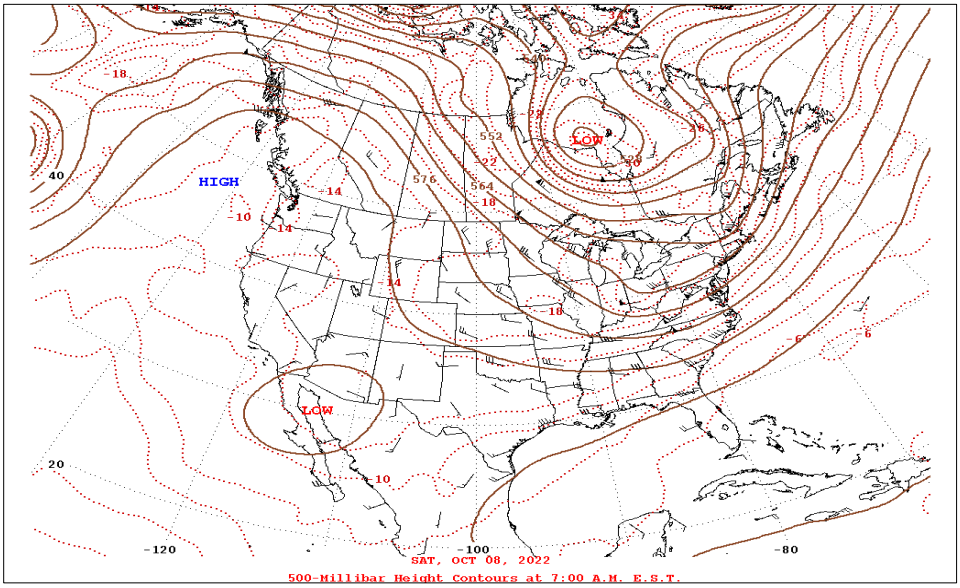


Image 3 – 500mb Height Contours

West Central Texas Regional Summary (continued)

The second round of storms occurred between the 15th and 17th. Once again showers and thunderstorms were initiated by the passage of a frontal boundary, followed closely by an upper-level low over the desert southwest moving east across the area. The Weather Prediction Center issued a marginal chance for excessive rainfall, which was observed mainly across portions of the Concho Valley, and Northern Edward's Plateau.

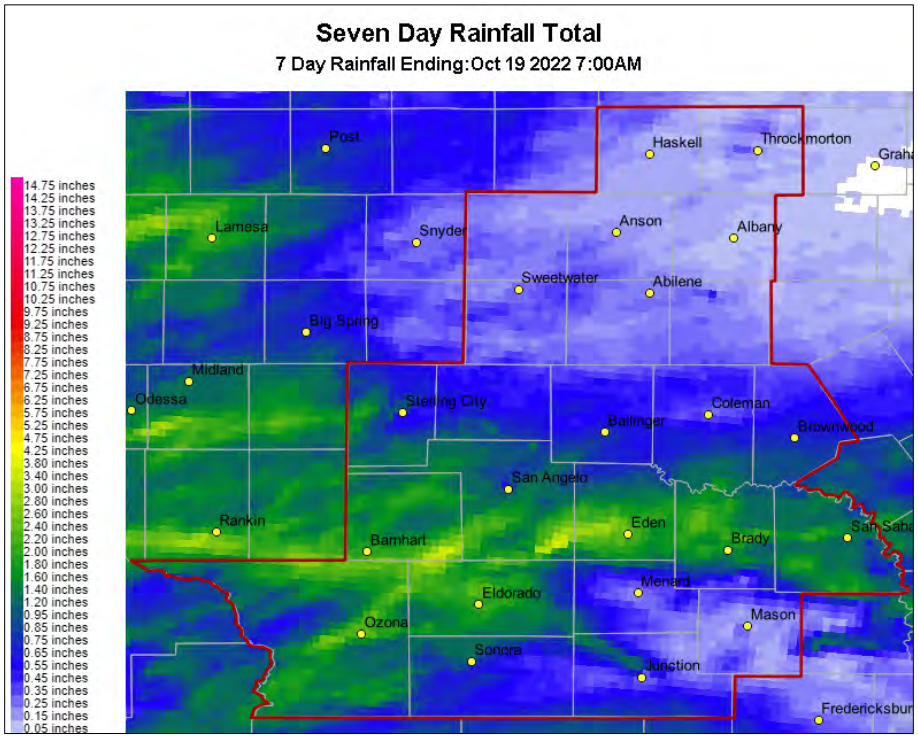


Image 4 - 7 Day Precipitation Total ending Oct 19th

The month of October would experience a few more rounds of precipitation, keeping the area moist and generally cooler. However, since October is the secondary severe weather season for West Central Texas, the expected precipitation (normal precipitation) for the month is high, and a few stations, namely, San Angelo and Junction, still remained below normal for the month despite the many rounds of showers. The table below shows how each station stood at the end of the month and their departure from normal.

Station	October Rainfall	Departure from Normal
Abilene	3.86"	**1.03"**
San Angelo	2.31"	**-0.11"**
Junction	0.97"	**-1.18"**

Table 2 - October rainfall compared to normal rainfall for the month

West Central Texas Regional Summary (continued)

Below is a graphical depiction of the observed rainfall, compared to the percent of normal received. It can be seen that the majority of the precipitation fell northwest of a line from Ozona, to San Angelo, to Abilene, though an apparent minimum exists over the San Angelo area.

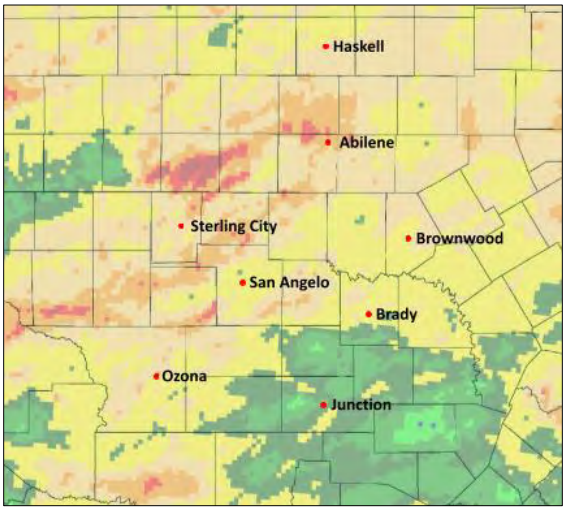


Image 5 - Observed October Rainfall

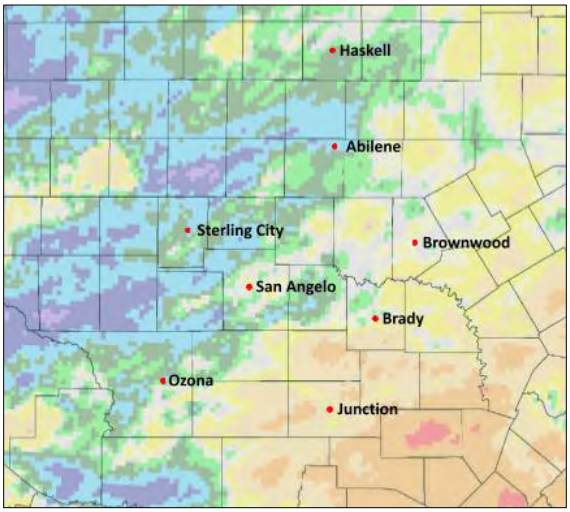


Image 6 - October Precipitation Percent of Normal

November

Overall, the month of November was wetter and cooler than normal. This was a welcome change given the extreme summer heat and lack of autumn in 2021. The foliage around the area responded by changing the many colors one expects during this time of year. This change in the pattern was driven by a more active jet stream, bringing upper-level support and surface front more frequently to the area. The first round of showers and thunderstorms, observed on the 4th of November, arrived with unseasonal severity. Yet, the only report of severe weather was in the form of hail, observed in Haskell County.

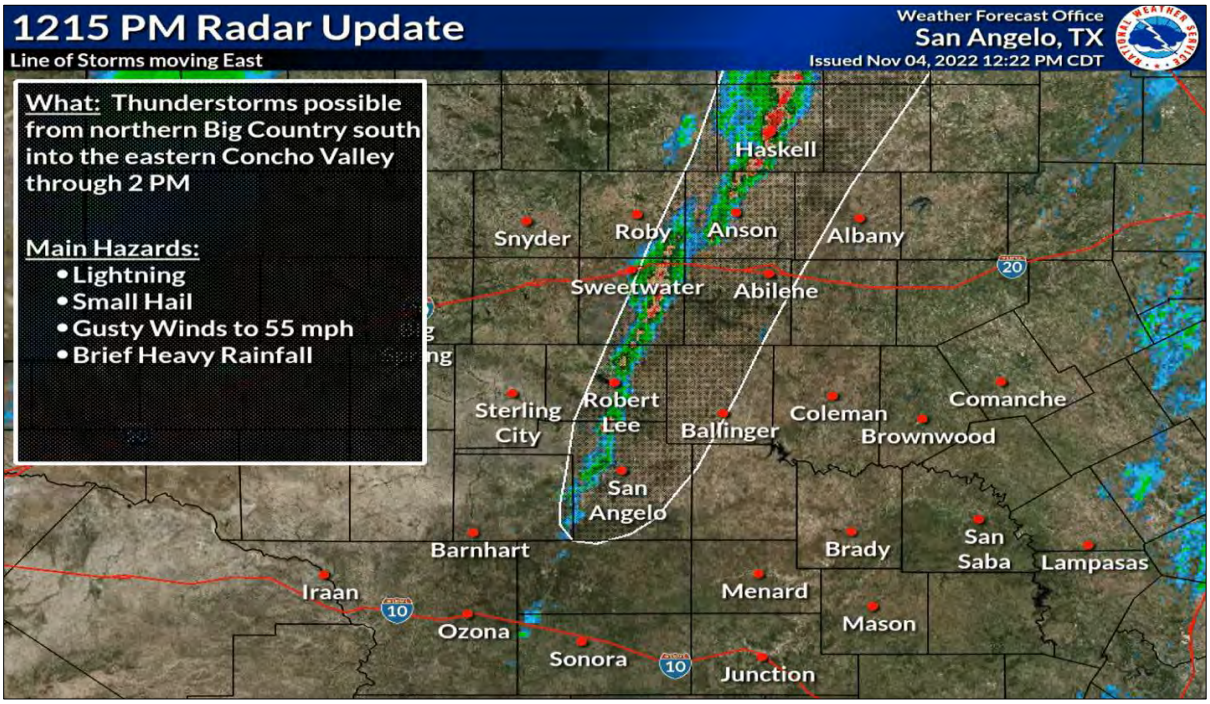


Image 7 - Radar image from November 4th

West Central Texas Regional Summary (continued)

Several more rounds of showers occurred across the area, though the Thanksgiving weekend event was the most notable. At first, long-range models were in such disagreement that forecasted rain chances remained low. However, as the event approached, the models began to align, developing a mid/upper low, which moves south into New Mexico, then east across northern Texas. Thanksgiving Day remained mild, with highs mainly in the 60s, an upper-level low moved into Texas late Thursday night and migrated northeast across the state on Friday. This dramatically increased rainfall chances and brought cooler temperatures to the area. The highest totals for the month occurred on Friday the 25th and Saturday the 26th.

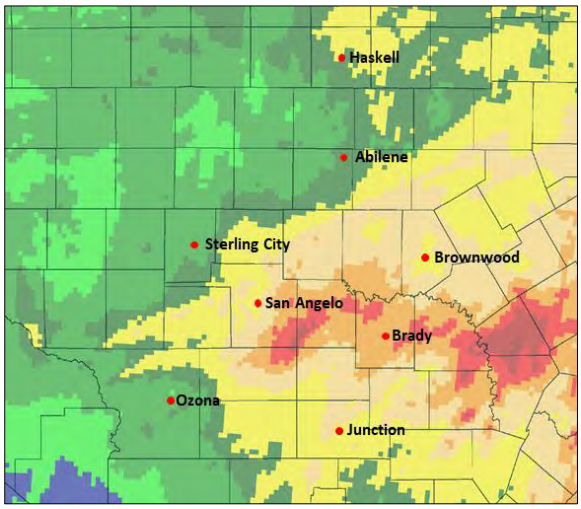


Image 8 - Observed November Rainfall

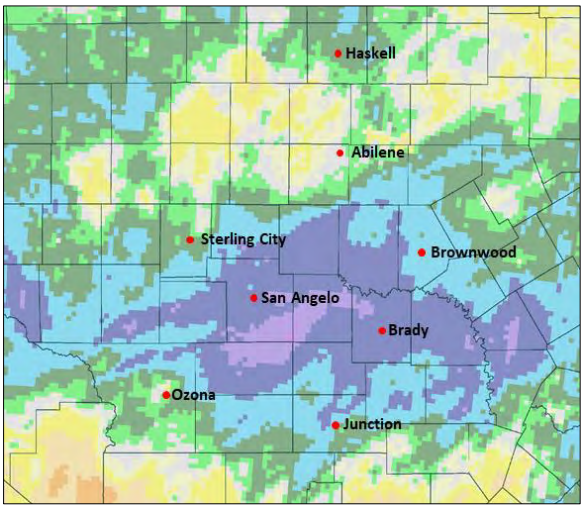


Image 9 - November Precipitation Percent of Normal

As mentioned earlier, the month of November ended wetter and cooler than normal, as seen in the table below.

Station	October Rainfall	Departure from Normal
Abilene	1.55”	**0.15”**
San Angelo	2.78”	**1.62”**
Junction	3.35”	**1.83”**

Table 3 - November rainfall compared to normal rainfall for the month

Corpus Christi Regional Summary

Below Normal Rainfall through Much of the Fall

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

Before we get into the article, I wanted to say welcome to all the new observers across the Coastal Bend and Victoria Crossroads, and thank you to everyone else for your time and commitment to reporting your rainfall totals. The fall season started relatively dry for South Texas, but ended on a high note with an above normal month of November. A continued La Niña pattern has been largely responsible for the below average rainfall thus far, with a 50-60% chance of below average rainfall continuing through February, as per the NOAA Climate Prediction Center.

Fall began drier than normal with much of the area reporting below normal rainfall. Looking at figure 2 below, the largest deficit was seen across the Victoria Crossroads with most locations 1.50-2.50” below normal for the month. The rest of South Texas generally saw rainfall deficits of 1.50” or less, except for the southern Brush Country and Coastal Plains where they saw a slight above average amount of rainfall for the month (Figure 1). Rainfall for the month of September was hit-or-miss as several weather systems moved across the region. The most significant rainfall occurred across the Coastal Bend and Rio Grande Plains with observers reporting accumulations between 3.00-6.45”. Observers across the Victoria Crossroads reported from 1.00-3.50” with others across the Brush Country and Coastal Plains reporting from 1.00-3.00” (Figure 2).

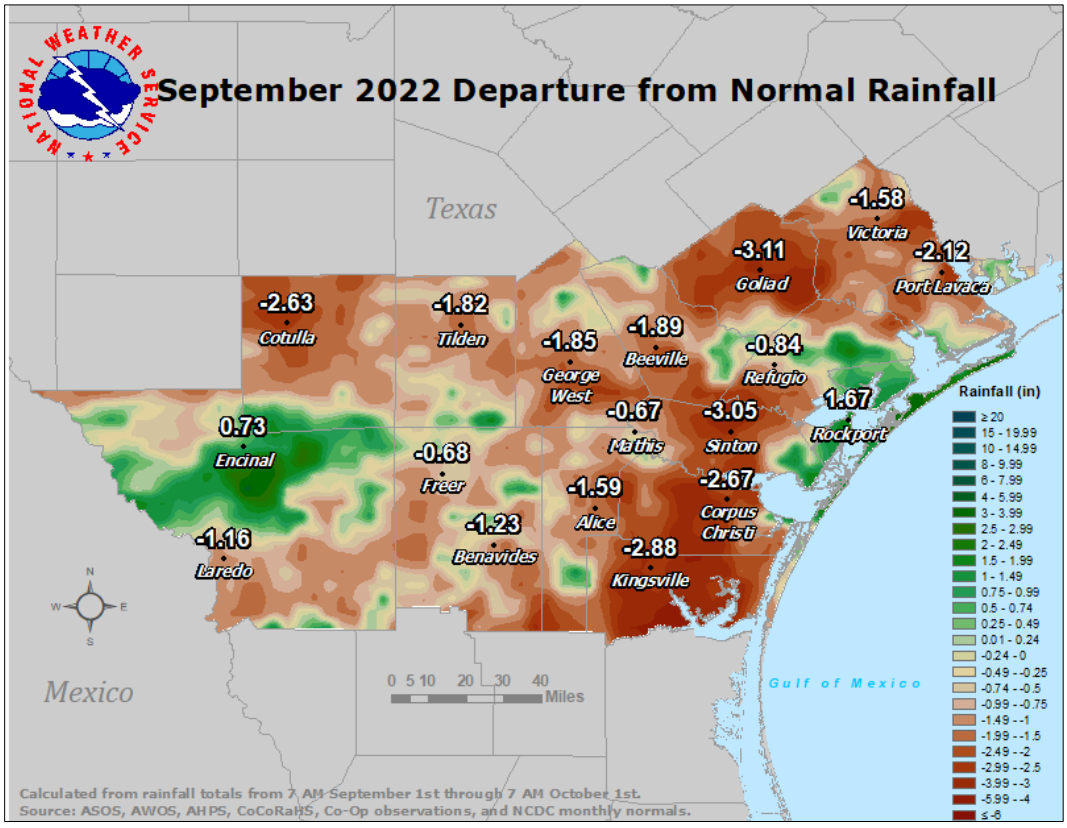


Figure 1: September 2022 Estimated Departure from Normal Rainfall

Corpus Christi Regional Summary (continued)

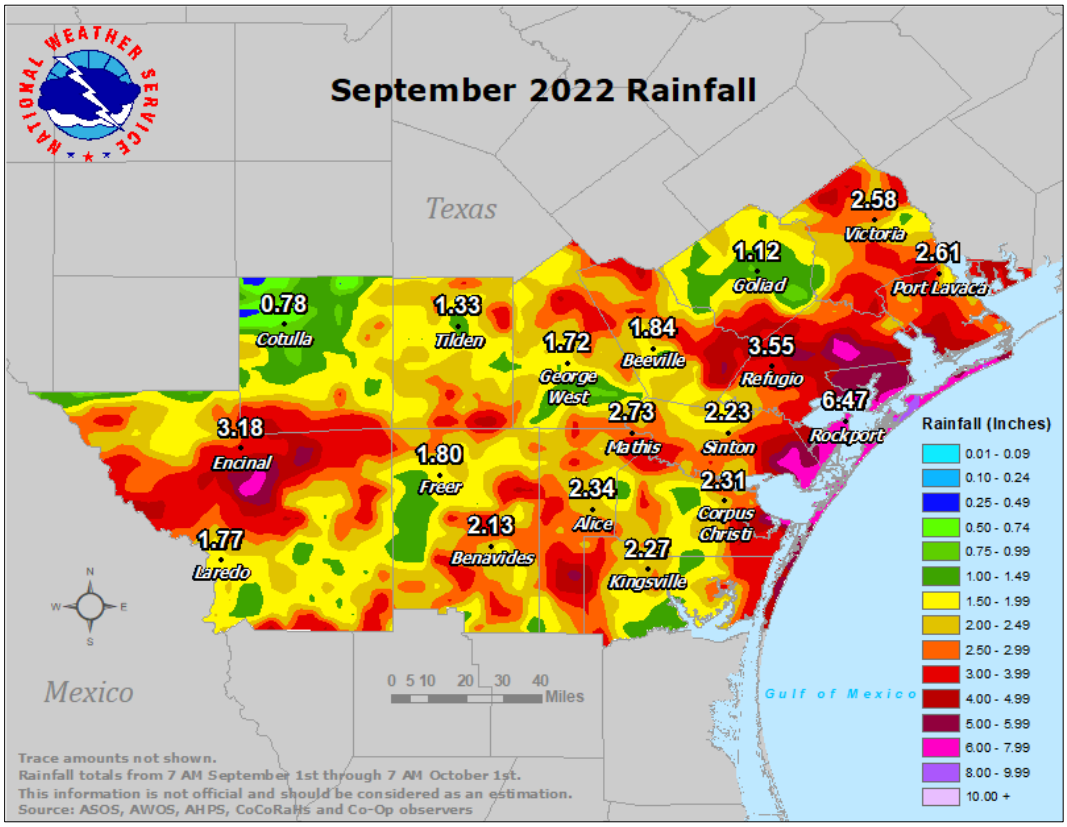


Figure 2: September 2022 Estimated Rainfall Totals

Unfortunately, October continued more of the same story, below normal rainfall across South Texas, especially across the Victoria Crossroads. Areas across the Victoria Crossroads and the Coastal Bend saw deficits between 1.50-2.5” while other areas saw deficits generally of 1.00” or less. Not to sound like a broken record, but the same areas that saw slightly above average precipitation in September saw another slight surplus in October (Figure 3). Similar to September, October only saw a couple of weather systems with isolated to scattered showers and thunderstorms. Looking at Figure 4, you can see the areas where the heaviest showers and thunderstorms trained over the same area. Observers within the thin linear area from the Rio Grande Plains to the Coastal Bend reported accumulations between 2.50-5.00”, elsewhere, accumulations reported by observers ranged from 1.00-2.50” for the month of October.

Corpus Christi Regional Summary (continued)

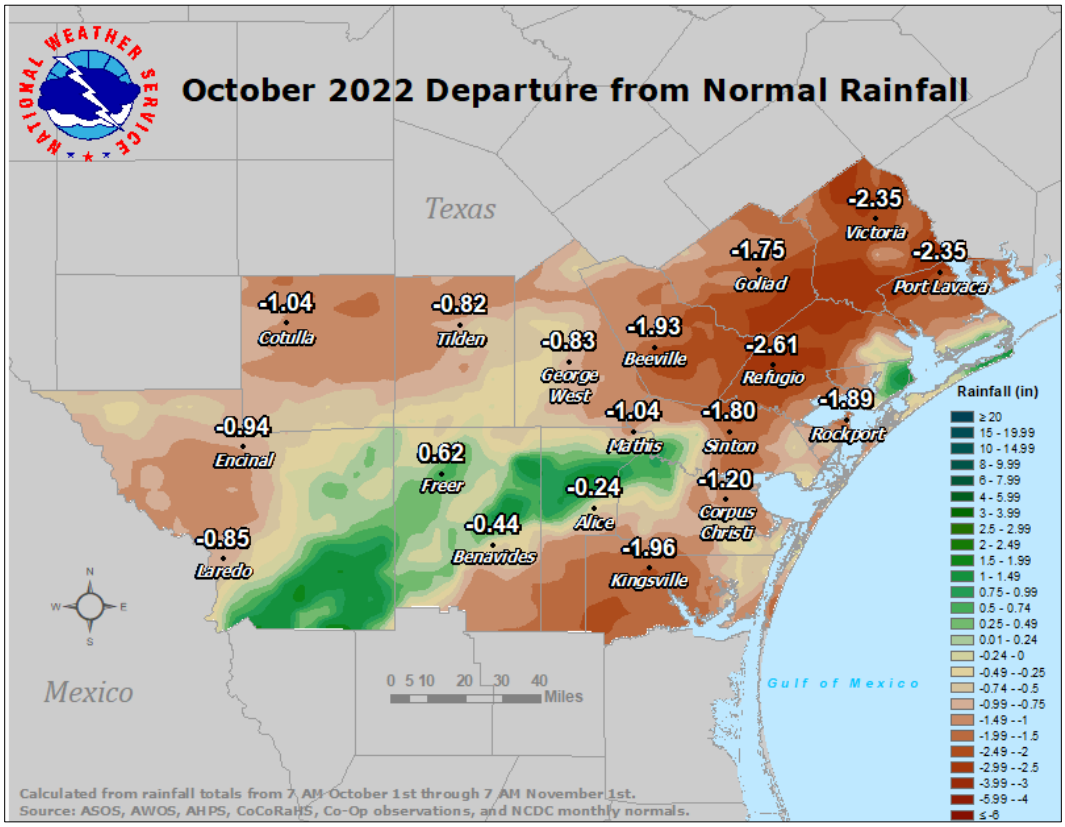


Figure 3: October 2022 Estimated Departure from Normal Rainfall

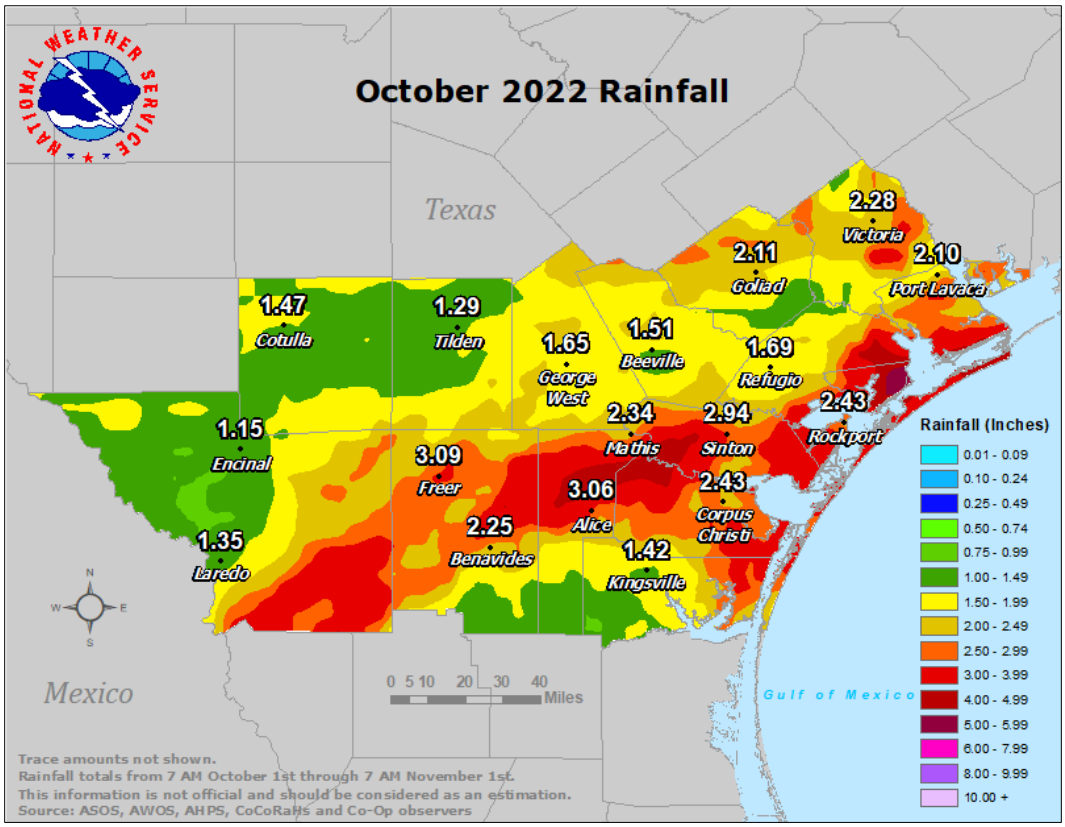


Figure 4: October 2022 Estimated Rainfall Totals

Corpus Christi Regional Summary (continued)

Thanks to a prolonged period of cloudiness and off and on showers, most of South Texas received above average rainfall in November, except for the Rio Grande Plains where observers reported up to 1.00" below normal rainfall for the month. Other observers across the Coastal Plains and Victoria Crossroads reported accumulations between 1.50" to 4.00" above normal for the month of November (Figure 5). In mid-November a cold front swept across South Texas which ushered in cooler temperatures and drier air, however, despite the drier air at the surface, moisture was being ushered into the region between 5,000 to 10,000 feet above the surface which lead to the development of a thick cloud layer. Throughout the majority of the remainder of the month of November, upper level troughs continued to move across the Continental United States, ejecting reinforcing cold fronts into South Texas which kept northeasterly winds at the surface. Meanwhile at elevated layers of the atmosphere above the surface, winds were out of the southwest where moisture was continuing to be pumped into the region. As you can see in Figure 6, overcast conditions were experienced from November 16th through November 26 with cloud levels generally less than 5,000 feet. With this unusual weather pattern for South Texas, light to moderate daily showers were observed from November 16th through the 26th. When November was all said and done, observers across the Victoria Crossroads reported accumulations between 4.00-8.00" with others across the Coastal Plains and Coastal Bend reporting accumulations between 3.00-5.00" (Figure 7). Across the Rio Grande Plains and the Brush Country, observers reported accumulation between 0.50-3.00" with accumulations decreasing from east to west.

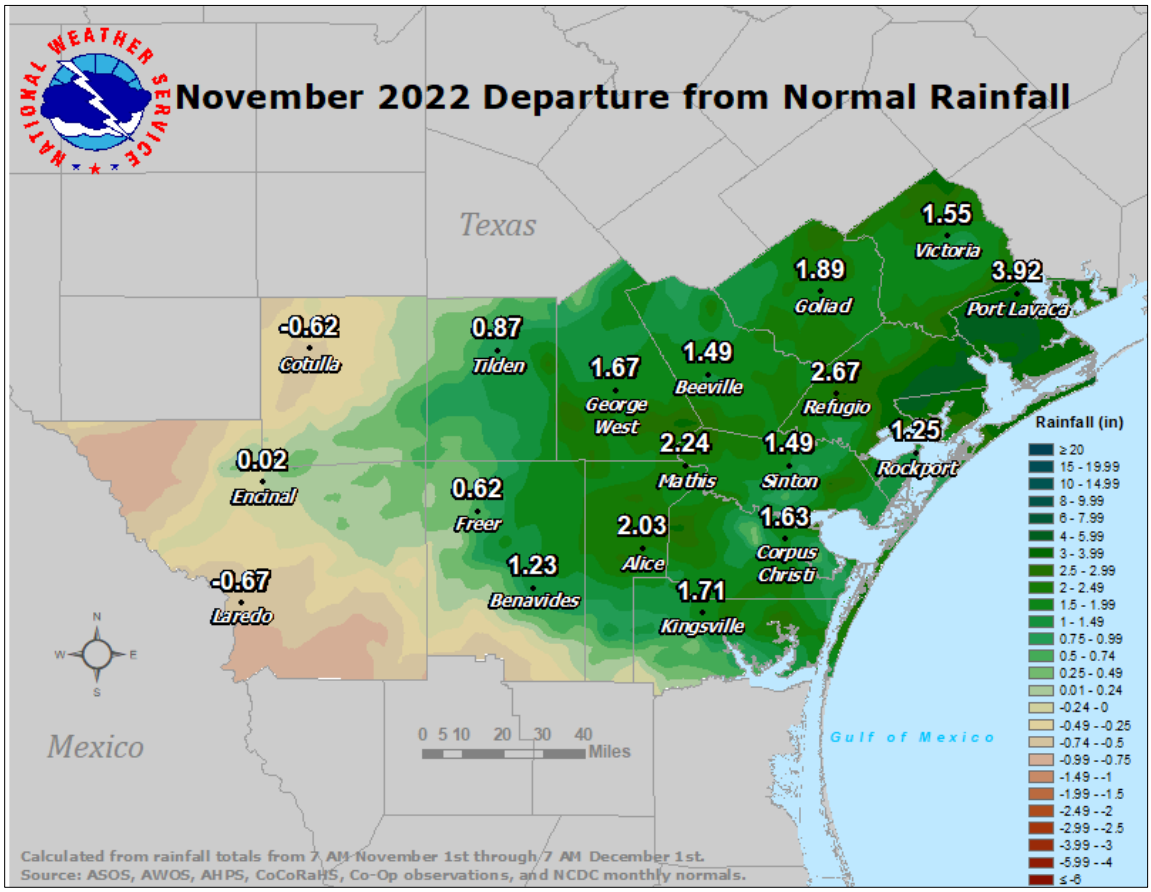


Figure 5: November 2022 Estimated Departure from Normal Rainfall

Corpus Christi Regional Summary (continued)

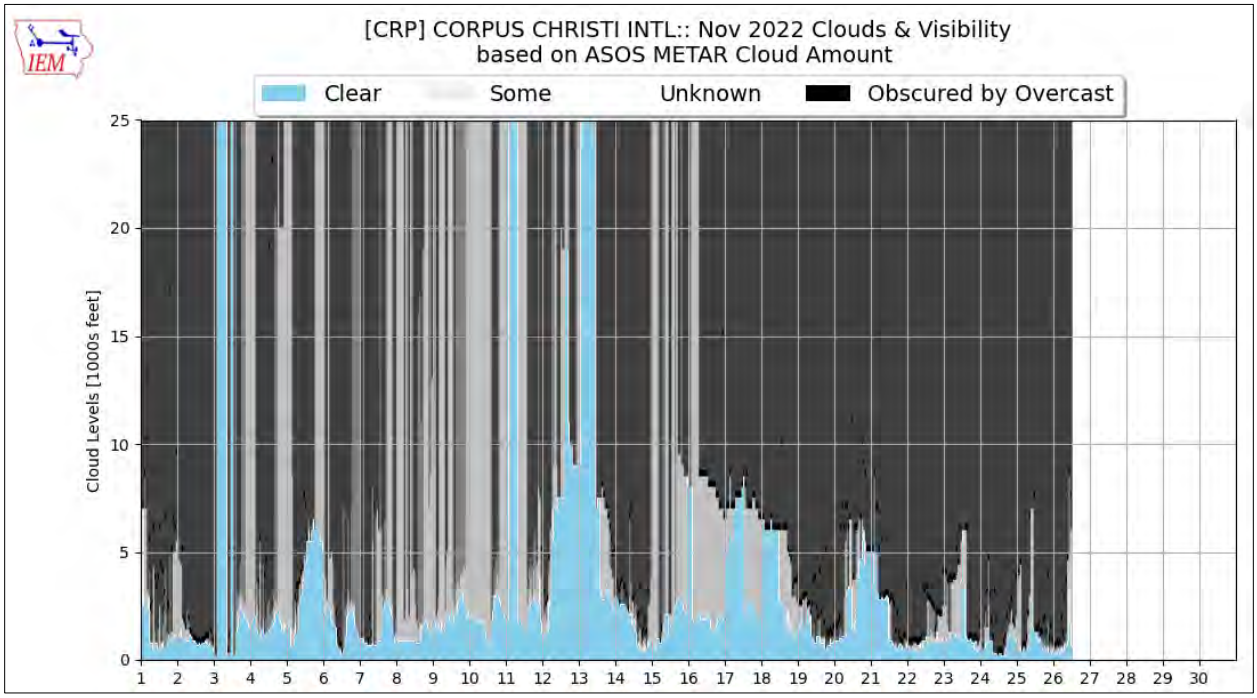


Figure 6: Clouds and visibilities for the Corpus Christi ASOS (Automated Surface Overserving Systems) where the blue colors are clear conditions, grey is some clouds, white is unknown and black is overcast conditions.

The horizontal axis is all the days within the month of November and the vertical axis is showing the base of the cloud heights.

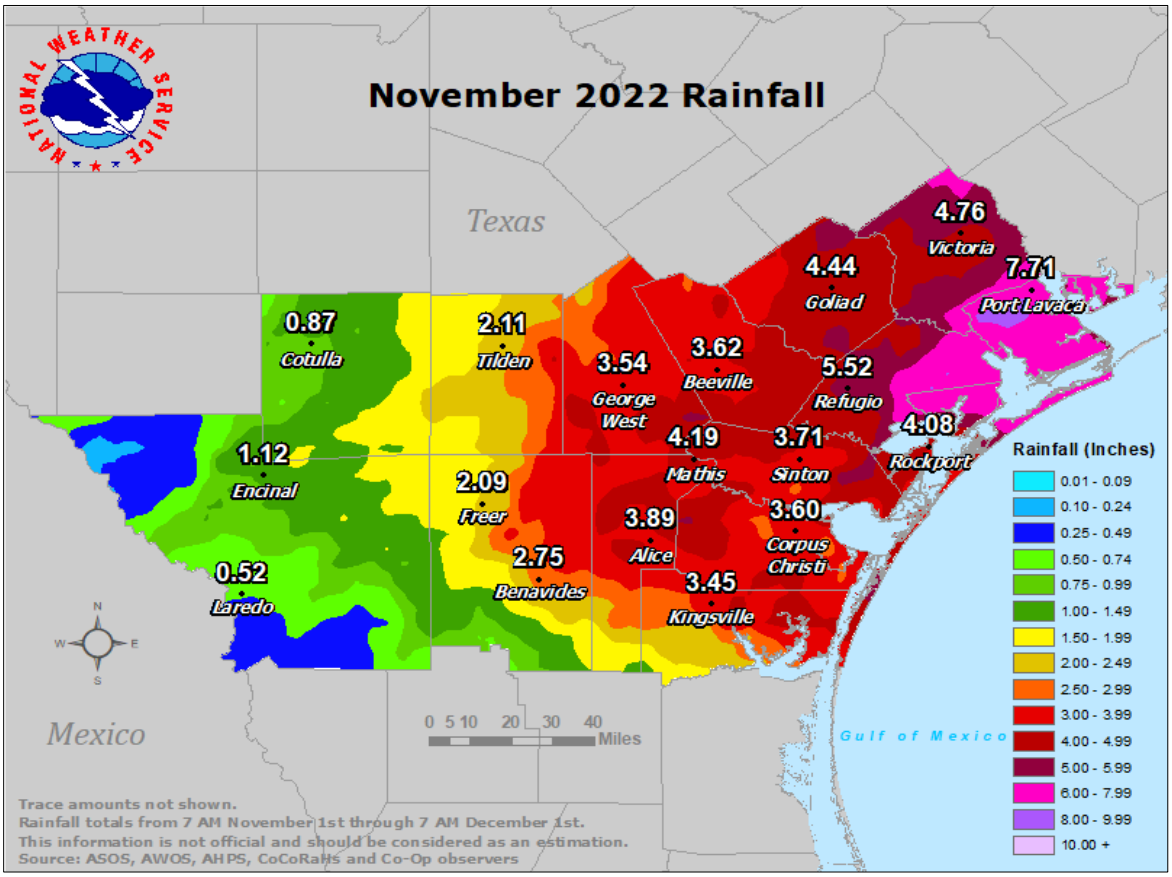


Figure 7: November 2022 Estimated Rainfall Totals

Rio Grande Valley Regional Summary

Rain Keeps Drought at Bay along Rio Grande; Dryness Returns across Ranch Country

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

Images 1 & 2: Left: Autumn 2022 may be most remembered for a mid to late November cold snap and a true "Nor'easter" that created pounding surf for several days, eroding the beaches similar to what several tropical cyclones did during the summer and autumn of 2020. Right: Just prior to the cool down, lush green landscapes were common across the Cameron County, which had ample rainfall through autumn.

Month-by-Month Summary

September returned drier-than-average rainfall to the Lower Rio Grande Valley, though there were local exceptions including both the McAllen metropolitan area and areas near Brownsville, where periods of fairly typical (climatological) rainfall between the 2nd and 6th, and again between the 14th and 27th (mainly around Brownsville), brought monthly values to near the 30-year averages (generally, between 4.5 and 6"). Other locations – across the Rio Grande Valley and especially the Brush Country and Coastal Plains, failed to exceed 50 percent of the average for the month. The dry trend in the region matched Texas overall, whose averages landed on the drier side. Locations falling within the 25 to 50 percent of the 1991-2020 (30-year) average included northern Zapata through Kenedy County, then southward into northern/eastern Hidalgo and western Cameron, including Harlingen. Fortunately, August rainfall and just enough rainfall in September helped mitigate temperatures, which ended up within a degree of the 30-year average. No impacts from tropical cyclones along the Lower Texas coast in September.

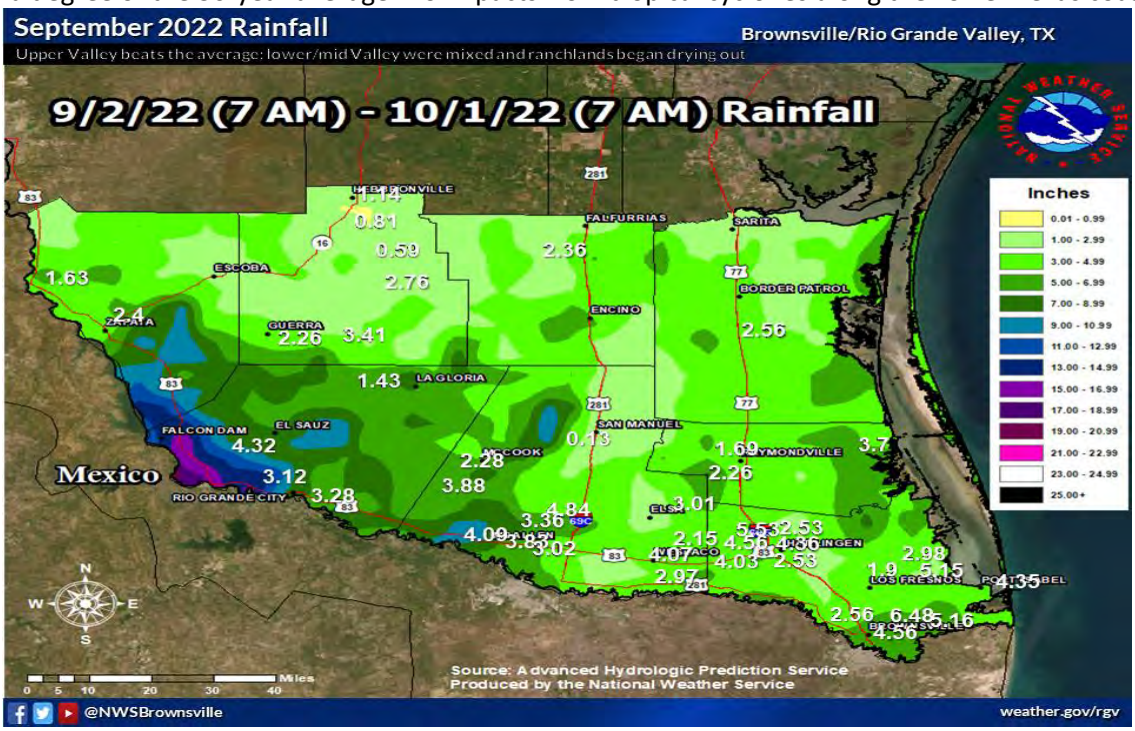


Figure 1. September rainfall estimates across the Lower Rio Grande Valley and Deep South Texas Brush Country/Coastal Plains. Annotations are a combination of NWS ASOS, Cooperative stations, CoCoRaHS, and Texas Mesonet.

Rio Grande Valley Regional Summary (continued)

October continued the drier than average theme for autumn, with all but Zapata County landing in the 10-25 percent of average range. For the Lower Valley (Cameron, Hidalgo, Willacy County) climate division, October was the 15th driest on record; combined with the aforementioned modestly drier-than-average September, the two months combined ranked 23rd driest. The dryness, which was most intense in Brooks, Kenedy, northern Hidalgo, and a swath along Interstate Highway 2 between Harlingen and McAllen, resulted in the redevelopment of Level 0 ("Abnormally Dry") conditions for the United States Drought Monitor by November 1. Locations south and east of Brownsville ended the month slightly above average, thanks to a weak upper-level disturbance just south of the border.

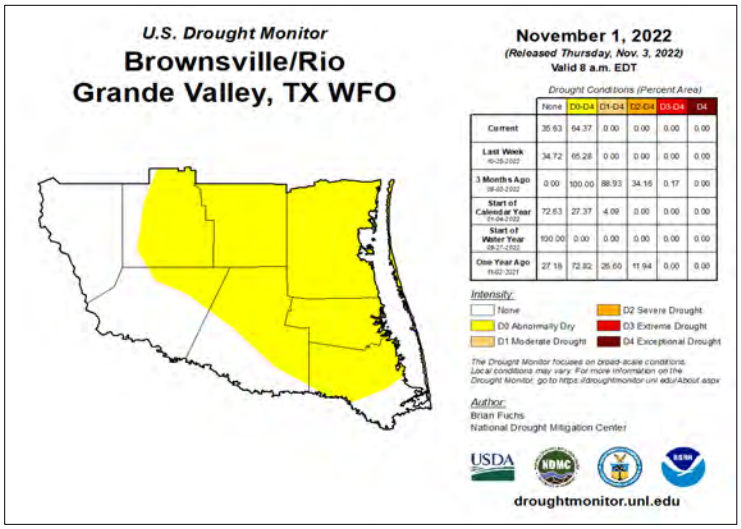


Figure 2. U.S. Drought Monitor for the Lower Rio Grande Valley/Deep South Texas Brush Country and Coastal Plains, as of November 1, 2022. Yellow signifies Level 0, or Abnormally Dry.

Temperatures through the 17th were a tick above average, before the season's first legitimate cold front slammed daytime temperatures down into the 50s during the afternoon of the 18th. A generally cooler than average regime persisted through month's end, with the Valley's anchor cities (Brownsville, Harlingen, and McAllen) ending up 1 to 2 degrees below average – similar to the South Texas region overall.

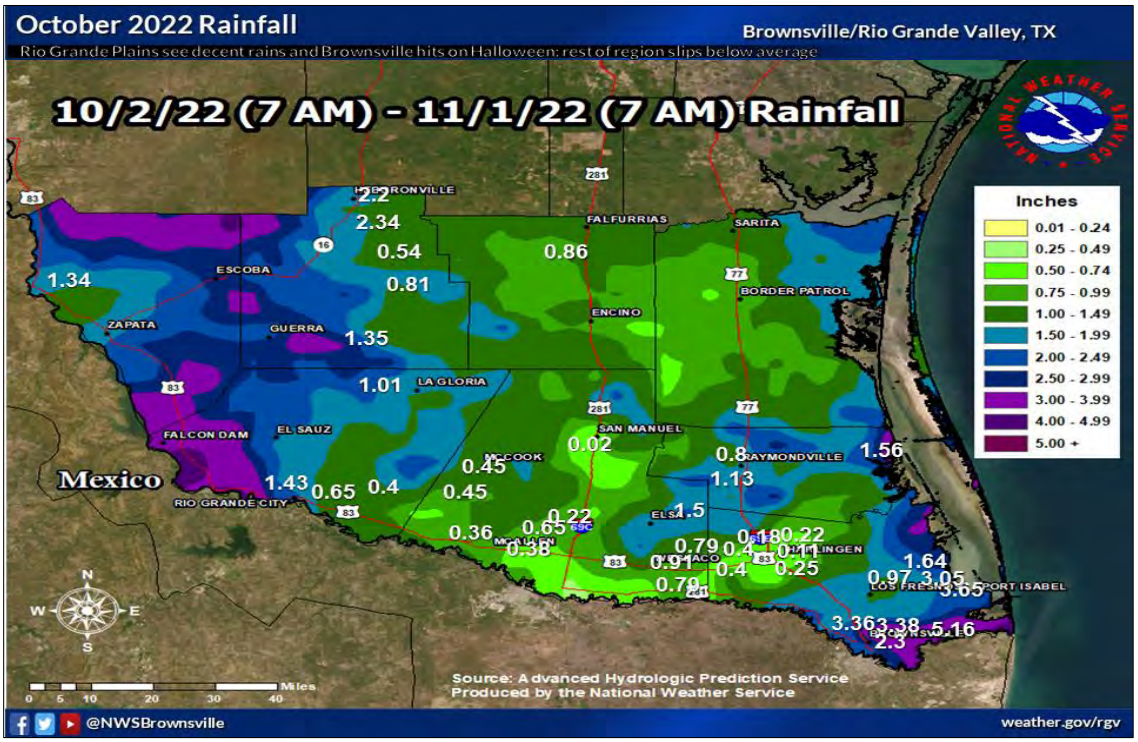


Figure 3. Similar to Figure 1, estimated rainfall for October 2022.

Rio Grande Valley Regional Summary (continued)

November 2022 was a tale of two seasons. Through Veterans Day, the month was on track for potential new record for warmth, with the first eleven days running 5 to 8 degrees above the 30-year average. The second notable cold front arrived that evening, along with locally heavy rainfall and even a wind gust of 59 mph (McAllen). A cool weekend would be followed by a single day (Nov. 14) of warmth before the season's coldest air slithered in beginning on the 15th as a series of strong high pressure ridges with origins in northwest Canada descended on the Great Plains, with the cold air reaching deep into Mexico.

By the weekend of the 18th through 20th, an area of low pressure formed east of the Lower Texas coast which, combined with the strong high pressure, created a true Nor'easter that brought persistent pounding surf that flooded the barrier island beaches and eventually eroded many dunes – dunes that were replenished after the multiple events from the 2020 Atlantic Hurricane Season. In addition to the coastal flooding, high and rough surf, and dangerously high and rough seas (Beaufort Scale 7 and 8) that reached nearly 20 feet – more similar to a tropical cyclone than a winter weather event - for shippers in prolonged gale-force winds (November 19-20), several bouts of rainfall moved across Cameron County between the 18th and 22nd, including more than 2" from Brownsville to South Padre Island overnight on the 21st into the morning of the 22nd. The total rainfall from all November events pushed Brownsville's official 5.44" to 5th wettest all-time (since 1878); McAllen, with 3.73" was 3rd wettest (since 1941), and Harlingen was 15th wettest (since 1911).

After the cold and wet period, the month ended quietly; after a one-day warmup on Thanksgiving for the "lower" Valley, a cool-ish and drizzly pattern reappeared into the first half of the weekend, before more significant warming arrived through the 29th before a weaker front ended the month. In the end, the very warm start was easily overcome by the cool to cold nineteen days that finished the season, and average temperatures were generally 2 to 3 degrees below the 30-year benchmark across the region – a negative 7 to 11 degree turnabout from the first eleven days.

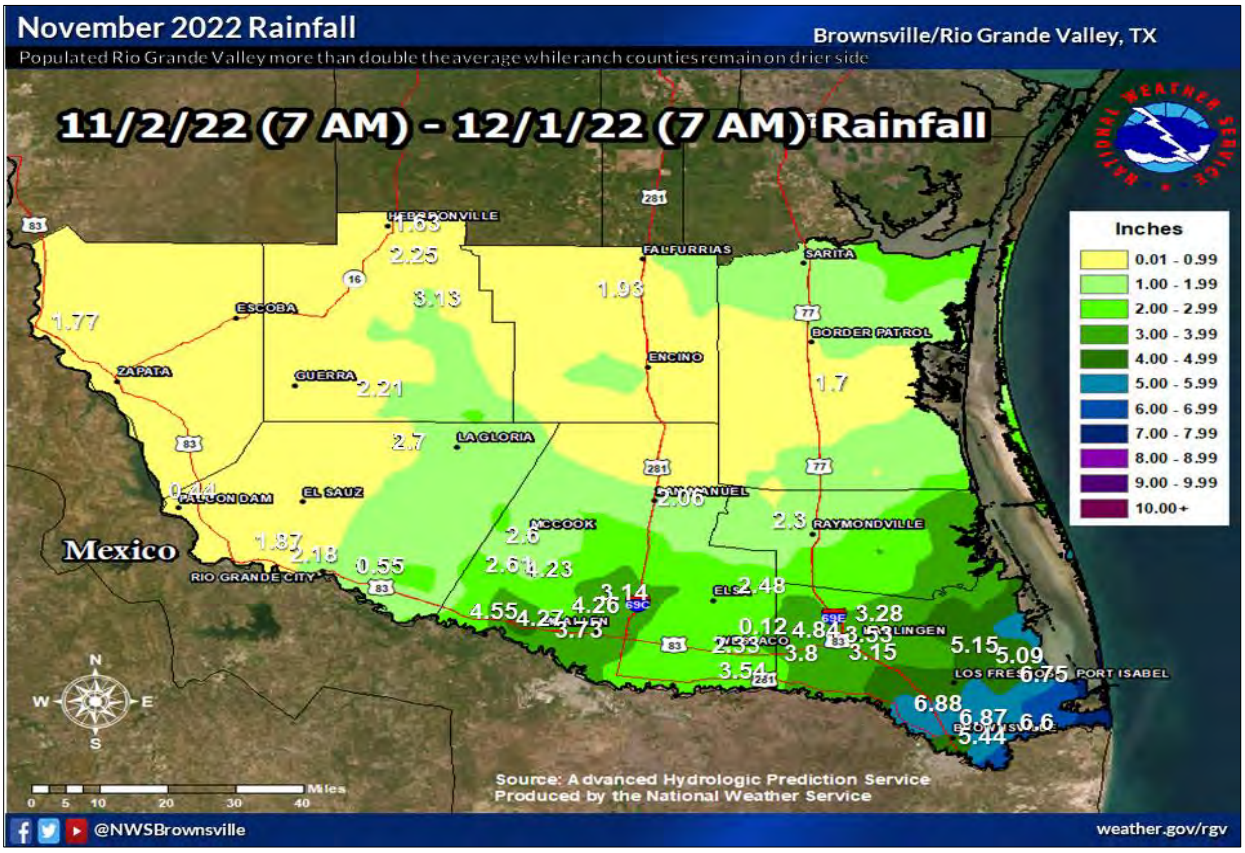


Figure 4. Same as figures 1 and 3, except for November 2022.

Rio Grande Valley Regional Summary (continued)

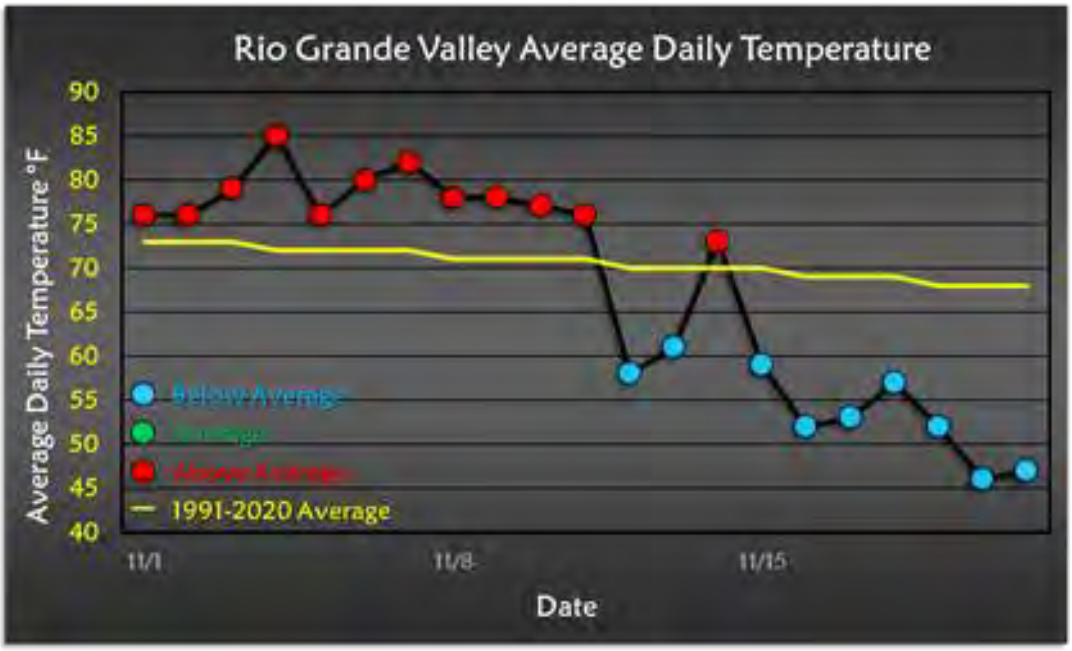


Figure 5. Segment of November average (day and night combined) temperatures for the McAllen/Harlingen/Brownsville combined data, for Nov. 1-21, 2022, showing the dramatic shift in temperatures from much above (red dots) to much below (blue dots) around the middle of the month. Much cooler than average temperatures continued through the 23rd, closer to the 30-year average values finished the month.

For the Autumn Overall, the notably lower than average temperatures in November nudged the season to be 1 to 2 degrees cooler than the 1991-2020 benchmark; however, for the entire period(s) of record, autumn 2022 finished in the top third warmest in Brownsville (48th out of 145 years), just below the midpoint in McAllen (47th warmest of 81 years), and just below the top third warmest in Harlingen (39th out of 111 years). Rainfall for the season varied; Brownsville (since 1878) which saw multiple decent rain events through the season, ended up with 12.3" which ranked 46th (top 33 percent) on record – though well below the top ten which were largely influenced by direct or relatively close landfalls of tropical cyclones. McAllen (since 1941) (7.94") finished at 33rd (top 40 percent) on record, but Harlingen (since 1911) finished with 8"at 56th wettest, right in the middle of the period of record.

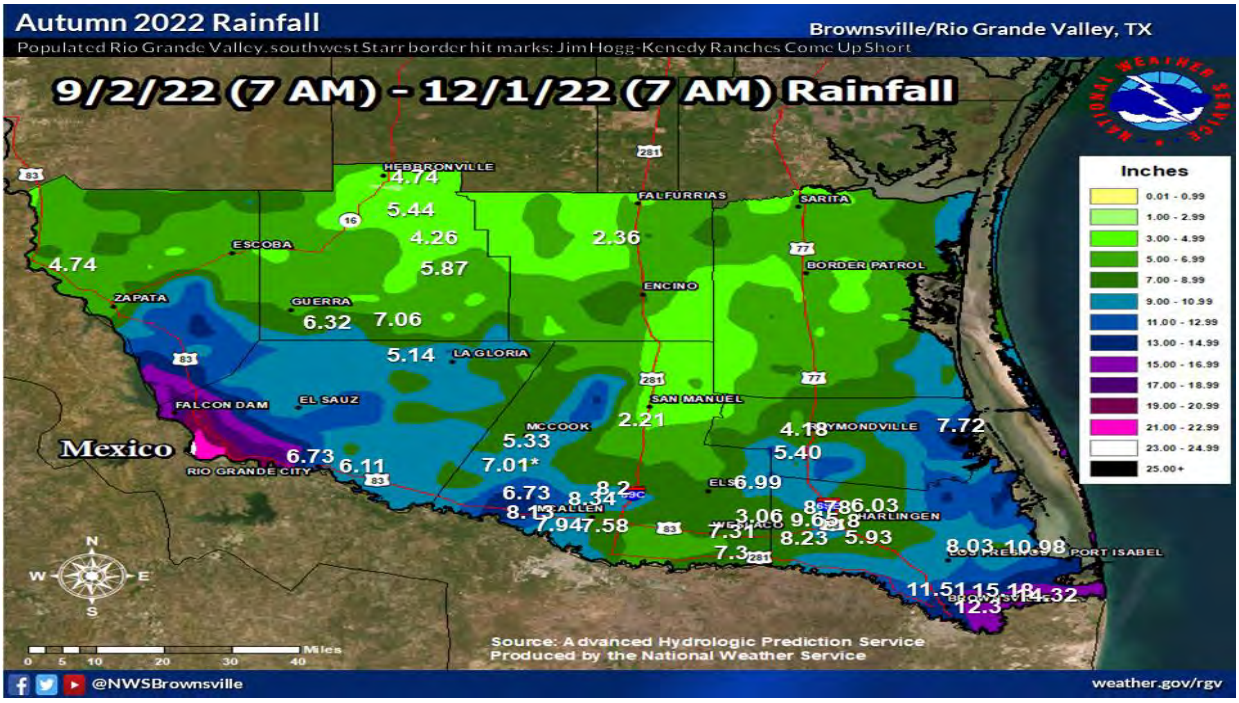


Figure 6. Same as Figures 1, 3, and 4, except for autumn (September-November) 2021.

Rio Grande Valley Regional Summary (continued)

Farther north, across the Kenedy, Brooks, and northern Hidalgo County ranch country, a “donut hole” of low rainfall contributed to a gradual worsening of dryness/drought, with moderate (D1) conditions arriving by the end of the season.

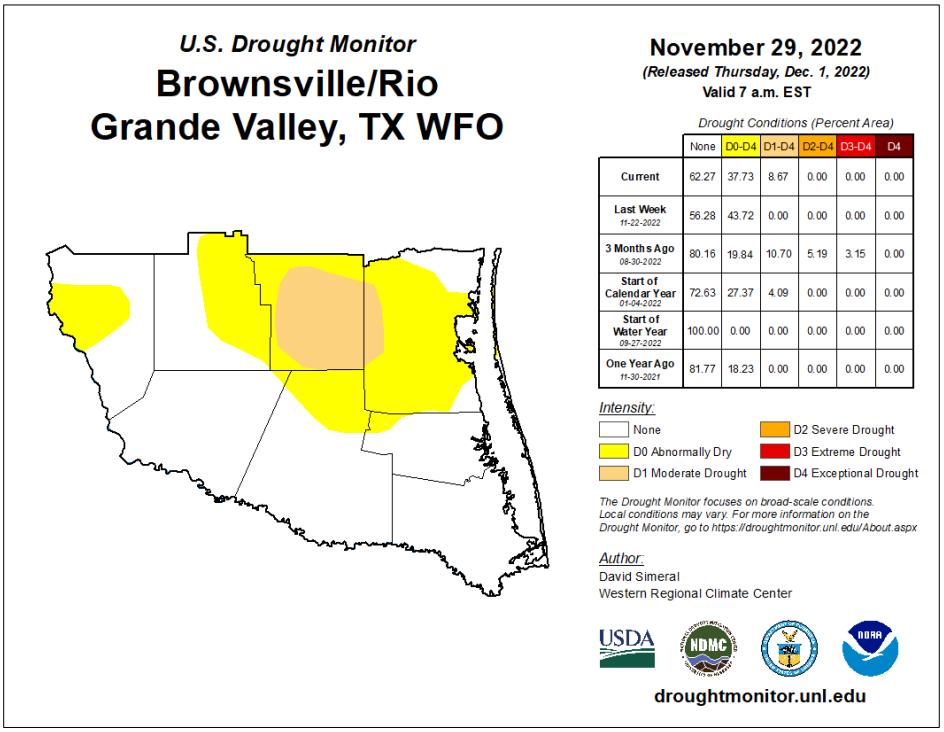


Figure 7. U.S. Drought Monitor depiction of the Lower Rio Grande Valley/Deep S. Texas region as of November 29th, 2022.

For Falcon International Reservoir, heavy rainfall from mid-August into early September across headwaters of the Rio Grande Watershed briefly nudged up storage levels that had been in the neighborhood of all-time low values (10.75 percent total storage on August 15th) since the dam and reservoir was constituted in 1954 by early October (18.7 percent). Dry weather, without any inflows from an Atlantic or an eastern Pacific tropical cyclone, stopped the rise soon after, and values into November dropped back to 17.8 percent before returning above 18 percent by month’s end. These levels were still very low headed into the dry season, including a forecast drier than average winter through mid-spring 2023 – continuing to rival the lowest in the period of record and just below the values between 1998 and 2002/2003. For the Texas share, the end of November values were below the 30-year low benchmarks, and are an ominous sign for Lower Valley agricultural and some municipal water supplies in the first half of 2023.

Amistad International Reservoir, whose releases can help provide necessary water to help recover some of the lost water in Falcon, fared better from additional rainfall events in the headwaters of the Rio Conchos basin as well as upstream on the Rio Grande into October. Slow rises continued into early November before leveling off. Despite the welcome rainfall, which doubled the percent capacity from a record low (post-constitution in 1971) of 22 percent of capacity on August 15th to 45 percent on November 30th. Still, the 45 percent capacity was near the end-of-year low 30-year benchmark here as well. With slow reduction expected to resume later in winter and especially into spring 2023, the available water to be released downstream to assist Falcon will be limited.

Rio Grande Valley Regional Summary (continued)

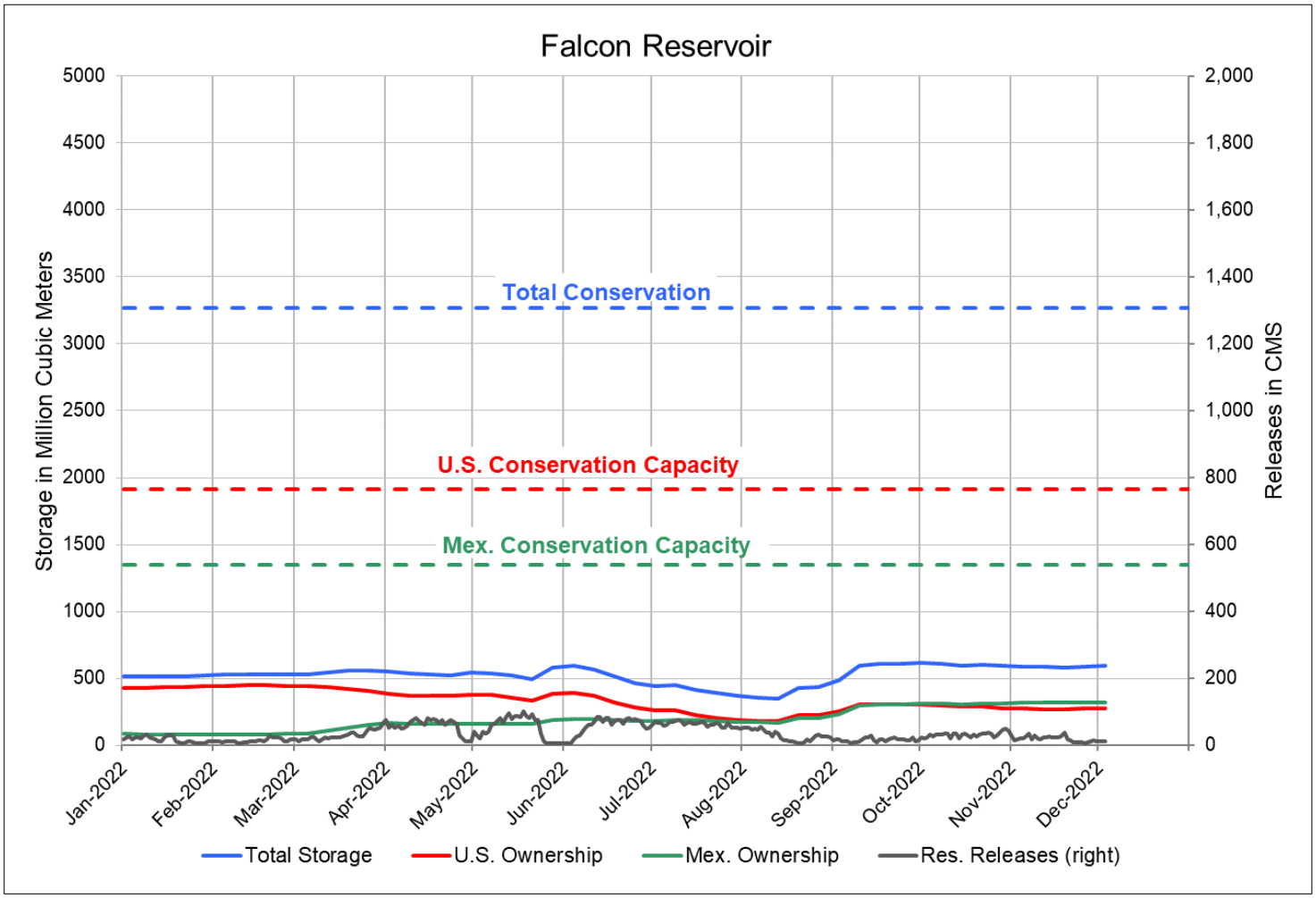


Figure 1. Total, U.S. only, and Mexico only storage levels at Falcon International Reservoir (along the Rio Grande between Zapata County and northwest Tamaulipas State, Mexico) as of the start of December, 2022. Note the rise into early October before leveling off, followed by very slow decreases through November.

Texas Winter Weather Outlook for 2023

By: Bob Rose, Meteorologist, Lower Colorado River Authority

Texas is widely known for its mild winters, and thanks to La Niña, the upcoming winter season will most likely allow Texas to keep its mild winter reputation intact. La Niñas often bring Texas milder than-normal and drier than-normal weather conditions through the winter months. Interestingly, this will be the third consecutive winter with La Nina. But do keep in mind that no two La Nina winters are ever exactly alike. Looking back to the winter of 2020-2021, it featured a mild December and January, but historic cold developed in February. The winter of 2021-2022 featured the warmest December on record, followed by cooler than-normal temperatures in January and February. And this La Niña winter will likely be quite a bit different from the last two. Atmospheric features and oscillations around the globe do overwhelm La Nina's influence from time to time, bringing about short-term changes to the temperature and precipitation pattern. But in the long-term average for the next three months, La Niña is expected to be the biggest player.

La Niñas develop when waters in the tropical Pacific between the west coast of South America and the International Date Line become colder than normal. As these cool waters set up, a broad area of high pressure in the upper atmosphere develops across the central and eastern Pacific. With the ridge in place, the jet stream flowing east out of Asia is forced to bend north into Canada, instead of coming east into Texas. This path takes most of the storm systems north into Canada, limiting the number of cold fronts and wet storm systems that would typically move across Texas. As a result, La Niña winters for Texas are often milder and drier-than normal.

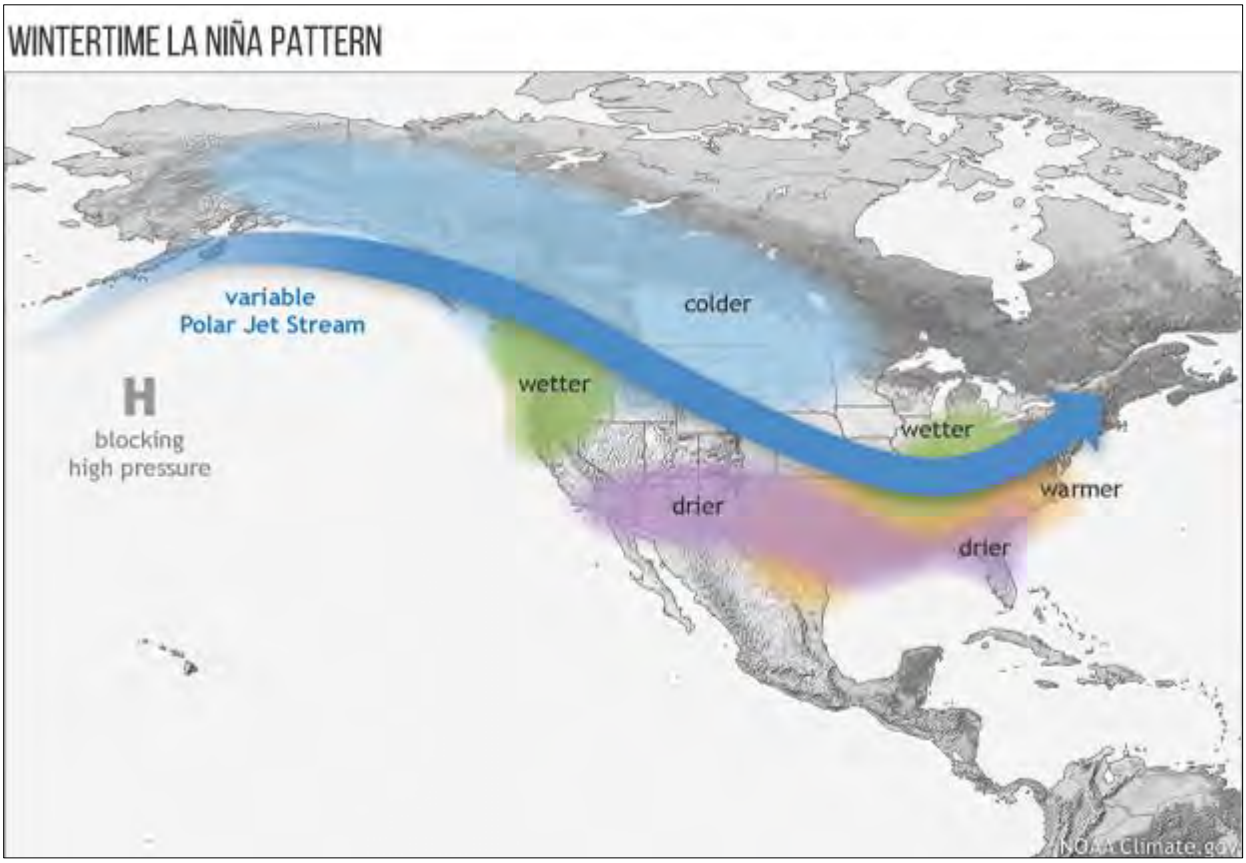


Figure1: Upper-level Polar Jet Stream flow at 35,000 feet typically associated with La Niña pattern

Texas Winter Weather Outlook for 2023 (continued)

Heading into this winter, a mature, and weak to moderate La Niña is in place. Climate Prediction Center forecasts call for the La Niña to peak in intensity in early January, then slowly weaken and decay between late January and April. Even through the La Niña will be weakening during the second half of winter, it's still expected to have a significant influence on Texas weather.

The Climate Prediction Center's winter outlook shows good odds that the temperature across almost all of Texas will average above normal. At the same time, there is a high probability will average below normal. This is very close to the typical type of weather we often see during La Niña winters.

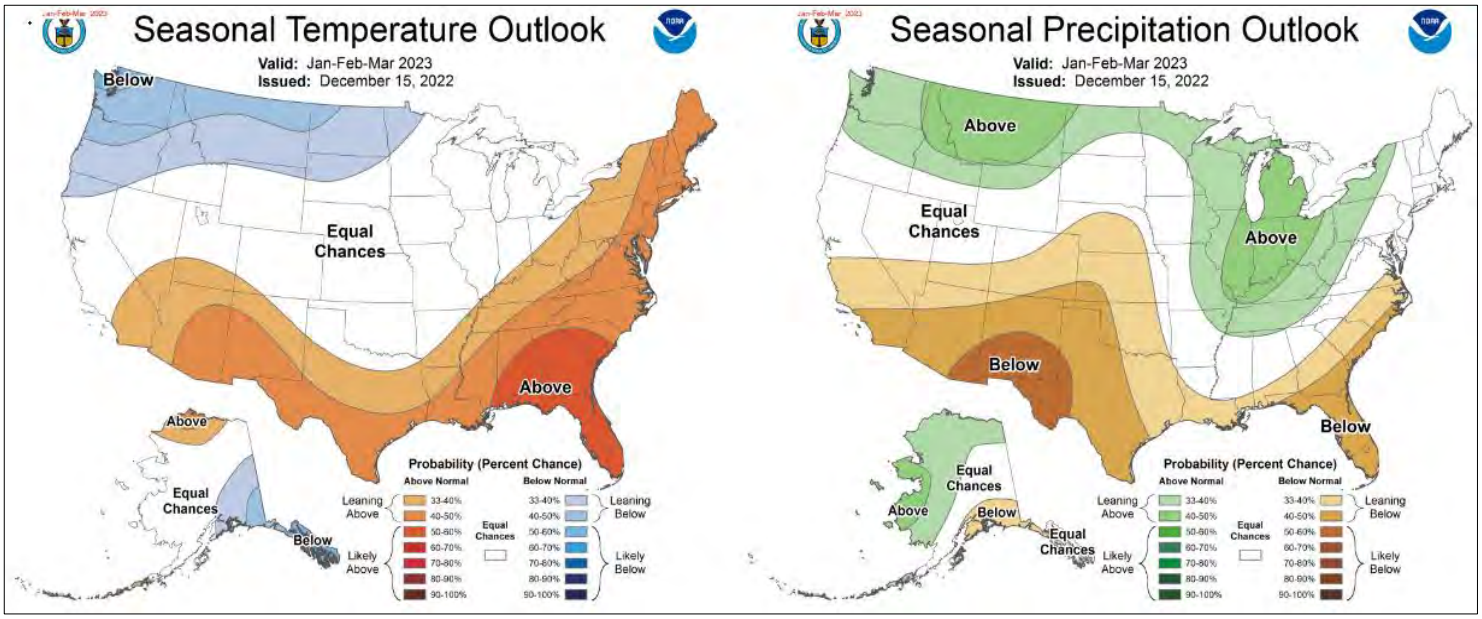


Figure 2: December 15, 2022 outlook for the rest of the winter season for temperature and precipitation probabilities.

Keep in mind that while the overall winter is expected to be milder and drier than-normal, we will likely see some brief stretches of bone-chilling cold temperatures from time to time as strong cold fronts pay us a visit from Canada. In addition, some brief periods of healthy rain may also take place as the typical mild and dry La Niña signal becomes overwhelmed by other atmospheric influences. But these interruptions are not expected to be very long lasting.

With the help from La Niña, Old Man Winter will likely go easy on us Texans again this winter.

Observer Tips, Information & Training Material

Volunteer Coordinators Needed in Texas

By: Ron Havran, CoCoRaHS Assistant State Coordinator

CoCoRaHS County Coordinators Wanted

Our network consists of over 38,000 individual volunteer observers across all fifty United States, 3,700 in Texas, all providing accurate, high-quality precipitation data for our numerous end-users on a timely basis. Our data is used by a wide variety of organizations and individuals, including the National Weather Service, other meteorologists, hydrologists, and many more. We have excellent quality control systems and processes in place to make sure our data is reliable and error-free. Our state and regional coordinators, as well as teams of quality control members, volunteer hours of their time to find potential errors in data across the state. But, in order to have the data to check, we need coordinators at the local level to help fill in the numerous gaps in data points.

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

Coordinator Responsibilities

Local County Coordinators help support CoCoRaHS in the following ways:

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

* Help organize and attend local training sessions as needed

*Provide support for volunteers in their county

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

* Help volunteers with the installation of their equipment

* Help volunteers who do not have internet access by entering their data

* Quality Control check the list of observers in your area and check for any stations no longer reporting

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

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

Remember: you are our most valuable resource, and we truly appreciate your time and efforts!

Observer Tips, Information & Training Material (continued)

Measuring Winter Precipitation

Snow Measurement Reminder

While we would like every observer to measure new snowfall, we realize that not all observers want to or are able to make this measurement. The snowfall entered on your daily form should be a measurement, not an estimate. The measurement is made by using a ruler or snow stick to measure the depth of the new snow on a snowboard or other level surface. **The depth of snow should never be measured in the rain gauge itself.** Snowfall should also never be calculated using a snow-to-water ratio or a temperature/snowfall chart. If you don't measure snow but want to provide an estimate of what has fallen, enter NA for new snowfall and include the estimate in your comments. Again, if you are measuring snow please review the online snow measurement videos - they are short and are great for a quick review. Below is good training material for all observers to review before winter precipitation measurements start. Most importantly remember to **remove the top funnel piece from your 4 inch diameter manual gauge** so snowfall will collect inside the large cylinder. **Snow collecting inside the large cylinder should be used for a melted liquid water amount measurement of the snow that fell.** Does this seem like a lot to remember? It is, so please watch each video below several times to get an understanding of winter precipitation measurements and reporting.

Winter Precipitation Measurements webinar posted on YouTube. The link is https://www.youtube.com/watch?v=4r6aL9nex1s

The slides from the webinar are available on the CoCoRaHS web site in the Training Slide Shows page. The link is: https://media.cocorahs.org/docs/WinterPrecipitationMeasurements_V3.0_Nov2022.pdf

Link to Ice Accretion measuring/reporting: https://media.cocorahs.org/docs/Ice_Accretion_Pilot.pdf

Scheduled CoCoRaHS Webinars

SPECIAL WEBINAR - REGISTER HERE - Thursday, January 19, 2023 1PM EST

"A Review of Significant Weather Events Occurring in 2022"

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 2022. 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.

Texas CoCoRaHS Observer
The official newsletter of Texas CoCoRaHS

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