SPRING 2007

THE TEXAS THUNDERBOLT

NATIONAL WEATHER SERVICE -- FORT WORTH, TX
SERVING ALL OF NORTH TEXAS
WWW.WEATHER.GOV/FORTWORTH

IN THIS ISSUE

PLUS MUCH MORE!

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Background image is courtesy of Alan Moller.

A Message from the Meteorologist in Charge

Spring is just around the corner, and with it will come the inevitable threat of thunderstorms. The tornado outbreak on December 29th, 2006 reminded us that the threat of severe weather is one we live with year round, but the months of March, April, and May are typically the most active months for tornadoes, flash floods, large hail, lightning, and damaging winds. It may be tempting to think of thunderstorms purely in terms of these dangers, but as much as 70 percent of the annual rainfall in North Texas comes from thunderstorms, and lightning helps to replenish nitrogen in the atmosphere. Without thunderstorms, agriculture would not flourish and our lakes and reservoirs would be in constant need of more rain.

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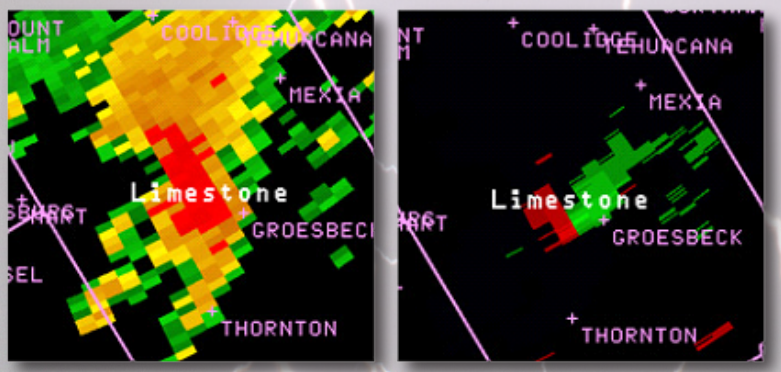
The December 29th North Texas Tornado Outbreak

by Stacie Hanes



Above: *Radar image of the storm that produced a tornado near Groesbeck. The image on the left is radar reflectivity at 0.5°. The image on the right is storm relative velocity.*

A rare winter tornado outbreak occurred on this date, spawning almost two dozen tornadoes across North Texas. As a powerful upper level low pressure system rotated over the Desert Southwest, Texas was hit with a barrage of severe weather. Rich low level moisture, a surface low pressure system, and a warm front across the region helped prime the environment for severe storms. The first storms erupted around 11 AM, with the first tornado reported just after 1 PM. Before the day was over, twenty-three tornadoes would touch down across North Texas. A total of thirty-five tornado warnings were issued, and an additional ten severe thunderstorm warnings and sixteen flash flood warnings were necessary.

Storm surveys conducted by the National Weather Service in Fort Worth found that three separate F2 tornadoes tore through Limestone, Bosque, Hill, and Johnson Counties. One death was reported in association with the Limestone County tornado, with a total of thirty-two injuries reported in Limestone and Johnson Counties. Based on monetary damages, the most destructive tornadoes touched down in Johnson, Henderson, and Limestone Counties, causing a total of $5 million in damages. The most powerful tornado rating assigned on this day was F2 on the Fujita Scale, with winds in the 113-157 MPH range.

In addition to the tornadoes, there were numerous reports of flash flooding as rain fell relentlessly over the same areas. Flash flooding caused one death in Freestone County as a car was swept away by the strong flood waters. Additionally, the weight of the water caved in a roof over an automobile dealership in Kaufman County, causing over $50k in damages.

Welcome Message (concluded)

While every thunderstorm poses a threat from lightning and locally heavy rainfall, only about 10 percent of all storms become severe by the National Weather Service's definition. A severe storm is one that produces penny-size (3/4-inch) hail or larger, winds of 58 m.p.h. or higher, or a tornado. Although the focus during the months ahead is often on the threat of tornadoes, statistics show that flooding is the number one thunderstorm-related killer. The integrated warning system that is in place across North Texas works to keep everyone informed and safe during severe weather season. Storm spotters provide critical ground truth on the structure and impacts of severe storms, and serve as the eyes and the ears of the warning system in communities across our area. City and county emergency managers ensure local readiness and activate warning systems such as outdoor warning sirens, cable television override, and reverse 911, among other methods. The broadcast and print media provides coverage of developing weather situations and promotes education and awareness. Your National Weather Service Office in Fort Worth is staffed 24-hours a day, constantly monitoring the atmosphere and providing forecasts and warnings to keep you safe.

For the warning system to work properly, it is critical that people in the path of a dangerous storm receive the severe weather warning and take the proper actions to keep safe. Now is the time to review, or develop, a severe weather safety plan for you and your family for both home and work. A good severe weather plan will include multiple ways of receiving weather information, including NOAA All-Hazards Weather Radio, local media, the Internet, and other sources. Also, there must be a designated weather watcher, someone who can monitor information sources and alert others when severe weather is approaching. This is especially important for schools and other places where large numbers of people are gathered. We can help with your severe weather safety questions. You'll find an abundance of information in the preparedness section of our Internet web page.

As severe weather season approaches, many people are working diligently to keep you informed and safe. The most important link in our warning system, however, is YOU.

Bill Bunting
Meteorologist In Charge
National Weather Service Fort Worth

Texas Was Southern Extent of Major Ice Storm

a Review of the January 13-17 North Texas Winter Weather Event

by Greg Patrick

A significant winter weather event affected parts of the southern and eastern U.S. in the middle of January. A very cold arctic airmass moved across OK into north TX on Friday, January 12, 2007, with bitterly cold temperatures spreading south across the area through the weekend. An active southern branch jet stream contributed to several rounds of winter precipitation across north TX; by Wednesday, January 17, nearly all of north TX had been impacted in some way by one or more rounds of winter weather. Numerous traffic accidents, major airport delays, power outages, and school closings were reported during this prolonged winter weather event.

By late Friday, Jan 12, a strong arctic front moved south across most of north Texas. Figure 1 shows an image of the cold front location as well as surface

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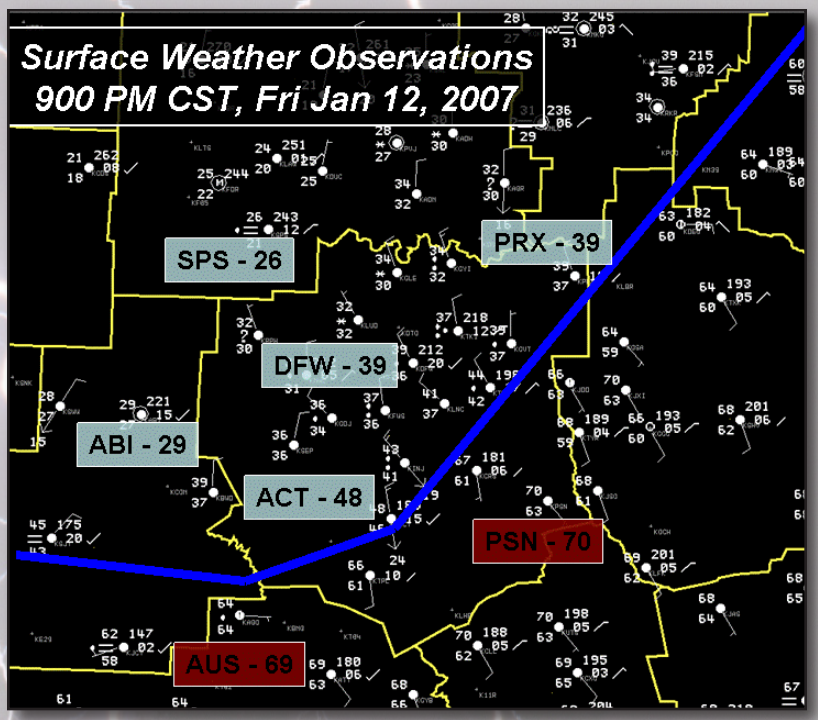

Figure 1: *Surface map valid at 900 PM CST Friday, January 12, 2007. The location of the cold front is shown as the thick blue line.*

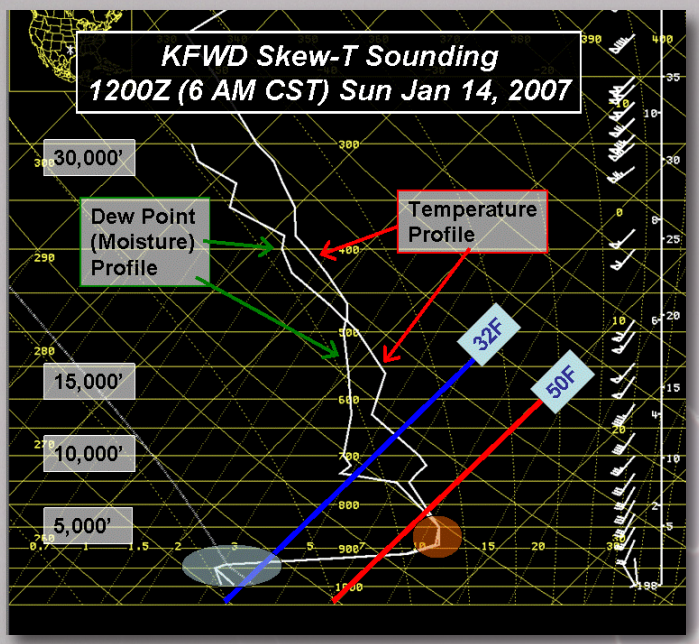

Figure 2: *Sounding taken at Fort Worth, TX at 600 AM CST, Sunday, January 14, 2007. The sounding graphs the vertical temperature, moisture and wind profile as measured by a weather balloon instrument. The freezing line is highlighted by the thick blue line and the 50 F line is shown as the thick red line. Height values are labeled on the left side of the image. Note the shallow cold layer (blue oval) near the surface and the warm (red circled region) layer aloft.*

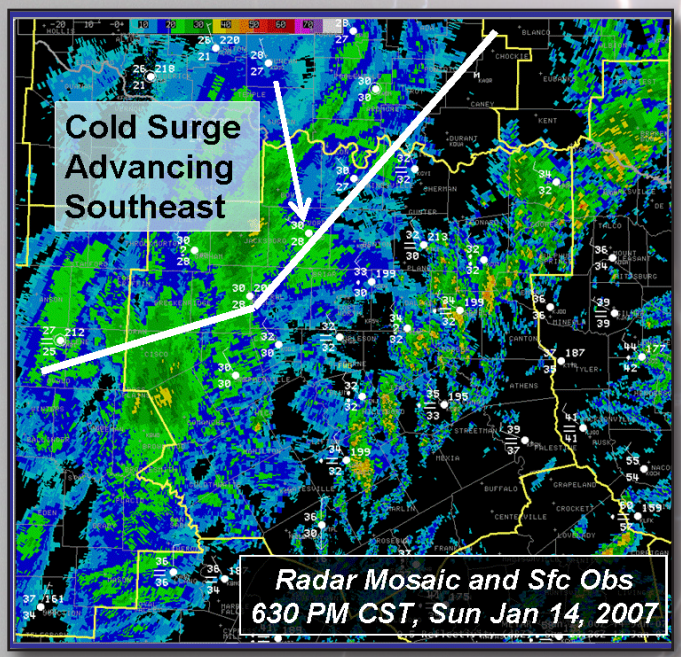

Figure 3: *Radar mosaic and surface observations from 630 PM CST, Sunday, January 14, 2007. Surface observations are shown in white and the solid white line is drawn to indicate a southward advancing surge of cold air. A large area of rain, freezing rain and sleet was occurring across most of north TX with freezing temperatures noted as far south as Waco.*

Winter Storm Review (continued)

observations across the region. Temperatures north of the front fell quickly into the 30s with gusty north winds while temperatures south of the front were in the 60s and 70s. Scattered showers and thunderstorms developed near and ahead of the frontal boundary as it moved south. An unusually moist airmass for January (dew point temperatures in the mid 60s) led to efficient rainfall producing shower and thunderstorm activity, which prompted several Flash Flood Warnings and Urban/Small Stream Flood Advisories late Friday. In addition, a weak tornado developed near Troy in northern Bell County late Friday afternoon in a line of storms that developed in the unstable air ahead of the cold front.

From late Saturday into Sunday, temperatures fell to near or below freezing across much of north TX roughly north of a line from Goldthwaite to Waco to Paris. As a strong disturbance in the jet stream moved northeast across TX, scattered thunderstorms with moderate freezing rain and sleet developed in western and northern sections of north TX. The thunderstorms moved quickly northeast and produced up to ¼ inch of freezing rain and/or sleet in their paths. However, the impacts from the winter precipitation were not as significant as they were across Oklahoma, where colder temperatures were in place and even heavier precipitation fell. The next several paragraphs serve to give my ideas on why the impacts were important, but not catastrophic, across north Texas.

Figure 2 shows the upper air sounding of temperature, dew point, and wind taken at Forth Worth TX (KFWD) at 6 AM CST on Sunday, Jan 14, 2007. The sounding is characterized by cold air near the surface, with a temperature of 30 F reported at sounding time near the ground. The cold air is very shallow, with the depth of sub-freezing temperatures around 1500 feet, with temperatures rising to 58 F at 3000 feet above the ground. Winds are from the north near the ground but quickly become south or southwesterly just above the surface and increase in speed up to the jet stream level (34,000 feet or 250 mb). The general profile of temperature and wind is somewhat characteristic of shallow arctic airmasses; however, the particular profile shown in Figure 2 has several distinctive and important features.

The very warm and saturated air noted in the layer between 3000 and 7500 feet above the ground was important for two reasons. First, instability is present in this sounding if we lift the saturated parcels that are near 3000 feet up to the 20,000 ft – 30,000 ft level. This theoretical "lifting" is subject to the assumptions of "parcel theory", which was developed to aid thunderstorm forecasting by simulating a potential updraft parcel in a developing thunderstorm. Since the lifted parcel

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Winter Storm Review (concluded)

becomes warmer than its environment at those levels above about 10,000 ft, we say that it is unstable since an initial upward vertical displacement would result in continued upward motion. Since the unstable parcels in this case only exist in a layer above the surface, we refer to the instability as "elevated" and label the thunderstorms as "elevated convection".

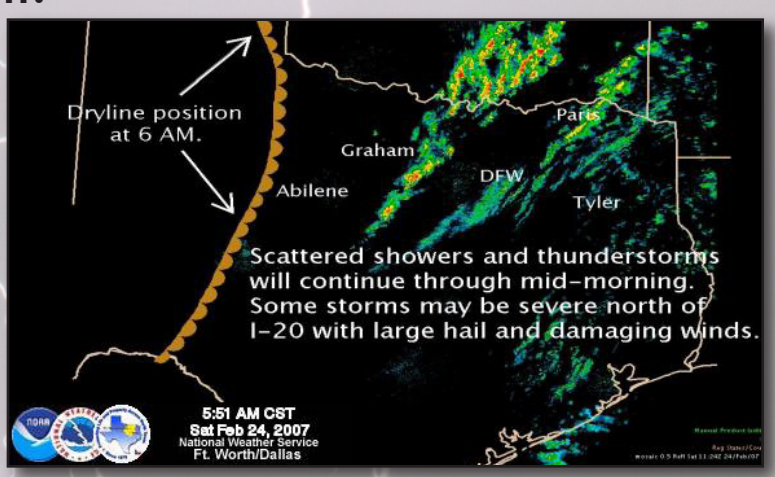
A second very important aspect of the "warm nose" between 3000 and 7500 feet is related to the depth and temperature of the layer. Any precipitation particles that fall into this layer from snow-producing clouds higher in the atmosphere will quickly and completely melt as they encounter the very warm air between 3000 and 7500 feet above the ground. It is then theorized that the air very near the ground, which was initially near or slightly below freezing, could actually be warmed by two processes when steady rain was falling. One process results from heat moving from warm raindrops to the colder surrounding air near the ground. Secondly, steady rains or showers may have helped create weak downdrafts which resulted in mixing the warm air above the ground with the colder air near the surface. These two processes may help explain the slight temperature increases that were observed near heavier rain areas during the winter event. When temperatures are 31 F and moderate rains result in warming the air to 32 F or 33 F, this will limit the amount of ice accumulation. Relatively warm soil temperatures also limited ice accumulations on major roadways through Sunday.

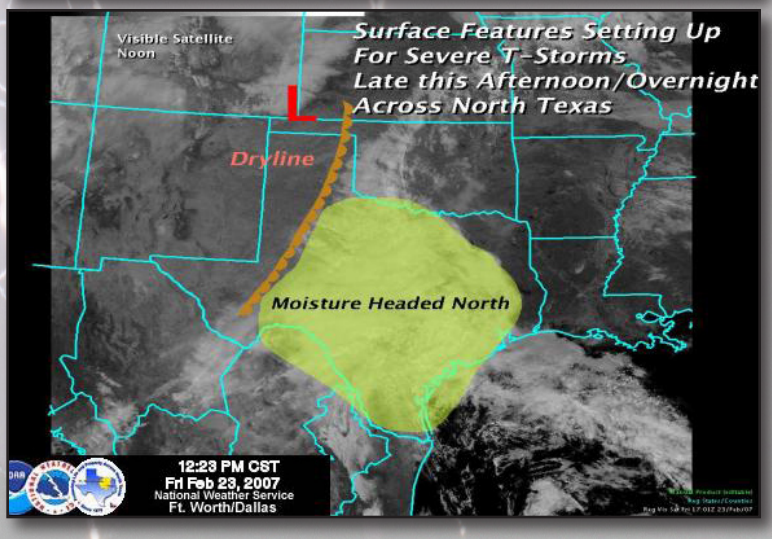
Additional precipitation developed late Sunday and early Monday as another upper level disturbance moved northeast across Texas. Another surge of cold air moved south through the area Sunday night, and temperatures fell to well below freezing in many areas by Monday morning. Although Monday was Martin Luther King, Jr day and a holiday for many schools and federal offices, there were still significant travel impacts. Figure 3 shows a radar image from late Sunday and depicts the cold surge advancing south into north TX as well as the widespread precipitation.

Graphicasts -- Have You Seen Them?

by Jessica Schultz

The National Weather Service in Fort Worth has been issuing Graphicasts, graphical forecasts and information, located on our webpage. These graphics will display radar or satellite imagery, temperature forecasts, severe weather or fire weather outlooks, or graphics regarding an upcoming storm system. When a Graphicast is in effect, the "Special Image" tab on our homepage will flash.





We Want Your Opinion!

We are looking for your feedback on our Graphicasts. Any input you could provide on your operations and decisions, improvements to the images, or frequency of updates will be appreciated.

You can send your opinions and suggestions to Jessica Schultz via e-mail:

jessica.schultz@noaa.gov

Old Tornado F-Scale Gets an Upgrade

New Enhanced Fujita (EF) Scale Implemented

by Jessica Schultz

Since 1971, the National Weather Service has used the Fujita scale, developed by Dr. Tetsuya Theodore Fujita, to estimate tornado wind speeds based on the damage. However, this scale has several limitations including a lack of damage indicators, no account for construction quality and variability, and no definitive correlation between damage and wind speed. These limitations have led to inconsistencies in tornado ratings and, in some cases, an overestimation of tornado wind speeds.

Implemented on February 1, 2007, the Enhanced Fujita (EF) scale was developed by the Texas Tech University Wind Science and Engineering (WISE) Center, along with a forum of nationally renowned meteorologists and wind engineers from across the country.

The EF Scale will continue to rate tornadoes from 0 to 5, but the ranges of wind speed in each category are now more accurate. The scale incorporates 28 damage indicators such as building type, structures, and trees. For each damage indicator, there are 8 degrees of damage, ranging from the beginning of visible damage to the destruction of the damage indicator. The original F scale did not incorporate these details.

Old Fujita Scale

F-Scale	Winds (mph)
0	40-72
1	73-112
2	113-157
3	158-207
4	208-260
5	261-318

Enhanced Fujita Scale

EF-Scale	Winds (mph)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

For More Information

▶ www.wind.ttu.edu/EFscale.pdf

2007 SkyWarn Spotter Training Underway

by Jessica Schultz

Above: *Forecaster Daniel Huckaby presents a Skywarn spotter training session in Arlington, TX.*

Meteorologists at the National Weather Service forecast office in Fort Worth monitor weather conditions daily, looking for conditions favorable for producing severe weather. Radar and Satellite are useful tools that assist forecasters in issuing life-saving warnings, however technology can't do it all. Ground-truth information, or details of what is actually occurring in the field, is priceless information. Details of a lowering funnel cloud, tornado on the ground, large hail, or flash flooding is critical in assisting forecasters issue timely warnings.

Each year, a team of meteorologists from NWS Fort Worth, including Warning Coordination Meteorologist Gary Woodall, in assistance with local emergency management units, conduct

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2007 SkyWarn (concluded)

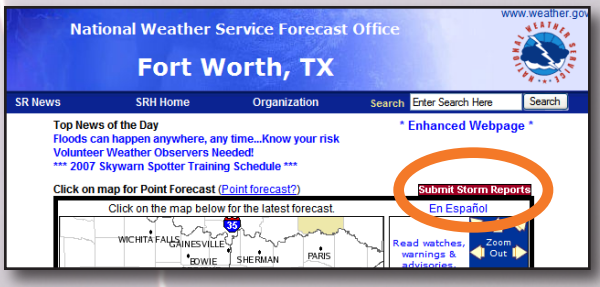
SkyWarn spotter training sessions. These classes, free of charge and open to the public, discuss ingredients necessary for severe weather, visual clues, and how get severe weather reports to the National Weather Service. Remember, severe weather is most common in April and May, but can occur at any time of the year.

Severe Weather Criteria

- Hail 3/4" in diameter or larger. (Penny size)
- Wind Gusts of 58 mph or greater. (50 knots)
- Observed wind damage or structural damage.
- Tornado. (Funnel that touches the ground)
- Deaths, injuries, or property damage due to lightning.
- Flash Flooding or flooding that causes death or injury.

You can help the NWS in Fort Worth by submitting severe storm reports online! Just click the link in the red box on our homepage and fill out the form. These reports are received in our office immediately and help with real-time assessment of the weather. Be sure to submit the time at which the event occurred!

Right: *Forecaster Alan Moller gives an advanced Skywarn spotter talk in Waco, TX.*



DR. WEATHER'S WISDOM

ALL ABOUT LIGHTNING AND THUNDER

BY: TED RYAN

Texas is no stranger to thunderstorms, but have you ever wondered how lightning and thunder work? Lightning is basically a giant spark. As a rain cloud billows high into the atmosphere where it is very cold, the raindrops begin to freeze and bump into each other. All of those collisions of frozen raindrops create an electric charge, and after a while the whole cloud becomes electrically charged. Once the charge is great enough in the cloud - zap - lightning strikes! If you have ever rubbed your feet across carpet and then touched a metal door handle, you know that you get shocked. Lightning works in the same way, just on a much bigger scale.

Lightning is about 50,000 degrees Fahrenheit, which is 5 times hotter than the surface of the sun! Where there is lightning, thunder is sure to follow since thunder is caused by lightning. Lightning is so hot that it causes the air around it to heat up and expand very quickly, causing a kind of explosion. This creates a huge push of sound waves which spread outward, and this is the thunder that we hear.

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Dr. Weather's Wisdom (Concluded)


© Alan Moller

The reason we see lightning before we hear thunder is because light travels almost instantaneously, where sound takes 5 seconds to travel 1 mile. You can count the distance that lightning is away from you by counting the number of seconds between when you see lightning and hear the thunder. Then take that number and divide by 5 and that is how far that lightning bolt was away from you in miles. For example: If you counted 10 seconds between the lightning and the thunder, the lightning is 2 miles away.

Every year an average of 85 people in the U.S. are killed by lightning, with many more seriously injured. Most people are struck by lightning when it is not even raining at their location, but a thunderstorm is nearby. That is why if you hear thunder, then you need to go indoors immediately. If your hair stands on end or if your skin starts to tingle, lightning is about to strike very close to you! If you are unable to seek shelter, move away from tall objects, crouch down on the tip of your toes and tuck your head down, keeping as little of your body touching the ground as possible.

Do You Have a Weather Question??

If you have a question you'd like to have answered, send an e-mail to:

sr-fwd.webmaster@noaa.gov

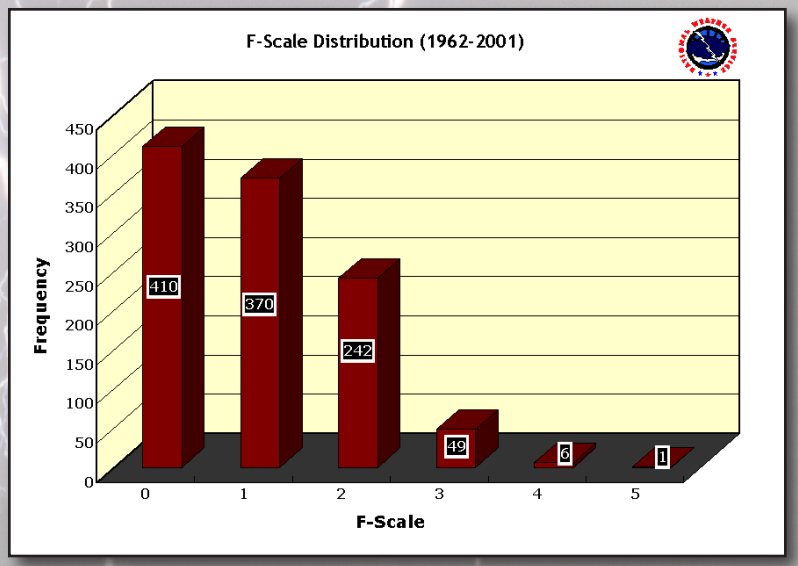
A meteorologist will answer your question as soon as possible. We might place your name and question in our next issue for Dr. Weather to answer.

Spring Tornadoes in North Texas

by Jessica Schultz

North Texans are familiar with all types of weather: extreme heat, winter storms, and severe weather. A tornado is one of the most violent and destructive forms of weather to roll across the South Central Plains. Tornadoes have occurred in every state in every month, but North Texans know that spring time is usually the prime time for severe weather.

For the area of North Texas served by NWS Fort Worth, a 40-year study of tornado climatology has shown that



Right: *F-Scale distribution of tornadoes across North Texas.*

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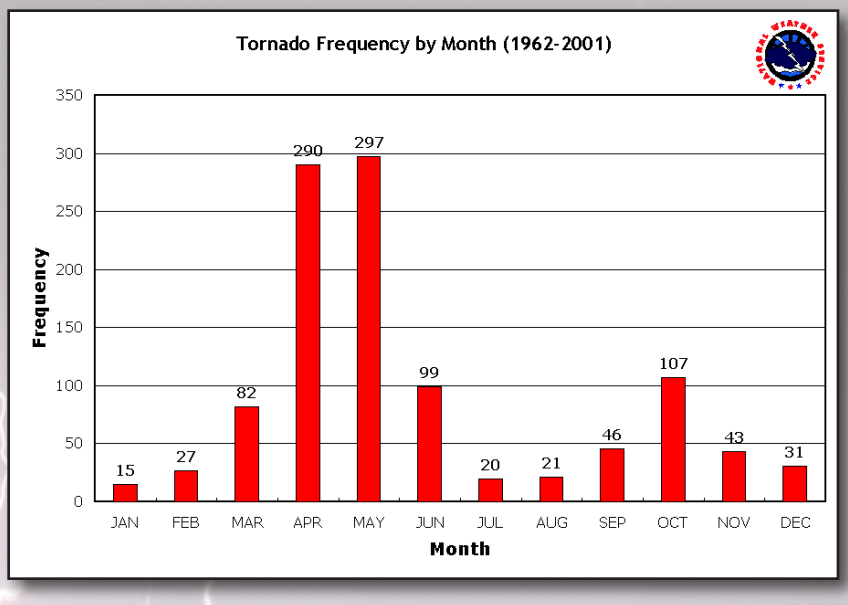
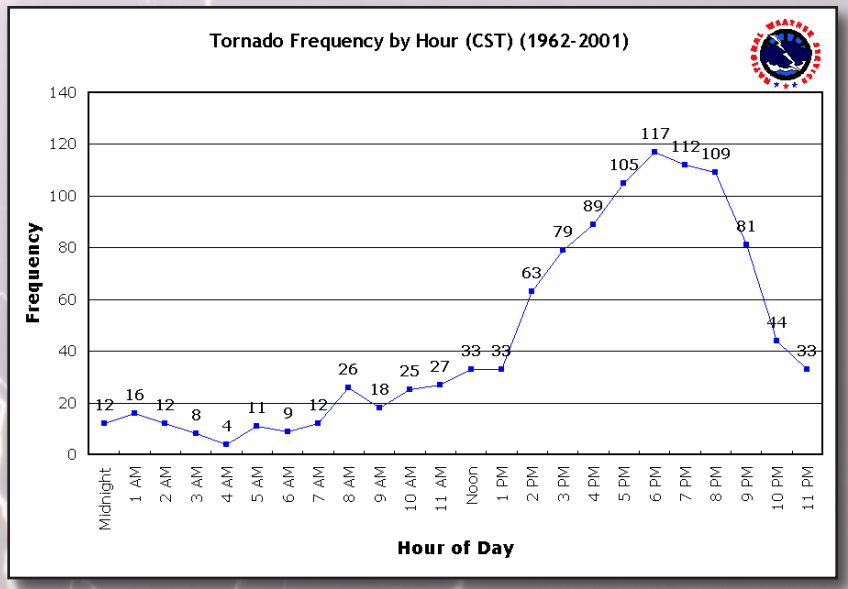
Spring Tornadoes (concluded)

most tornadoes occur in April and May. During these months, nearly 30% of all North Texas tornadoes are rated F2 or greater. However, strong and violent tornadoes are still quite rare. According to statistics, an F5 tornado will only occur about once every 40 years. Meanwhile, F0s, F1s, and even F2s are rather common across this part of the country.

Tornadoes have occurred at every time of the day, but the most common time is mid- afternoon through late evening, or about 3 pm to 9pm. During these hours, many people will be driving home from work, children will be leaving school, and spectators will be enjoying evening sporting events or other recreational activities. As a result, many people can be caught unaware of impending severe weather.

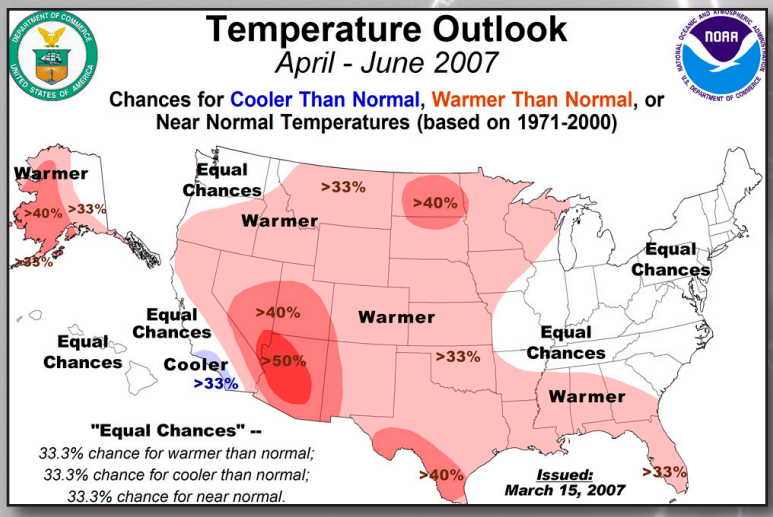
It is especially important to keep updated on weather forecasts, watches, and warnings. A NOAA weather radio, particularly one that is portable, is an excellent way to keep critical weather information on-hand. Commerical radio and television stations will also relay hazardous weather information from NWS Fort Worth to the public.

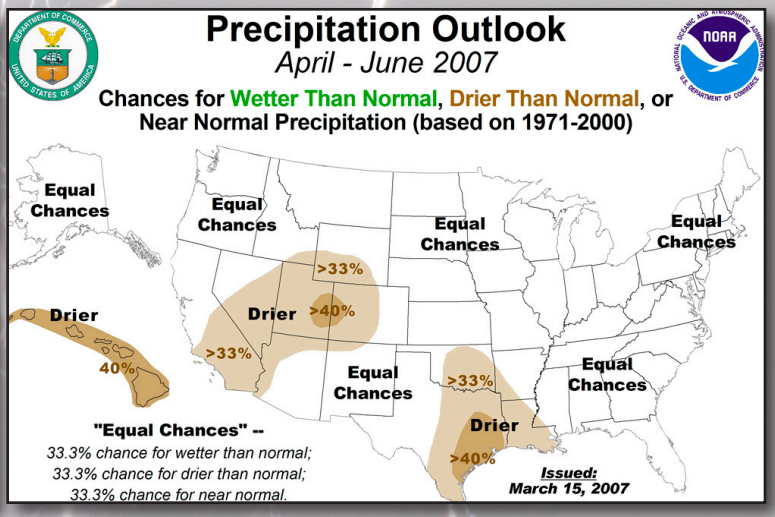




Top Right: *Tornado distribution by month across North Texas.* ***Bottom Right:*** *Tornado distribution by hour across North Texas. All graphs 1962-2001.*

Spring Temperature and Precipitation Outlooks Released

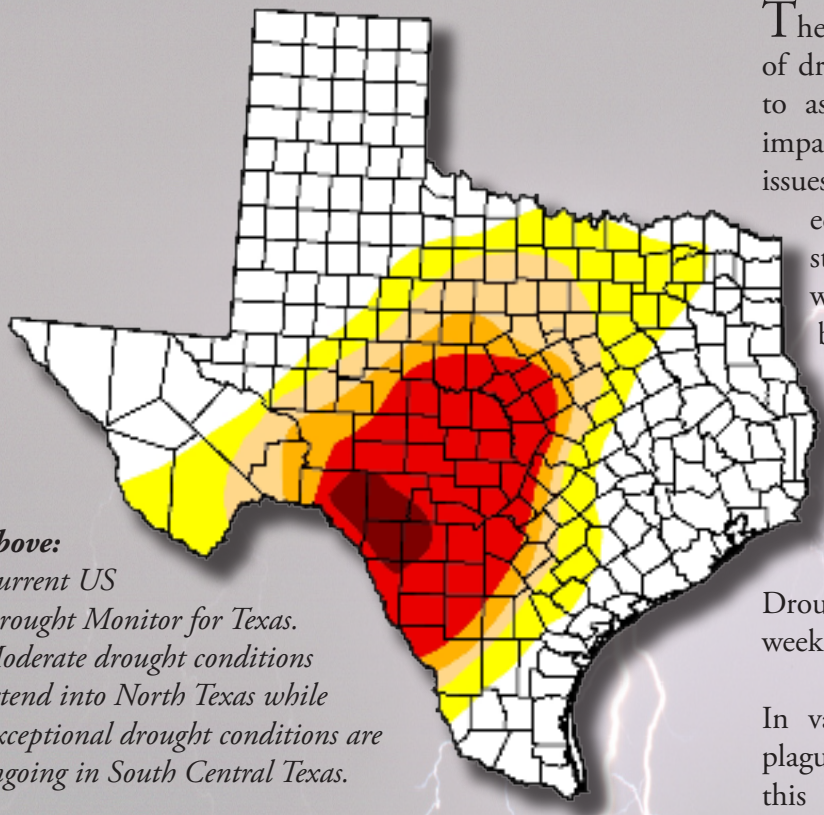




Top Left and Right: *The 2007 Spring climate outlook. There is a >33% chance of above normal temperatures and a >33% chance of drier than normal precipitation for the April-June time period.*

Drought Assessment and Mitigation

by Daniel Huckaby



Above: *Current US Drought Monitor for Texas. Moderate drought conditions extend into North Texas while Exceptional drought conditions are ongoing in South Central Texas.*

▶ **www.weather.gov/fortworth/drought.html**

The concept of drought may seem simple, but the onset of drought and its instantaneous severity are often difficult to assess. Drought severity is inherently linked to the impacts of drought. Such impacts include agricultural issues, hydrologic deficits, increased fire danger, and other economic and social consequences. To compile and standardize these impacts, the U.S. Drought Monitor was established to assess drought severity in a subjective but uniform manner. Since 1999, various agencies, including those within the U.S. Department of Agriculture (UDSA) and the National Oceanic and Atmospheric Administration (NOAA), have pooled their expertise with that of academia and other local interests to more accurately categorize drought. Incorporating the input of all these entities, the National Drought Mitigation Center (in Lincoln, Nebraska) issues a weekly assessment of drought impacts on a national scale.

In varying degrees of severity, drought conditions have plagued North Texas for over two years. Although this is the most significant drought of this length in a half-century, Texas is no stranger to drought. Multi-year droughts generally occur every couple of decades in Texas. Notable droughts of the 20th century include the 1930s Dust Bowl years and the benchmark drought of the 1950s. Paleoclimatology, including analysis of tree rings, has revealed past megadroughts that lasted for decades.

It is clear that drought is part of the natural climate cycle of North Texas, but never before has a population of the current size been faced with a drought of this magnitude. As the number of residents continues to rise, the stress on water resources will also increase. While we have no control over the amount of rainfall we receive, water conservation is one of the things we can do to mitigate the impacts of the drought. As the warm season approaches, be aware of local restrictions on outdoor watering. Avoid watering between 10 a.m. and 6 p.m. when evaporation limits its effectiveness. In addition, try to refrain from watering when rain is expected. These and other conservation methods will help maintain sufficient water resources throughout the upcoming Texas summer.

Cooperative Observer Snowfall Reports for January

Below is a list of all Co-op sites that reported snow during the month of January. These reports were taken from the B-91s that are collected at the end of each month. Thanks to all who reported this data! (All data in inches)

▶ Arlington	0.5	▶ Dublin 2SE	3.0	▶ Hico	1.3	▶ Meridian	0.5
▶ Bremond	Trace	▶ Fairfield 3W	Trace	▶ Hillsboro	0.5	▶ Morgan Mill	2.0
▶ Chalk Mountain	0.3	▶ Fort Worth NWS	0.8	▶ Honey Grove	Trace	▶ Stephenville 1N	2.5
▶ Cleburn	0.5	▶ Frisco	0.2	▶ Itasca	1.0	▶ Wills Point	0.5
▶ DeLeon	2.7	▶ Gainesville 5ENE	Trace	▶ Marlin	1.6	▶ Youngsport	Trace

Co-Op Corner

BY: JENNIFER DUNN

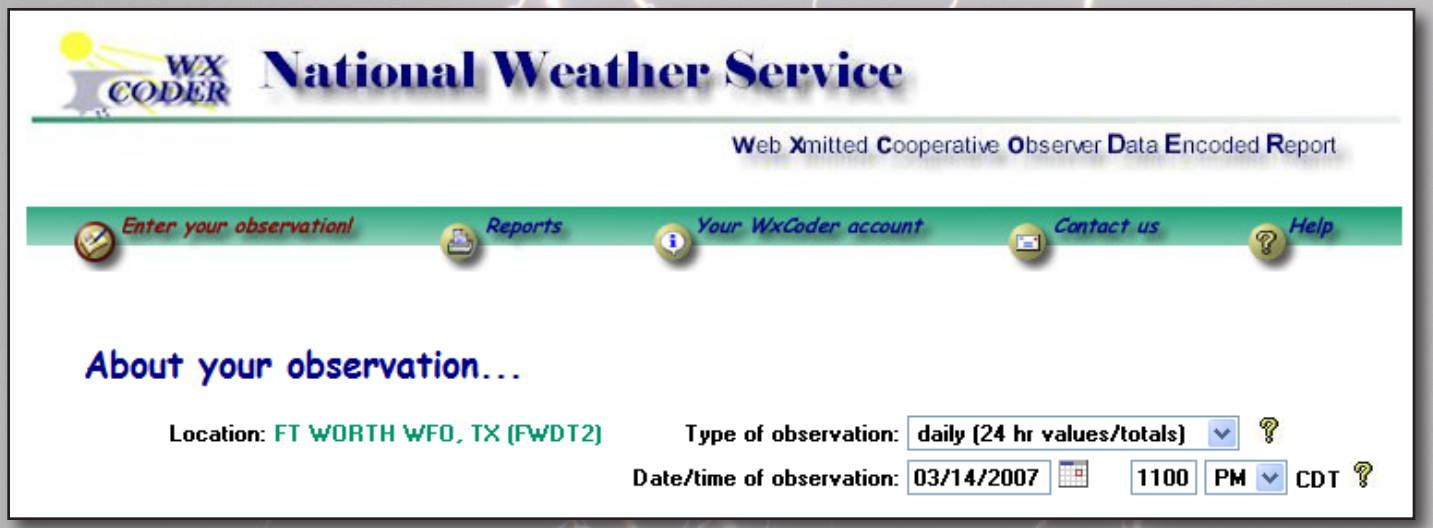
Hello Cooperative Weather Observers!

Check Out the Co-Op Observer Snowfall Totals on Page 9!

It's been a while since we've been able to put together a newsletter just for Co-ops, but we jumped at this opportunity to reach out to you and stay in touch! In this section, we will touch on different subjects each issue to keep you all up-to-date and informed of things that are happening within our Co-op program here in North Texas. We are also in the process of redesigning our Co-op webpage on the NWS Fort Worth website, so look for changes in the near future! Our hope with the new website is for it to be a central place for you to find answers to questions you may have about your equipment, reporting your observations, submit supply requests, learn more about the program, and find the latest co-op news.

In this first issue, we will be addressing a few topics about WxCoder for those who use the online system to submit their reports. There is one issue we want to address that has been a continuous problem with several sites: We ask that you please have an entry for every day of the month on your form by the time the end of the month comes around! Even if you record no precipitation on a certain day, you need to enter in a 0.00 (zero) amount. This helps our National Climate Data Center to know that there really was no measurable precipitation and that the information is not missing. The folks at this center work very hard to keep all of the records as complete and accurate as possible, so the more help we can give them, the better the data and records for your area will be! So please make sure to enter in an observation for every day!!!

On that note, there is one instruction we would like to walk through/refresh with you: entering in data for a previous day (or days). Let's say you have not entered in 0.00 (zero) precipitation for the past few days, and it has not rained. It is nearing the end of the month, and you want to go back and enter in the zeros to complete your form. You all are familiar with the screen that appears when you log into WxCoder. For right now, let's focus on the top part.



Above: *WxCoder Homepage.*

The only element that we are going to need to change is the "Date/time of observation". Since you have not previously entered in a report for these days, you are going to leave the "Type of observation" at "daily (24 hr values/totals)".

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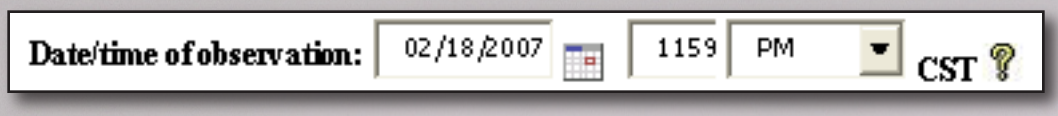
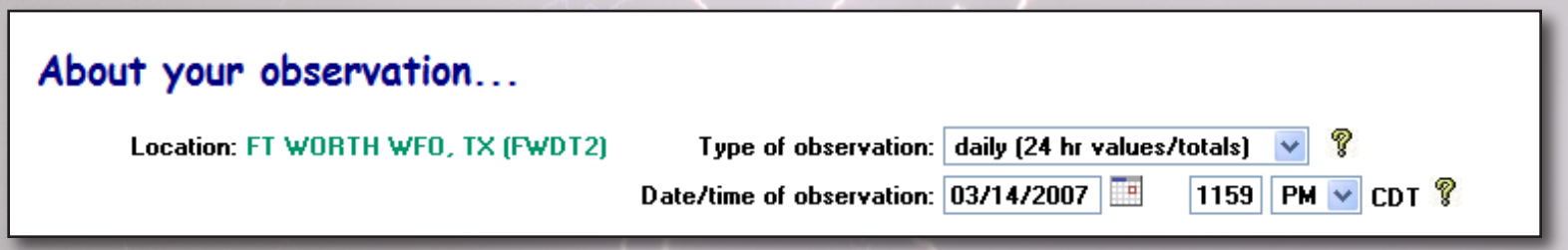
Co-Op Corner (continued)

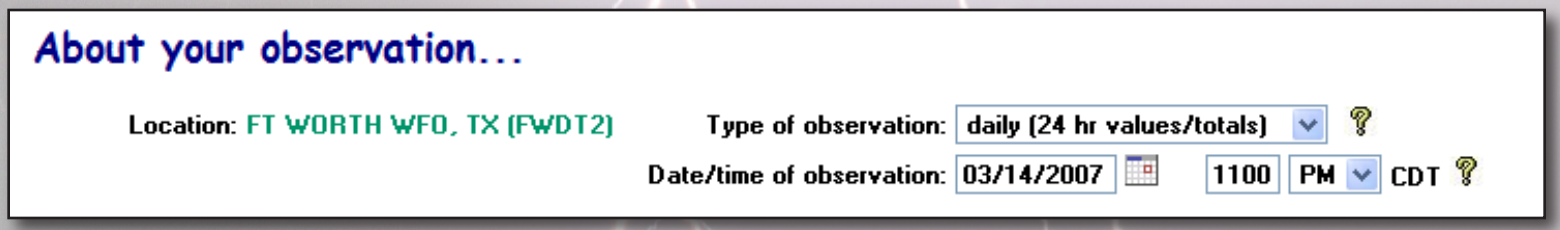
In order to change the date, click on the calendar symbol next to the current date:



This will pop up a calendar in a new window. Select the date you want to enter in data for by just clicking on the number of the day. The red highlighted day is the current day. You can also change the month or year by using the arrows at the top. Once you have selected the day, the calendar will disappear and you should note the date has changed in the window:



You have now successfully changed the date and can enter your observation like normal. If you took your observation at a time other than your regularly scheduled time, remember to change the time in the "Date/time of observation" element:



Once you have entered in your observation, click on the "Submit Data" button at the bottom, and you are done! If you need to enter in observations for several days, you will need to repeat the process for each day by changing the calendar day. You can return to the observation section by clicking on the "Enter your observation!" link in the upper left.

Thanks for your time and effort in fully completing the forms! If you have any questions, please feel free to send us an email or call!

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