

The Dryline



Fall 2011

A Look at the Historic Hot and Dry Summer Across the Panhandles

By Andrew Moulton, Meteorologist Intern

For residents of the Texas and Oklahoma Panhandles, 2011 was the driest and hottest year that most people can remember. It was common during the summer to turn on the evening news and see another triple digit temperature day and a record that had stood for decades be broken. A question that many residents have been asking is "How bad has this past summer really been?" To answer this we have to look at multiple factors, including lack of rain, extreme temperatures, and the impacts it had on the residents and the industry of the area.

The most noticeable part of this summer is the lack of precipitation and excessive heat we have experienced. This is mostly due to La Niña conditions that developed late last fall (and will be discussed in more detail in a later article) causing a shift in the movement of the air in the upper atmosphere. This shift caused most of the rainfall to stay north and out of our area. These La Niña conditions remained dominant into the spring when much of the annual rainfall for the Panhandles occurs, causing this spring to be one of the driest on record. Unfortunately when there is little rainfall the ground dries up, and dry soil heats

...Historic Summer continued on page 2...

What is Drought?

By Justyn Jackson, General Forecaster

Believe it or not, drought is tough to precisely define. According to the American Meteorological Society's Glossary of Meteorology, a drought is "a period of abnormally dry weather sufficiently long enough to cause a serious hydrological imbalance." Simply put, a drought is a period of drier than normal weather conditions that persists for a long enough period of time to cause problems over an affected area.

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Historic Summer (continued)

up much more than moist soil during the daytime. This dry soil then heats the air, and when the air is hot it can be difficult to get rain. The only way to cool down the soil is by getting rain, which is difficult when it's so hot. It is a vicious cycle that occurred throughout the spring and summer.

To put this drought in perspective, it is worth looking at several of the records that were broken. In Amarillo, 2011 broke records for most 90 degree days, most 100-degree days, most consecutive days over 90 degrees, the second highest average temperature, and least precipitation from January to October. It is a long list considering records have been kept in Amarillo since 1890. Unfortunately, many cities across the region have broken similar records. The most impressive record that was broken is the number of 100-degree days Amarillo experienced. The previous record was set in 1953 with 26 days reaching 100 degrees or more. However, 2011 saw a whopping 50 days reach triple digits, almost doubling the previous record! When it comes to 90-degree days, Amarillo experienced 111 days of 90 degrees or more, that's almost a third of the days in the year! When it comes to precipitation, things don't look much better as this is the driest year on record in Amarillo. As of this writing, Amarillo has only received 4.94 inches of rain. By comparison, the average is 19.30, which puts us currently at 14.36 inches below the amount of precipitation that is normally recorded at this point in the year. Even comparing this year to other very dry years, 2011 still stands out with 1953 being the second driest year. However, at this point, 1953 received over twice as much rain as 2011. Currently in Amarillo, 31 record high temperatures have been tied or broken and 15 record warm low temperatures have been tied or broken this year.

NWS Amarillo Participates in Chili Cook-off

The Veteran's Administration (VA) in Amarillo threw a chili cook-off on October 7th to raise money for the Combined Federal Campaign (CFC). Electronics Technician Dave Wilburn entered the contest for the fifth year in a row. Dave continued his streak on making an award winning spicy, traditional tomato based chili. To get his chili so hot, Dave puts in several different types of hot peppers into his chili, including the ghost pepper, which is the hottest pepper on earth, according to the Guinness Book of World Records. HMT Steve Bildeau, co-chair of the CFC, helped organize this event. Although not entered officially into the cook-off, Steve made a pot of chili to serve to the crowds. It was a much milder New England Clam style chili.



What is Drought (continued)

The magnitude, or severity, of a drought is dictated by precipitation deficiency, the amount of area affected by the drought, and the length of the drought. Needless to say, the lack of rainfall across the Texas and Oklahoma Panhandles for the last year has resulted in historic drought conditions across our area.

There are four types of drought, including a meteorological drought, an agricultural drought, a hydrological drought, and a socioeconomics drought. A meteorological drought can be thought of as a measure of departure from normal precipitation. However, departure from normal precipitation is highly variable from region

to region. For instance, if Amarillo only received 0.5" of rainfall during the month of September (normal is 1.92"), the precipitation deficit would be 1.42". On the other hand, if Mobile, Alabama received 0.5" of rainfall during September (normal is 5.31"), it would be 4.81" below normal. While it would still be considered a dry month in Amarillo, it would be considered an exceptionally dry month in Mobile. An agricultural drought is a situation where adverse crop effects occur because the amount of soil moisture no longer meets the needs of a particular crop. A hydrological drought occurs when there are surface and subsurface water deficiencies. A socioeconomic drought refers to a situation that occurs when water shortages begin affecting people. Across the Panhandles, the current drought is a combination of all four types, which has made it so bad.



Dry soils are an all too familiar sight across the Panhandles. Photo taken near White Deer, TX on September 11, 2011. Photo courtesy of Jason Boggs.

One of Amarillo's Staff Members Earns Regional Cline Award

General Forecaster Sarah Johnson was recognized recently with a Southern Region Issac Cline award for Leadership. The award was presented for her high initiative and outstanding leadership in various aspects of our operations at WFO Amarillo. She is extremely supportive of fellow staff members and dedicated to the mission of the National Weather Service. She displays all of the characteristics of a "servant leader". She is very dependable and volunteers to assist with any task in our office, large or small.



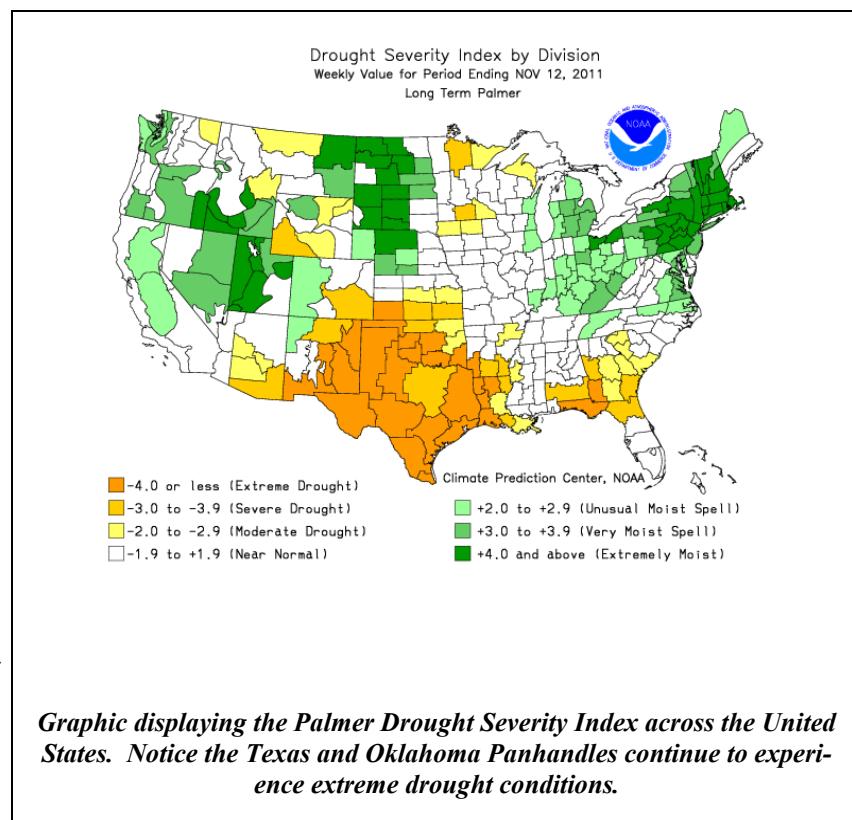
La Niña Returns; How Will this Affect the Panhandles?

By Christine Krause, General Forecaster

As any Texas and Oklahoma resident knows, we are currently suffering through what has become a historic and terrible drought. This has devastating effects on crops and livestock throughout these states as farmers have lost upwards of about 10 billion dollars in income. Wheat, cotton, and cattle operations have been especially hit hard. Although the area was already in a multi-year drought, La Niña took hold last summer and continued through the spring, exacerbating drought conditions. Besides the disastrous drought across the Southern Plains, La Niña is also one of the primary culprits behind the record flooding in the Northern Plains and a catastrophic round of severe weather, which included a record number of tornadoes in April 2011. Unfortunately, it looks like the Panhandles are in for more of the same this winter as the National Weather Service's Climate Prediction Center (CPC) has declared that La Niña has officially returned to the Equatorial Pacific waters.

La Niña is a climate phenomenon that is characterized by colder than normal sea surface temperatures in the tropical Pacific Ocean. La Niña often implies drier than normal conditions across the Southwest U.S. and in portions of the middle and lower

Mississippi and Tennessee Valleys. Since the effects of La Niña are most pronounced in the fall and winter months, it looks like another dry and warm winter is expected for the Panhandles. In fact, the latest outlook provided by CPC indicates above normal temperatures and below normal precipitation. This is undoubtedly bad news for farmers as warm and dry weather conditions will only exacerbate crop and cattle losses since very little rain has fallen over the past several months, which is when the bulk of our annual precipitation falls. These conditions will also raise the concern for wildfires. However, one silver lining in this ominous cloud is that historically when back-to-back La Niña's form, the second occurrence is not nearly as severe as the first one. Time will tell, of course, but even if La Niña conditions are not as strong this winter, it is very slim that the Panhandles will receive enough rainfall anyway to provide any kind of relief to the severe and exceptional drought conditions currently impacting the area.



Major Radar Advancement for Amarillo NWS this Fall

By John Cockrell, Senior Forecaster

Beginning in the autumn of 2011, the entire fleet of weather surveillance radars (also known as the WSR-88D or NEXRAD) which are used to monitor atmospheric processes across the nation will undergo a significant upgrade. This includes 121 radars operated by the National Weather Service (NWS), 12 operated by the Federal Aviation Administration, and 26 radars operated by the U. S. Air Force and the U. S. Army. Following years of research and testing, nationwide deployment of the new radar began in September 2011, and fortunately for residents of the Texas and Oklahoma Panhandles, the NWS office in Amarillo was among the first in the country to receive the upgrade. The installation of our new radar was completed on November 13, 2011. Five teams will work their way across the county, installing the new radars. They will spend two weeks at each radar site, then move on to the next one, with the final radar installation scheduled to be completed on May 5, 2013.

Conventional weather radars, including the WSR-88D, which represented a major advancement to operational meteorology since its deployment to the NWS in the early 1990s, transmit pulses of electromagnetic energy (radio waves) into the atmosphere. When these pulses reach a meteorological target, such as rain, hail or snow, some of the energy will be scattered back to the radar, producing a graphical depiction of the areal extent and intensity of the precipitation which is detected. The transmitted radio wave pulses which detect the weather features have a horizontal orientation. This horizontal orientation allows for horizontal measurements within clouds and precipitation to be made.

Our new radar upgrade will transform the WSR-88D into actual polarimetric radar, which is also known as a dual-polarization or “dual-pol” radar. For more than 20 years, researchers have been developing dual-polarization radar, and the benefits of their work have been made available to all the people of the United States. Dual-polarization means that vertically oriented radio waves will also be transmitted and scattered back to the radar. The vertical orientation of the pulses will enable vertical measurements of the atmospheric phenomena to be made. With the radar’s high-speed multi-tasking computer ingesting these new measurements, as input to new algorithms, a variety of new data sets will be made available to NWS meteorologists.

The enhancements to the radar will allow for new ways to detect small-scale features such as hail cores, heavy rain cores, and nearby tornadic debris. The radar’s new capabilities will also provide improved accuracy in estimating ground-level precipitation amounts.

...Major Radar Advancement continued on Page 6....

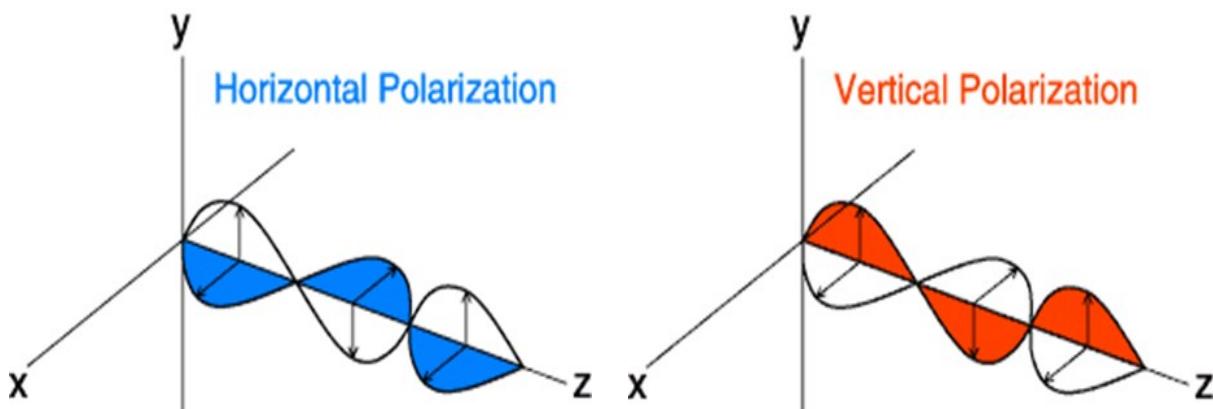
Major Radar Advancement (continued)

The new analysis schemes will offer NWS meteorologists an improved method to determine precipitation type, more easily differentiating rain from sleet, freezing rain, and snow, as well as differentiating very heavy rain from hail. These enhancements will provide valuable information to NWS meteorologists when making the decision to warn for severe thunderstorms, tornadoes, flash flooding, winter storms and floods.

Polarimetric radar detection of ice crystals within thunderstorms is expected to provide information on a given storm's lightning potential. Conditions leading to aircraft icing are expected to be detected and identified. The new radar also promises to allow an easier identification of non-meteorological targets as well, including insects, birds, anomalous propagation, ground clutter and chaff.

The overall quality of radar data is expected to be improved. Polarimetric radar data are expected to be less prone to attenuation, partial beam blockage, and miscalibration. This means that erroneous storm measurements resulting from radar limitations will occur less often.

The NWS meteorologists and hydro-meteorological technicians in Amarillo have already begun an extensive training program prior to the new radar's arrival. Following the radar's deployment, the forecast and warning staff will gain experience in interpreting the new data through the daily use of this powerful new tool. We are confident that the citizens of the Panhandles will receive improved forecasts and warnings as a direct result of the radar's new detection and analysis capabilities.



Example of the structure of a horizontally polarized radio wave

Example of the structure of a vertically polarized radio wave

Severe Weather Season Recap

By Justyn Jackson, General Forecaster

This year's severe weather recap will be short, but that's a good thing! In stark contrast to 2010, this year proved to be a very inactive severe weather year across the Texas and Oklahoma Panhandles. Climatologically, the severe weather season got off to a normal start. The first severe thunderstorm of the season occurred on April 19 when quarter size hail fell at Spearman, TX. Although there were occasional severe thunderstorms from late April through early June, there were no days with widespread severe weather or any severe weather outbreaks.

The first big severe weather day of the year occurred on June 11 across the eastern half of the Oklahoma Panhandle and the far northeastern Texas Panhandle. What made this particular day noteworthy was the fact that it was the first and only day this year that tornadoes have occurred. Hardest hit were Texas, Beaver, and Lipscomb Counties. An EF-1 tornado occurred near Tyrone, OK and EF-0 tornadoes occurred near Boyd, OK; Follett, TX; and Darrouzett, TX. This became the sixth latest date of the first tornado occurrence within the Texas and Oklahoma Panhandles since 1950. Additionally, if no other tornadoes occur this year, 2011 will join 1950, 1964, and 1988 as having the distinction of only having four tornadoes occur in the Panhandles. The least number of tornadoes ever reported in a year across the Panhandles is one, which occurred in 1952.

Through the remainder of June and into early August, the severe weather season remained relatively quiet, but there were occasional severe thunderstorms that produced large hail and damaging wind gusts. Arguably, the most noteworthy event during this period occurred on July 22 when a microburst produced an 81 mph wind gust at Rick Husband International Airport in Amarillo that resulted in damage to hangar doors and two aircraft at the airport. This measured wind gust speed actually tied the all-time highest wind speed recorded at Amarillo.

The largest and most damaging severe weather event of the year occurred on August 9 as clusters of severe thunderstorms moved from west to east across the area and produced several damaging wind gusts. The hardest hit areas were near Pampa, TX and Forgan, OK. Straight line



Straight line winds up to 120 mph caused significant damage to a hog farm on August 9, in Beaver County, OK.

..Severe Weather Recap continued on Page 8....

Severe Weather Recap (continued)

winds up to 90 mph near Pampa snapped power lines and toppled an old grain elevator. The most significant damage occurred in Beaver County, OK near Forgan where winds up to 120 mph damaged hog farms. A climatologically anomalous early fall severe weather event occurred on October 11 when isolated supercell thunderstorms developed across the eastern Panhandles. The storms produced hail up to the size of baseballs near Lefors, TX and several funnel clouds near Lefors, Clarendon, and Alanreed, TX. However, no tornadoes were reported.

To compare how active the severe weather seasons have been over the last six years, the table below shows how many severe thunderstorm and tornado warnings have been issued by our office between 2005 and 2011. Clearly, this year has been the least active year over the 6-year period, and we can only hope 2012 will be even less active than this year.



An EF-1 tornado blew the roof off of a manufactured home near Tyrone, OK on June 11.

Year	Severe Thunderstorm	Tornado
2011	93	7
2010	183	65
2009	291	15
2008	226	29
2007	296	63
2006	166	8
2005	200	26

Table 1. Number of severe thunderstorm and tornado warnings issued by NWS Amarillo, 2005-2011.

Winter Weather Safety

By Christine Krause, General Forecaster

After such a hot and dry summer, the return to colder weather can seem jarring to Texas and Oklahoma Panhandle residents. However, the onset of winter is right around the corner. In fact in the past, there have been numerous winter weather events that occurred in the months of October and November, even as recently as October 27th. Since winter is rapidly approaching, now is as good a time as any to review winter weather safety tips when freezing rain, sleet, and snow impact the Panhandles.

It is highly recommended to stay home and avoid traveling during a winter storm. However, if you must travel, ensure that your vehicle is prepared for inclement winter weather. A few items that should be checked to winterize your vehicle include the battery, brakes, heater, defroster, and tires. Also, check to make sure fluids such as antifreeze and windshield wiper fluid are not low and fill up/replace, if necessary. When traveling, keep your gas tank near full and avoid traveling alone. Prior to departing, check the latest road conditions and plan an alternate route. Inform a friend or family member of your travel plans and when you expect to arrive at your destination. An emergency supply kit is recommended in the event you become stuck or stranded. Items that should be included are a mobile phone, blankets, dry clothing, non-perishable food, water, a first aid kit, flashlights, extra batteries, and a snow shovel.



The National Weather Service in Amarillo issues a wide variety of products and statements to inform the public, emergency managers, and decision makers on winter weather that will impact the Panhandles. This information can be accessed by listening to NOAA Weather Radio, visiting our website at <http://www.srh.noaa.gov/ama>, or tuning in to local broadcast media.

Winter Weather Products Issue by the NWS Amarillo

Winter Storm Watch: A winter storm watch is issued when conditions are favorable for hazardous winter weather to develop across all or parts of the Texas and Oklahoma Panhandles. Winter storm watches are generally issued 12 to 48 hours in advance to provide the public and decision makers time to prepare for the impending winter weather.

Winter Storm Warning: When hazardous and life-threatening winter weather is occurring, likely, or has a high probability of occurrence, a winter storm warning will be issued. The following criteria or combination of will warrant a winter storm warning:

- Snow accumulations of 6 inches or more in a 24 hour period
- Sleet accumulations greater than one half of an inch
- High impact/life-threatening events that do not meet defined warning criteria (e.g. near blizzard conditions)

...Winter Weather Safety continued on Page 10....

Winter Weather Safety (continued)

Blizzard Warning: A blizzard warning will be issued when both of the following conditions are forecast to occur for three or more hours:

Wind speeds of 35 mph or greater

Considerable falling or drifting snow with visibilities at or below one quarter of a mile

Ice Storm Warning: When significant ice accumulations of one quarter of an inch or greater are expected, an ice storm warning will be issued.

Winter Weather Advisory: A winter weather advisory will be issued for hazardous winter weather that causes significant inconveniences. The following criteria or combination of will warrant a winter weather advisory:

Snow accumulations of 1 to 5 inches in a 24 hour period.

Sleet accumulations less than one half of an inch

Freezing Rain Advisory: A freezing rain advisory will be issued for a light accumulation of ice from light rain and/or drizzle.

For the latest road conditions, please use the following numbers:

Texas Panhandle: 1-806-468-1488

Oklahoma: 1-405-425-2385

Texas:

1-800-452-9292

New Mexico: 1-800-432-4269

Historical High Water Mark Sign Unveiling at Palo Duro Canyon State Park

On Thursday October 6th, the NWS office in Amarillo teamed up with the Texas Parks and Wildlife Department to place an official High Water Mark sign in the Palo Duro Canyon State Park. This sign, funded and provided by the National Weather Service, illustrates the crest of the flood waters on May 27, 1978. On this date, severe thunderstorms produced rainfall amounts of over 10 inches just west of Canyon, Texas. This heavy rain ran off into the Palo Duro and Tierra Blanca Creeks and produced extensive flash flooding in the city of Canyon. The flood killed four people and caused approximately 20 million dollars in property damage. This sign was placed near Low Water Crossing #1 to show park guests how high flood waters rose that fateful night. At this particular site, the Prairie Dog Town Fork of the Red River rose to 24 feet (21 feet above the current location of Low Water Crossing #1).



Nathan Londonberg, assistant manager of Palo Duro Canyon State Park (l), Lance Goehring, Hydro Program manager (c), and Cory Evans, manager of Palo Duro Canyon State Park unveil the high water mark sign.

NWS Amarillo Hosts Emergency Preparedness Day But Gets Interrupted By A Real Disaster

By Krissy Scotten, Warning Coordination Meteorologist

The National Weather Service Office in Amarillo and the Amarillo/Potter/Randall Office of Emergency Management co-hosted the 2011 Amarillo Emergency Preparedness Day on Friday, September 16 at the Wal-Mart on Georgia Street and Interstate 27. This event was held in conjunction with September being National Preparedness Month and the National Weather Service's Weather-Ready Nation initiative.

Several experts were on hand to discuss safety preparedness and disaster topics including severe weather, wildfires, blizzards, flash floods, and house fires. Local representatives included NWS Amarillo, Texas Department of State Health Services, Metropolitan Medical Response System, Amarillo/Potter/Randall Office of Emergency Management, Texas Panhandle Association of Contingency Planners, Blackmon Mooring, American Red Cross, and the Amarillo Fire Department's Kid's Safety FireHouse.



NWS Amarillo Forecaster Christine Krause hands out materials and discusses weather safety (*photo taken by Krissy Scotten, NWS Amarillo*)

Even though this outreach event was a huge success, many emergency and safety participants were quickly called away just before the Emergency Preparedness Day began due to a Hazmat Incident involving several rail cars in downtown Amarillo. In fact, mandatory evacuations near downtown were ordered as well as shelter-in-place advisements.

During this Hazmat event, NWS Amarillo forecasters provided numerous briefings that afternoon, including running the NOAA Hysplit. Two NWS Amarillo Emergency Response Meteorologists were dispatched to the Amarillo/Potter/Randall Emergency Operations Center to provide on-site decision support for the duration of this potentially catastrophic event. **Dr. Maribel Martinez, Assistant Emergency Management Coordinator, said, "As always, thanks for all the weather, NOAA Hysplit, and personnel support during this event!"** In addition, the Amarillo Police Department issued a Press Release mentioning NWS Amarillo forecasts that afternoon. Luckily, there were only a few minor injuries reported, and the Hazmat spill of isopentane and molten sulphur was quickly contained.

...Emergency Preparedness Day continued on Page 12...

National Weather Service Participates in Week of Service

During the week of September 25th through October 1st, National Weather Service offices throughout the country along with regional and national centers, river forecast offices, and center weather service units were invited to participate in the first annual National Week of Service. The National Weather Service is a service organization where they serve the country by providing forecasts and warnings; but there was also a desire to reach out to the public in other ways besides beyond the context of their jobs. This initiative helped to enhance servant leadership as offices headed out to their local communities to voluntarily serve with an organization of their choice.

As a part of the National Week of Service, NWS Amarillo staff and family members volunteered at the North Branch YMCA center in Amarillo on September 29th. A couple of people in the group helped serve dinner to the kids while two others delighted the kids by creating a tornado in a tornado machine. The group also played basketball, air hockey, and board games with the kids and also provided homework help when needed. Kids and adults alike all had a good time, and hopefully the success of this project will lead to more Week of Service volunteer activities in the future.



Steve Bilodeau, Hydrometeorological Technician creates a tornado in the tornado machine at the YMCA.

Emergency Preparedness Day (continued)

Meteorologist-In-Charge, José Garcia, commented: "I am extremely proud of the WFO Amarillo staff. Many people depend on our NWS spirit of service, and the staff performed excellent team work in supporting both an outreach and Hazmat event simultaneously!" This Hazmat event just shows that even though the best laid plans are made, you never know when that next disaster will strike and interrupt your events!



Rail cars and Hazmat spill shortly after the fire was extinguished (photo taken by Amarillo Fire Department)

Weather Review and Outlook

By Rich Wynne, Science & Operations Officer

REVIEW OF SUMMER 2011

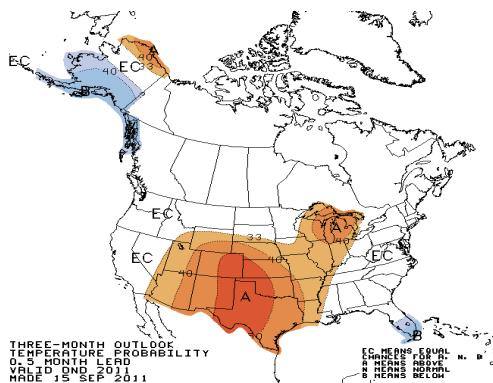
Record heat and dryness gripped the Texas and Oklahoma Panhandles through Summer 2011. All-time high temperature records were broken across the area. Amarillo set its all-time high of 111 degrees on June 26th. As of November 11th, Amarillo only recorded 4.94 inches of rain for the year, just 26% of the normal amount of rainfall (19.19"). The number of days with temperatures of 100 F (~38 C) or higher in a calendar year reached 50 by the end of September, which set a new record for Amarillo.

	Avg High(F)	Avg Low(F)	Avg Temp(F)	Precip(inch)
JUL	99.6 (+8.6)	70.8 (+5.5)	85.2 (+7.0)	1.00 (-1.68)
AUG	99.7 (+10.3)	70.5 (+6.3)	85.1 (+8.3)	0.52 (-2.39)
SEP	84.8 (+2.2)	56.5 (+0.1)	70.7 (+1.2)	0.92 (-1.00)

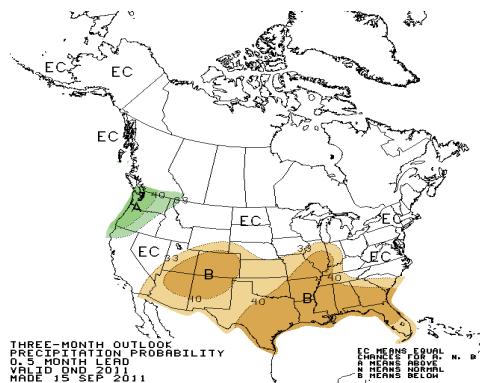
Summer/early Fall 2011 statistics for Amarillo, TX (departures in parentheses)

OUTLOOK FOR FALL/EARLY WINTER 2011

Experts at the Climate Prediction Center (CPC) have determined that La Niña has developed and will slowly strengthen into early winter. Unfortunately for the Panhandles, storms will tend to track farther north as they cross the U.S. and continue the warm and dry trend for the Southern Plains. The change will be gradual, however. The three-month outlook for Oct-Nov-Dec (OND) reflects the trend described by the CPC experts. The outlook shows an over 80% chance for near or above normal temperatures, for the Texas and Oklahoma Panhandles through the end of the year. The chances also favor below normal precipitation amounts through December. These trends are gradual and do not rule out localized exceptions to the overall outlook.



OCT-NOV-DEC 2011 Temperature Outlook



OCT-NOV-DEC 2011 Precipitation Outlook



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