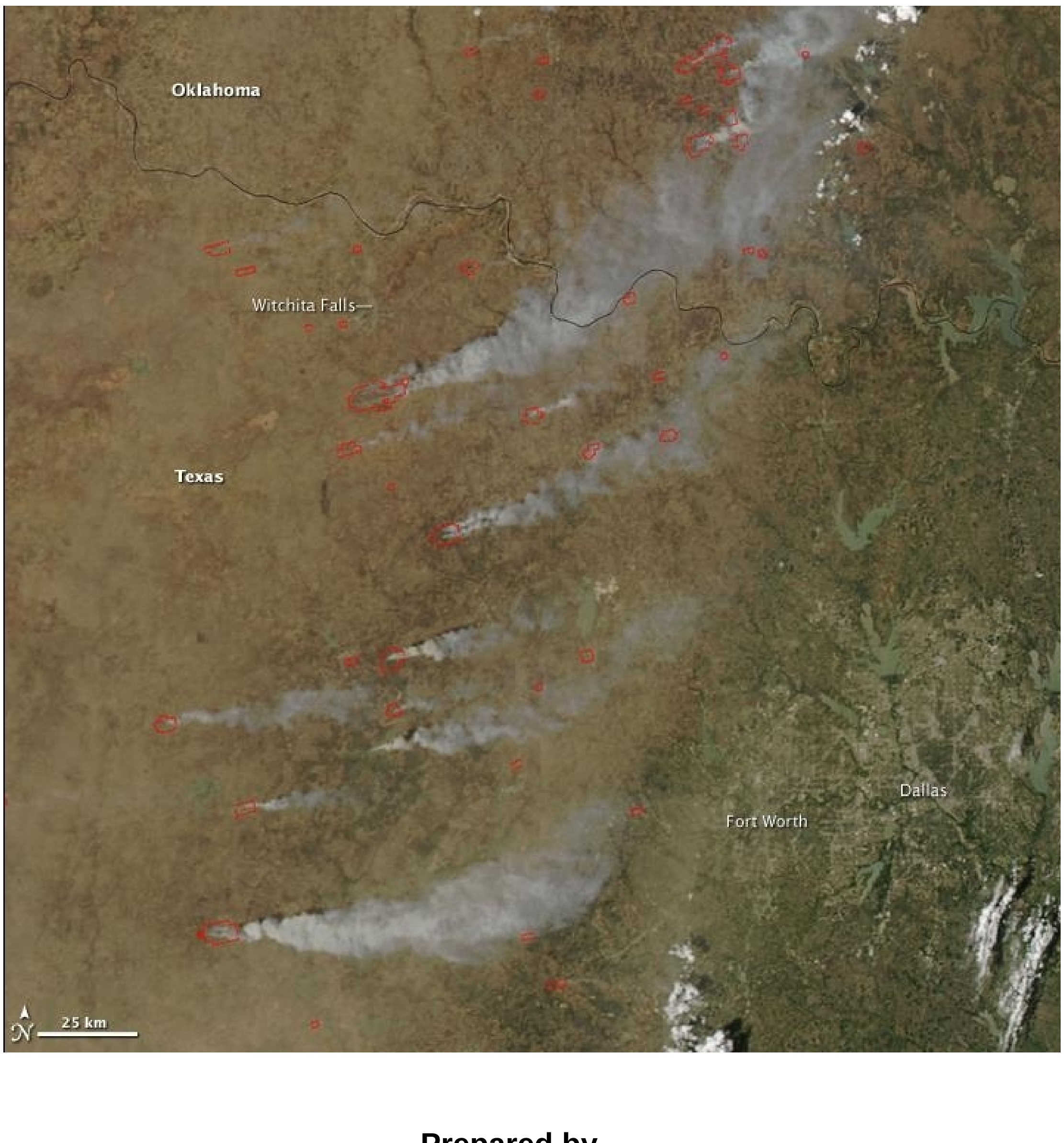
Overview of the April 9th, 2009 North Central Texas Wildfire Outbreak



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Fire Analyst II

Background and Purpose

On April 9th, 2009, fire weather and wildland fuel conditions combined to produce a regional wildland fire outbreak in north central Texas. The core of the outbreak stretched from Interstate 20 near the community of Cisco northward to the Red River near the community of St. Joe. There were 17 fires that started or escaped containment on the 9th that burned 147,924 acres. Numerous evacuations of homes, businesses, neighborhoods, and entire communities took place on this day emphasizing the destructive and disruptive potential of the individual wildland fires associated with a regional scale wildfire outbreak. Sadly there were four civilian fatalities associated with this wildfire outbreak. Property losses included 111 homes, along with numerous barns, outbuildings and vehicles. This is not the first wildfire outbreak to occur in Texas and it will not be the last. The regional wildland fire outbreak is a significant type of event that can adversely impact thousands of people in a matter of hours and can continue to impact those affected for months as they move through the rebuilding process. The purpose of this document is to present the combination of fire weather and fuel conditions that produced this wildland fire outbreak so that fire weather forecasters, wildland fire analysts and fire managers can better forecast significant wildland fire outbreaks in the future.

Wildland Fuels and Fuel Conditions

A primary consideration for wildland fuel condition is the state of herbaceous greenness. April is a transition month for herbaceous greenup in north central Texas. A combination of adequate soil moisture and warm temperatures are required to initiate and support active growth in the grasses. Both cured and transitional grasses were present on April 9th, but there were no significant areas of effective green grasses in the wildfire outbreak region.

1. **Effective Green;** Grasses provide an effective barrier or retardant to fire spread even in the presence of critical to extreme fire weather. The live to dead ratio is greater than 75% green.
2. **Transitional Green;** Grasses do not provide an effective barrier to fire spread in the presence of critical or extreme fire weather but rates of spread are slowed due to presence of some greenness. Live to dead ratio is between 20-75% green.
3. **Cured;** Fire spread is not affected by any greenness present in grass profile. Live to dead ratio is less than 20% green.

An assessment of the grasses in the outbreak area showed that grasses were cured in Clay, Montague, Archer, Wichita and Shackelford Counties. Grasses in Wise, Jack, Young, Stephens and Eastland were in transition from cured to green. Montague County grasses were mostly cured but grasses on the east side of the county were transitioning to green. The head of the Bellevue fire ran into grasses that were more representative of transitional grasses.

This picture looks across a burned pasture on the left flank of the Bellevue fire just east of Stoneburg. The slightly rolling terrain with a mixture of cured grasses, dormant mesquite and dormant oak outside of the burn is representative of the fuelscape on the western 2/3 of the Bellevue fire.

A closer look at the grass profile reveals the green of cool season grasses and weeds at the soil surface. The previous definition of cured grasses allows for the presence of up to 20% green in the live to dead ratio. This picture of cured grasses was taken on the right flank of the Bellevue fire just east of Stoneburg.

At right is an example of transitional grasses. This picture was taken on the left flank of the Breckenridge fire in Stephens County on April 9th. When exposed to extreme fire weather conditions the 50% green to dead ratio in these grasses could still produce rates of spread and fire intensities at the head of the fire that resisted containment efforts of the local resources.

Grass fuel loadings had an impact on the resultant fire behavior and overall fire growth. This was especially true in transitional green grasses where the grass fuel loading determined the live (green) to dead ratio. Short grass rangeland that had been heavily grazed had little dead thatch to carry significant fire spread. Fires that encountered these fuels lost momentum and intensities and were much less resistant to containment.

At left is a picture of a heavily grazed mesquite flat on the Cement Mountain fire in Young County. Light grass loadings increased the green to dead ratio in transitional grasses. The fire was able to move across the flat with 25-30mph 20 foot windspeeds but the lack of dead fuel loading decreased the fire intensities and momentum.

Another common mixture of wildland fuels in the north central Texas region includes a combination of grass, juniper and mesquite. The grass fuels generally determine the rate of spread and the juniper and mesquite brush fuels add intensity.

Here is a view of a common wildland fuel mix that includes grass, juniper and mesquite. The grasses shown here are normal load grasses that are transitioning to green. This picture was taken on the Cement Mountain fire in Jack and Young County.

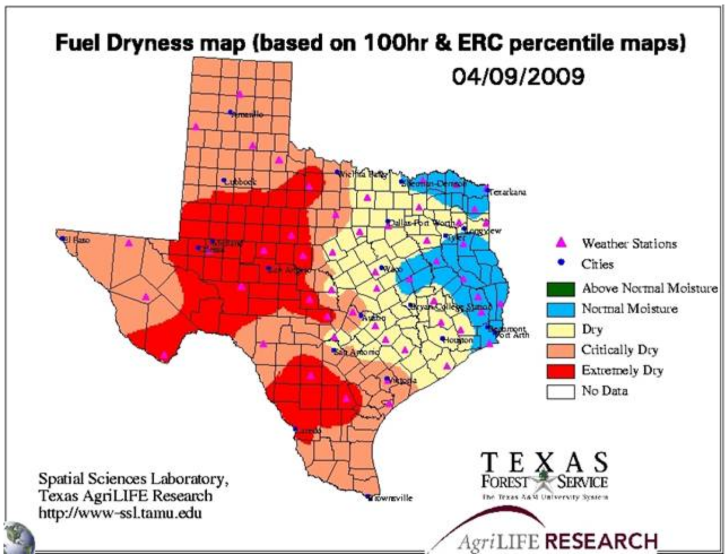
This picture of the grass, juniper, and mesquite mix was taken directly across the left flank perimeter from the previous picture that showed the same fuel mix unburned. There appears to have been enough moisture in the transitional grass and juniper canopies to prevent some of the juniper canopies from torching.

A majority of the April 9th fires contained timber fuels. The most common was the deciduous Post Oak timber fuels. The Post Oak fuels are generally found on hillsides and ridges where shallow soils are not conducive for grass or pasture production. This fuel type generated fire intensities that contributed significantly to property losses and increased the level of resistance to containment and control.

The picture above shows a representative stand of Post Oak. This picture was taken near the Cement Mt. fire in Jack County. This stand is in the early stages of leafing out. Some of the Post Oak stands in Montague County were still dormant. Notice the amount of sunlight penetrating the open canopy to the surface litter which drives daily fuel moistures lower.

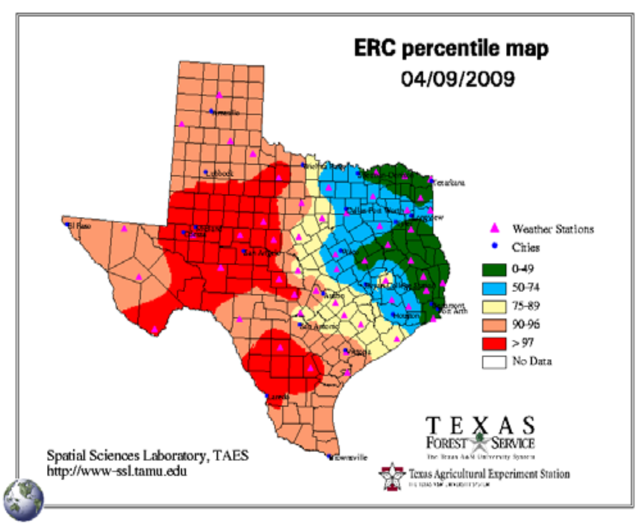
The Texas Forest Service relies on a number of National Fire Danger Rating System (NFDRS) based products to assess fuel conditions across the state. Several of these products (ERC, Fuel Dryness, 100FM, 100FM) use percentile rankings to provide an adjective description and thus relate the level of dryness in the selected index based on climatology. There is a document posted on the TFS Fuels and Fire Danger page http://ticc.tamu.edu/fuels.htm entitled **Firefighter's Guide to Percentiles and Thresholds** that provides information on interpreting percentile rankings for NFDRS indices.

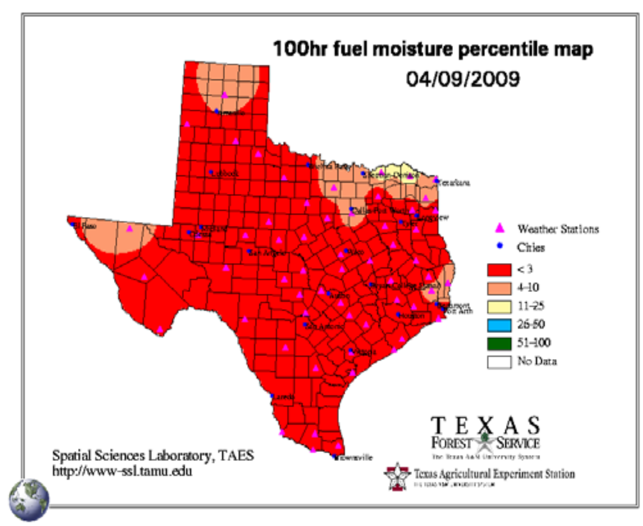
The following products provide a snapshot of fuel conditions on or prior to April 9th.



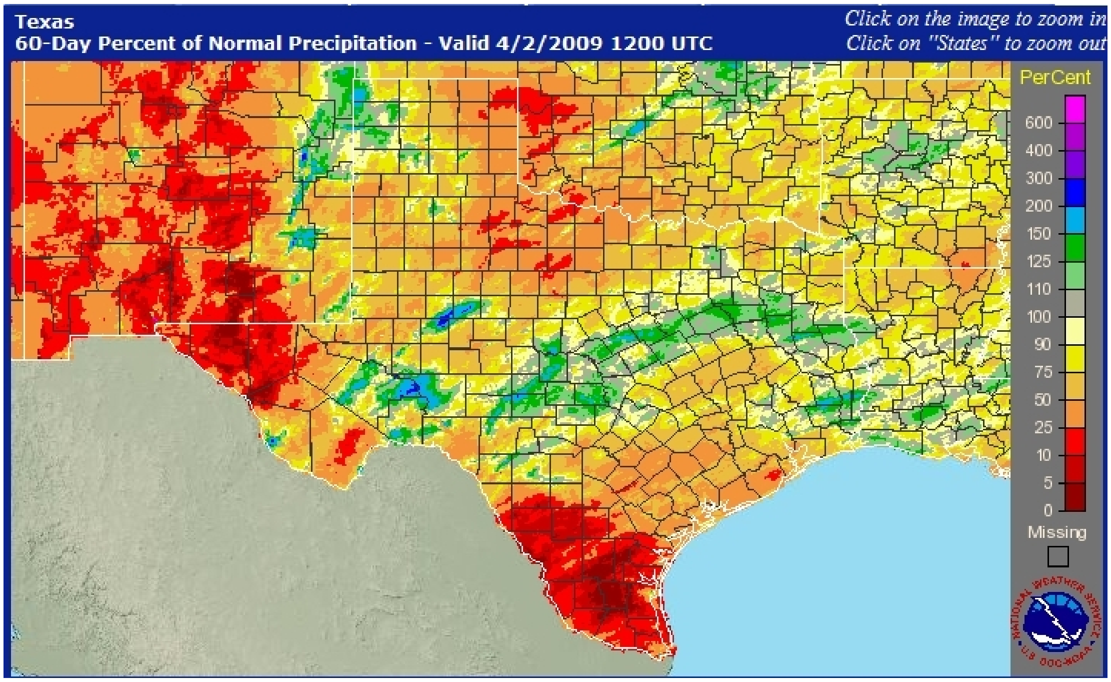
The Fuel Dryness map shows that over half of the state carried fuels that were critically or extremely dry. The north central Texas region was right on the transition of critically dry to dry fuels.

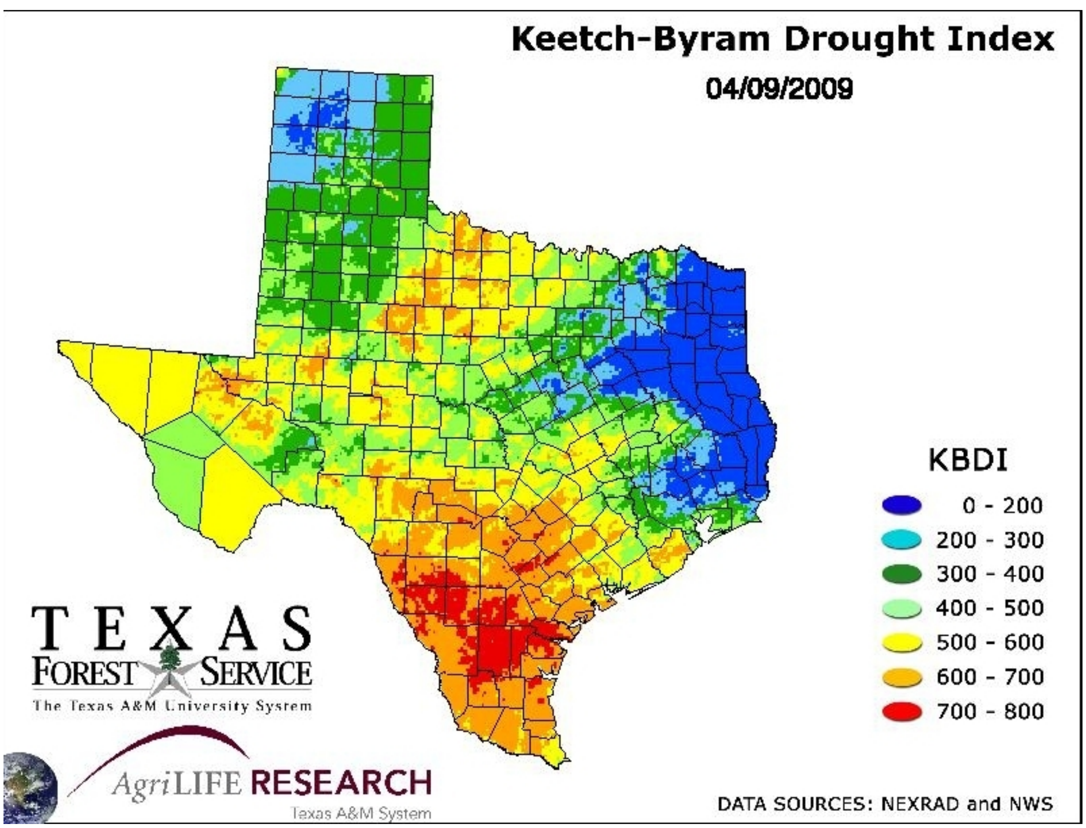
Below are the ERC and 100FM percentile maps which are the components of the Fuel Dryness Index map.



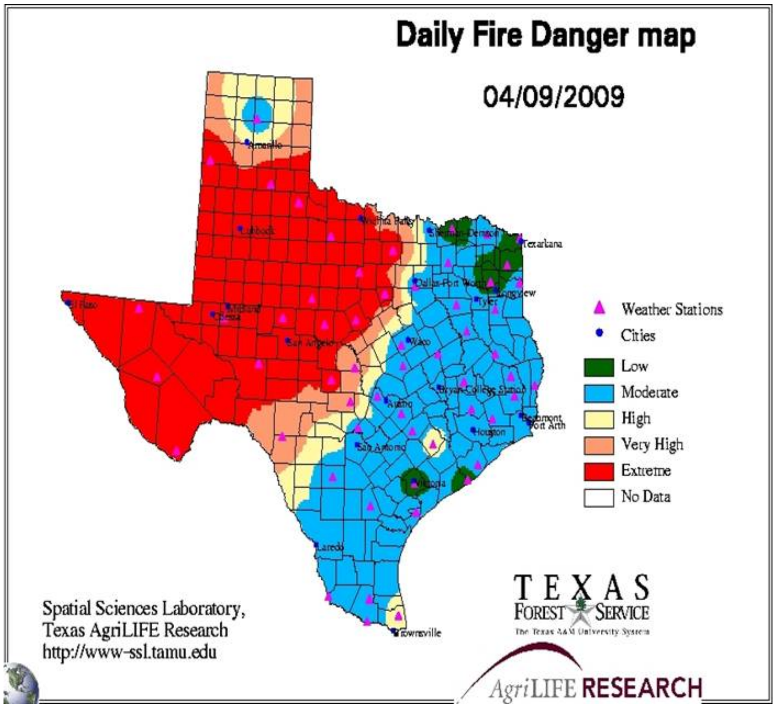


The 60 Day Percent of Normal Rainfall product (as captured on April 2nd) and the 4km KBDI product illustrate the expanding dryness in the Rolling Plains and North Central Texas regions.

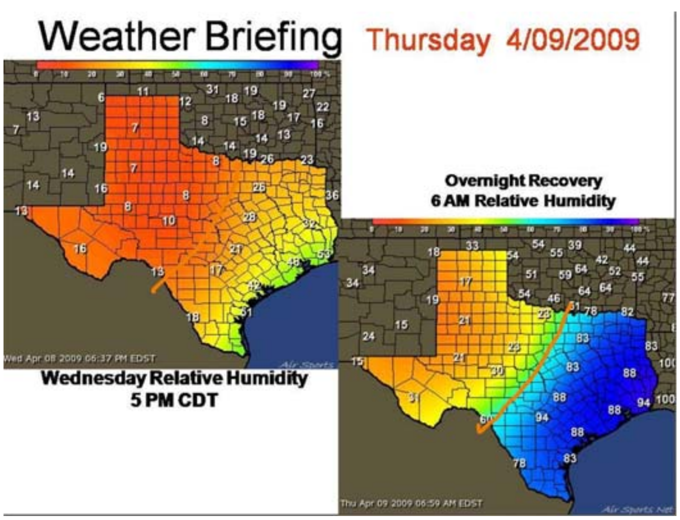


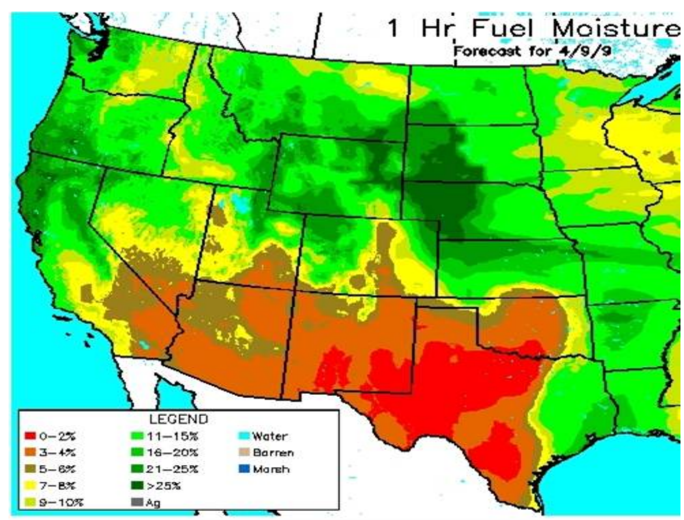


The Observed Fire Danger product below captures the distinct boundary created by the dry line or dew point frontal boundary present on April 9th.



The north central Texas region was entering into the second 24 hr period of dry conditions that pushed fine dead fuel moisture levels to the 2-3% level by 1200 hrs. Below are briefing graphics from the morning of April 9th to illustrate this. On the left is the observed minimum RH from the 8th and the 0600 observed RH on the 9th. On the right is the forecast 1-hr dead fuel moisture which is representative of the observed afternoon 1-hr on the 9th in north central Texas.





Wildland Fuel Summary

April is a transition month in north central Texas. Grass, brush and timber fuels are transitioning from dormant winter conditions to active growing season conditions. In general, fuels were cured in the northwest portion of the outbreak area and transitioned to green as you traveled southeast.

Grass fuels occupy the majority of the landscape in north central Texas. Grass fuel loading and herbaceous greenness are key considerations in this fuel type.

The grass, juniper, and mesquite fuel association (grass and brush) is a very common mix of wildland fuels in north central Texas. The herbaceous state of grasses and the grass fuel loading is a key consideration for this association. Another key consideration for this association is the live fuel moisture (LFM) content in juniper. The LFM content determines the probability of passive and active crowning in the juniper canopies.

Timber fuels are generally found along ridges and hillsides or other areas that are not suitable for grazing and grass production. Timber types include a variety of deciduous hardwoods with Post Oak being the most common. The presence of Post Oak is a key consideration. Post Oak is slower to transition to the growing season. Post Oak leaves are large and create a deeper litter layer. It is common to find persistent dead leaves in the canopy until new leaves appear.

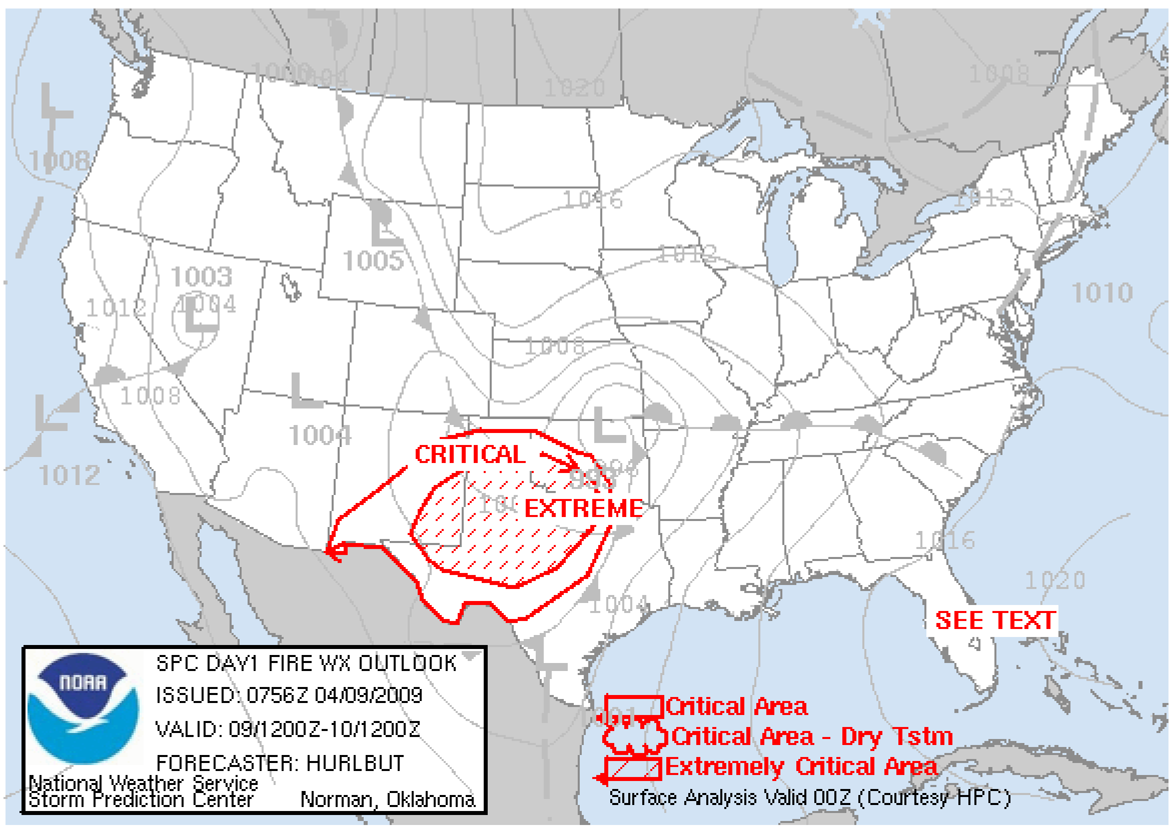
The National Drought Monitor showed that the north central Texas region moved from an abnormally dry rating on January 1st 2009 to a severe drought rating on April 7th. The 60 Day percent of normal rainfall for the region was generally less than 50% of normal. The NFDRS fuel dryness was ranked dry to critically dry and recent dryness as measured by the 100FM percentile rankings was extremely dry.

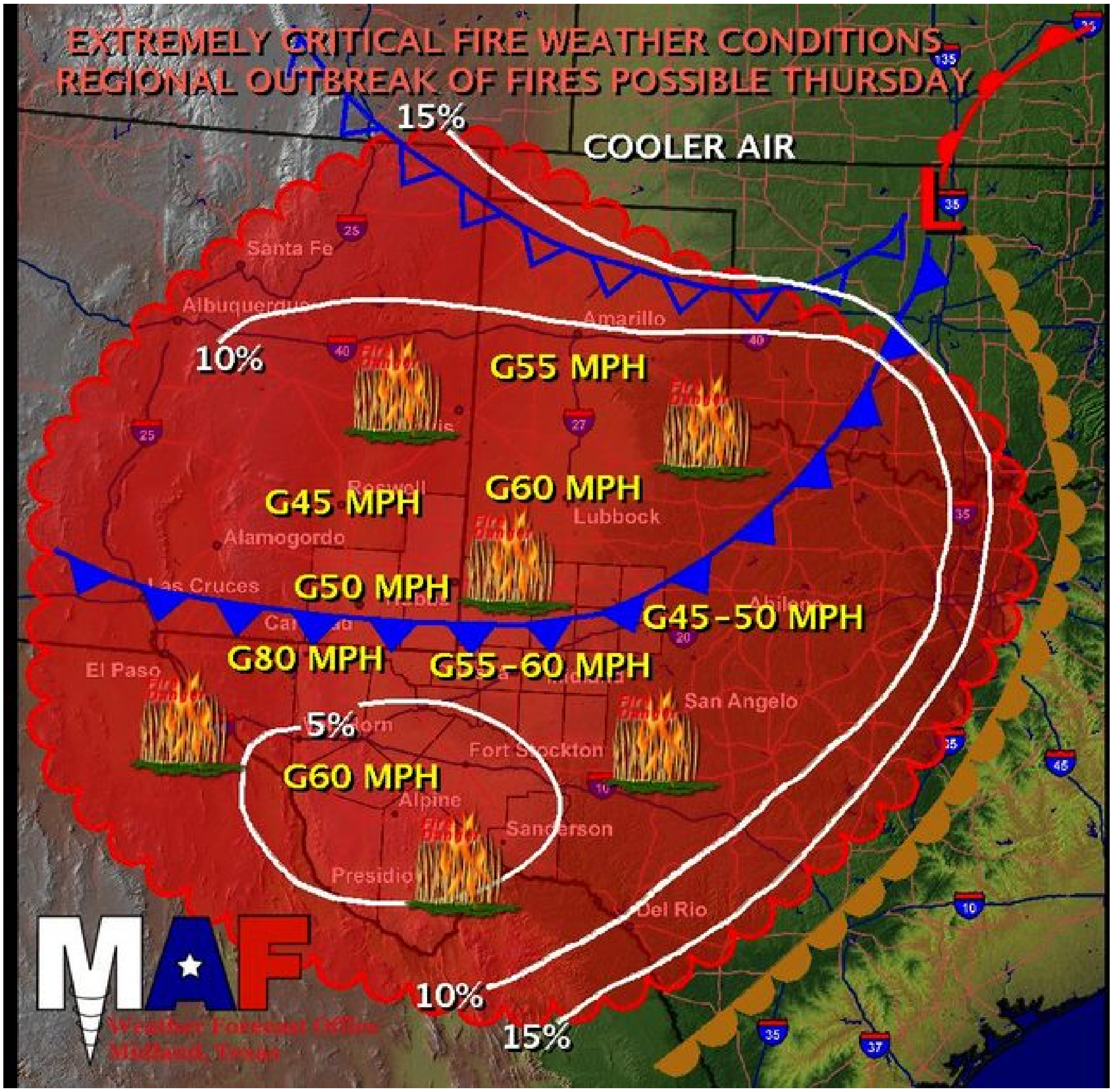
Fire Weather

The following overview of the fire weather for April 9th was written by Greg Murdoch. Greg is the lead fire weather forecaster for the National Weather Service in Midland and has been an IMET for at least ten years. Greg and other fire weather forecasters in Texas and Oklahoma have formed a working group that has been investigating the fire weather circumstances leading to regional wildland fire outbreaks. They have been conducting this investigation since 2006. Greg was working his normal job in April and saw this event unfold over a seven day period and was a keen observer on April 9th. His narrative starts on the next page.

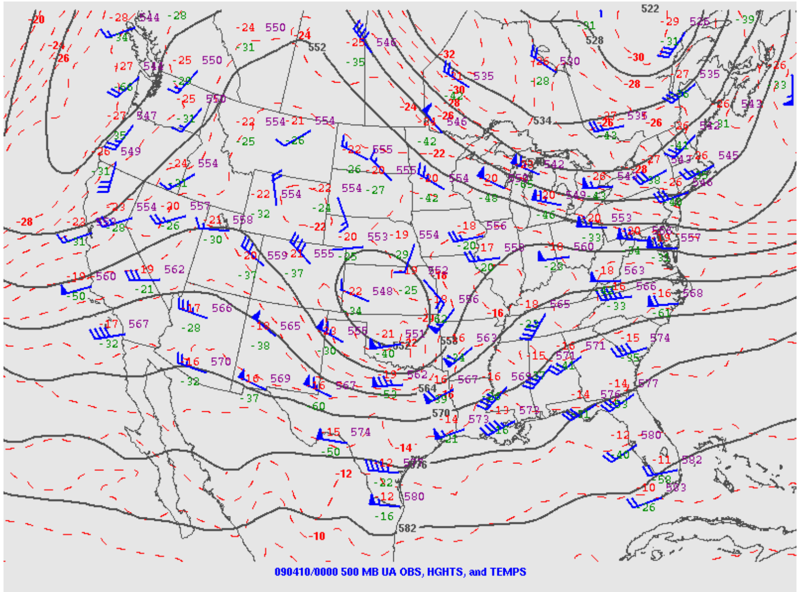
Fire Weather Overview
Greg Murdoch

Extremely critical fire weather developed April 9th as a powerful upper level low moved into the southern Plains. Warm and dry air was pre-positioned across west Texas and as the upper low moved east strong west winds developed early across west Texas and spread east into Low Rolling Plains and northern Texas by noon. This type of pattern has been identified as one that has been associated with Regional Outbreaks of Fires across the Southern Plains. On this day there was great concern due to the intensity of forecast weather, the duration of the extremely critical weather, and the shear size of the area that was forecast to be affected, and in fact some forecast called for a high probability of high impact fire weather. The weather associated with this system certainly was considered intense with gusts near 50 mph, single digit humidity, and high temperatures 10-15 degrees above normal. Typically Red Flag Warnings are characterized by a 2-3 hour period within the burning period however on Apr 9th there were Red Flag conditions of extended duration lasting 6-8 hours. Finally, extremely critical fire weather was forecast from the Panhandle south to parts of the Trans Pecos and extending east into north Texas and near the Hill Country.

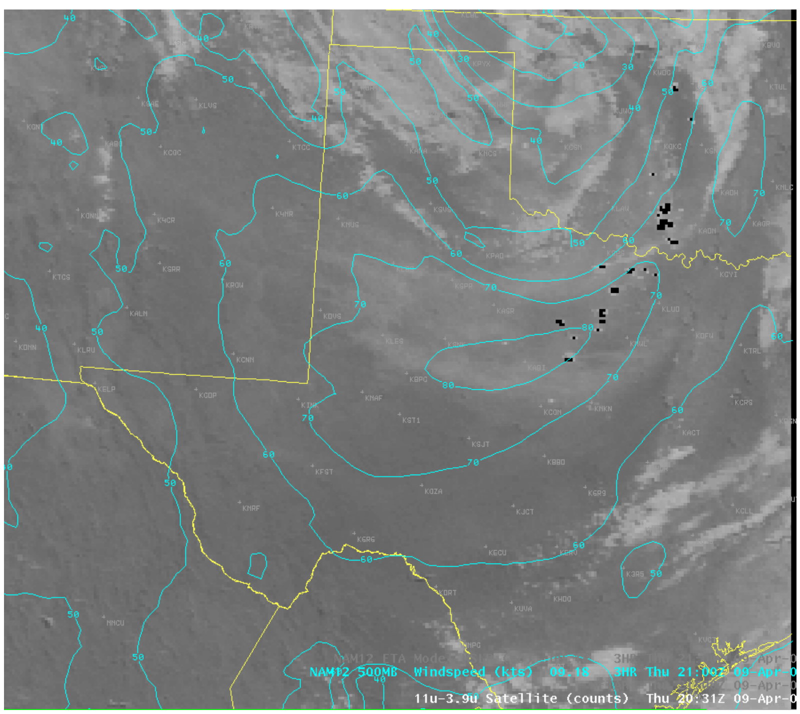




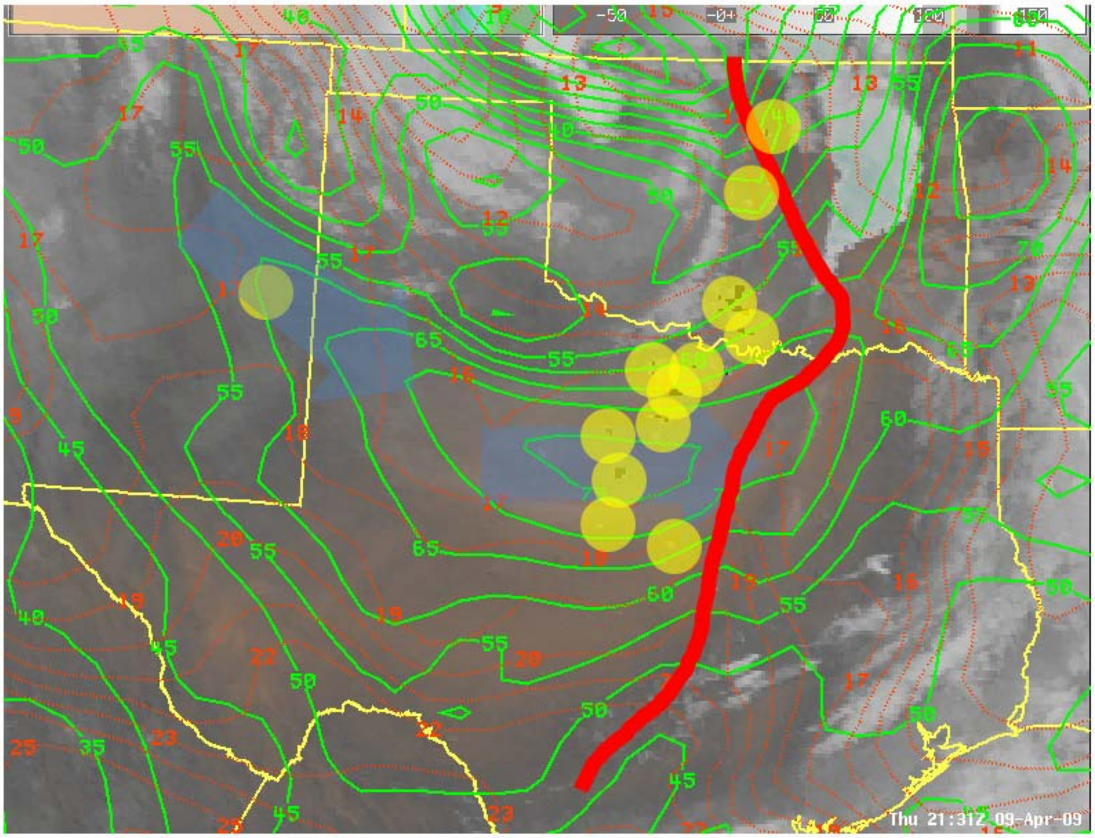
The above image is a graphical forecast image issued by the National Weather Service in Midland on Wednesday evening Apr 8th for Thursday Apr 9th highlighting the potential for a Regional Outbreak of fires.



The image above represent the mid level weather pattern about 18,000 feet above mean sea level. Of interest to fire weather forecasters are the position of the low along the Oklahoma-Kansas border and the strength of the wind field. It is interesting to note that the strongest wind in this image, 75 knots over Ft. Worth is in close proximity to where most fires occurred. This map represents the weather at 7 pm CDT Apr 9.
During these fires forecasters were able to do some real time analysis and where able to document where the fire developed with respect to a few weather features. The image below is an overlay of a satellite image that depicts the fires in black pixels and the wind field at 18,000 ft above mean sea level.



There is clear evidence that the fires occurred in close proximity to the mid level jet maximum. The whitish milky color from around Lubbock to Big Spring and east through Abilene is widespread blowing dust.



The image above is another satellite image showing the extent of the dry air in the upper levels of the atmosphere. Of most interest in this image are the red dotted lines and the heavy solid red line. These lines represent temperatures about 5000 feet above mean sea level. The fires shown here are within the yellow circles and are in close proximity to the warmest temperatures as depicted by the red dotted lines.

In summary the weather that occurred on April 9, 2009 is associated with Regional Outbreaks of fires across the southern Plains. The potential for these type of weather patterns are often identified days in advance by fire weather forecasters and research is ongoing within the National Weather Service to better establish and document not only these patterns but with the guidance of fuel assessment to identify target areas that are more likely to have fires.

End of Narrative

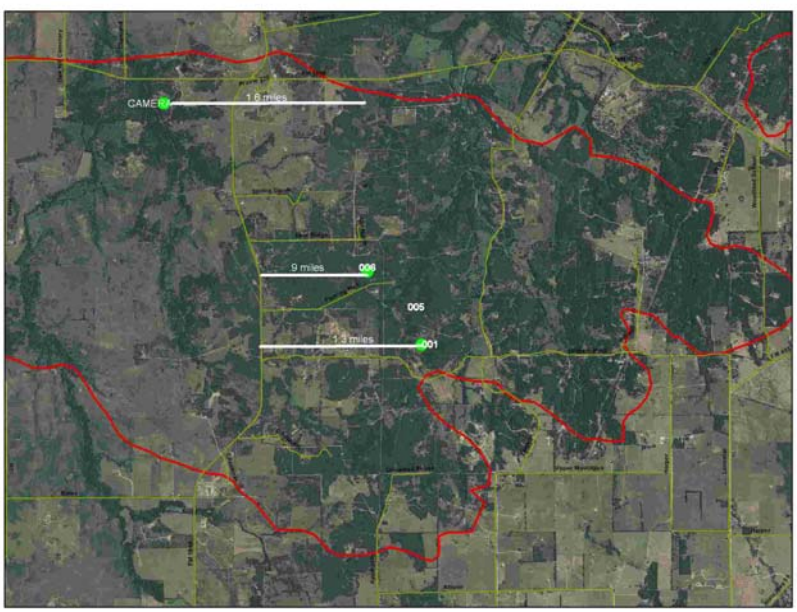
Additional weather data including hourly observations from RAWS and NWS weather stations can be found in attachments 1 and 2 respectively. Hourly surface map observations can be found in attachment 3.

The surface conditions on April 9th changed drastically as the dryline moved west to east. The dryline is a term used to describe the boundary between a warm moist maritime tropical airmass and a hot, dry, continental airmass. The hot, dry airmass will be west or behind the dryline. The moist airmass will be to the east of the dryline. The dryline is often associated with an upper level low pressure system. The dryline is a very sharp boundary with conditions changing quickly as it passes. The 1400 surface map in attachment 3 contains a good illustration. The LBJ RAWS is less than 10 miles away from the Decatur airport weather station. At 1400 hours LBJ observed RH at 9% and a temperature of 90 degrees. At the same time Decatur observed RH at 39% and a temperature of 81 degrees. The dryline was between the two observation sites. Peak surface fire weather conditions behind the dryline can be described by southwest to west sustained winds (20 foot) at 30 to 35mph with gusts to 40 to 45mph. The highest observed 20-foot winds were observed at the Miller Creek RAWS in Baylor County where sustained windspeed was observed at 36mph and the highest gust was 50mph. RH values behind the dryline ranged from 5 to 9%. The Hamby RAWS, The western most RAWS documented, observed these values for 10 hours. The eastern stations like LBJ and Denton saw these conditions for 5 to 6 hours. Maximum temperatures ranged from 83 degrees at Hamby to 91 degrees at Mineral Wells. The dryline passed Abilene about 1030 hours and was observed in Denton five hours later at 1525 hours.

Fire Behavior

Describing fire behavior on a regional scale is not a simple matter of stating rate of spread and flame length in a single fuel type. The outbreak wildland fires burned in multiple fuel types over a period of 8 to 12 hours under extreme to critical fire weather conditions. The significant fire behavior factors that became apparent after inspecting several of the fire areas and talking with firefighters involved in suppression on April 9th were the linear growth rates over multiple fuel types, fire intensities generated in dormant hardwood timber that could support active crowning, and the intensities that created significant spotting from dormant hardwood timber.

Adequate information and data were available to estimate the linear growth rate on two of the outbreak fires. The image below shows the location of several game trail cameras on the east end of the Bellevue Fire.



The images on these cameras were used to document the time the fire passed each location. Game camera 006 was used as the representative camera as it was closer to the center line of the fire spread.

The Bellevue fire started off Highway 287 between 1300 and 1330 hours on April 9th according to an after action report from the Bellevue fire department. The department was dispatched to the fire at 1330 hours. The images on game camera 006 show the passage of the fire front at 1706 hours. The approximate distance from ignition to the camera was 12.75 miles. The time it took the fire to travel this distance was approximately 3.5 to 4 hours. The estimated linear growth rate was 3.25 to 3.75 mph. The mix of fuels was estimated at 75% cured grass and 25% timber.

A similar look at the Breckenridge fire revealed that forward spread averaged about ½ mph in mostly transition grasses and mesquite brush. Suppression crews reported that the fire began around noon and that foreword progress was stopped around 1900 hours. The fire traveled 3.5 miles in 7 hours for an estimated linear growth rate of ½ mph.

These two examples capture the high end foreword spread that occurred on the 9th and the low end foreword spread that occurred on the 9th. The significant difference was fuel composition and herbaceous greenness in the grasses.

It is interesting to compare the surface rate of spread outputs from a number of Behave Plus fuel model selections to see if any of the modeled spread rates match the observed spread rates from the Bellevue or Breckenridge fires. Below are the inputs used and outputs produced from a Behave Plus 3.0.2 Surface modeling run.

Modules: SURFACE		
Description		
Fuel/Vegetation, Surface/Understory		
Fuel Model		1, 2, 3, 5, 6, gr2, gr3, gr4
Fuel/Vegetation, Overstory		
Canopy Cover	percent	0
Canopy Height	ft	
Crown Ratio		
Fuel Moisture		
1-h Moisture	percent	3
10-h Moisture	percent	5
100-h Moisture	percent	7
Live Herbaceous Moisture	percent	30,60,90,100
Live Woody Moisture	percent	100
Weather		
20-ft Wind Speed (upslope)	mi/h	30
Terrain		
Slope Steepness	percent	0

The inputs (above) include representative fire weather and fuel moistures as described in previous sections. Input variables include nine fuel models (six original and three standard fuel models) and live herbaceous moisture. The rate of spread outputs are below.

Fuel Model	Live Herbaceous Moisture percent			
	30	60	90	100
1	5.6	5.6	5.6	5.6
2	2.8	2.5	2.2	2.1
3	6.9	6.9	6.9	6.9
5	1.2	1.2	1.2	1.2
6	2.0	2.0	2.0	2.0
gr2	2.5	1.6	0.7	0.0
gr3	3.5	2.1	0.9	0.6
gr4	6.1	3.9	1.8	0.8

The standard fuel model gr3 appears to most closely match the observed average rate of foreword growth on the Bellevue and Breckenridge fires. 30% herbaceous moisture (considered cured) produced a linear growth rate of 3½ mph which matches the observed rate for the Bellevue fire. 100% herbaceous moisture in fuel model gr3 is the closest to matching the observed linear growth rate on the Breckenridge fire. This is a small sample but it looks worthy to investigate the use of standard fuel model gr3 to model foreword linear growth rates on landscape scale fires that cross multiple fuel types in north central Texas

Several of the fires showed evidence of active crown fire in dormant hardwood timber. The predominant species in this timber fuel was Post Oak (*Quercus stellata).* Active crown fire in dormant Post Oak, even with the extreme fire weather that was present on April 9th, would not be an expected fire behavior. No eye-witness accounts of this behavior were available so comments are based on post fire observations. Most crown fire models consider four components that determine whether or not timber stands will support passive or active crown fire. These factors include surface fire intensity, canopy base height, foliar moisture and canopy bulk density. Below is an illustration from a slide used in the advanced fire behavior course (S-490).

As the illustration suggests we generally associate crown fire with trees that have needles or leaves. Dormant hardwood timber is generally not considered capable of supporting active crown fire. One possible explanation is that the Post Oak forest may react more like a dormant hardwood brush fuel when exposed to an enhanced fire environment such as experienced on April 9th.

This picture was taken on the Bellevue fire on April 15th. It appears that there was active crown fire in the dormant hardwood timber on the ridge in the top of the picture. The average tree height is between 30 and 35 foot. The crowns grow close together and contain a high percentage of fine branching. There were remnant dead leaves on some of the trees and some were beginning to produce new leaves and buds.

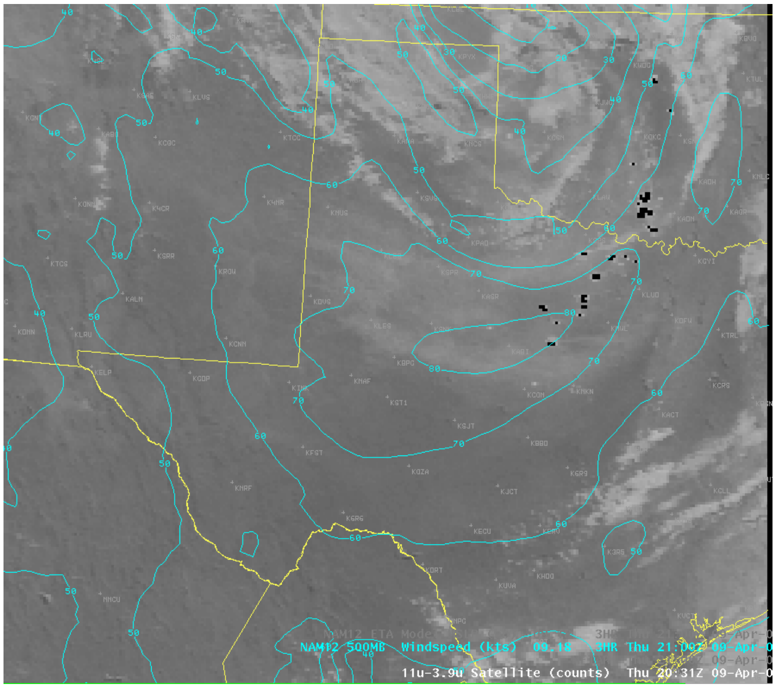
This picture is a close up view of the hardwood crowns that shows the amount of fine branching. If you look closely, you can see some of the persistent dead leaves.

Here is another example of active crown fire in mostly dormant hardwood. This was taken on the Cement mountain fire in Jack County. The leaf out on the hardwood was further along here than on the Bellevue fire. The wind direction and slope were also in alignment here which helped to produce the active crown fire.

This picture is representative of the closed canopy Post Oak forests that supported active crown fire in north central Texas. The surface litter is a fluffy leaf litter 1-2 inches deep with a moderate amount of dead branch wood. The understory contains hardwood regeneration like the hickory in the foreground. At first glance there does not appear to be enough surface fuel and understory ladder fuel to transition the surface fire to the crowns. The crown fuel loading also appears too light to support active crown fire.

Here is an uphill (less than 30% slope) crown run that was exposed to the wind. It is hard to tell post-fire but there appears to have been a significant amount of hardwood regeneration in the understory. This picture was taken on the Bellevue fire.

The extreme fire behavior was limited primarily to areas with either cured grass fuels where the rate of spread exceeded 3 mph or in the timber fuels that had a large component of Post Oak where active crown fire occurred.



The image above was used earlier in the fire weather section. It is shown here again because the upper air dynamic was a key to the significant fire occurrence on April 9th. This image depicts the windspeed of the mid-level jet that occurs about 18,000 feet above sea level. It is also referred to as the 500 mb height winds. The significant fires of April 9th occurred along the same axis as where the maximum mid-level jet windspeeds occurred. Before the NWS meteorologists documented the upper air dynamics it was difficult to explain the location of the significant fire occurrence. These locations did not have the driest fuel conditions. Just one or two counties to the west the Fuel Dryness was 1 to 2 rankings higher at the extremely dry level. Observed surface weather to the west of the outbreak area was just as severe as the weather observed where the significant fires occurred. So the big question was why did the fires occur this far to the east and not back to the west where fuel conditions were drier.

Some initial speculation suggested that the fire occurrence was related to the proximity of the population centers of the Dallas-Ft. Worth metroplex. There may be more infrastructures such as roads and power lines due to the proximity to the metroplex but population in the counties where the fires occurred was not that high. The highest county population was Wichita at 127,300. The lowest was Jack County at 8,800. Montague County has 19,700, Young County 17,500, and Clay County 10,900. In comparison, Taylor County has 126,800 and Midland County has 129,500. The significant fire occurrence also spread into Oklahoma along the same axis crossing various population densities. It is possible that there were a few more significant fires due to the increased infrastructures in proximity to the Dallas-Ft. Worth metroplex but it is difficult to make the case that all of the significant fire occurrence was due to population density.

The National Weather Service (NWS) offices in west Texas have been studying the fire weather patterns that produce regional scale outbreaks of wildland fires for two years. From this study, they have developed a composite map that depicts the “ingredients” required for outbreak occurrence. It appears that the upper level atmospheric conditions as outlined by Greg Murdoch in the fire weather section are key to the location of the significant fire occurrence on April 9th. The position of the 500 height maximum wind speeds as it relates to the fire locations and the proximity and alignment of the 850 height thermal ridge to the axis of the 500 height speed max are the key “ingredients” responsible for the fire locations. These same upper air dynamics most likely provide an enhancement to the surface fire weather environment that supported active crown fire in dormant hardwood timber which is a very rare occurrence.

Summary

There is a combination of fire weather and fuel conditions that combine to produce regional wildland fire outbreaks such as witnessed in north central Texas on April 9th 2009.The west Texas working group of the National Weather Service has developed a composite map that details the fire weather set up that consistently produces significant fire occurrence on a regional scale. With each new outbreak the forecasting skills are improving. The legacy of the April 9th outbreak may be that we are better able to narrow or quantify the area of higher risk for significant fire occurrence based on upper level air features like the 500 height speed max and the 850 height thermal ridge. When compared to the years of research and effort to understand the upper air dynamics that produce severe weather and tornados, we have barely scratched the surface of understanding the upper air dynamics that enhance the surface fire environment and contribute to regional wildland fire outbreaks.

A special thanks to those who contributed their time, expertise and insights to the preparation of this report.

Don Hannemann	TFS College Station
Joe Harris	NWS Ft. Worth
Greg Murdoch	NWS Midland
Karen Ridenour	TFS Bastrop
Bill Spencer	TFS Lufkin
Tom Spencer	TFS College Station

Attachment 1

RAWS Hourly Observations

1. Hamby 419401

ID = HBYT2	TMP °F	DWP °F	RELH %	SKNT mp	GUST mp	DRCT °	QFLG	SOLR W/r	PREC in	FT °F	FM gm	PEAK mp	PDIR °
4-10-2009 5:03 CDT	49	28.6	45	7	12	4	OK	0	1.79	46	4	12	16
4-10-2009 4:03 CDT	52	27.2	38	6	13	354	OK	0	1.79	47	4	13	359
4-10-2009 3:03 CDT	53	23.9	32	3	12	354	OK	0	1.79	46	4	12	18
4-10-2009 2:03 CDT	57	20.6	24	8	12	10	OK	0	1.79	53	4	12	4
4-10-2009 1:03 CDT	58	16	19	3	11	19	OK	0	1.79	46	4	11	7
4-10-2009 0:03 CDT	64	12.2	13	6	15	353	OK	0	1.79	58	3	15	331
4-9-2009 23:03 CDT	62	16.7	17	7	9	225	OK	0	1.79	58	3	9	186
4-9-2009 22:03 CDT	66	13.8	13	7	10	239	OK	0	1.79	61	3	10	253
4-9-2009 21:03 CDT	71	9.4	9	8	18	261	Caution	1	1.79	66	3	18	264
4-9-2009 20:03 CDT	75	6.8	7	13	29	273	Caution	71	1.79	72	3	29	272
4-9-2009 19:03 CDT	78	9	7	21	31	276	Caution	299	1.79	80	3	31	268
4-9-2009 18:03 CDT	80	10.4	7	21	32	282	Caution	527	1.79	87	3	32	288
4-9-2009 17:03 CDT	81	3.7	5	22	35	280	Caution	738	1.79	90	3	35	279
4-9-2009 16:03 CDT	81	7.7	6	23	36	276	Caution	901	1.79	91	3	36	283
4-9-2009 15:03 CDT	80	7	6	26	40	274	OK	1005	1.79	90	3	40	248
4-9-2009 14:03 CDT	80	13.4	8	27	40	276	OK	868	1.79	90	4	40	270
4-9-2009 13:03 CDT	79	12.7	8	27	44	260	OK	869	1.79	88	4	44	276
4-9-2009 12:03 CDT	80	16.1	9	33	44	264	OK	879	1.79	88	4	44	257
4-9-2009 11:03 CDT	83	32.2	16	30	41	270	OK	749	1.79	90	5	41	270
4-9-2009 10:03 CDT	79	44	29	16	26	235	OK	420	1.79	85	5	26	227
4-9-2009 9:03 CDT	73	43	34	16	23	209	OK	249	1.79	78	5	23	203
4-9-2009 8:03 CDT	69	37.1	31	15	21	211	OK	16	1.79	67	5	21	215
4-9-2009 7:03 CDT	71	35.3	27	17	24	209	OK	0	1.79	70	5	24	201
4-9-2009 6:03 CDT	72	33.2	24	14	22	198	OK	0	1.79	71	4	22	204
4-9-2009 5:03 CDT	75	31.2	20	16	29	204	OK	0	1.79	73	4	29	188
4-9-2009 4:03 CDT	78	32.4	19	21	32	201	OK	0	1.79	76	4	32	190
4-9-2009 3:03 CDT	76	30.8	19	19	28	215	OK	0	1.79	74	4	28	207
4-9-2009 2:03 CDT	73	28.3	19	14	20	207	OK	0	1.79	71	4	20	211
4-9-2009 1:03 CDT	74	26.4	17	12	21	199	OK	0	1.79	71	4	21	203
4-9-2009 0:03 CDT	76	28	17	13	20	203	OK	0	1.79	73	4	20	209

2. Miller Creek 419301

ID = MCBT2	TMP °F	DWP °F	RELH %	SKNT mph	GUST mph	DRCT °	QFLG	PREC in	FT °F	FM gm	PEAK mph	PDIR °
4-10-2009 5:05 GMT	62	20.5	20	10	17	338	OK	4.56	57	4	17	344
4-10-2009 4:05 GMT	65	25.2	22	10	16	335	OK	4.56	59	4	16	331
4-10-2009 3:05 GMT	64	20.9	19	6	15	343	OK	4.56	57	3	15	342
4-10-2009 2:05 GMT	66	19.9	17	4	6	335	OK	4.56	54	3	6	345
4-10-2009 1:05 GMT	71	19.4	14	3	16	334	OK	4.56	62	3	16	341
4-10-2009 0:05 GMT	78	23.2	13	13	30	311	OK	4.56	81	3	30	319
4-9-2009 23:05 GMT	81	21.5	11	18	47	311	OK	4.56	89	3	47	301
4-9-2009 22:05 GMT	82	8.4	6	30	47	282	Caution	4.56	89	3	47	268
4-9-2009 21:05 GMT	82	11.9	7	31	49	266	Caution	4.56	89	3	49	262
4-9-2009 20:05 GMT	81	16.9	9	35	49	269	Caution	4.56	89	3	49	260
4-9-2009 19:05 GMT	80	10.4	7	36	49	265	OK	4.56	88	3	49	274
4-9-2009 18:05 GMT	81	16.9	9	30	47	268	OK	4.56	90	3	47	262
4-9-2009 17:05 GMT	83	9.2	6	29	51	251	OK	4.56	91	3	51	258
4-9-2009 16:05 GMT	83	20.8	10	36	50	261	OK	4.56	90	4	50	261
4-9-2009 15:05 GMT	83	35.1	18	30	42	266	OK	4.56	89	4	42	263
4-9-2009 14:05 GMT	80	37.7	22	18	25	239	OK	4.56	84	4	25	235
4-9-2009 13:05 GMT	74	37.9	27	13	21	213	OK	4.56	71	5	21	202
4-9-2009 12:05 GMT	75	37.8	26	14	21	202	OK	4.56	73	4	21	204
4-9-2009 11:05 GMT	75	37.8	26	12	18	201	OK	4.56	73	4	18	203
4-9-2009 10:05 GMT	78	37.2	23	14	21	209	OK	4.56	76	4	21	211
4-9-2009 9:05 GMT	77	32.8	20	16	23	218	OK	4.56	75	4	23	210
4-9-2009 8:05 GMT	74	33.8	23	15	21	205	OK	4.56	71	4	21	200
4-9-2009 7:05 GMT	74	30.4	20	12	18	209	OK	4.56	72	4	18	203
4-9-2009 6:05 GMT	69	29.7	23	9	12	200	OK	4.56	66	4	12	199
4-9-2009 5:05 GMT	70	30.5	23	7	13	201	OK	4.56	66	4	13	171
4-9-2009 4:05 GMT	72	26.2	18	5	10	189	OK	4.56	66	4	10	179
4-9-2009 3:05 GMT	77	27.4	16	9	12	170	OK	4.56	74	4	12	164
4-9-2009 2:05 GMT	75	31.2	20	6	8	169	OK	4.56	71	3	8	165
4-9-2009 1:05 GMT	80	28.2	15	6	11	184	OK	4.56	74	3	11	197
4-9-2009 0:05 GMT	88	22.1	9	9	19	210	OK	4.56	86	3	19	219

3. Commanche 419403

4-10-2009 5:10 CDT	56	30.8	38	16	22	341	Caution	0	48.9	54	5	22	337
4-10-2009 4:10 CDT	57	25.9	30	9	14	343	Caution	0	48.9	53	5	14	330
4-10-2009 3:10 CDT	61	20.8	21	11	19	348	Caution	0	48.9	57	5	19	331
4-10-2009 2:10 CDT	63	14.6	15	9	20	314	Caution	0	48.9	58	5	20	326
4-10-2009 1:10 CDT	69	14.3	12	13	20	314	Caution	0	48.9	65	5	20	293
4-10-2009 0:10 CDT	70	15.1	12	11	14	247	Caution	0	48.9	65	5	14	250
4-9-2009 23:10 CDT	68	13.5	12	10	12	240	Caution	0	48.9	63	5	12	248
4-9-2009 22:10 CDT	70	13.1	11	10	12	242	Caution	0	48.9	64	5	12	241
4-9-2009 21:10 CDT	72	12.5	10	9	11	242	Caution	0	48.9	65	5	11	241
4-9-2009 20:10 CDT	76	7.5	7	9	20	260	Caution	33	48.9	71	5	20	263
4-9-2009 19:10 CDT	80	7	6	15	31	271	Caution	174	48.9	79	5	31	277
4-9-2009 18:10 CDT	83	9.2	6	22	32	275	OK	369	48.9	85	5	32	270
4-9-2009 17:10 CDT	84	13.3	7	22	36	273	OK	557	48.9	89	5	36	249
4-9-2009 16:10 CDT	85	14.1	7	22	44	269	OK	759	48.9	93	5	44	239
4-9-2009 15:10 CDT	85	14.1	7	23	44	265	OK	900	48.9	95	5	44	263
4-9-2009 14:10 CDT	87	26.1	11	28	40	271	OK	946	48.9	98	5	40	282
4-9-2009 13:10 CDT	89	38.5	17	28	41	266	OK	920	48.9	100	6	41	266
4-9-2009 12:10 CDT	86	50.9	30	24	37	252	OK	793	48.9	97	6	37	258
4-9-2009 11:10 CDT	80	57.9	47	11	19	225	OK	678	48.9	92	6	19	205
4-9-2009 10:10 CDT	73	58.7	61	13	18	195	OK	408	48.9	80	7	18	192
4-9-2009 9:10 CDT	69	56.7	65	5	19	207	OK	99	48.9	73	6	19	203
4-9-2009 8:10 CDT	67	55.3	66	5	16	161	OK	11	48.9	67	6	16	189
4-9-2009 7:10 CDT	68	54.9	63	14	19	189	OK	0	48.9	67	6	19	201
4-9-2009 6:10 CDT	68	54	61	13	20	202	OK	0	48.9	67	6	20	212
4-9-2009 5:10 CDT	69	54.1	59	14	24	211	OK	0	48.9	67	6	24	206
4-9-2009 4:10 CDT	69	53.6	58	16	26	213	OK	0	48.9	68	6	26	206
4-9-2009 3:10 CDT	69	52.6	56	17	26	197	OK	0	48.9	68	5	26	197
4-9-2009 2:10 CDT	70	48.8	47	18	29	188	OK	0	48.9	69	5	29	188
4-9-2009 1:10 CDT	72	42.1	34	17	25	188	OK	0	48.9	70	5	25	183
4-9-2009 0:10 CDT	74	40.6	30	15	22	186	OK	0	48.9	72	5	22	187

4. Possum Kingdom 419402

ID = PKLT2	TMP °F	DWP °F	RELH %	SKNT mpl	GUST mp	DRCT °	QFLG	SOLR W/r	PREC in	FT °F	FM gm	PEAK mpl	PDIR °
4-10-2009 5:05 CDT	52	32.4	47	10	16	338	OK	0	0	48	4	16	347
4-10-2009 4:05 CDT	54	31.4	42	8	15	338	OK	0	0	50	3	15	338
4-10-2009 3:05 CDT	57	29.6	35	8	14	317	OK	0	0	52	4	14	348
4-10-2009 2:05 CDT	59	25.9	28	6	12	323	OK	0	0	52	4	12	292
4-10-2009 1:05 CDT	63	21.3	20	7	13	323	OK	0	0	56	4	13	343
4-10-2009 0:05 CDT	64	22.1	20	4	9	335	OK	0	0	53	3	9	334
4-9-2009 23:05 CDT	65	20.5	18	3	6	332	OK	0	0	50	3	6	335
4-9-2009 22:05 CDT	66	21.3	18	2	5	338	Caution	0	0	53	3	5	336
4-9-2009 21:05 CDT	71	15.8	12	2	12	267	Caution	0	0	59	3	12	261
4-9-2009 20:05 CDT	77	11.2	8	7	21	263	Caution	36	0	72	3	21	286
4-9-2009 19:05 CDT	80	7	6	9	31	264	Caution	188	0	80	3	31	273
4-9-2009 18:05 CDT	82	4.4	5	15	30	267	Caution	408	0	88	3	30	300
4-9-2009 17:05 CDT	83	9.2	6	13	34	272	Caution	613	0	94	3	34	248
4-9-2009 16:05 CDT	83	9.2	6	19	33	276	OK	725	0	93	3	33	285
4-9-2009 15:05 CDT	83	9.2	6	17	31	250	OK	843	0	96	4	31	277
4-9-2009 14:05 CDT	86	11.3	6	15	33	254	OK	855	0	99	4	33	251
4-9-2009 13:05 CDT	86	20.6	9	22	39	252	OK	851	0	99	4	39	240
4-9-2009 12:05 CDT	89	31.8	13	15	32	247	OK	778	0	102	4	32	253
4-9-2009 11:05 CDT	86	41.5	21	13	24	229	OK	604	0	100	4	24	233
4-9-2009 10:05 CDT	79	47.4	33	9	18	199	OK	175	0	85	4	18	198
4-9-2009 9:05 CDT	74	43.8	34	9	18	194	OK	49	0	74	4	18	189
4-9-2009 8:05 CDT	74	40.6	30	11	22	206	OK	6	0	73	4	22	201
4-9-2009 7:05 CDT	74	37.9	27	11	23	202	OK	0	0	73	4	23	198
4-9-2009 6:05 CDT	75	37.8	26	11	21	208	OK	0	0	73	4	21	179
4-9-2009 5:05 CDT	73	39.7	30	10	20	202	OK	0	0	71	4	20	194
4-9-2009 4:05 CDT	72	40.5	32	12	22	194	OK	0	0	69	4	22	215
4-9-2009 3:05 CDT	72	38	29	10	19	189	OK	0	0	69	4	19	209
4-9-2009 2:05 CDT	73	37	27	11	19	182	OK	0	0	70	4	19	182
4-9-2009 1:05 CDT	74	36.9	26	9	17	190	OK	0	0	70	4	17	165
4-9-2009 0:05 CDT	75	38.7	27	10	19	181	OK	0	0	71	4	19	176

5. Granbury 419702

ID = GRYT2	TMP °F	DWP °F	RELH %	SKNT mpl	GUST mp	DRCT °	QFLG	SOLR W/r	PREC in	FT °F	FM gm	PEAK mpl	PDIR °
4-10-2009 5:03 CDT	56	33.2	42	17	31	332	OK	0	16.08	54	5	31	357
4-10-2009 4:03 CDT	59	31.4	35	10	14	327	OK	0	16.08	56	5	14	328
4-10-2009 3:03 CDT	59	25.9	28	6	10	313	OK	0	16.08	53	5	10	311
4-10-2009 2:03 CDT	61	24	24	7	9	310	OK	0	16.08	56	5	9	310
4-10-2009 1:03 CDT	65	24.1	21	5	9	312	OK	0	16.08	57	5	9	268
4-10-2009 0:03 CDT	68	18.6	15	5	13	286	OK	0	16.08	59	5	13	289
4-9-2009 23:03 CDT	67	20.8	17	5	13	273	Caution	0	16.08	62	5	13	4
4-9-2009 22:03 CDT	71	17.7	13	8	11	224	Caution	0	16.08	67	5	11	217
4-9-2009 21:03 CDT	72	16.6	12	6	11	218	Caution	0	16.08	67	5	11	266
4-9-2009 20:03 CDT	78	11.9	8	10	17	267	Caution	36	16.08	74	5	17	277
4-9-2009 19:03 CDT	82	14.9	8	13	24	269	Caution	181	16.08	80	5	24	282
4-9-2009 18:03 CDT	83	12.6	7	16	32	275	OK	418	16.08	86	5	32	280
4-9-2009 17:03 CDT	86	11.3	6	23	34	258	OK	669	16.08	91	6	34	270
4-9-2009 16:03 CDT	87	12	6	22	37	274	OK	781	16.08	94	6	37	238
4-9-2009 15:03 CDT	89	17	7	25	40	268	OK	966	16.08	98	7	40	289
4-9-2009 14:03 CDT	90	34.4	14	24	32	280	OK	251	16.08	100	7	32	277
4-9-2009 13:03 CDT	82	59.8	47	15	21	168	OK	928	16.08	97	8	21	177
4-9-2009 12:03 CDT	75	61.1	62	14	21	179	OK	554	16.08	90	9	21	180
4-9-2009 11:03 CDT	69	60.4	74	12	17	168	OK	246	16.08	75	10	17	170
4-9-2009 10:03 CDT	68	61.6	80	9	24	145	OK	126	16.08	72	10	24	161
4-9-2009 9:03 CDT	66	58.9	78	10	14	145	OK	29	16.08	66	10	14	166
4-9-2009 8:03 CDT	66	58.6	77	5	12	156	OK	6	16.08	65	9	12	155
4-9-2009 7:03 CDT	67	58.1	73	11	17	160	OK	0	16.08	66	8	17	146
4-9-2009 6:03 CDT	67	57.7	72	9	16	166	OK	0	16.08	66	8	16	167
4-9-2009 5:03 CDT	67	56.5	69	5	16	156	OK	0	16.08	65	7	16	142
4-9-2009 4:03 CDT	68	55.8	65	10	18	168	OK	0	16.08	66	7	18	181
4-9-2009 3:03 CDT	70	55	59	12	19	177	OK	0	16.08	67	6	19	181
4-9-2009 2:03 CDT	71	54	55	14	23	180	OK	0	16.08	69	6	23	186
4-9-2009 1:03 CDT	72	48.9	44	13	20	174	OK	0	16.08	69	6	20	184
4-9-2009 0:03 CDT	72	45.7	39	11	14	160	OK	0	16.08	68	6	14	156

6. LBJ Grasslands 419601

ID = LBJT2	TMP °F	DWP °F	RELH %	SKNT mph	GUST mph	DRCT °	QFLG	SOLR W/m*m	PREC in	FT °F	FM gm	PEAK mph	PDIR °
4-10-2009 5:02 CDT	51	34	52	11	21	325	OK	0	4.23	49	6	21	301
4-10-2009 4:02 CDT	54	34.8	48	9	17	327	OK	0	4.23	51	6	17	287
4-10-2009 3:02 CDT	57	34.7	43	9	18	320	OK	0	4.23	54	6	18	302
4-10-2009 2:02 CDT	60	30.1	32	6	12	290	OK	0	4.23	56	6	12	289
4-10-2009 1:02 CDT	62	27.6	27	5	11	306	OK	0	4.23	57	6	11	319
4-10-2009 0:02 CDT	61	22.9	23	2	7	305	OK	0	4.23	53	6	7	322
4-9-2009 23:02 CDT	65	25.2	22	4	8	320	OK	0	4.23	59	6	8	314
4-9-2009 22:02 CDT	68	24.2	19	3	5	271	OK	0	4.23	60	6	5	292
4-9-2009 21:02 CDT	71	24	17	3	14	279	Caution	0	4.23	64	6	14	312
4-9-2009 20:02 CDT	76	23.4	14	9	21	310	Caution	42	4.23	72	6	21	301
4-9-2009 19:02 CDT	80	7	6	11	25	266	Caution	213	4.23	80	6	25	251
4-9-2009 18:02 CDT	83	12.6	7	13	32	262	Caution	474	4.23	86	6	32	256
4-9-2009 17:02 CDT	84	13.3	7	13	29	250	Caution	607	4.23	91	6	29	247
4-9-2009 16:02 CDT	85	10.6	6	18	34	234	OK	765	4.23	91	7	34	245
4-9-2009 15:02 CDT	86	11.3	6	18	33	240	OK	704	4.23	94	7	33	245
4-9-2009 14:02 CDT	90	23.6	9	16	30	236	OK	434	4.23	98	8	30	231
4-9-2009 13:02 CDT	79	58.7	50	14	25	154	OK	834	4.23	90	8	25	165
4-9-2009 12:02 CDT	74	59.2	60	16	26	161	OK	722	4.23	84	8	26	186
4-9-2009 11:02 CDT	66	58.2	76	16	24	164	OK	157	4.23	68	10	24	161
4-9-2009 10:02 CDT	67	57.7	72	12	18	159	OK	105	4.23	68	9	18	136
4-9-2009 9:02 CDT	66	56.3	71	13	19	152	OK	41	4.23	66	8	19	137
4-9-2009 8:02 CDT	66	56.3	71	11	19	153	OK	9	4.23	65	8	19	122
4-9-2009 7:02 CDT	69	53.1	57	10	20	140	OK	0	4.23	67	8	20	148
4-9-2009 6:02 CDT	65	54.6	69	8	13	141	OK	0	4.23	64	7	13	139
4-9-2009 5:02 CDT	67	54	63	6	14	159	OK	0	4.23	65	7	14	179
4-9-2009 4:02 CDT	68	53.6	60	10	21	167	OK	0	4.23	65	7	21	173
4-9-2009 3:02 CDT	68	51.7	56	10	20	168	OK	0	4.23	65	6	20	167
4-9-2009 2:02 CDT	69	48.5	48	11	20	166	OK	0	4.23	66	6	20	166
4-9-2009 1:02 CDT	70	47.1	44	13	23	155	OK	0	4.23	67	6	23	150
4-9-2009 0:02 CDT	71	46.1	41	12	20	153	OK	0	4.23	68	6	20	165

Attachment 2

NWS Hourly Observations

1. Decatur

ID = KLUD	TMP °F	DWP °F	RELH %	SKNT mpl	GUST mp	DRCT °	QFLG	ALTI in	WNUM	VSBY mil
4-10-2009 0:05 CDT	64.4	20.8	19	7		290	OK	29.71	clear	10
4-9-2009 23:45 CDT	64.6	21.2	19	6		280	OK	29.7	clear	10
4-9-2009 23:25 CDT	65.5	21.4	18	7		280	OK	29.69	clear	10
4-9-2009 23:05 CDT	66.2	21.7	18	7		290	OK	29.68	clear	10
4-9-2009 22:45 CDT	66	23	19	5		290	OK	29.67	clear	10
4-9-2009 22:25 CDT	67.6	22.1	18	6		260	OK	29.65	clear	10
4-9-2009 22:05 CDT	67.5	22.8	18	6		250	Caution	29.64	clear	10
4-9-2009 21:45 CDT	69.4	21.7	16	6		240	Caution	29.62	clear	10
4-9-2009 21:25 CDT	70.5	21	15	6		230	Caution	29.61	clear	10
4-9-2009 21:05 CDT	70.3	21.4	16	5		220	Caution	29.6	clear	10
4-9-2009 20:45 CDT	71.6	21.2	15	5		280	Caution	29.59	clear	10
4-9-2009 20:25 CDT	73.2	20.7	14	7		300	Caution	29.58	clear	10
4-9-2009 20:05 CDT	74.3	20.5	13	9	18	300	Caution	29.58	clear	10
4-9-2009 19:45 CDT	75.9	20.1	12	17	21	300	Caution	29.57	clear	7
4-9-2009 19:25 CDT	78.3	14.3	9	13	24	290	Caution	29.56	clear	7
4-9-2009 19:05 CDT	79.7	10.2	7	15	26	270	Caution	29.55	clear	7
4-9-2009 18:25 CDT	80.8	10.8	7	21	35	260	Caution	29.54	clear	7
4-9-2009 18:05 CDT	81.5	12.4	7	24	33	250	Caution	29.54	clear	7
4-9-2009 17:45 CDT	81.7	10.8	7	26	44	250	Caution	29.53	clear	7
4-9-2009 17:25 CDT	82	12.6	7	31	44	260	OK	29.53	clear	7
4-9-2009 17:05 CDT	81.3	12.9	7	21	41	260	OK	29.52	clear	7
4-9-2009 16:47 CDT	82.2	10.8	7	25	40	250	OK	29.52	haze	5
4-9-2009 16:25 CDT	83.3	13.3	7	25	44	260	OK	29.52	haze	5
4-9-2009 16:05 CDT	83.7	14	7	24	39	250	OK	29.51	haze	5
4-9-2009 15:45 CDT	84.2	15.4	8	24	39	240	OK	29.51	clear	7
4-9-2009 15:25 CDT	85.1	15.3	7	26	38	230	OK	29.51	clear	7
4-9-2009 15:05 CDT	85.8	13.8	7	30	36	230	OK	29.52	haze	5
4-9-2009 14:45 CDT	86.5	13.3	6	28	41	250	OK	29.52	haze	4
4-9-2009 14:25 CDT	87.3	20.1	8	29	41	240	OK	29.5	haze	5
4-9-2009 14:05 CDT	81.7	54.7	40	17	26	200	OK	29.51	clear	10
4-9-2009 13:45 CDT	79.7	55	43	21	29	170	OK	29.51	clear	10
4-9-2009 13:25 CDT	77.5	56.3	48	22	30	170	OK	29.52	clear	10
4-9-2009 13:05 CDT	77.2	56.1	48	20	31	160	OK	29.52	clear	10
4-9-2009 12:45 CDT	76.3	55.6	49	21	25	170	OK	29.53	clear	10
4-9-2009 12:27 CDT	73.9	56.1	54	22	32	170	OK	29.55	clear	10
4-9-2009 12:05 CDT	71.4	57.2	61	23	30	160	OK	29.56	clear	10

2. Denton

ID = KDTO	TMP °F	DWP °F	RELH %	SKNT mpl	GUST mp	DRCT °	QFLG	PMSL in	ALTI in	P03D in	WNUM	VSBY mil
4-10-2009 14:53 CDT	68	36	31	13	23	350	OK	30.05	30.07		haze	10
4-10-2009 13:53 CDT	66	36	33	13	23	330	OK	30.07	30.09		haze	10
4-10-2009 12:53 CDT	63	35.1	35	15	22	350	OK	30.07	30.08	29.94	haze	10
4-10-2009 11:53 CDT	61	35.1	38	12	20	350	OK	30.07	30.08		haze	10
4-10-2009 10:53 CDT	57	35.1	44	15		350	OK	30.05	30.06		haze	10
4-10-2009 9:53 CDT	53.1	34	48	14	23	320	OK	30.03	30.04	30.77	haze	10
4-10-2009 8:53 CDT	51.1	34	52	14	21	320	OK	30.01	30.02		haze	10
4-10-2009 7:53 CDT	48.9	35.1	59	14	20	320	OK	29.95	29.96		haze	10
4-10-2009 6:53 CDT	48	35.1	61	9	18	320	OK	29.89	29.91	89.53	haze	10
4-10-2009 5:53 CDT	50	35.1	56	16	25	330	OK	29.86	29.88		haze	10
4-10-2009 4:53 CDT	52	34	50	15	21	330	OK	29.83	29.85		haze	10
4-10-2009 3:53 CDT	54	35.1	49	14	22	330	OK	29.79	29.82	89.68	haze	10
4-10-2009 2:53 CDT	57	32	39				OK	29.74	29.76		haze	7
4-10-2009 1:53 CDT	57	28	33	8		280	OK	29.71	29.73		haze	8
4-10-2009 0:53 CDT	61	27	27	8		290	OK	29.69	29.71	30.42	haze	10
4-9-2009 23:53 CDT	59	28.9	32	8		290	OK	29.66	29.68		haze	10
4-9-2009 22:53 CDT	62.1	28.9	28	6		280	OK	29.64	29.66		haze	10
4-9-2009 21:53 CDT	64	28.9	27	7		240	OK	29.59	29.62	30.42	haze	10
4-9-2009 20:53 CDT	70	26.1	19	5		260	Caution	29.56	29.58		haze	7
4-9-2009 19:53 CDT	75	18	11	10		310	Caution	29.54	29.56		haze	6
4-9-2009 18:53 CDT	80.1	15.1	9	14	26	260	OK	29.5	29.53	88.94	blowing du	10
4-9-2009 17:53 CDT	81	15.1	8	18	33	260	OK	29.48	29.51		blowing du	7
4-9-2009 16:53 CDT	84.9	16	8	29	43	250	OK	29.46	29.48		blowing du	4
4-9-2009 15:53 CDT	87.1	18	8	25	39	230	OK	29.46	29.49	177.74	haze	6
4-9-2009 15:25 CDT	87.8	15.8	7	31	43	250	OK		29.47		clear	9
4-9-2009 14:53 CDT	82.9	57.9	43	26	35	180	OK	29.47	29.5		clear	10
4-9-2009 13:53 CDT	80.1	57	45	24	35	180	OK	29.49	29.52		clear	10
4-9-2009 12:53 CDT	75.9	59	56	29	37	170	OK	29.52	29.55	236.48	clear	10
4-9-2009 11:53 CDT	68	57.9	70	22	30	170	OK	29.56	29.58		clear	10
4-9-2009 10:53 CDT	66	57.9	75	17	28	180	OK	29.57	29.59		clear	10
4-9-2009 9:53 CDT	64.9	57.9	78	14	28	160	OK	29.55	29.57	236.59	lt rain	10
4-9-2009 9:42 CDT	64.4	57.2	77	20		160	OK		29.59		mostly cle	10
4-9-2009 8:53 CDT	64.9	57.9	78	17		160	OK	29.58	29.6		mostly cle	10
4-9-2009 7:53 CDT	64.9	57	76				OK	29.57	29.6		mostly cle	10
4-9-2009 6:53 CDT	64.9	57	76	13		180	OK	29.58	29.61	88.68	mostly cle	10
4-9-2009 5:53 CDT	64.9	55.9	73	16		180	OK	29.56	29.59		clear	10

3. Gainesville

ID = KGLE	TMP °F	DWP °F	RELH %	SKNT mpl	GUST mp	DRCT °	QFLG	ALTI in	WNUM	VSBY mil
4-10-2009 0:29 CDT	64.4	28.4	26	15		300	OK	29.71	clear	10
4-10-2009 0:06 CDT	64.4	24.8	22	13	16	290	OK	29.7	clear	10
4-9-2009 23:44 CDT	64.4	24.8	22	10		290	OK	29.69	clear	10
4-9-2009 23:24 CDT	60.8	24.8	25	7		280	OK	29.69	clear	10
4-9-2009 23:04 CDT	60.8	24.8	25	7		280	OK	29.68	clear	10
4-9-2009 22:44 CDT	62.6	24.8	24	8		280	OK	29.68	clear	10
4-9-2009 22:24 CDT	62.6	26.6	25	6		270	OK	29.66	clear	10
4-9-2009 22:09 CDT	64.4	26.6	24	6		280	Caution	29.65	clear	10
4-9-2009 21:44 CDT	64.4	26.6	24	6		290	Caution	29.63	clear	10
4-9-2009 21:24 CDT	64.4	26.6	24	6		290	Caution	29.61	clear	10
4-9-2009 21:05 CDT	68	24.8	19	7		270	Caution	29.6	clear	10
4-9-2009 20:45 CDT	69.8	24.8	18	7		280	Caution	29.59	clear	10
4-9-2009 20:24 CDT	73.4	23	15	10		280	Caution	29.58	clear	10
4-9-2009 20:04 CDT	73.4	21.2	14	10	20	280	Caution	29.58	mostly clo	10
4-9-2009 19:44 CDT	75.2	19.4	12	17	22	290	Caution	29.58	overcast	10
4-9-2009 19:24 CDT	75.2	23	14	18	26	290	Caution	29.57	mostly clo	7
4-9-2009 18:44 CDT	78.8	19.4	11	17	26	290	Caution	29.55	overcast	7
4-9-2009 18:25 CDT	78.8	17.6	10	17	29	290	Caution	29.54	overcast	7
4-9-2009 18:04 CDT	80.6	5	5	25	35	260	Caution	29.53	haze	5
4-9-2009 17:44 CDT	80.6	3.2	5	36	41	250	Caution	29.52	mostly clo	7
4-9-2009 17:25 CDT	82.4	6.8	6	33	43	260	Caution	29.52	overcast	7
4-9-2009 17:04 CDT	82.4	3.2	5	28	40	250	Caution	29.51	haze	5
4-9-2009 16:45 CDT	80.6	-7.6	3	30	43	250	OK	29.51	overcast	7
4-9-2009 16:24 CDT	82.4	3.2	5	29	43	250	OK	29.5	haze	5
4-9-2009 15:44 CDT	87.8	6.8	5	26	40	240	OK	29.49	clear	7
4-9-2009 15:24 CDT	87.8	3.2	4	31	41	230	OK	29.48	clear	7
4-9-2009 15:04 CDT	87.8	8.6	5	25	37	230	OK	29.49	clear	7
4-9-2009 14:49 CDT	82.4	59	45	18	30	180	OK	29.49	clear	10
4-9-2009 14:29 CDT	80.6	60.8	51	22	32	180	OK	29.49	clear	10
4-9-2009 14:04 CDT	78.8	60.8	54	25	33	180	OK	29.51	clear	10
4-9-2009 13:44 CDT	78.8	60.8	54	24	35	170	OK	29.51	clear	10
4-9-2009 13:29 CDT	78.8	60.8	54	28	35	170	OK	29.52	clear	10
4-9-2009 12:44 CDT	77	60.8	57	23	31	180	OK	29.54	clear	10
4-9-2009 12:25 CDT	75.2	62.6	65	25	32	170	OK	29.55	clear	10
4-9-2009 12:09 CDT	73.4	60.8	65	21	30	180	OK	29.55	clear	10

4. Graham

ID = KRPH	TMP °F	DWP °F	RELH %	SKNT mpl	GUST mp	DRCT °	QFLG	ALTI in	WNUM	VSBY mil
4-10-2009 0:02 CDT	62.6	21.2	20	8		320	OK	29.73	clear	10
4-9-2009 23:42 CDT	59	24.8	27	6		320	OK	29.72	clear	10
4-9-2009 23:22 CDT	62.6	24.8	24	0			OK	29.71	clear	10
4-9-2009 23:02 CDT	62.6	24.8	24	0			OK	29.7	clear	10
4-9-2009 22:42 CDT	64.4	24.8	22	3		300	OK	29.69	clear	10
4-9-2009 22:22 CDT	64.4	24.8	22	3		300	OK	29.67	haze	5
4-9-2009 21:42 CDT	62.6	24.8	24	3		350	OK	29.63	haze	5
4-9-2009 21:22 CDT	68	21.2	17	0			OK	29.62	clear	7
4-9-2009 20:42 CDT	71.6	21.2	15	3		340	OK	29.59	clear	10
4-9-2009 20:22 CDT	71.6	21.2	15	5		310	OK	29.59	clear	10
4-9-2009 20:02 CDT	73.4	19.4	13	7		320	OK	29.58	clear	10
4-9-2009 19:24 CDT	78.3	20.7	12	13	24	310	OK	29.57	clear	10
4-9-2009 19:04 CDT	80.8	12.4	7	21	29	260	OK	29.56	clear	7
4-9-2009 18:44 CDT	81.7	12.2	7	21	33	260	Caution	29.55	clear	7
4-9-2009 18:24 CDT	81.9	12.8	7	22	37	270	Caution	29.55	haze	4
4-9-2009 18:04 CDT	82.9	12.8	7	20	33	270	Caution	29.54	haze	3
4-9-2009 17:44 CDT	83.5	12.4	7	21	36	260	Caution	29.54	haze	2
4-9-2009 17:24 CDT	83.5	14	7	29	41	260	Caution	29.54	haze	1
4-9-2009 17:04 CDT	84.2	14.4	7	26	41	260	Caution	29.54	haze	1.5
4-9-2009 16:44 CDT	84.6	14.7	7	28	47	260	Caution	29.54	haze	0.5
4-9-2009 16:24 CDT	90.9	20.7	8	25	38	250	Caution	29.54	haze	1
4-9-2009 16:04 CDT	88.7	19.6	8	31	40	250	Caution	29.55	haze	0.25
4-9-2009 15:44 CDT	85.8	17.8	8	30	47	260	OK	29.55	haze	1.25
4-9-2009 15:24 CDT	84.4	14.9	7	22	44	260	OK	29.54	haze	5
4-9-2009 15:04 CDT	84.4	16.2	8	32	43	260	OK	29.55	clear	7
4-9-2009 14:44 CDT	84.2	16.3	8	32	40	250	OK	29.54	clear	7
4-9-2009 14:24 CDT	84.6	17.4	8	31	41	240	OK	29.55	clear	7
4-9-2009 14:04 CDT	84.6	19	9	25	44	240	OK	29.54	clear	7
4-9-2009 13:44 CDT	85.5	18	8	30	44	220	OK	29.54	partly clou	7
4-9-2009 13:24 CDT	84.6	14.5	7	31	45	240	OK	29.55	haze	5
4-9-2009 13:05 CDT	86	18.7	8	36	47	250	OK	29.56	haze	5
4-9-2009 12:44 CDT	86.7	21.4	9	25	43	250	OK	29.54	partly clou	7
4-9-2009 12:43 CDT	87.8	21.2	9	25	43	240	OK	29.54	clear	7
4-9-2009 12:02 CDT	87.8	26.6	11	31	48	240	OK	29.54	clear	10
4-9-2009 11:42 CDT	89.6	30.2	12	28	39	250	OK	29.53	clear	10
4-9-2009 11:24 CDT	87.8	32	14	24	40	240	OK	29.52	clear	10
4-9-2009 11:02 CDT	87.8	37.4	17	20	28	230	OK	29.53	clear	10

5. Mineral Wells

ID = KMWL	TMP °F	DWP °F	RELH %	SKNT mp	GUST mp	DRCT °	QFLG	PMSL in	ALTI in	P03D in	WNUM	VSBY mil
4-10-2009 5:53 CDT	51.1	33.1	50	23	39	340	OK	29.81	29.84		clear	10
4-10-2009 4:53 CDT	54	33.1	45	20	24	340	OK	29.84	29.87		clear	10
4-10-2009 3:53 CDT	55.9	34	43	16		340	OK	29.8	29.84	89.59	clear	10
4-10-2009 2:53 CDT	57.9	30	34	12		320	OK	29.75	29.79		clear	10
4-10-2009 1:53 CDT	57	27	31	7		340	OK	29.72	29.76		clear	10
4-10-2009 0:53 CDT	59	26.6	29	6		330	OK	29.7	29.73	30.56	clear	9
4-9-2009 23:53 CDT	59	26.6	29	3		340	Caution	29.67	29.7		clear	10
4-9-2009 22:53 CDT	66	21	18	5		260	Caution	29.63	29.67		clear	8
4-9-2009 21:53 CDT	69.1	18	14	0			Caution	29.6	29.63	89.33	clear	10
4-9-2009 20:53 CDT	73.9	14	10	8		230	Caution	29.55	29.59		clear	10
4-9-2009 19:53 CDT	78.1	10	7	15		260	Caution	29.53	29.57		clear	10
4-9-2009 18:53 CDT	82	8.1	6	22	33	280	Caution	29.52	29.56	88.77	clear	10
4-9-2009 17:53 CDT	82.9	10.1	6	23	35	270	Caution	29.51	29.55		clear	10
4-9-2009 16:53 CDT	84.9	9	6	26	39	270	Caution	29.5	29.54		lt rain	10
4-9-2009 15:53 CDT	86	10.4	6	30	38	280	OK	29.49	29.54	0.21	clear	10
4-9-2009 14:53 CDT	87.1	12.9	6	26	45	270	OK	29.49	29.54		clear	10
4-9-2009 13:53 CDT	89.1	17.1	7	33	54	270	OK	29.49	29.54		clear	10
4-9-2009 13:00 CDT	91.4	30.2	11	30	45	250	OK		29.51		clear	10
4-9-2009 12:53 CDT	91	37	15	25	35	250	OK	29.47	29.51	236.92	clear	10
4-9-2009 11:53 CDT	81	57	44	18		150	OK	29.52	29.56		clear	10
4-9-2009 10:53 CDT	73	57.9	59	18	25	170	OK	29.54	29.58		clear	10
4-9-2009 9:53 CDT	66.9	57	71	14		150	OK	29.55	29.58	88.68	clear	10
4-9-2009 8:53 CDT	66	55.9	70	15		140	OK	29.53	29.57		mostly cle	10
4-9-2009 7:53 CDT	64.9	55.9	73	14	17	140	OK	29.54	29.58		mostly cle	10
4-9-2009 6:53 CDT	64.9	55	70	12		150	OK	29.53	29.57	177.36	partly clou	10
4-9-2009 5:53 CDT	66.9	54	63	12		130	OK	29.53	29.58		mostly cle	10
4-9-2009 4:53 CDT	66	53.1	63	8		130	OK	29.54	29.58		clear	10
4-9-2009 3:53 CDT	68	51.8	56	10		160	OK	29.55	29.59	236.65	clear	10
4-9-2009 2:53 CDT	68	48.2	49	7		170	OK	29.57	29.61		clear	10
4-9-2009 1:53 CDT	68	44.6	43	9		160	OK	29.58	29.62		clear	10
4-9-2009 0:53 CDT	63	44.1	50	12		140	OK	29.59	29.63	177.36	clear	10

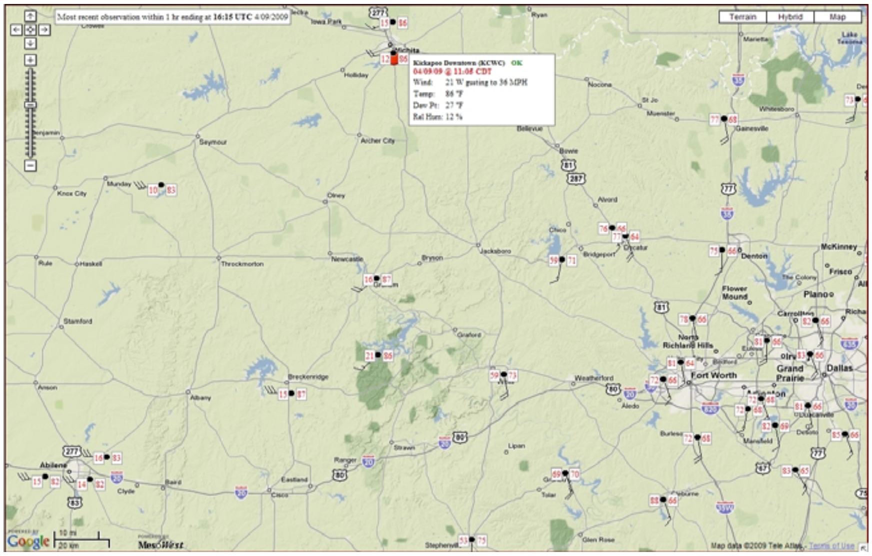
6. Wichita Falls

ID = KCWC	TMP °F	DWP °F	RELH %	SKNT mp	GUST mp	DRCT °	QFLG	ALTI in	WNUM	VSBY mil
4-10-2009 0:05 CDT	63.9	31.5	30	12	20	330	OK	29.73	clear	10
4-9-2009 23:45 CDT	64.8	30.2	27	13	21	330	OK	29.72	clear	10
4-9-2009 23:25 CDT	65.7	27.7	24	15	22	340	OK	29.71	clear	10
4-9-2009 23:05 CDT	66.6	22.6	19	14	20	330	OK	29.7	clear	10
4-9-2009 22:45 CDT	68	19	15	14	22	330	OK	29.69	clear	10
4-9-2009 22:25 CDT	69.1	17.8	14	13	21	330	OK	29.68	clear	10
4-9-2009 22:05 CDT	70	19.2	14	12	17	320	OK	29.66	clear	10
4-9-2009 21:45 CDT	70.3	20.3	15	9		320	OK	29.64	clear	10
4-9-2009 21:25 CDT	71.1	20.3	15	9	16	310	OK	29.62	clear	10
4-9-2009 21:05 CDT	72.5	19.9	14	8		310	OK	29.61	clear	10
4-9-2009 20:45 CDT	73	18.5	13	9		310	OK	29.59	clear	10
4-9-2009 20:25 CDT	73.9	18.5	12	7		320	OK	29.58	clear	10
4-9-2009 20:05 CDT	75	18.5	12	7		300	OK	29.57	clear	10
4-9-2009 19:45 CDT	75.7	19	12	10	21	300	OK	29.57	clear	10
4-9-2009 19:25 CDT	77	19.2	11	12	21	320	OK	29.57	clear	10
4-9-2009 19:05 CDT	77.9	18.7	11	18	33	300	OK	29.57	clear	10
4-9-2009 18:25 CDT	78.6	22.1	12	18	31	310	OK	29.56	clear	10
4-9-2009 18:05 CDT	79.2	21.7	12	22	36	310	OK	29.55	clear	10
4-9-2009 17:45 CDT	79.7	21.7	12	22	37	310	OK	29.54	clear	10
4-9-2009 17:25 CDT	80.2	22.3	12	22	40	320	OK	29.53	clear	10
4-9-2009 17:05 CDT	79.9	22.3	12	20	33	310	Caution	29.52	clear	7
4-9-2009 16:45 CDT	80.2	21.7	11	22	53	310	Caution	29.52	clear	10
4-9-2009 16:26 CDT	82.2	18.1	9	20	44	290	Caution	29.51	clear	10
4-9-2009 16:05 CDT	82.2	17.6	9	26	40	270	Caution	29.5	clear	7
4-9-2009 15:45 CDT	81.9	18.5	9	26	46	260	Caution	29.51	clear	7
4-9-2009 15:25 CDT	82.4	18.9	9	31	45	270	Caution	29.51	clear	7
4-9-2009 15:05 CDT	82.8	14	8	32	43	280	OK	29.51	clear	7
4-9-2009 14:45 CDT	83.3	14.7	8	28	44	270	OK	29.5	clear	10
4-9-2009 14:25 CDT	83.3	15.1	8	24	40	260	OK	29.49	clear	10
4-9-2009 14:07 CDT	82.8	16.2	8	28	46	260	OK	29.5	clear	10
4-9-2009 13:45 CDT	84.4	18.9	9	26	43	260	OK	29.51	clear	10
4-9-2009 13:25 CDT	84.4	18.1	9	28	38	260	OK	29.5	clear	10
4-9-2009 13:05 CDT	86	18.3	8	18	35	270	OK	29.49	clear	10
4-9-2009 12:45 CDT	86.5	19.1	8	23	38	250	OK	29.49	clear	10
4-9-2009 12:25 CDT	86	20.8	9	25	44	260	OK	29.49	clear	10
4-9-2009 12:05 CDT	86.7	22.3	9	25	43	260	OK	29.5	clear	10
4-9-2009 11:45 CDT	87.1	23.2	10	20	38	260	OK	29.49	clear	10
4-9-2009 11:25 CDT	87.6	28.6	12	15	35	250	OK	29.49	clear	10
4-9-2009 11:05 CDT	86	29.1	13	21	36	260	OK	29.5	clear	10

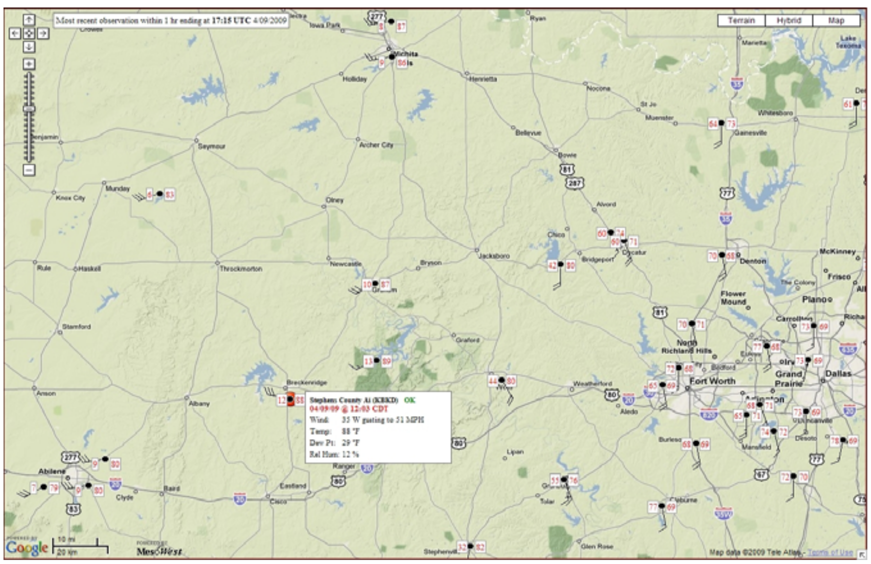
Attachment 3

MesoWest Hourly Surface Weather
RH and Temperature

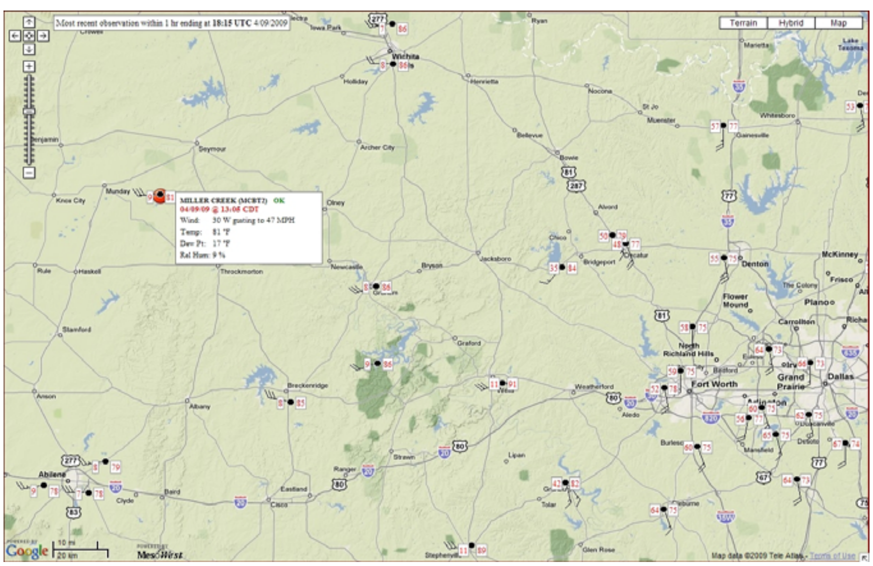
1100 CDT



1200 CDT



1300 CDT



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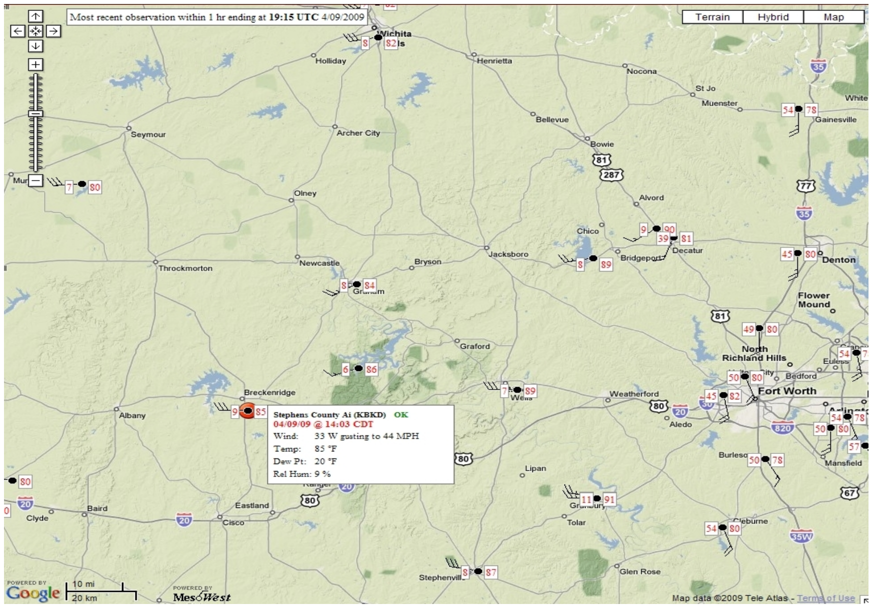

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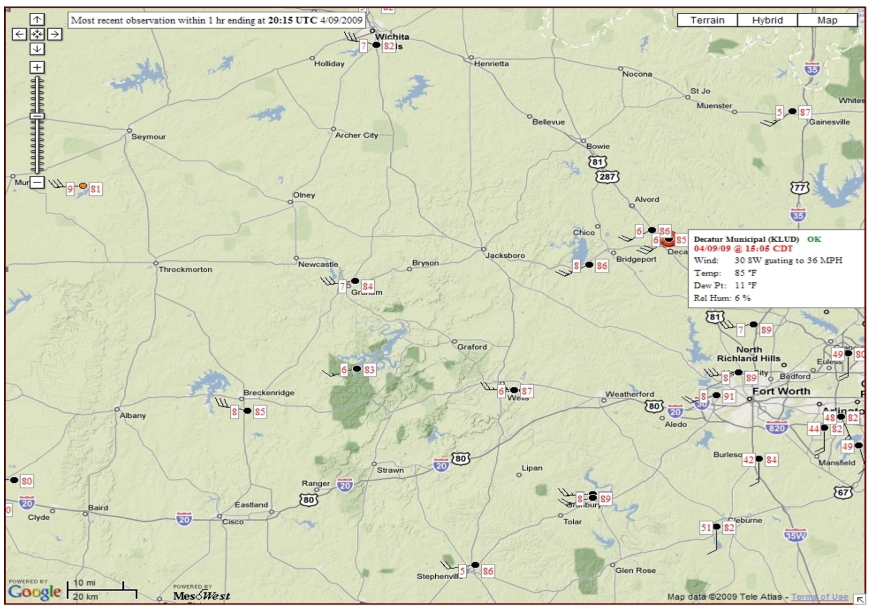

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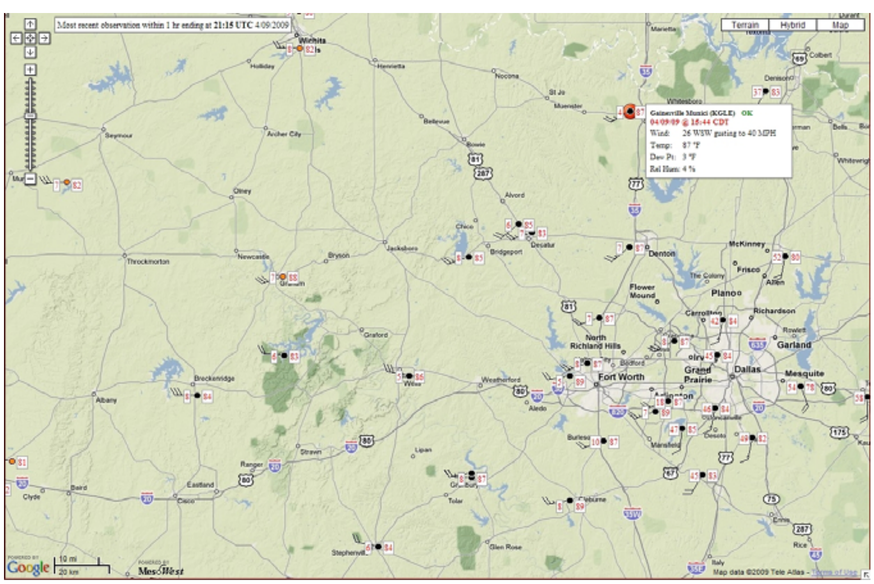

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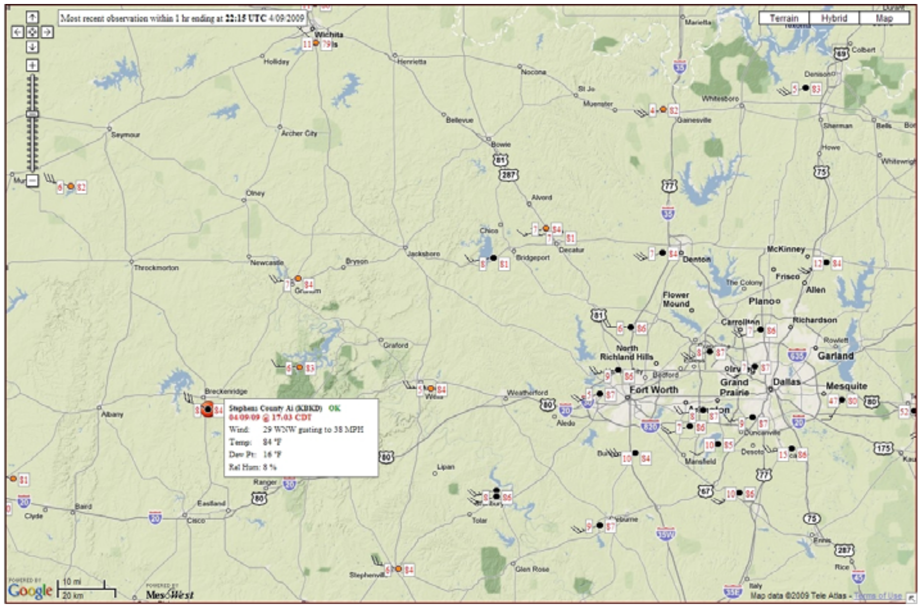

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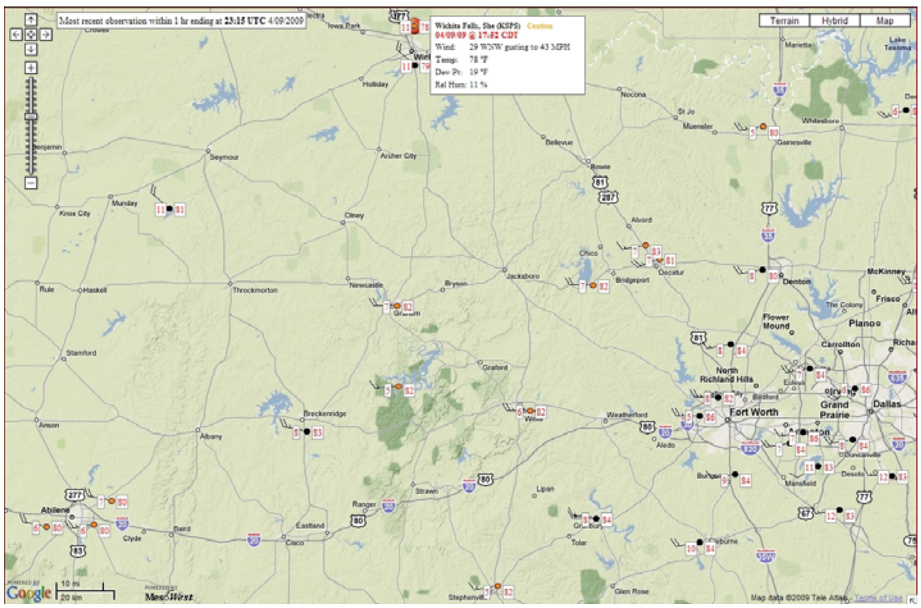

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