

The Dryline

The Official Newsletter of the National Weather Service in Amarillo

Spring 2009



Amarillo Becomes Storm Ready at 2009 Severe Weather Conference

The 2009 Severe Weather Workshop, hosted by the Amarillo Emergency Management, was well attended and a great success. Approximately 400 citizens attended the biennial event at the Amarillo Civic Center on March 21st, 2009. Local meteorologists from the National Weather Service and every major TV station in Amarillo set up booths and interacted with the public during the morning. During the afternoon, attendees were treated to presentations by John Brost of the National Weather Service, John Harris and his staff from KAMR Channel 4, Doppler Dave Oliver and his staff from KFDA Channel 10, and Dr. Kevin Kloesel of the University of Oklahoma. Topics ranged from recent tornado studies and videos to the differences between tornadoes and downbursts. At the close of the workshop, a spotter training class was held with 160 in attendance.



City and county leaders receive StormReady recognition at the 2009 Severe Weather Conference. National Weather Service MIC Jose Garcia (far left) and WCM Steve Drillete (far right) present the award to (from left to right) Amarillo Emergency Management Director Kevin Starbuck, Potter County Judge Ware, and Amarillo Mayor Debra McCartt.

In addition to the workshop, the City of Amarillo and Potter and Randall Counties were awarded with StormReady Recognition. The StormReady designation signifies the community has taken additional measures above those required by law to ensure their community is well-prepared to protect their citizens during severe weather. Amarillo and Potter and Randall Counties now join 11 other communities in the Texas and Oklahoma Panhandles in achieving the StormReady designation.

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The NWS Amarillo thanks Walmart, Chick-fil-A, Coffee Memorial Blood Center, Fast Signs, KGNC, and others for sponsoring the 2009 Severe Weather Conference.

A Day in the Life...Of A NWS Forecaster – Severe Weather Operations

By Christine Krause, General Forecaster, and Roland Nuñez, Senior Forecaster

As winter transitions into spring, the threat of severe weather increases across the Plains. The return of warmer temperatures signals the arrival of the severe weather season across the area. Thus, forecasters at the National Weather Service (NWS) monitor the potential for severe weather in the Texas and Oklahoma Panhandles while continuing to produce the seven day forecast.

Since forecasters routinely issue a seven day forecast, we are constantly evaluating computer models that provide weather guidance more than a week in advance. Because model trends often vary from day to day, we try to apply some level of

confidence to the thunderstorm potential and indicate the primary severe weather threats. This information is conveyed through the Hazardous Weather Outlook product where all potential hazards are described. Twenty-four hours a day forecasters monitor the potential threats and make any necessary updates to the severe weather outlook as the threat becomes more imminent. The severe weather potential is also highlighted in other forecast products once the threat gets closer. To enhance awareness, forecasters also prepare graphical forecasts, which can be viewed on our website: www.srh.noaa.gov/ama

Coordination and collaboration becomes important as the severe weather event approaches. We often host conference calls for our local emergency managers, media, and other decision making customers once the threat of severe weather becomes likely. These calls serve to describe the severe weather threat, raise awareness, and allow customers to discuss concerns. Another line of communication is our internet chat service. The NWS has used chat internally for years, allowing forecasters to coordinate with neighboring offices. Recently, chat service was expanded to instant two-way communication with our local partners, which has proved to be an invaluable tool in coordinating concerns before, during, and after the event.

When severe weather strikes the Panhandles, we increase our staffing to meet the needs of the severe weather event. NWS Amarillo employs 22 staff members ranging from forecasters to technicians and administrative personnel who may be called upon expertise during an event. From the forecasters who issue the products, to the technicians who maintain the equipment, the NWS Amarillo staff works together to provide timely warnings and statements to pinpoint areas that may be threatened by severe weather. In addition, we often utilize volunteer HAM radio operators who are trained to observe severe weather. Other trained spotters assist us with ground truth and compliment the warning decision process.

Severe weather is a fact of life in the Panhandles, and unfortunately can have devastating consequences. The NWS in Amarillo has served the Panhandles since 1892 and remains committed to its mission of protecting life and property.



NWS forecasters monitor the weather and issue warnings while collaborating with Emergency Management officials and HAM Radio operators during the tornado outbreak of March 28, 2007.

Severe Weather Safety

By Chris Kimble, Meteorologist Intern

As the weather begins to warm up, it is important to remind ourselves that we are entering the time of year when thunderstorms often occur. Thunderstorms are an important part of life in the Texas and Oklahoma Panhandles. In Amarillo, 87% of the annual rainfall is received from March through October, and almost all of this can be attributed to thunderstorms. Without this beneficial rain, the Panhandles would be a virtual desert. However, when thunderstorms do occur there are many hazards that can cause damage to property or threaten lives. It is important that everyone be aware of these hazards and know how to protect themselves and their property.



Lightning is a part of EVERY thunderstorm and often strikes without warning. Lightning kills dozens of people and injures hundreds more each year in the United States, with most deaths occurring when people are caught outside with no shelter. It is important to remember that lightning can strike several miles away from the thunderstorm, so the best place to be is inside. If you hear thunder, you are close enough to be struck by lightning and should seek shelter immediately!



Flooding causes more than 100 deaths each year in the United States and can occur almost anywhere. Most flood related deaths occur in automobiles. Even if you don't live near a river or stream, you can still be affected by flood waters. Flash flooding is an increased concern in the Texas and Oklahoma Panhandles during the summer months when thunderstorms drop very heavy rainfall in a short amount of time. Drainage systems may not be able to handle all the water at once and roads and underpasses can quickly flood. If you run across water covering the road, you should turn around and find an alternate route. It only takes a small amount of water to cause your vehicle to stall or float.



Severe thunderstorms can produce large hail and damaging straight line winds. A severe thunderstorm is defined as having hail $\frac{3}{4}$ inch in diameter (the size of a penny) or larger or straight line winds of 58 mph or higher. When severe thunderstorms approach, seek shelter in a sturdy building to avoid injury. Large hail can damage property and can cause injury to those caught outside. Strong straight line winds can occasionally exceed 100 mph and cause widespread damage equivalent to that of a tornado. These winds can overturn mobile homes and damage sturdy buildings.

BECOME A STORM SPOTTER

The National Weather Service will continue to host Spotter Training sessions at many locations in the Texas and Oklahoma Panhandles through the early summer. If you would like to become a storm spotter, please attend one of the 2009 spotter training classes.

The full spotter training schedule is available at <http://www.srh.noaa.gov/ama/?n=spottertalks>

| | | |
|----------------|----------|-------|
| Goodwell, OK | April 20 | 2 PM |
| | | 4 PM |
| Boys Ranch | April 22 | 10 AM |
| | | 3 PM |
| Boise City, OK | April 28 | 7 PM |





Tornadoes are a very rare natural phenomenon associated with thunderstorms, but occur in the United States Great Plains more than anywhere else in the world. In the Texas and Oklahoma Panhandles, tornadoes are most common in late spring and early summer. The strongest tornadoes can produce some of the strongest winds ever recorded at the Earth's surface and completely destroy well-built structures. The best place to be during a tornado is in a basement or inside a sturdy building, far away from outside walls and windows. If caught outside with no shelter available, lie flat in a ditch or other low spot away from the strongest winds and debris.

The first step in protecting yourself and your property is to know when a severe thunderstorm or tornado is approaching. Understand the statements and warnings issued by the National Weather Service and have a reliable means of being alerted when these statements are issued. One of the best ways to make sure you know when a warning is issued is to have a NOAA All Hazards Weather Radio. These devices are inexpensive and can be specially programmed to alert you when threatening weather is approaching.

Watches: The National Weather Service issues a watch when conditions are favorable for a hazardous weather event to develop within the watch area. Some watches include Severe Thunderstorm Watch, Tornado Watch, or Flash Flood Watch. When a watch is issued, you should be alert for changing weather conditions, make initial preparations for the potential for hazardous weather, and listen for possible warnings.

Warnings: When the National Weather Service issues a warning for your area, it is intended to alert you that hazardous weather is occurring now or is imminent. Some warnings include Severe Thunderstorm Warnings, Tornado Warnings, and Flash Flood Warnings. When a warning is issued, you should take immediate action to protect life and property from the impending hazardous weather event.

Panhandle Tornadoes

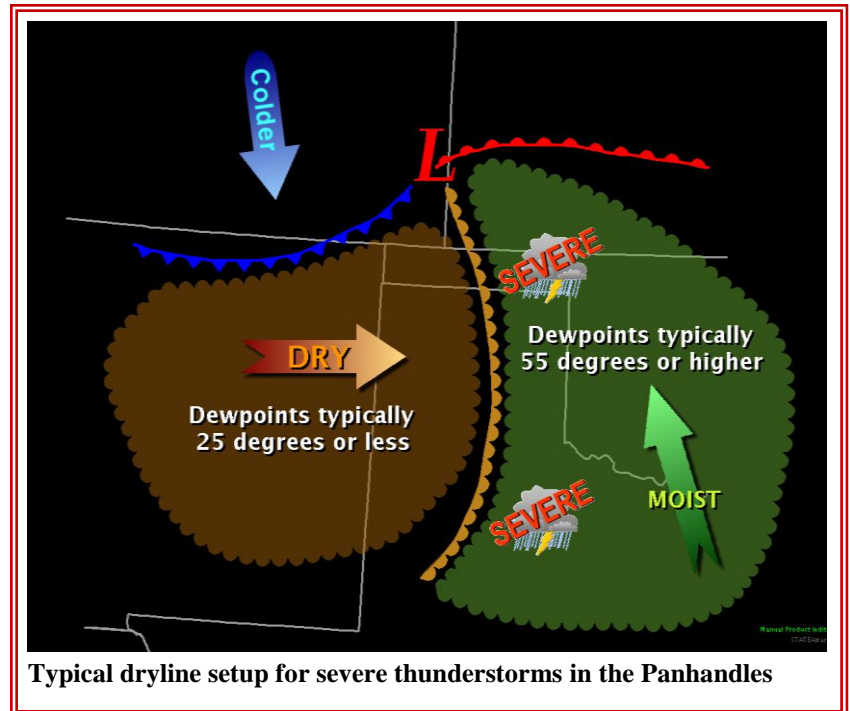
By Mike Johnson, General Forecaster

Tornadoes are more common across the Panhandles than many other areas of the country. In an average year, the Texas and Oklahoma Panhandles will experience around 20 tornadoes, with approximately 33 tornado warnings issued by the National Weather Service office in Amarillo, Texas. The Panhandles of Texas and Oklahoma are located in a favorable area for severe weather and tornadoes. The purpose of this article is to provide a basic understanding of tornado development and describe the classic weather pattern that is often observed during Panhandle tornado outbreaks.

Before discussing the factors that lead to tornadoes, let's look at what causes thunderstorms. Three ingredients are necessary for the development of thunderstorms: moisture, instability, and lift. Thunderstorms will not occur if any of these ingredients are missing. Since tornadoes are almost always associated with thunderstorms, they also require these three ingredients. However, most tornadoes occur within supercell thunderstorms and these types of thunderstorms require additional ingredients.

Supercells typically form in areas of high instability and strong vertical wind shear. This type of environment is typically found in the warm sector of extra-tropical cyclones (low pressure systems). It is generally characterized by southerly winds at the surface with southwest to west winds in the mid levels of the atmosphere. This “turning” of winds with height contributes to the supercell’s unique rotating updrafts. The vertical wind shear also causes the thunderstorm updraft to become tilted, giving supercell thunderstorms amazing longevity since the updrafts are removed from the precipitation cores that ultimately weaken storms by choking off the updrafts. This longevity gives the storm more time in the mature phase and a better opportunity to produce a tornado.

The exact causes of tornado development are still not completely understood by scientists, but the following is what the most recent studies suggest. As previously stated, a supercell contains a deep rotating updraft, known as a mesocyclone. As the mesocyclone develops and strengthens, the thunderstorm updraft intensifies. The updraft then ingests horizontally rotating air which is found in the pre-storm environment (due to wind shear), tilts this rotating column of air into the vertical, and stretches it. This process is what is thought to create the very strong rotating air that becomes a tornado.



A look at the climatology of tornadoes in the Texas and Oklahoma Panhandles shows that a vast majority of tornadoes occur in the late spring. This is during the time of year when the prevailing westerly flow aloft is still rather strong and temperatures above the surface are relatively cold. This results in the development of the familiar surface low pressure system over southeast Colorado. We begin to see the intrusion of gulf moisture into the region during the spring, providing the moisture needed for thunderstorm development.

The sloping terrain of the Panhandles allows for the formation of the dryline (figure above). This feature typically develops in eastern New Mexico and moves east as warmer, drier air is mixed down to the surface. The dryline commonly serves as a low level focus for thunderstorms in the spring, providing the low level lift. The other factors, wind shear and strong instability, allow some of these thunderstorms to take on supercell characteristics, which in turn produce large hail, damaging winds, and in some cases, tornadoes.

This setup is obviously not the only way that tornadic thunderstorms are produced. However, most tornadoes and almost all violent tornadoes are associated with supercell thunderstorms. Tornadoes can also form in squall lines or ordinary thunderstorms but this type of tornado is generally short lived and relatively weak.

Weather Review and Outlook

By Chris Kimble, Meteorologist Intern, and Richard Wynne, Science and Operations Officer

REVIEW OF WINTER 2009

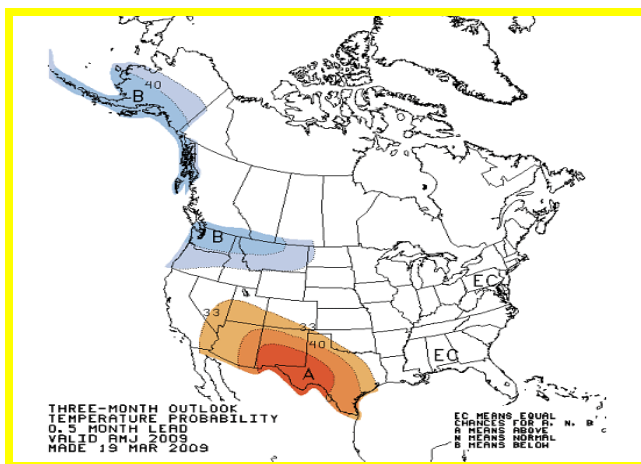
The dry and warm pattern which had dominated the late fall season for the Panhandles continued through most of the winter. Although periodic outbreaks of very cold temperatures did occur, temperatures were well above normal on average, with below normal precipitation. In fact, an inch of snow had not yet fallen in a single storm in Amarillo through the beginning of March. This had not happened since 1957. But similar to 1957, that pattern was soon to change as the region saw a major blizzard at the end of March. Snowfall amounts were generally 12 to 18 inches across the Panhandles, with 11.0 inches recorded in Amarillo. Some areas saw as much as 24 inches of snow and snow drifts more than 10 feet high. All this snow brought much needed moisture back to the region.

| | AVG HIGH | AVG LOW | AVG TEMP | PRECIP | SNOW |
|-----|-------------|-------------|-------------|--------------|--------------|
| JAN | 54.6 (+5.7) | 22.5 (-0.1) | 38.5 (+2.7) | 0.03 (-0.60) | 0.7 (-4.1) |
| FEB | 62.2 (+8.1) | 29.0 (+2.0) | 45.6 (+5.0) | 0.45 (-0.10) | 0.0 (-4.1) |
| MAR | 67.0 (+4.8) | 35.4 (+1.8) | 51.2 (+3.3) | 1.01 (-0.12) | 12.6 (+10.9) |

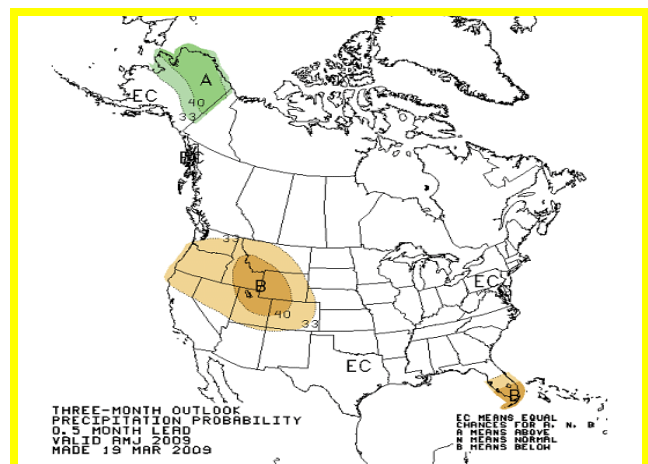
Winter 2009 statistics for Amarillo, TX

OUTLOOK FOR SPRING 2009

The three-month outlooks for April, May, and June have been issued by the Climate Prediction Center. The temperature outlook shows an enhanced chance for above normal temperatures for the Panhandles over the three month period leading into summer. The greatest likelihood for above normal temperatures is over the southwestern Texas Panhandle. Temperatures normally increase through the late spring and early summer with some of the hottest temperatures of the year often occurring in June. The last freezing temperatures of the season usually occur in April. The precipitation outlook indicates equal chances for above and below normal precipitation for the Panhandles. This means there are no major climate indicators pointing to above or below normal precipitation for this area. Normally, precipitation increases through spring and into early summer as Gulf of Mexico moisture and thunderstorms return to the High Plains.



APR-MAY-JUN 2009 Temperature Outlook



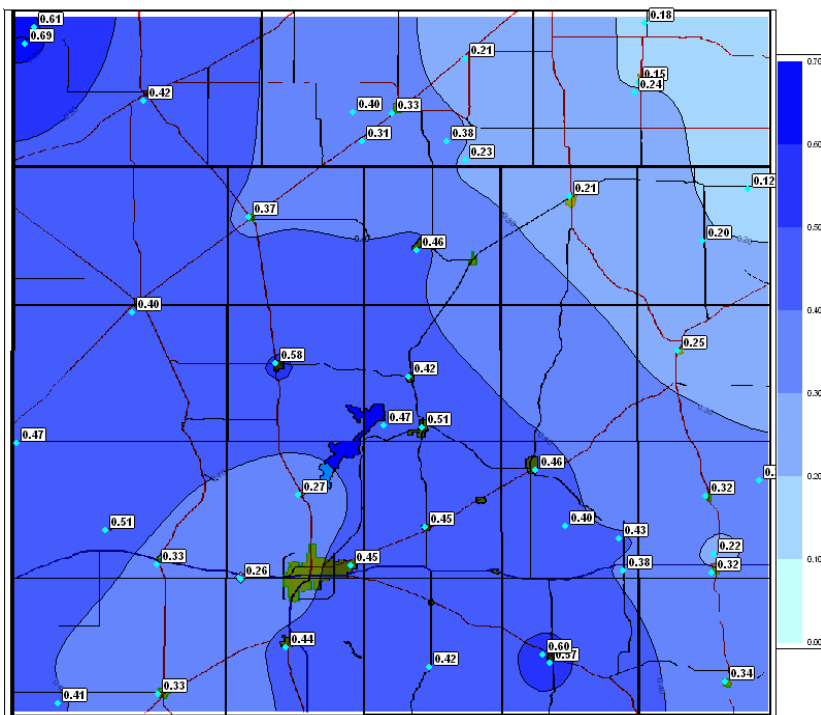
APR-MAY-JUN 2009 Precipitation Outlook

Severe Weather Strikes Early

By Todd Beal, General Forecaster

Aside from a few light wintry events in December and January, the Texas and Oklahoma Panhandles had not received any significant precipitation since mid-October. However, February 8th brought a welcomed, albeit brief change in the weather in the form of some much needed rainfall and the season's first severe thunderstorms.

An upper level disturbance approached the Panhandles from the west on Saturday, February 7th. At the surface, southeasterly winds aided in transporting moisture into the forecast area. While there was some uncertainty with the quality of moisture return across the Panhandles, by early afternoon on the 8th, dewpoint temperatures had climbed into the middle to upper 40's. This influx of moisture served to blanket the area with considerable cloudiness throughout the day, which limited the overall instability for thunderstorm development. The onset of showers and thunderstorms was delayed until the upper level disturbance and its associated cold front moved into the area.



Rainfall amounts from February 8 thunderstorms.

By 5:00 p.m., a line of showers and thunderstorms developed along and just ahead of the eastward moving cold front across eastern New Mexico. A rare February Severe Thunderstorm Watch was issued at 5:15 p.m. for the western and central Texas Panhandle until 10:00 p.m. that evening. Showers and thunderstorms entered the western Texas Panhandle around 7:00 p.m. and continued to race northeast at around 40 to 50 mph. A couple of these storms became severe, with the primary threat being damaging straight line winds. A swath of 60 to 65 mph winds was reported from Deaf Smith County to Potter and Randall Counties, including the cities of Amarillo and Canyon. The main extent of damage across the area was downed power lines, telephone poles, fences, and a couple of toppled storage sheds.

Despite several reports of wind damage, the good news was that all twenty-three counties in the forecast area received some much needed rainfall. On average, rainfall amounts were between 0.25 and 0.50 inches across most of the Texas and Oklahoma Panhandles (figure above). Rainfall amounts of 0.15 inch or less were reported across parts of eastern Beaver County in Oklahoma and northeast Lipscomb County in Texas. Unfortunately, the region quickly reverted back to the dry spell observed throughout fall and winter, as no significant precipitation fell for more than a month across the region.

Late Season Blizzard Strikes Panhandles

On the evening of Thursday, March 26th a strong cold front pushed southward through the Oklahoma and Texas Panhandles. Temperatures behind the front quickly dropped below freezing with winds gusting to over 50 MPH. Meanwhile, a powerful upper level storm system was strengthening and tracking across the Southern Rockies. Light snow began to overspread most of the Panhandles, with heavier snow falling with blizzard conditions on the higher terrain of the Western Oklahoma Panhandle and Northwest Texas Panhandle. Thunder and lightning accompanied the snow at times overnight. During the day on Friday, March 27th, the low pressure system



Downtown Amarillo digs out on Saturday, March 28, 2009 after a rare late season blizzard dropped about a foot of snow on the area. Photo by NWS Forecaster J.J. Brost from a TXDOT Helicopter

moved Eastward across the Southern Plains, dropping heavy snow on the Southern and Eastern Texas Panhandle with blizzard conditions. By Saturday morning the system had departed, having dropped 12 to 24 inches of snow on parts of the area. For more information on this storm, please view the March 2009 Blizzard page on our website at

http://www.srh.noaa.gov/ama/?n=march2009_blizzard

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