Montague Complex Fire

April 9, 2009

A case study

TEXAS FOREST SERVICE
The Texas A&M University System

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Montague County

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Abstract

The purpose of this publication is to examine the destruction that occurred Thursday, April 9, 2009, in 14 North Texas counties. This case study focuses on the Montague Complex Fires, specifically the Bellevue Fire. The study reviews economic, agriculture and community impacts. X-factors such as home construction, vegetation, road access and ignition sources affecting home loss during the fire event are also discussed.

On April 9, 2009, a dryline pushed easterly through much of Central United States and combined with dry fuel conditions and single-digit relative humidity readings to create a devastating situation. In less than eight hours, the State of Texas experienced a major outbreak of wildfires in 12 North Texas counties.

In several areas, humidity levels dropped from 40 percent to 8 percent in a matter of minutes. The already drought-stressed fuels, exceptionally low humidity levels and high winds gusting to 70 mph, set up what Texas Forest Service dreads the most – "perfect storm" conditions for extreme fire.

Through the next eight hours, 205 wildfires raged throughout the North Texas area. The large, fast-moving wildfires exhibited extreme fire behavior and many quickly overwhelmed the capabilities of local fire departments.

TFS was called to assist local departments and soon had all firefighting assets committed to fighting fires. The high winds grounded all aviation assets throughout much of the event, preventing much-needed water and retardant from being dropped on the flames. It quickly became obvious more assistance would be needed. TIFMAS (Texas Intrastate Fire Mutual Aid System) was activated and fire departments from the Dallas area were called in to help their neighbors.

The wildfires threatened lives, homes, businesses, communities and anything else that got in their destructive paths. Rapid evacuations were necessary to save lives in multiple communities. Even though everything possible was done to prevent human injury, four civilians tragically lost their lives during the event.

After initial massive suppression efforts, local and state firefighting resources continued fire suppression operations in several counties for weeks after the onset of the wildfire event. State mass care agencies were brought in to work with local officials to identify unmet needs of individuals and communities.

The counties of Archer, Clay, Eastland, Hamilton, Jack, Montague, Palo Pinto, Parker, San Saba, Shackelford, Stephens, Wichita, Wise and Young were all affected by the events of April 9. In Montague County, seven wildfires burned independently of one other. A total of 36,408 acres of agricultural land, 86 homes and four lives were lost.

Based on the examination of the home sites, the team found that pier-and-beam construction, vinyl and wood siding, attached wooden decks and lack of defensible space contributed to home loss. Several recommendations were given based on the findings, including reduction of fuel loads around homes, maintenance of sprinkler systems, early movement of livestock and increased situational awareness by residences.

In Texas, there is one wildland firefighter for every 1,600 square miles

Definitions

Air attack – Small, fixed-wing aircraft that has an air tactical group supervisor along with the pilot. These "eyes in the sky" assist ground resources with information about the wildfire.

Air tanker – A fixed-wing aircraft that has been certified by FAA to carry and deliver fire retardant.

Combustion – A complex sequence of chemical reactions between a fuel and an oxidant accompanied by the production of heat or both heat and light in the form of either a glow or flames

Crown fire – A fire that is burning in the treetops.

Dew point – Temperature to which a specified parcel of air must cool, at constant pressure and water-vapor content, in order for saturation to occur.

Energy Release Component (ERC) – The computed total heat release per unit area within the flaming front at the head of a moving fire.

Engine – A ground vehicle that can provide a specific level of pumping, water and hose capacity.

Firewise communities – A multi-agency effort designed to involve homeowners, community leaders, planners, developers and others in the effort to protect people, property and natural resources from the risk of wildland fire before a fire starts.

FEMA Declared Wildfire (FMAG – FEMA Management Assistance Grant) – Provides partial reimbursement to the state for the cost of the wildfire.

Fuel – Any combustible material; includes trees, grass, needles, wood, etc.

Ladder fuels – Provide a vertical link between fuels. They allow the fire to move from the ground to shrubs and trees easily. They also help start crown fires.

Litter – Composed of twigs, branches, dead sticks and fallen leaves or needles.

Needle drape – Dead pine needles that have fallen and are now hung on the other vegetation.

Red flag warning – Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

Relative humidity (RH) – The ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated.

Single engine air tanker (SEAT) – More commonly known as crop dusters. These aircraft drop water or retardant at lower levels than large air tankers.

Smoldering – Flameless form of combustion that derives its heat from oxidations occurring on the surface of a solid fuel

Spotting – Embers from the main wildfire land in receptive fuel beds ahead of the main fire and start new ignitions.

TFS – Texas Forest Service

Type (1-6) – generally refers to dozers, engines and water tender capabilities. A Type 1 resource is larger in size, power, capacity, etc., than a Type 6. Typing allows managers to pick the best resource for the job at hand.

USFS – United States Forest Service

VFD – Volunteer Fire Department

Water tenders – Any ground vehicle that can transport a large amount of water – generally 2,000 to 5,000 gallons.

WUI – The line, area or zone where structures and other human development meet or intermingle with wildland.

Dedication

In Memory of Carrie Miller, Alta Yancy and Cathy and Matt Quinn

Our deepest regrets go out to the families who lost loved ones during the wildfire siege on April 9, 2009.

- Carrie Miller and her husband, Gary, attempted to keep the flames back from their home. Carrie collapsed and was rushed to the hospital where a report indicated she died from a heart attack.

- Alta Yancy attempted to save her home from a wildfire with a water hose. She eventually had to flee to her car where she suffered a heart attack and died.

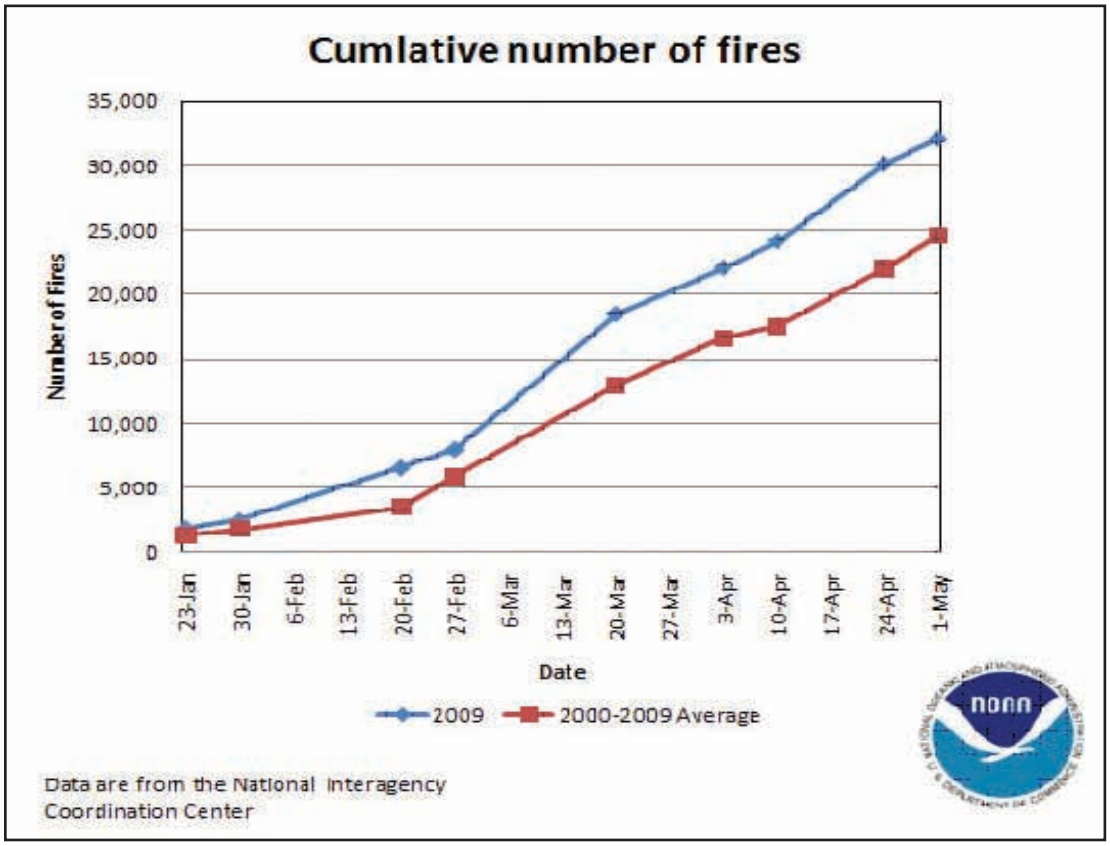
- Cathy and Matt Quinn were packing their truck to evacuate when they were overrun and killed by the fast-moving wildfire. Their son, Chris, received multiple burn injuries while trying to rescue his parents.

Our thoughts and prayers also are with the scores of families and individuals who lost their homes or businesses in the wildfire event.

The men and women of the fire departments worked long hours with little rest and were still going strong, saving countless lives and property. They are truly heroes.

Introduction

So far in 2009, the total number of fires and acres burned has exceeded the respective 10-year averages. The number of fires and the magnitude of those fires seem to be increasing. When comparing early fire season totals and acres burned, we find that early season fire activity has a strong and significant correlation with how end-of-year totals looks. For example, if intense fire activity occurs early in the season, the stage is set for a long, challenging wildland firefighting year. While the small number of years limits confidence, the strong relationship coupled with the above average fire behavior thus far in 2009 indicates this year is increasingly likely to see above average wildland fire activity.



Local fire departments and state agencies responded to 205 wildfires burning throughout Texas on April 9, 2009. Along with the Montague County fires, Texas Forest Service personnel responded to more than 17 other fires throughout the state. A total of 147,924 acres of land were burned. Once state resources were exhausted, countless other fires were left to be contained by local volunteer departments. Resources were stretched well beyond their capacity.

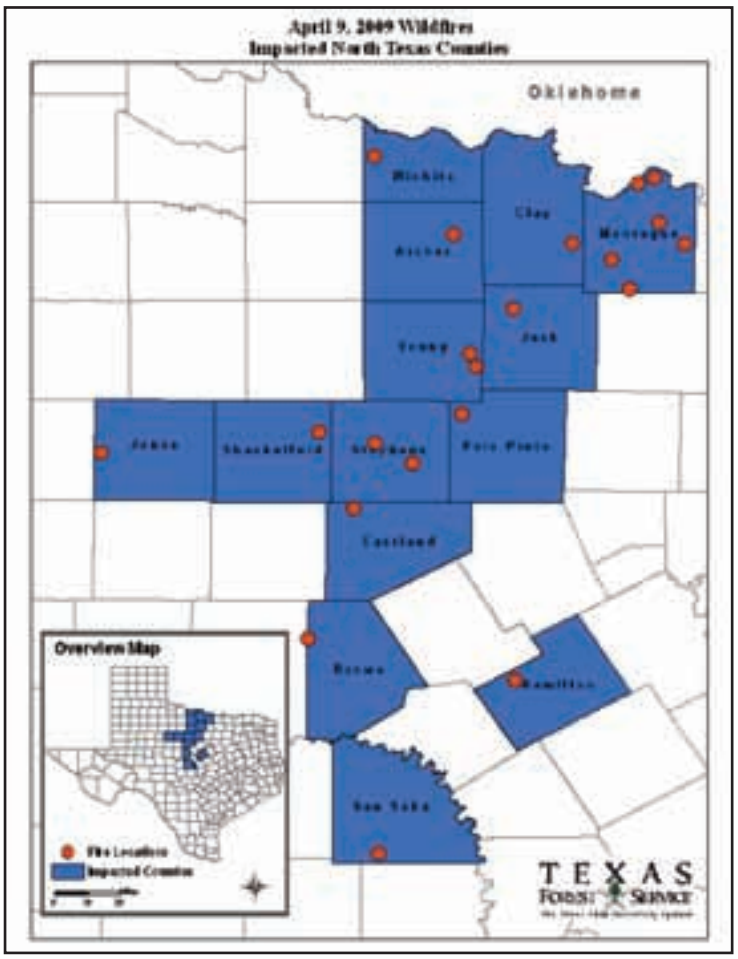
The North Texas Panhandle was the setting for these large, devastating wildfires that took place on that single day. They affected countless lives throughout Texas. By early afternoon on April 9, all TFS resources in North and West Texas had been committed to wildfires and calls for assistance kept coming. The Governor's Division of Emergency Management requested that TFS enact TIFMAS (Texas Interstate Fire Mutual Aid System) because of the large number of requests for assistance. As a result, fire departments from the North Central Texas region were asked to provide assistance to their neighbors.

The following chart and map depict the locations of fires to which TFS responded, along with acres and homes lost during the wildfire event on April 9, 2009.

Table 1. Homes and Acres Lost in North Texas Counties to Wildfires that TFS Reponded To

Start date	Fire name	County	Acres	Homes lost	Homes saved	Barns lost	Barns saved
07-Apr-09	Cedar Mountain	Eastland	18,360	-	100	3	50
09-Apr-09	Carriker	Jones	7	-	2	-	-
09-Apr-09	Rocky Mound	Young	45	1	3	-	1
09-Apr-09	Grosvenor	Brown	500	1	35	-	16
09-Apr-09	Little Cedar Creek	Stephens	91	-	4	-	-
09-Apr-09	Breckenridge (Convenience)	Stephens	3,200	-	100	-	-
09-Apr-09	Black (Pitzer)	Shackelford	16,000	-	-	-	-
09-Apr-09	Cook II	San Saba	425	-	6	-	10
09-Apr-09	617	Hamilton	2,800	-	150	1	-
09-Apr-09	Roberts Branch - 56	Jack	16,444	2	1,125	-	-
09-Apr-09	1148 Complex	Palo Pinto	700	14	198	-	-
09-Apr-09	Montague County Complex	Montague	36,408	87	310	61	-
09-Apr-09	Cement Mountain Complex	Young/Jack	37,876	19	-	46	-
09-Apr-09	Electra West	Wichita	4,500	2	800	-	-
09-Apr-09	Two Mile Hill	Archer	21,525	3	-	-	-
09-Apr-09	Doughit	Howard	300	-	-	-	-
	Total		**144,192**	**129**	**2,523**	**111**	**77**

- **617 Fire – Hamilton County**
  The wildfire started at 4 p.m. and burned 2,800 acres of grass and brush. The blaze was caused by transmission lines arcing in heavy winds. Local departments and several TFS and TxDOT dozers saved 150 homes in the City of Hamilton. One outbuilding and approximately $7,000 worth of hay were lost.



- **1148 Complex Fire – Palo Pinto County**
  Made up of the 1148 Fire and the Willingham Fire, the wildfire burned on the west side of Possum Kingdom Reservoir. The Palo Pinto Fire Marshal requested TFS assistance in the form of both ground and air resources, but none were available. Extreme fire behavior was exhibited in the heavy cedar and brush throughout the area and around homes. The fire destroyed 14 homes and 700 acres of land around Possum Kingdom Reservoir.

- **Black (Pitzer) Fire – Shackelford County**
  The wildfire threatened the town of Albany and burned 16,000 acres of brush fuels. The fire exhibited extreme behavior with flame lengths exceeding 11 feet. Five local departments and TFS responded to the wildfire. No homes were threatened, but approximately $8 million worth of agricultural land was lost.

Embers traveled almost a mile across a river inlet during the 1148 Complex Fire.

- **Breckenridge "Convenience Store" Fire – Stephens County**
  The wildfire burned just north of the Breckenridge city limits and destroyed 3,200 acres of brushy fuels. An apartment complex, multiple businesses and several homes were evacuated. No losses were reported; however, 100 homes were saved. The county received a FEMA Management Assistance Grant (FMAG). The FMAG declaration process is initiated when a state submits a request for assistance to the FEMA regional director when a "threat of major disaster" exists. The entire process is accomplished on an expedited basis and FEMA renders a decision in a matter of hours. The Fire Management Assistance Grant Program (FMAGP) provides a 75 percent federal cost share and a 25 percent state cost. The state must demonstrate that total eligible costs for the declared fire meet or exceed either the individual fire cost threshold, which applies to single fires, or the cumulative fire cost threshold, which applies to numerous smaller fires burning throughout the state.

Fire behavior seen on the Breckenridge Fire.

- **Cedar Mountain Fire – Eastland County**
  On Wednesday, April 8, this wildfire was reported to be 60 acres and 95 percent contained. It escaped containment lines the next day and quickly burned an additional 7,000 acres. At 4:51 p.m., the Texas Division of Emergency Management broadcast a message to local residents:

  A large fire is currently in northern Eastland County just west of the Morton Valley community. The fire jumped Highway 183 and was moving in the direction of Morton Valley and Yellow Mound, where evacuations have started. If you are near Morton Valley or Yellow Mound, prepare to evacuate immediately. Stay tuned to local media and follow instructions as given by local officials.

  By Thursday evening the final report stated a loss of 18,360 acres and 100 homes threatened. Fortunately, no homes were lost.

- **Cement Mountain Complex Fire – Young and Jack counties**
  The wildfire stretched 18 miles and consumed 28,000 acres. Most of the wildfire burned in Jack County where it threatened the town of Bryson. Multiple fires burned in Jack County throughout the day in addition to the Cement Mountain Complex. The complex was a combination of two fires – the Graham Fire and the Cement Fire. The Graham Fire started east of the Graham Airport south of US 380 and burned toward Cement Road. The Cement Fire started just off Cement Mountain Road south of US 380 and burned east toward the Jack County Line. Nineteen homes and 46 outbuildings were lost. A FMAG was received.

Cement Mountain Fire

- **Cook II Fire – San Saba County**
  The wildfire started at 3 p.m. by a rancher burning pastures and fields despite being under burn ban. The wildfire burned 325 acres of grass fuels and 100 acres of timber. Local fire departments and TFS dozers and engines saved six homes and 10 outbuildings. No structures were lost.

- **Doughit Fire – Howard County**
  The wildfire was started by electrical lines arcing in high winds. The fire burned 300 acres. TFS responded with air attacks and a Type 1 helicopter. A private dozer assisted by cutting firebreaks.

- **Electra West Fire – Wichita County**
  The wildfire burned 4,500 acres and destroyed the Agriboard - Modular Home Builder, which had 70 employees at the time of the fire. As the wildfire burned into the city limits of Electra, it forced residents from more than 800 homes to evacuate, including a nursing home. Local resources reported 12 other wildfires burning within the county besides the Electra West Fire. A FEMA Management Assistance Grant was received.

Agriboard, a modular home building company, was destroyed during the Electra West Fire.

- **Grosvenor Fire – Brown County**
  The wildfire burned 100 acres of brush, destroyed one home and threatened 35 others. Local fire departments initially were dispatched to this fire, but were diverted to the Cedar Mountain Fire, which was threatening a larger number of homes.

- **Little Cedar Creek Fire – Stephens County**
  This wildfire started at 7:30 p.m. in brush. As the extreme fire behavior from earlier in the day began to calm, firefighters were able to contain the fire at 91 acres and save four homes. One USFS and two TFS dozers responded along with local volunteer fire departments.

- **Roberts Branch Fire (not part of the Cement Mountain Fire) – Jack County**
  The wildfire started at 12:19 a.m. and destroyed two homes and threatened 1,125 others. The fire burned through 16,444 acres of grassland. TFS was contacted for assistance at approximately 1:15 p.m. by the Jack County Rural VFD. They were told that all TFS resources were committed to other fires. Due to the extremely high winds, air resources could not be utilized. TxDOT responded to the fire with three dozers at approximately 7:45 p.m.

- **Rocky Mound Fire – Young County**
  Debris burning started the wildfire at 5 a.m. It was the first fire of the day. Exhibiting moderate fire behavior, the fire burned 45 acres of brush fuels and destroyed one home. Three homes and one outbuilding were saved. Two TFS dozers and one engine responded with local fire departments.

- **Two Mile Hill Fire – Archer County**
  Two wildfires merged to form this 21,525-acre wildfire that destroyed three homes. Firefighting efforts are directly attributed to saving the community of Scotland.

Wildfire History in Montague County

Wildfires are not new to this area of the state. In Montague County, local volunteer fire departments have responded to more than 804 wildfires in the last 10 years. From January to April 8, 2009, prior to the Montague Complex Fire, these volunteer departments responded to 125 wildfires throughout the county with limited resources and manpower.

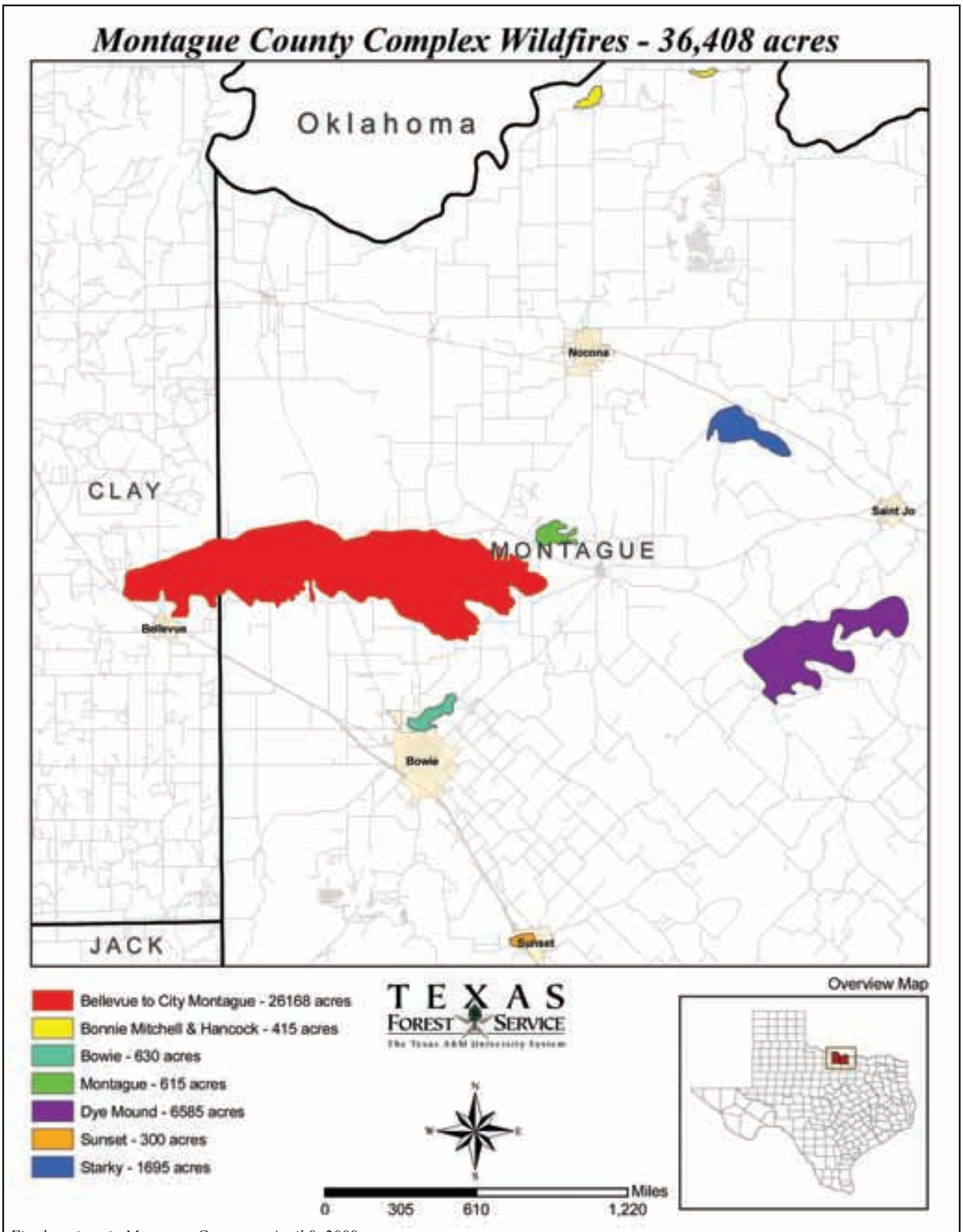
In the early afternoon on April 9, as a front pushed through North Texas, wildfires began popping up throughout Montague and surrounding counties. As the dry line moved across the area, relative humidity percentages dropped sharply from 43 percent to 7 percent. The humidity drop took less than one hour. Temperatures shot to 86 F and the dew point fell to 13 degrees. Wind speeds picked up and were sustained at 28 mph. Wind gusts of 76 mph, the strength of a Category 1 hurricane, were reported. All emergency firefighting aircraft were grounded. The wind conditions across the area made flying and dropping much needed water and retardant impossible. The high winds and haze also delayed flights at Dallas/Fort Worth International Airport. The Texas Commission on Environmental Quality urged individuals who were sensitive to smoke or had respiratory problems to stay indoors.

The media, who covered and released statements during and after the event, left the rest of Texas with a visual image of the destructive event.

- "A small fire northwest of Sunset in Montague County came out of nowhere to totally engulf a mobile home. Firefighters are currently stretched too thin to be able to protect isolated homes like this; they have taken a defensive posture trying to keep the fires from spreading."
  - Troy Bush, HD Chopper 8 pilot

- "Nature's blitzkreig left Montague County looking like a moonscape. Wildfires swept through on Thursday afternoon, charring the landscape and leaving several oil storage tanks ablaze. Just down the road, Stoneburg — a hamlet of just a couple dozen homes 15 miles west of Montague — was among the hardest-hit communities. 'Wiped out quite a bit of it,' said Stoneburg resident Jack Beasley. 'Man over there lost his house, shop, business — everything.' By nightfall, flames offered the only light in Stoneburg; scorched homes, charred cars and utility poles burning in two leave a hint of the rebuilding work ahead."
  - Jason Whitely, reporting from Montague County

- "Yesterday, it was a thriving community. Today, nothing but charred remains can been seen throughout the town, after wildfires swept through, reducing it to rubble. Even today, Montague County is still burning. Everywhere you look, another hotspot reigniting. Despite all the losses, close-knit communities are coming together, vowing to help one another out of this mess."
  - Cynthia Vega, reporting from Stoneburg



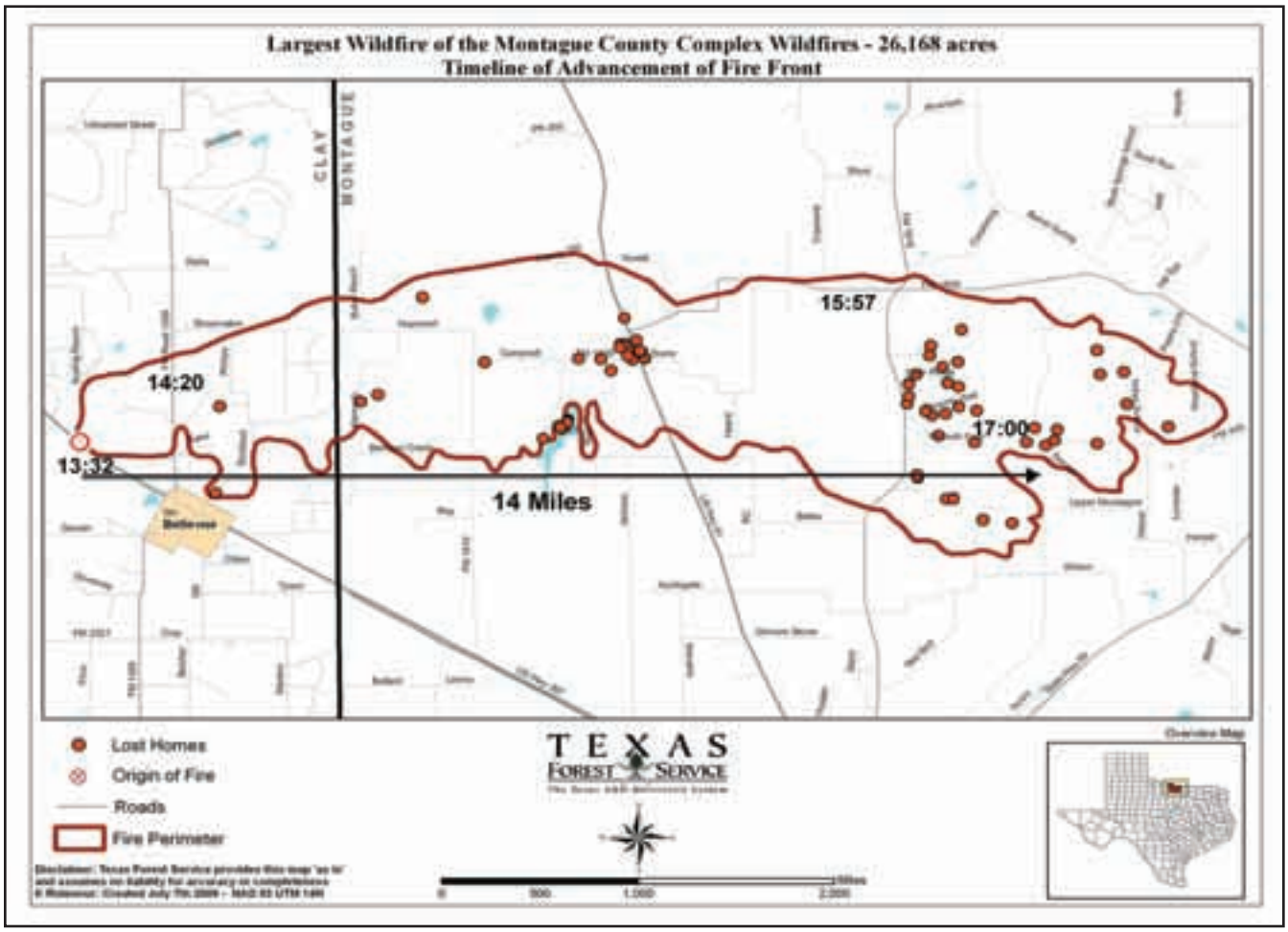
Fire locations in Montague County on April 9, 2009.

Timeline of events

This timeline is based on reports from Bellevue Fire Chief Mark Hanson and observations made by homeowners and data from trail cameras.

The largest of the Montague County Complex fires – the Bellevue Fire – began in Clay County outside the city of Bellevue, east of Scaling Road near US Hwy 287 and the BNSF railroad. The wildfire burned in light, flashy fuels. The Bellevue and Henrietta VFDs were called out at 1:32 p.m. At 1:45 p.m., Clay County Judge Kenneth Liggett notified Montague County Judge Ten H. Winn that the Bellevue VFD had been called out, but did not have the resources to stop the fire in Clay County because they already were fighting two large fires. At approximately 2:20 p.m., the wildfire crossed FM 1288. Less than three hours later it had burned across FM 1816 and to Rock Springs Road.

Fire personnel reported active and extreme wildfire behavior. They said the wildfire was leaping ahead of itself 300 to 400 yards at a time. In light, grassy fuels, flames were reported to be 30 to 40 feet high. Fire whirls in grassy fuels were more than twice as tall as telephone poles and had 10 to 15 feet base widths. Bark was seen "blowing off" oak trees because of the extreme heat. The wildfire jumped roads as if they were part of the fuel. Initially, winds were 40 to 50 mph hour and were forecasted to become higher. Fortunately, a wind shift occurred later in the day and winds reduced to 30 mph. The lighter winds allowed firefighters to hold the flanks of the wildfire.



Based on available address data, there were approximately 310 homes within the fire perimeters in Montague County. Of the 310 homes, 86 were lost. The chart on the following pages displays the type of home construction and additional x-factors that contributed to home loss and location of the homes throughout the county.

Bowie County - Woodland Estates									
Paper ID	**Foundation**	**Roof**	**Exterior walls**	**Deck**	**Set-back from slope**	**Value lost**	**Additional x-factors for ignition**	**Number of outbuildings lost**	**Number of vehicles lost**
1	Cinder block	Composite	Vinyl siding	Yes	N/A	-	Vegetation overhanging roof. Back and front decks open with plywood floor. Outbuilding that was lost was about three feet away from home	2	0
Montague County - Area surrounding west side of city of Montague									
2	Slab	Metal	Concrete	Yes	N/A	132,055	Located on crest of slope	3	8
3	Cinder block	Metal	Vinyl	No	N/A	?	Located at end of box canyon. The fire crowned through this area.	3	4
4	Slab	Metal	?	Yes	N/A	15,500	Less than 50 feet from crest of slope. Lattice work with vegetation. No defensible space.	4	1
5	Cinder block	Metal	?	Yes	N/A	33,320	Garbage pile on east side of house. Railroad ties landscaping in front of walkway to house.	0	0
6	Cinder block	Composite	Vinyl	Yes	50 feet	42,960	Box canyon on north side of house.	3	9
7	Cinder block	Metal	Vinyl	No	20 feet	?	Storage shed against home. Near crest.	5	35
8	Concrete retaining wall with crawl space	Composite	Asbestos	Yes	N/A	?	Extreme fire behavior was observed around home.	3	1
9	Cinder block	Metal	Vinyl	Yes	N/A	9,430	Green nylon sun shade across front of house.	0	0
10	Slab	Composite	Wood	Yes	N/A	27,704	House located at bottom of 10 percent slope that ran +/- 100 feet down to northwest side of house. Oaks touching house. Wooden frame porch on front.	1	0
11	Cinder block	Composite	Vinyl	Yes	N/A	?	Heavy oak over structure leading up to and around house except for nine foot grassy wide around the house. Propane tanks for gas grill and paint cans.	2	5
12	Cinder block	Metal	Vinyl	No	N/A	13,440	Fire came from backside of house from grass field.	2	2
13	Cinder block	Metal	Masonite	Yes	N/A	36,960	Attached wooden structures. Home not skirted.	1	1
14	Slab	Composite	Brick	Yes	N/A	33,158	Two large spot fires behind house; however, entire yard is still green. Ember ignitions contributed to loss.	1	3

Montague County - Area surrounding west side of city of Montague *(continued)*									
Paper ID	**Foundation**	**Roof**	**Exterior walls**	**Deck**	**Set-back from slope**	**Value lost**	**Additional x-factors for ignition**	**Number of outbuildings lost**	**Number of vehicles lost**
15	Slab	Composite	Vinyl	Yes	N/A	159,901	Porch attachments and siding materials.	5	1
16	Slab	Composite	Masonry	Yes	N/A	245,487	Oaks overhanging roof. Trampoline against house.	5	6
17	Slab	Metal	Brick	No	N/A	167,814	Thick, tall grass under heavy brush. Heavy cedar overhangs	4	0
18	Cinder block	Composite	Vinyl	Yes	N/A	?	Attached wooden structures. Home not skirted.	0	1
19	Cinder block	Composite	Wood	Yes	N/A	59,490	Vegetation overhanging roof.	2	1
20	Cinder block	Composite	Vinyl	No	N/A	29,818	Railroad landscaping next to foundation	1	0
21	Slab	Metal	Metal	Yes	N/A	171,401	Extreme fire behavior and intensity were observed.	1	0
22	Pier and beam	Metal	Metal	?	N/A	?	Extreme fire behavior and intensity were observed.	1	1
23	Cinder block	Metal	?	?	N/A	?	Railroad ties for walkway.	3	0
24	Cinder block	Metal	Vinyl	Yes	N/A	?	Two wooden framed porches on cinder blocks. Little defensible space.	0	1
25	Cinder block	Metal	Vinyl	No	N/A	?	Large +/- 30-foot travel home under metal framed carport with two stalls with metal roof.	1	1
26	Slab	Composite	?	?	20 feet	?	North and south sides of house in contact with oaks.	2	0
27	Cinder block	Composite	Vinyl	Yes	5 feet	?	Covered wooden front porch with a metal roof.	0	0
28	Slab	Composite	Aluminum - back; Vinyl - front	No	5 feet	?	Vegetation overhanging roof.	0	7
29	Slab	Composite	Metal - first floor; wood - second and third floor	Yes	30 feet	78,867	Picnic table against house.	0	0
30	Cinder block	Metal	Aluminum	Yes	N/A	?	Located at bottom of box canyon. Not skirted.	?	?
31	Cinder block	Composite	Hardiplank	Yes	30 feet	?	Near crest of hill.	1	2
32	Slab	Brick	Composite	Yes	Rise 100 yards from top to bottom	100,577	Vegetation overhanging roof.	1	2

Montague County - Area surrounding west side of city of Montague *(continued)*									
Paper ID	**Foundation**	**Roof**	**Exterior walls**	**Deck**	**Set-back from slope**	**Value lost**	**Additional x-factors for ignition**	**Number of outbuildings lost**	**Number of vehicles lost**
33	Cinder block	Composite	Hardiplank	Yes	?	?	Compressors and riding mowers against house.	1	55
34	?	Metal	?	Yes	N/A	?	Vegetation less than 10 feet from roof.	0	0
35	Cinder block	Metal	Aluminum	Yes	N/A	?	Wooden attachment. Vegetation overhanging roof.	3	0
36	Cinder block	Metal	Vinyl	Yes	30 feet	?	Railroad ties and electric poles used for landscaping. Open wooden deck. Vegetation overhanging roof.	2	4
37	Cinder block	Metal	Aluminum	Yes	N/A	?	Open wooden front porch.	0	11
38	Cinder block	Composite	Vinyl	Yes	N/A	?	Vegetation overhanging roof. No skirting.	3	3
39	Cinder block	Composite	Vinyl	Yes	N/A	?	Vegetation overhanging roof. No skirting.	?	?
40	Cinder block	Composite	Vinyl	Yes	N/A	27,926	Lawn furniture and gas grill against house. Vinyl skirting. Wooden decks.	4	17
41	Cinder block	Composite	Vinyl	Yes	N/A	1,500	Erratic fire behavior - fire “rolled over” mobile home.	1	0
42	Concrete retaining wall with crawl space	Metal	Hardiplank	Yes	75 feet	25,257	Isolated location. Location to crest of hill. Erratic fire behavior.	3	0

Montague County - City of Saint Jo									
Paper ID	**Foundation**	**Roof**	**Exterior walls**	**Deck**	**Set-back from slope**	**Value lost**	**Additional x-factors for ignition**	**Number of outbuildings lost**	**Number of vehicles lost**
43	Cinder block	Metal	?	?	N/A	?	Vegetation overhanging roof, lack of mitigation, remote location.	3	5
44	None	Aluminum	Aluminum	?	N/A	?	Vegetation overhanging roof, lack of mitigation, remote location.	0	0
45	None	Metal	Rock	Yes	N/A	?	Mobile home with wheels removed. Stone work on parts of mobile home. Vegetation overhanging roof.	5	2

Montague County - City of Stoneburg									
Paper ID	**Foundation**	**Roof**	**Exterior walls**	**Deck**	**Set-back from slope**	**Value lost**	**Additional x-factors for ignition**	**Number of outbuildings lost**	**Number of vehicles lost**
46	Concrete flooring with crawl space	Composite	Brick	?	N/A	39,469	Trees overhanging structure. Broken windows. Two to four foot dry weeds covering lot. Large amounts of debris.	0	0
47	Concrete flooring with crawl space	Composite	Brick	No	N/A	36,075	Trees overhanging structure. Broken windows. Two to four foot dry weeds covering lot.	0	0
48	?	Metal	Wood	?	N/A	?	Trees overhanging structure. Broken windows. Two to four foot dry weeds covering lot.	0	0
49	Cinder block	Composite	Vinyl siding	Yes	N/A	?	Broken windows. Two to four foot dry weeds covering lot.	0	0
50	Slab	Metal	Metal	?	N/A	?	Tree overhanging structure. Broken windows. Two to four foot dry weeds covering lot.	3	1
51	Slab	Composite	Wood	Yes	N/A	38,975	Located next to heavy fuels (grasses).	1	0
52	Cinder block	Metal	?	Yes	N/A	9,216	Located next to heavy fuels (grasses). Wooden deck.	2	1
53	Slab	Metal	Rock	?	N/A	?	Trees overhanging structure. Broken windows. Two to four foot dry weeds covering lot. Tires stacked against/ near house. Large amounts of debris against/near house..	1	2
54	Pier and beam	Composite	Wood	No	N/A	?	Radiant heat from cedar trees lining front area approximately +/- 25 feet from house.	0	0
55	Cinder block	?	?	?	N/A	11,920	Grass fuel load.	0	0
56	Pier and beam	Metal	Wood	No	126 feet	?	Location to crest.	?	1
57	Slab	Metal	Wood	Yes	N/A	?	Trees overhanging structure. Broken windows. Two to four foot dry weeds covering lot. Tires and building material stacked against/near house. Large amounts of debris. Leaf litter accumulation against structure.	3	4
58	Pier and beam	Metal	Wood	?	N/A	?	Vegetation overhanging roof.	?	7
59	Slab	Composite	Wood	Yes	N/A	42,754	Home sat in a wooded area surrounded by dry vegetation and debris. House constructed of wood had open porches made of wood.	3	4
60	Pier and beam	Composite	Wood	Yes	N/A	?	Wooden attachments. Vegetation overhanging roof.	3	1

Montague County - City of Stoneburg *(continued)*									
Paper ID	**Foundation**	**Roof**	**Exterior walls**	**Deck**	**Set-back from slope**	**Value lost**	**Additional x-factors for ignition**	**Number of outbuildings lost**	**Number of vehicles lost**
61	Cinder block	Metal	Vinyl siding	Yes	N/A	?	Dense understory. Wooden attachments.	?	?
62	Cinder block	Metal	Vinyl siding	No	N/A	?	Leaf litter accumulation	0	0
63	Pier and beam	Composite	Masonry	Yes	N/A	?	Wooden ramp leading to front door not enclosed. Heavy leaf litter.	0	0
64	Cinder block	Composite	Vinyl siding	Yes	N/A	?	Vegetation overhanging roof. Radiant heat from neighboring structure fire possibly caused ignition	1	6
65	Slab	Metal	Metal on two sides; wood on two sides	Yes	N/A	?	Vegetation overhanging roof. Radiant heat from neighboring structure fire, possibly caused ignition.	0	5
66	Slab	Composite	Brick	No	At top	200,665	Witness indicated fire entered through gable end-vent.	2	3
67	Slab	Composite covered with metal	Wood	Yes	N/A	261,235	House constructed of wood.	5	1
68	Pier and beam	Metal	Asbestos	Yes	N/A	?	Vegetation overhanging roof, plus possible dried vegetation on perimeters. Location is very remote surrounded by pastures.	0	0
69	Slab	Metal	Wood	No	N/A	?	Remote location surrounded by pastures.	9	3
70	Cinder block	Metal	Wood	No	N/A	?	Remote location surrounded by pastures.	2	0
71	Cinder block	Metal	Press board	No	N/A	?	?	0	0
72	Concrete footing with crawl space	Wood	?	?	N/A	?	Building material. Intensity of fire.	3	7
73	Wheels	Aluminum	Aluminum	?	N/A	?	Travel trailer that was serving as main residence. Dry grass on lot, radiant heat from house.	3	1
74	Concrete foundation with crawl space	Metal	Asbestos	?	N/A	?	Isolated location. Erratic fire behavior.	3	0
75	Cinder blocks with crawl space	Composite	?	Yes	N/A	?	Isolated location. Erratic fire behavior.	1	1

Montague County - City of Sunset									
Paper ID	**Foundation**	**Roof**	**Exterior walls**	**Deck**	**Set-back from slope**	**Value lost**	**Additional x-factors for ignition**	**Number of outbuildings lost**	**Number of vehicles lost**
76	?	Metal	?	?	N/A	?	Construction materials and other combustible materials against home.	2	2
77	Cinder block	Metal	Wood	?	N/A	?	Tires, paint and cedar tree against structure.	3	0
78	Cinder block	Metal	Wood	Yes	N/A	?	Not skirted.	?	?
79	Slab	Composite	Asbestos	No	N/A	?	Vegetation and brush less than 30 feet from home. Trees overhanging roof.	0	1
80	Cinder block	Metal	Wood	Yes	N/A	16,440	Vegetation, brush, tree line and wood decking less than 30 feet from home. Trees overhanging roof.	0	1
81	?	Composite	Wood	Yes	At top	?	?	?	?
82	Cinder block	Metal	Wood	?	N/A	?	Tires against home.	2	0
83	Slab	Metal	Metal	No	N/A	51,376	This was a metal building that served as a shop and resident. Dry vegetation against/surrounding property.	0	8
84	Pier and beam	Composite	Wood	Yes	N/A	84,349	Ignited detached garage first, then traveled to house.	1	3
85	?	Composite	Wood	Yes	N/A	76,801	Structure surrounded by trees including a 35 inch diameter tree in the middle of a wood deck. Vegetation overhanging roof.	0	0
86	?	Metal	Wood	?	N/A	?	Debris against structure.	?	1

Vegetation and Fuels of Montague County

Most of Montague County's 937 square miles lie in the region known as the Western Cross Timbers, in which the pre-dominantly light colored, sandy and loamy soils support post oak savannahs. The terrain of the county is level to gently rolling with broad valleys and high rolling prairies. The elevation ranges from 850 to 1,318 feet. A fifteen mile-wide belt of woodland, known as the Upper Cross Timbers, runs north and south through the county and contains post oak (*Quercus stellata*) interspersed with pecan (*Carya illinoinensis*), walnut (*Juglans sp.*) and blackjack oak (*Quercus marilandica*) trees. Almost 50 percent of the land is considered prime farmland. The growing season normally extends 229 days and the rainfall average is 30 to 35 inches per year. Temperatures range from an average high of 96 F in July to average low of 32 F in January. The emergence of large cattle ranches and the continued increase in population attracted railroads to the county in the early 1880s. The railroad enabled the growth of the Bowie, Sunset and Fruitland communities.

Upland sites in the Western Cross Timbers predominantly contain post oak, blackjack oak, cedar elm (*Ulmus crassifolia*), Ashe juniper (*Juniperus ashei*), sugarberry (*Celtis laevigata*) and Texas red oak (*Quercus texana*). In the Western Cross Timbers escarpment, live oak (*Quercus fusiformis*) is predominant. On the top of hillsides, it is common to find post oaks mixed with live oaks. On many hillsides where fire has been eliminated, there is a mix of Ashe junipers, Spanish oaks (*Quercus falcata*) and red oaks. Most junipers in this area are Ashe junipers and there are occasional eastern red cedars (*Juniperus virginiana*) in the eastern areas of this eco-region. Fire has a major impact on the vegetation, especially in the prairie areas. Traditionally, these were fire dominated regions and periodic burns kept much of the woody vegetation at bay, which favored the growth of grasses. As fire has been eliminated, much of this area has been invaded by woody vegetation such as juniper and mesquite and is no longer a prairie. Within the wooded areas, fire often kept the understory clear and open.

Prior to the wildfires on April 9, federal officials reported there already had been almost twice as many wildfires in Texas this year than during the same period last year. They also noted that the outlook through the middle of the year predicted more fires to come. The National Interagency Fire Center, the national support center that coordinates responses to wildfires, stated that as of Friday, April 10, 2009, there had been 24,126 open forest and grassland blazes this year in Texas, involving more than 668,000 acres. Texas had its driest winter since records were started in 1895, and rainfall was still a foot below normal in many parts of the state, including those in the northwest hit hard by wildfires the week of April 5, 2009. More than 90 percent of the state was under some degree of drought. Drought conditions lower live and dead fuel moistures, making the fuels more likely to combust. This applies not just to fine fuels, but also heavier 10 hour and 100 hour fuels.

Brad Smith, TFS fire analyst II, provided the following explanation of wildland fuel conditions in grass fuels affecting April 9 events.

Grass and timber fuels comprised the majority of wildland fuels found throughout Montague County. One of the first fuel considerations is the herbaceous state of the grasses. 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 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 percent 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 percent green.

3. Cured – Fire spread is not affected by any greenness present in grass profile. Live to dead ratio is less than 20 percent green.

Cured grasses

Montague County grasses were mostly cured, though grasses on the east side of the county were greener than grasses on the western side of the county. The head of the Bellevue Fire ran into grasses that were more representative of transitional grasses. 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 percent green in the live to dead ratio.

Grass fuel loadings had an impact on the 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.

The other major fuel types in this area were timber fuels. Timber fuels throughout the Montague County region were composed of various tree species such as blackjack, post oaks, and in some places hickory and elm. Dead oak leaves are sizeable and add to forest floor fuels to create a deep litter layer of burnable biomass. It is common to find persistent dead leaves in the canopy until new leaves appear. These dead leaves increased ember production and potential spotting ahead of the fire front. Along with leaves, the intensity of the fire caused the bark to explode off trees and create large embers.

Dead trees are seen after a wildfire. The bark from these trees exploded off the tree and created large embers because of the high intensity of the wildfire.

The undergrowth was so matted in many places with grapevines and greenbriers (Smilax bona-nox) it formed almost impenetrable "roughs," as described by homeowners. Greenbrier can overwhelm the lower canopy of hardwood forests and create elaborate vine communities climbing up hardwood trunks. Prescribed surface fires were conducted in February 1982 in Texas to assess the response of vegetation under either Texas live oak or post oak. By July, greenbrier had increased in relative dominance and frequency on both site types (Hutcheson, et al, 1989). Smilax bona-nox is the only species of greenbrier that has been reported for Montague County. This species of greenbrier loves shade and characteristically forms dense tangles almost everywhere it occurs. Smilax bona-nox is common throughout the post oak region; it is the most common greenbrier in Central Texas (David Lemke, Ph.D., Department of Biology, Texas State University, San Marcos). The leaves of greenbrier fall off during the winter, leaving 1 and 10-hour dead fuels in heavy masses throughout the understory and into oak canopies. Along with dead, 1 and 10-hour fuel accumulations from previous growing cycles, greenbrier leaves contain suberin, which is a common lipid for plant protection (wax). Also, there are some other special oils (ketones) found in Smilax that are volatile, similar to the oils in juniper (Joseph White, Ph.D., Department of Biology, Baylor University, Waco, Texas). The vine operates in a step-by-step manner with the combustible materials of post oak leaf litter on or near the ground. The leaf litter will ignite and the greenbrier will carry the fire to the crown of the trees. The oak fuel type along with dormant vine fuels generated fire intensities that significantly contributed to property losses and increased the level of resistance to containment and control.

Greenbrier

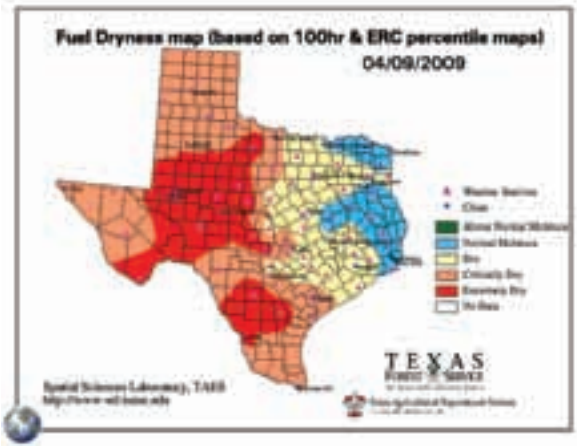
Post oak leaf litter

A brief snapshot

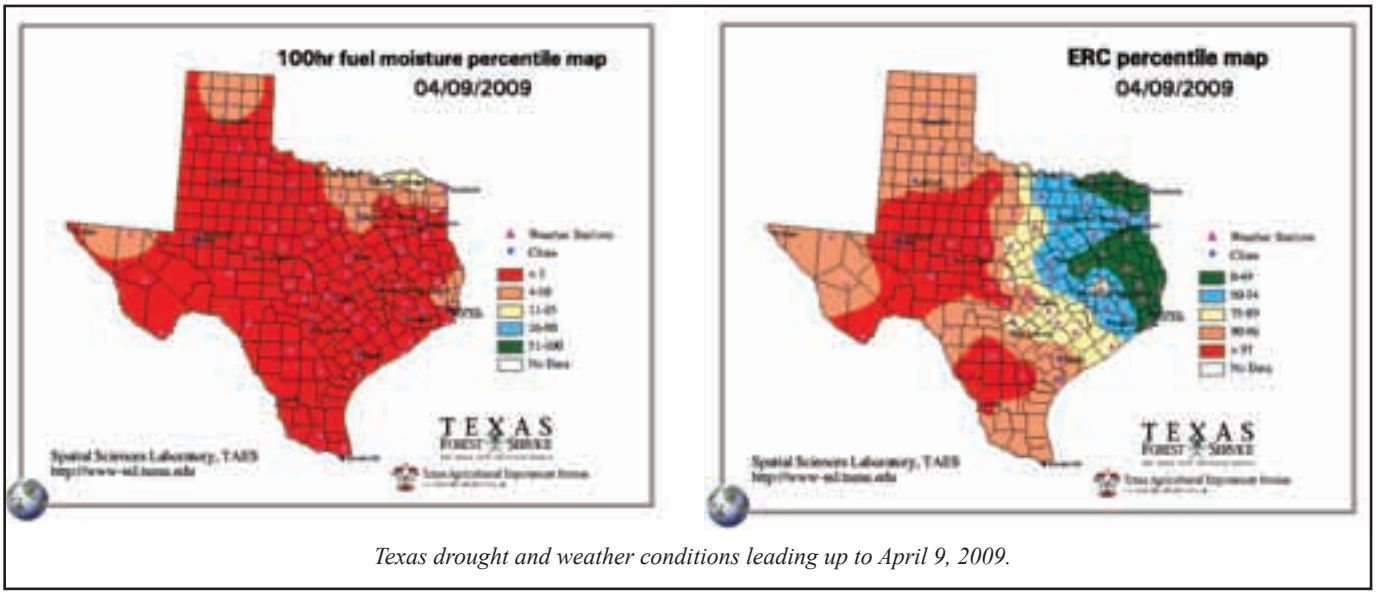
National Fire Danger Rating System (NFDRS) produces various indices to assess fuel conditions across the state. Several of these products (ERC, Fuel Dryness, 100 Fuel Moisture, 1,000 Fuel Moisture) use percentile rankings to provide an adjective description and thus relate the level of dryness in the selected index based on climatology.

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

The Fuel Dryness map shows that over half 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 100 Fuel Moisture percentile maps that are the components of the Fuel Dryness Index map.



Texas drought and weather conditions leading up to April 9, 2009.

"Most portions of the state were at least six to 10 inches below normal [in mid-April]," said Gary Woodall with the National Weather Service in Fort Worth. "Some areas in Central Texas and the Hill Country were 15 to 20-plus inches below normal."

The U.S. Drought Monitor gives ratings of D0-4. Statewide condition reports from the monitor showed more than half of Texas rated D2 Drought or severe drought present; 25.1 percent rated D3 Drought or extreme drought present; and 11.5 percent rated D4 Drought or exceptional drought present.

"Clearly, it took us a long time to build up the extreme precipitation deficits and it will likely take a long time to remove them," Woodall said. "We would probably need an extended wet period as we saw in the spring and summer of 2007."

Of course, while that amount of rain would no doubt relieve the drought situation, Woodall said it also would likely lead to widespread flooding as was seen in 2007.

An anomalously strong weather system contributed to the extreme fire behavior on April 9. Typically, the boundary between two air masses with differing temperatures defines a front. In the U.S. Southern Plains during springtime, however, another phenomenon separates the dry air blowing from the Mexican Plateau into West Texas from the moist air carried north from the Gulf of Mexico into Central and East Texas. This boundary is called the "dryline." During spring in the southern U.S., the dryline exists most commonly in West and Central Texas. This boundary separates the moist air mass with higher relative humidity to the east and the dry air mass with lower relative humidity to the west. The difference in relative humidity values across the dryline can be astounding. Dew point temperatures can be as low as the single digits west of the dryline and as high as the 70s east of the feature. Air temperatures ahead of a dryline are typically in the 70s and 80s, while temperatures behind the dryline can range from the mid 80s to mid 90s.

Greg Patrick with the National Weather Service in Fort Worth said, "On the day of the Montague Complex wildfires, a strong weather system resulted in a deep surface low pressure center across northern Oklahoma. Very strong west and southwesterly surface winds to the south of the low-pressure center allowed the dryline to be pushed east through much of North Texas.

"So even though the pattern observed was somewhat typical of an April weather system, this system was associated with anomalously strong winds near and west of the dryline as it crossed the fire event area. The energetic weather system allowed for deep mixing of higher level (6,000 – 10,000 ft Above Ground Level) winds creating strong and gusty winds at the surface. As the dryline passed the fire event area, very strong south winds switched to the west and temperatures rose quickly under sunny skies. With hot temperatures and very low dew points behind the dryline, relative humidity values plummeted."

These extreme weather conditions, in conjunction with prolonged drought conditions, set up the area for the perfect fire weather event – extremely dry, fine fuels allowed for easier ignitions and strong winds led to increased rates of spread, spotting and ignition potentials.

The National Weather Service Forecast Office in Fort Worth is responsible for weather forecasts in Montague County. The forecast office issued a Red Flag Warning for much of North Texas including Montague County the day before the event. Below is an excerpt from that Red Flag Warning, issued at 2:53 p.m. Central Daylight Time (CDT) on April 8.

URGENT – FIRE WEATHER MESSAGE
NATIONAL WEATHER SERVICE FORT WORTH TX
253 PM CDT WED APR 8 2009

…A RED FLAG WARNING IS IN EFFECT THURSDAY AFTERNOON FOR THE NORTHWEST TWO THIRDS OF NORTH TEXAS DUE TO GUSTY SOUTHWEST WINDS…VERY LOW HUMIDITIES AND VERY WARM TEMPERATURES.

.A DEEP SURFACE LOW PRESSURE SYSTEM WILL MOVE EAST ACROSS OKLAHOMA ON THURSDAY AND RESULT IN THE PASSAGE OF A DRYLINE ACROSS NORTH TEXAS DURING THE AFTERNOON. VERY WARM...WINDY...AND DRY CONDITIONS WILL OCCUR BEHIND THE DRYLINE RESULTING IN CRITICAL FIRE CONDITIONS THROUGH SUNSET THURSDAY EVENING.

The National Weather Service issued an updated statement reiterating the forecast of extreme fire weather conditions on April 9 at 4:03 a.m. CDT.

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403 AM CDT THU APR 9 2009

...RED FLAG WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM CDT
THIS EVENING...

A RED FLAG WARNING REMAINS IN EFFECT FROM NOON TODAY TO 8 PM CDT
THIS EVENING.

WEST AND SOUTHWEST WINDS BETWEEN 25 AND 40 MPH...WITH GUSTS TO 50 MPH...
WILL DEVELOP BY THIS AFTERNOON...AS A STRONG LOW PRESSURE SYSTEM MOVES
EAST ACROSS OKLAHOMA. THE VERY STRONG WESTERLY WINDS WILL COMBINE WITH
VERY LOW HUMIDITY VALUES FALLING BELOW 15 PERCENT TO CREATE AN EXTREME
FIRE DANGER WITH EXPLOSIVE GRASS FIRE POTENTIAL.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

A RED FLAG WARNING MEANS THAT CRITICAL FIRE WEATHER CONDITIONS ARE
EITHER OCCURRING NOW...OR WILL SHORTLY. A COMBINATION OF STRONG WINDS...
LOW RELATIVE HUMIDITY...AND DRY VEGETATION WILL CREATE EXPLOSIVE FIRE
GROWTH POTENTIAL. AVOID ALL OUTSIDE BURNING AND WELDING ON TODAY. DO
NOT TOSS LIT CIGARETTE BUTTS OUTSIDE. REPORT WILD FIRES TO THE NEAREST
FIRE DEPARTMENT OR LAW ENFORCEMENT OFFICE.
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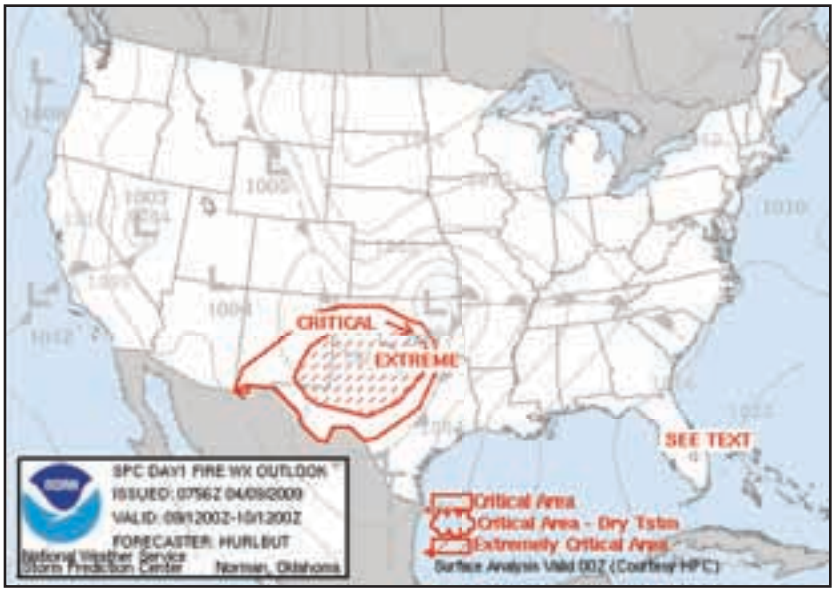
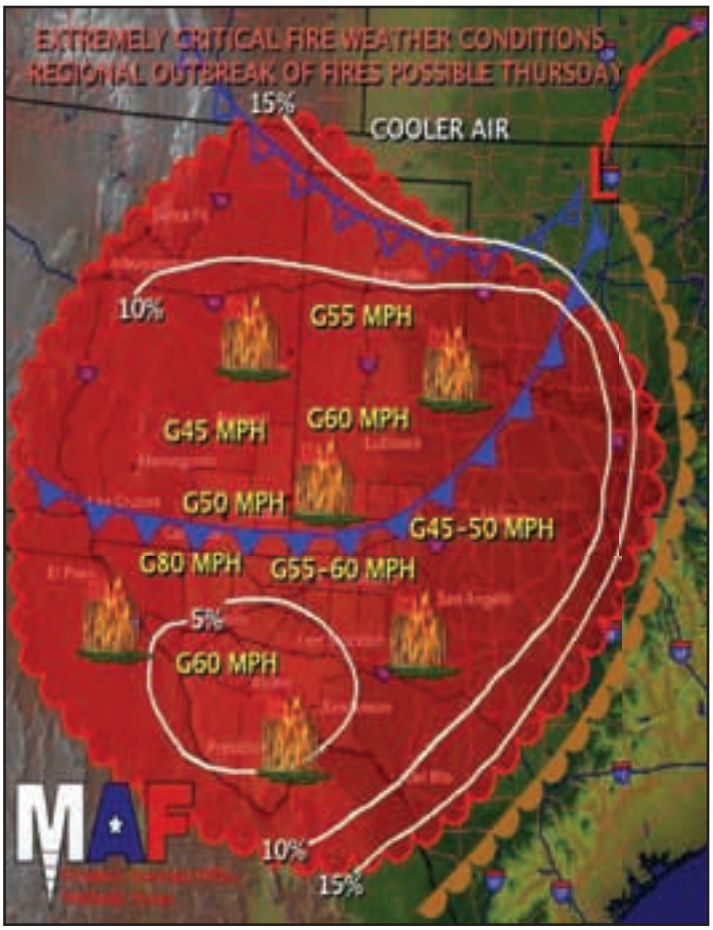
Greg Murdoch with the Midland National Weather Service and IMET (Incident Meteorologist) provided the following explanation for the April 9 events:

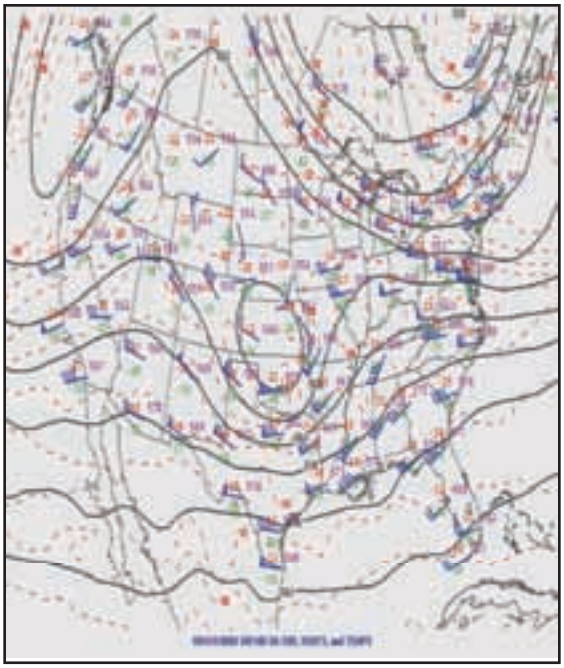
Extremely critical fire weather developed April 9 as a powerful upper level low moved into the Southern Plains. Warm, dry air was pre-positioned across West Texas and as the upper low moved east, strong west winds developed across West Texas. The winds had spread eastward into the lower Rolling Plains and North Texas by noon. In the past, this type of weather pattern has been associated with regional outbreaks of fires across the Southern Plains. Forecasters and fire danger analysts were concerned about the forecast weather intensity, the duration of extremely critical weather and the shear size of the area that was forecast to be affected. Some forecasts were even calling for a high probability of high impact fire weather. The weather was predicted to be intense. Winds were forecast to gust near 50 mph, humidity was predicted to be in the single digits and temperatures were forecast to be 10 to 15 degrees above normal. Typically, Red Flag Warnings are characterized by a two to three hour period within the burning period. On April 9, the Red Flag Warning was extended to six to eight hours. The 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.



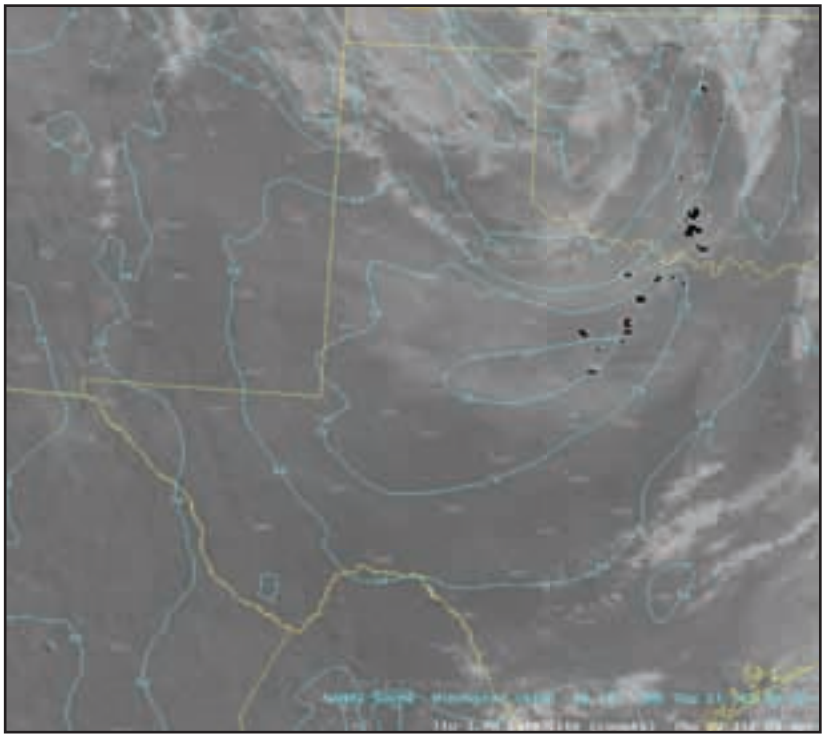
On Wednesday, April 8, the National Weather Service in Midland produced this graphical forecast image for Thursday, April 9. The below image highlights the potential for a regional outbreak of fires.



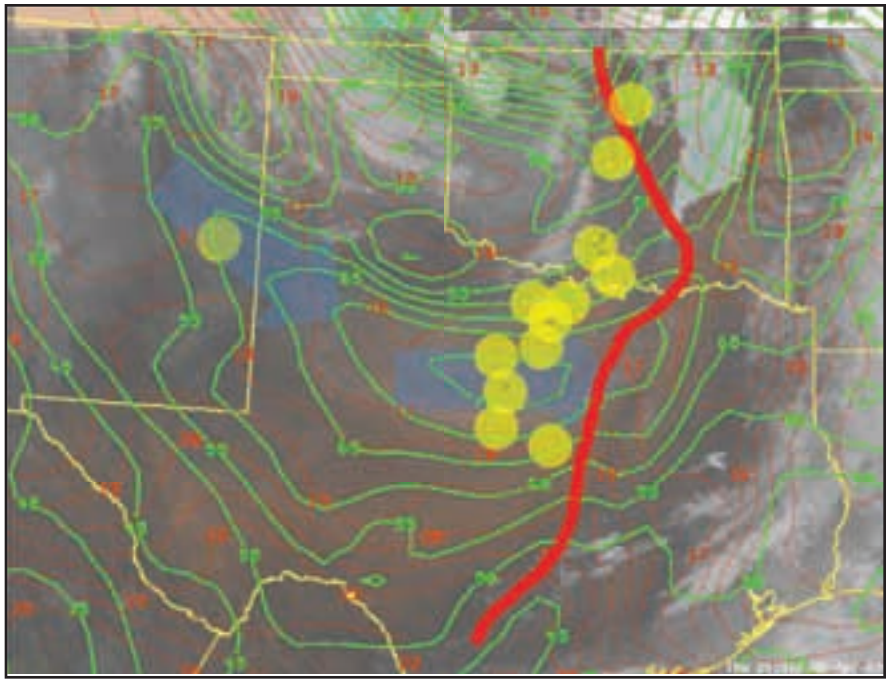
The mid-level weather pattern, approximately 18,000 feet above mean sea level, was interesting to fire weather forecasters because of the low position along the Oklahoma-Kansas border and the strength of the wind field. The strongest wind in this image--75 knots over Fort Worth--is in close proximity to the location of most of the fires. The map below represents the weather at 7 p.m. CDT April 9.



Forecasters were able to do real time analysis and document where fires developed with respect to weather features during the April 9 fires. In this satellite image, fires are depicted in black pixels and the wind field is at 18,000 feet above mean sea level. The image shows the fires occurred in close proximity to the mid-level jet maximum. The whitish-milky color from Lubbock to Big Spring and east through Abilene is widespread, blowing dust.



Dry air can be seen in the upper levels of the atmosphere. Researchers are most interested in the red dotted and heavy solid lines. These lines represent temperatures approximately 5,000 feet above mean sea level. The wildfires, shown within the yellow circles, are in close proximity to the warmest temperatures as depicted by the red dotted lines.



In summary, the weather that occurred on April 9, is associated with regional outbreaks of fires across the Southern Plains. The potential for this type of weather pattern is often identified days in advance by fire weather forecasters. The National Weather Service is researching how to better establish and document not only these patterns, but also identify target areas that are more likely to have wildfires with the guidance of fuel assessment.

During the investigation, citizens and firefighters kept repeating several phrases. The fire was like an avalanche. The fire was cyclonic. The fire appeared to be rolling. The fire whirl was about two to three feet at the base; it looked like someone took a telephone pole soaked it in gasoline and set it on fire.

Others told investigators how their home was consumed by the inferno before fire departments could arrive, despite good Samaritans' best efforts. The house seemed to be overwhelmed by direct flames and firebrands. The fire seemed to "flow" through vents and into the attic, and ignite the house. The fire traveled down the fence line, igniting a storage shed, an RV and finally the house.

This case study underlines the importance of fire behavior education and home survivability for homeowners, firefighters and community officials. The study incorporates eyewitness events, along with scientific research to give rich detail of the events that happened April 9, in North Central Texas.

Winingham – Livestock Impacts

James Winingham said day turned to night as he and his family watched the smoke ahead of the fast-moving wildfire spread towards their property. From the cab of his truck, James could not even see the hood of his truck the smoke was so thick.

James had been a local volunteer firefighter for many years and did not think the fire departments could possibly have control of the fire.

"The fire departments had no impact on the actual fire," he said.

Even efforts such as setting backing fires to stop the forward movement of the fire by burning available fuels would have been futile due to the incredibly high wind speeds. Meteorologists later reported that wind speeds over many of the fires rivaled those of hurricanes.

After the smoke cleared, the fire department had saved the Winingham residence, but 900 acres of pastureland, three barns, two trailers, one tractor, one silo, one well house and 25 round bales of hay had been destroyed. Of the 900 acres burned, 85 were knee-high coastal hay, 160 were mesquite-encroached short pasture and the remaining 655 were short-grazed pasture.

James Winingham's barn was totally destroyed by the wildfire.

During the fire, James tried to move cattle around to various pastures as the fire passed through the area. However, his efforts were futile. The biggest loss was the registered Limousine cattle that were trapped and burned by the fire. Forty cows and calves and one bull had to be euthanized. Winingham said his Limousine show calves were worth $750 to $1,000 each and breeder cows were worth $1,500 to $2,000 each.

Not only were dead cattle a problem, live cattle posed another issue – there was no way to contain or feed them. Miles of fencing and pastureland had been lost. In North Texas, the average stocking rate for cattle is seven acres per cow. With 900 acres of pastureland destroyed, James had a serious problem on his hands – figuring out how to sustain the remaining cattle, displaced from their routine grazing areas, without bringing feed into the property.

Many other ranches throughout the area experienced these same problems. For some, cattle ranching was a hobby or a source for a second income. For others, this was their livelihood. TFS officials assessed the area on April 22, 13 days after the wildfire event. At that time, the USDA had not yet appropriated any funds to help ranchers with their losses. Immediate post-fire assistance came from state agencies and cooperative groups.

In response to the devastating wildfires in North Texas, organizations including the Chisholm Trail Resource Conservation and Development (RC&D), Inc. and the Texas and Southwestern Cattle Raisers Association (TSCRA) have teamed up to establish the North Texas Cattlemen's Relief Fund. This relief fund allowed producers to receive funds to help with damage caused by the wildfires. Applications were accepted from cattlemen who lost livestock, feed, equipment, fencing and other related costs as a result of the wildfires. Additionally, producers across northern Texas donated hay to the fire victims. A hay distribution center was set up at the Bowie Rodeo grounds.

By May 5, Texas Agriculture Commissioner Todd Staples sought federal relief for Texas farmers and ranchers who suffered $35 million in losses from fires that had been occurring since early March. The request for USDA assistance was sent after wildfires destroyed more than 220,000 acres of pasture, approximately 1,500 miles of fence and almost 500 head of cattle and calves.

Staples asked that the 18 North Texas counties impacted during that time by wildfires be declared disaster areas, a designation that would provide relief funding and open up grazing acreage. The 18 counties were Archer, Baylor, Callahan, Clay, Cooke, Eastland, Hamilton, Hood, Jack, Montague, Palo Pinto, Parker, Shackelford, Stephens, Wheeler, Wichita, Wise and Young.

Lesson learned – Livestock affected by a wildfire have long lasting impacts on the community

Before the April 9, 2009, wildfire event, ranchers already were experiencing heavy financial burdens due to ongoing drought conditions. In March 2009, Texas AgriLife Extension issued a report estimating Texas cattle producers had lost roughly $1 billion to drought. More than half that amount had been lost since November 2008. Travis Adams with Texas AgriLife Extension Service said those losses were expected to continue to mount. Rising feed costs and early sales of cattle and calves in a declining market are only a few of the problems farmers are facing, he said.

Heath complications are a problem in animals subjected to flames from wildfire. Ranchers often have a very short window to evaluate and decide whether to take "salvage value" or gamble and medicate cattle after a wildfire. Multiple livestock medical issues can arise from being subjected to a fire. Dr. Ron Gill, associate department head for Animal Science at Texas A&M University, said one of the immediate problems ranchers have to deal with after a wildfire is damage to the feet and the coronary band above the hoof.

Ranchers should deal with hoof problems within the first two to three days. Things are complicated further by the fact that livestock might not show foot damage from a wildfire for 10 days to two weeks after the event. Gill said that cattle often will lose their hoof wall and develop secondary infections, which can cause them to become lame and unable or unwilling to stand.

A veterinarian should be called as soon as lameness is seen to help decide what is best for the animal. Another major health concern for animals affected by wildfire is the potential of mastitis development in lactating cows. Damage to teats and udders will prevent calves from nursing.

Van Baize, executive director of the Texas Southwestern Cattle Raisers Association, said, "Before these secondary complications of infection occur, immediate slaughter for human consumption may be the most appropriate, humane procedure. Prior to slaughter, inspections are conducted by inspectors to determine safety and wholesomeness for human food."

In North Texas, ranchers were given the opportunity to sell their burned cattle for salvage value to a local packing company based on a per-pound processed weight of $0.80. An average 1,100-pound cow would bring a salvage value of around $440. The replacement market value for stocker cattle can range from $1,000 to $1,200 per cow, particularly if the cow is of breeding age. These weekly weighted averages can vary throughout the year based on the livestock market report. Baize said insurance is not available for cattle and often ranchers who suffer thorough a wildfire event such as this are financially ruined because of the loss.

Ranchers do have the option to medicate cattle immediately after a fire for any infections or respiratory ailments. However, once the animals are medicated, the industry requires they wait 30 days before being introduced to the food chain for slaughter. Michael Kalmbach, DVM, said it has been noted that cattle that need mediation after a wildfire typically die several days later and have no value once dead.

The economic impacts from wildfires in rural America reach far beyond what is seen by the public during the typical media frenzy that occurs during and immediately after a wildfire.

"Once the ranchers lose cattle, they no longer need feed supplies, fertilizers and equipment," Baize said. "There are no longer animals to take to the sale barn and veterinary needs are unnecessary. The effects filter down to every aspect of the community."

Based on available data from AgriLife Extension, anticipated losses were reported as:

- 245 cows lost at an average of $1,100 per head = $269,500.00
- 85 percent of calf crop lost at an average of $600 per calf = $124,950.00
- Total loss = $394,450.00

These estimates are low due to the average values used. Many of the cattle lost were registered breeds with much high market values. Additional cattle were anticipated to be reported as dead in the weeks following the wildfire event.

Beverage – Topographic Features

Jim Beverage and Tim Duncan risked their own lives to take care of friends and family members, a task that is rare in the world we live in today. As Jim and Tim attempted to escape the wildfire burning on either side of their driveway, the fuel line on their 1974 Chevy half-ton truck started to melt. They continually pumped the gas pedal, trying to run from the blaze.

Jim said the fire seemed to hit the truck in "waves." The wind would subside and then the next wave would slam into the truck. With each flame advance, it was more difficult to breathe and the increasing heat inside the truck made if feel like his skin was falling off, Jim said. By the time they reached the end of the half-mile drive, the truck was completely engulfed in flames. The glass in the windows had shattered and the heat had set Jim's shirt on fire. Fortunately, the pair escaped into a family member's vehicle and evacuated the area.

The two men said the embers were heavy and made up of large leaf pieces and bark that burned their arms and neck as they assisted evacuating relatives. They were helping Jack and Margaret Nickels, an elderly couple who lived in the neighborhood, evacuate their home on the top of a small plateau when it ignited. It was the first of four homes lost. Jim estimated that it only took 10 to 15 minutes for the fire to travel half-a-mile and up the slope to the Nickels' trailer home.

The lost homes located at the top of the plateau were less than 20 feet from the slope. Multiple post oaks and dense greenbrier thickets closed in on the homes. Jim's home was located at the base of a box canyon. His mobile home had an open cinder block foundation, single-pane windows and limbs overhanging the metal roof.

Lesson learned – Slope means the flames are going to move faster

Fuels are pre-heated as a fire moves up slope – even gradual slopes. The pre-heating dries vegetation ahead of the fire and makes it easier to ignite.

Wildfires sometimes move faster than you can drive a car. A fire spreading up a steep slope looks similar to a fire spreading in front of a strong wind. A slope of 10 degrees doubles the rate of spread. A slope of 20 degrees increases spread by four times. Terrain shape, such as narrow canyons and ravines, can influence fire behavior. For example, a fire burning on one slope radiates a great deal of energy toward the opposite slope. This energy can dry and pre-heat fuels enough to make it highly receptive to ignition from blowing embers. Occasionally, the whole slope, or a large part of it, will ignite in a matter of minutes.

Armbruster – Vents

Gary Armbruster watched the fire progress up either side of the driveway through grass and oak litter, knowing there was nothing he could do to stop the flames. The fire was producing a large number of embers, one of which ignited the wooden deck on the back of his rock mason home. Gary and friends attempted to fight the fire with what they had – well water. Then the electricity went out and the well was useless.

Heat and embers traveled up the side of the house and entered through the soffit and eaves along the roof line. Vents are designed to remove excess moisture in the roof by allowing air to circulate; however, this also provided entry access for flames and heat.
In a final attempt to save his home, the group used chainsaws to remove the deck from the back of the house. Despite their efforts, the house's wooden-framed windows caught fire. With no water available, they could only watch the structure burn. More than 30 years of single-handed masonry work was lost in less than 30 minutes due to the lack of an accessible water supply.

Lesson learned – Pay attention to your vents – they could catch your house on fire.

Most building codes specify vents in crawl spaces or attics to prevent a buildup of moisture, which can lead to mold growth and decay. However, these vents also offer an easy entry point for embers and flames. Steve Quarles, a researcher at the Center for Fire Research and Outreach at Berkeley's Richmond Field Station, says most building codes require that vents be covered with, at a minimum, quarter-inch mesh to minimize plugging and reduction in air movement. However, Quarles says the quarter-inch mesh is inadequate when trying to keep flames away from the inside of your home.

"This is an example of conflict in code preferences between building and fire officials," Quarles said. "Quarter-inch mesh cannot stop embers and flames during wildfires. Smaller-mesh screens would do a better job of keeping them out, but they plug up more easily."

The importance of vents in wildfire resistance is leading to innovations such as specially-designed vents that limit ember and flame intrusion while still allowing sufficient airflow for ventilation and construction designs and procedures that permit unvented attics to avoid moisture-related problems.

The California Office of the State Fire Marshal has building codes relating to homes in the wildland urban interface. One code deals with eave vents and attic ventilation. There are products currently on the market that is endorsed by the office.

Overhanging vegetation or vegetation that is in contact with the home also can increase the movement of fire up walls and into the venting system of a home.

Russell – Ingress and Egress

At 3:30 p.m., Holly Russell received a phone call from her husband Bill saying that F.M. 1816 was blocked off due to smoke. The first thing Holly did was call the insurance company to make sure their insurance policy was current and paid. The insurance company told her they had put freezes on all policies in the area, but allowed her to make the monthly payment. The smoke outside was increasing. By 5 p.m. Holly had the car packed and had moved their horses to a corral on the property.

Holly will never forget the repeated, frantic calls she made to 911, pleading for help for her family and neighbors. All were trapped at the end of Deer Ridge Road, a road with one-way-in access. The fire was burning on both sides of the road when a volunteer firefighter made the decision to use his personal vehicle to escort the families out of the area. The smoke was so thick that Holly could not see the taillights in front of her if she got more than two feet away from the car she was following.

"The county really needs to improve roads like Deer Ridge that are in poor shape, and provide alternate routes out," Holly said.

Bellevue Fire Chief Mark Hanson said that an additional concern is the road network system throughout the county's rural areas. In several locations, roads do not exist at all. For example, just west of Bellevue there is a three to four mile area with no roads that could stop a wildfire before it entered the town. In such instances, there is no way to get ahead of an advancing fire front.

The Russell driveway

Lesson learned – Have an evacuation plan!

Some residential areas only can be accessed by one road. This limitation can present serious problems when trying to escape during a wildfire. Homeowners need to implement their own evacuation plans in areas where fire danger is frequent.

Pay attention to weather events and chances of high fire danger or Red Flag Warning days in the area. It is easy to become complacent after repeated fire warnings, but homeowners need to be overly cautious rather than find themselves caught off guard. Remember, the only information available may come from listening to local radio or television stations. Firefighters may not be able to reach and assist you. Do NOT wait for emergency personnel to contact you. If you feel you are in danger, put your emergency plan into action.

Access to an area is very important in fire protection. Failure to provide reasonable access for incoming emergency equipment and civilian evacuation - two events that may be happening at the same time - can result in a loss of life, property and natural resources. A fire engine sitting at an intersection waiting for civilians to exit a narrow roadway cannot do its job. Safe access means that street and road networks have few dead ends, are of reasonable widths and have turnarounds and turnouts. Rural areas might need to reexamine/develop county road and bridge standards to insure fire vehicles can easily enter, exit and access the area.

Also, proper identification of your home is essential when firefighters are trying access to your property. Remember, during a major wildfire firefighters from across the state could be arriving to assist local firefighters. They will rely on street signs and addresses to find your home. Your street name and address should be printed in letters and numbers that are on a contrasting color background and visible from the road to allow firefighters to quickly locate your home. The sign should be made of fire resistant materials. If your home is set back from the street or road, post your address at the entrance of your driveway. In situations where more than one home can be accessed from a single driveway, all addresses should be posted at the street and at each appropriate intersection along that driveway. If your property is gated, leave the gate open and unlocked as you evacuate to allow firefighters quicker access to your property.

Porter - Defensible Space

Firefighters told Wayne Porter that a 25-foot fire wall was coming and that his family needed to evacuate immediately. By the time Wayne and his wife reached their home, they had only 15 minutes to grab a few belongings and abandon their home. As they were leaving, they saw the fire top the hill behind their home. Wayne remembers seeing multiple fire whirls - or "fire tornados" - and flames as tall as three feet moving through the grass.

"I had a misconception of the speed of the fire," Wayne said. "I knew the heavy brush behind my house needed to be removed to create defensible space."

However, Wayne had not removed the brush from behind the house. The oak trees, entangled with dormant greenbrier, created a dense mass of ladder fuels that allowed the wildfire to move into the tree crowns as it moved up the slope.

As they fled from the fire, the Porters watched as spotting embers started new fires in their open garage. Heavy cedar beams emerging from the eaves of their home and cedar siding across the front of the home would be additional ignition points on the home.

Lesson learned – Defensible space is vital to saving your home from a wildfire

Defensible space around your home or structures where vegetation is modified and maintained to slow the rate and intensity of an advancing wildfire. It is expressed as the distance extending out from the sides of your home to wildland vegetation.

This distance can vary based on the type of vegetation growing near your home and the steepness of the landscape. Some general recommendations include the following, but greater distances may be required if other factors influence the threat of wildfire to your home, such as areas that experience high winds speeds.

	Gentle Slope 0-20%	Moderate Slope 21-40%	Very Steep +40%
Grass	50 feet	100 feet	100 feet
Shrubs	100 feet	200 feet	200 feet
Trees	100 feet	200 feet	300 feet

If the recommended distance goes beyond your property boundaries, contact the adjacent property owner and work cooperatively on creating a defensible space. The effectiveness of defensible space increases when multiple property owners work together

Keeping your defensible space effective is a continual process that must be maintained year round. An effective defensible space can quickly diminish through neglect. Most plants accumulate some sort of seasonal foliage shed. A wildfire will spread much slower if homeowners actively reduce this accumulation of potential fuel by regular pruning, mowing and raking.

Currently there is no adequate methodology for predicting the radiation levels received by a structure from an advancing fire front. Hence, the current prescriptive standard for building setback from fuels when creating defensible space is based solely on expert opinion and is defined in a very coarse range (Cary etal 2003).

Ligget - Little Things

Charles and Mary Ligget watched as the wildfire approached and crested the hill above their metal framed home and business. With no evacuation notification and the fire approaching rapidly, they were forced to ride out the event. Even before the wildfire front became visible from inside their home, the Leggits watched 15 goats collapse from heat and smoke exposure.

The wildfire continued forward, wrapped around their home and ignited a wooden storage shed 10 feet from the carport. Through the garage window they watched a stack of firewood inside the carport burst into flames. With no electricity, getting water from the well was not an option. It was quickly becoming evident that trying to escape the blaze was the only way they could survive. However, the massive amount of smoke increased the difficult of reaching their car.

"The smoke was so thick, at times I couldn't see five feet in front of me," Charles said.

Smoke is composed primarily of carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, and other organic chemicals such as nitrogen oxides, trace minerals and several thousand other compounds. The actual composition of smoke depends on fuel type, fire temperature and wind conditions. Smoke behavior depends on many factors including fire size, location, topography of the area and weather. Smoke concentrations change constantly during a wildfire making it difficult to breath and creating disorientation due to lack of visibility.

The Liggets fled to their car, desperate to outrun the blaze. They watched the wildfire destroy their home from their driveway just 200 feet away. Windows blew out as the wildfire burned its way through the house. The Ligget's lost not only their home, but Charles' business as well. Despite a bare dirt driveway around the house, the small wooden storage shed compromised their home.

Lesson learned – The smallest things often can lead to the largest disasters

Small things can destroy homes during a wildfire. Often the slow, low intensity fires that continue to burn compromise a home after a severe wildfire front has already passed. Fire finds the little things around homes - brush under the eaves, a stack of wood next to the garage or lawn furniture on a deck - and uses them as a starting point to destroy the structure.

Hubbard – Water Supply

Steve Hubbard's newly constructed home was void of vegetation because it was in a pre-landscaping stage. Who would have guessed that this unsightly feature would ultimately save his home. Steve stayed on his property throughout the wildfire event. While moving equipment and horses to a bare dirt arena behind his home, he witnessed extreme spotting ahead of the fire and active fire behavior in short grass pastures.

The Hubbard's home suffered minimal damage from the wildfire. Several shingles were lost from spotting embers, the vinyl fencing around the house melted and multiple vents melted from the heat.

Steve is currently finishing a degree in landscaping and expressed how important it is that homeowners utilize native plant species, which are less prone to ignition, when placing plants near their homes.

Almost all homeowners in the area said they did not have enough water to protect their homes and property during the wildfire event. In the future, Steve plans to utilize rainwater collection - not just for landscaping needs, but also for emergencies such as this. He is also going to purchase an emergency generator for his well in case of electricity loss.

Lesson learned – Water is crucial when trying to save your home from a wildfire

During a wildfire, thousands of embers can rain down on your roof and pelt the side of your home like hail. Embers, or firebrands, range in size from miniscule pieces of burning branches to flaming chunks as thick as two-by-fours. Roofs with lots of angles have more intersections than simple roofs. Those intersections create valleys that collect leaves, pine needles and other debris that easily ignite. Roof gutters full of leaves and needles also are a flash point. An ember being exposed to flammable housing material is one of the major reasons why homes are destroyed during wildfires.

In small rural counties, it is critical that homeowners know where they can access available water sources. Developing a Geographic Information System (GIS) mapping of water resources for local and out-of-area firefighters to utilize during extreme wildfire events could prove beneficial. If homeowners have water storages on their property, they should clearly mark and notify the fire department of their location during an emergency. A cooperative emergency storage tank among several neighbors can provide benefits for multiple homes at a shared cost.

The need for generator power is another rural community concern that should be addressed. Electricty was lost quickly at the onset of the April 9 wildfire event. The loss of electricity resulted in fewer suppression efforts - such as turning on sprinklers - prior to the arrival of the wildfire. Emergency generators, that can be used to operate well pumps in the event of power failure, might reduce home loss from wildfires in areas that have higher wildfire dangers.

Geis – Windows

David Geis stayed to protect his home throughout the entire wildfire event. The wildfire was still more than 1,000 feet away when he started feeling its heat. David said the heat was intense and estimated it to be higher than hundreds of degrees. Using two large tanks fitted with gas pumps, he spent hours spraying his home with water and monitoring the fire's behavior. As embers blew through the compromised windows and eaves, David periodically checked the attic for starts. He stamped out embers that found their way into the attic to keep them from catching the rest of the home on fire. In his effort to save his home, he lost one small storage unit, two large storage units, one dump truck, two trucks and five trailers.

Lesson learned – Window glass is not immune to the intense heat produced by a wildfire

Radiant energy from a fire is similar to the radiant energy from the sun. A standard window transmits about 70 percent of this energy to the interior of a structure, reflects about 10 percent and absorbs about 20 percent. During wildfires, windows are vulnerable to not just radiant heat, but also to flames that can compromise window sashes. Often, high radiant heat or the impact of embers on a window will cause the glass to crack and fall out. The difference in temperatures between the glass protected by the window frame and the glass exposed to the wildfire causes the glass to expand at different rates and break. Minor flaws along the edge of glass can increase with the heat and cause the entire window glass to crack and eventually fall out, making the interior of the home vulnerable.

Vegetation near windows, as well as windowsills, can be exposed to embers for hours before a wildfire arrives and after it has passed. This prolonged exposure can cause the vegetation and/or sills to ignite. To reduce exposure risks to windows, keep vegetation away from windowsills and replace sills with noncombustible materials. Normally, an additional 10 to 20 minutes of protection is all that is needed for a window to survive a wildfire.

Double pane windows can increase your homes safety. The outer pane acts as a thermal shield and protects the inner pane. The inner pane heats up more slowly and uniformly and may not fail even if the outer pane does. Unfortunately, in a severe firestorm, windows still could be vulnerable because both panes are likely to break and fall out. Developers and homeowner associations need to explore the use of double pane and double thermal pane windows in newly constructed homes. Insurance companies could reduce homeowner insurance premiums for replacing single pane windows in existing homes or utilizing Firewise windows in newly constructed homes. Windows need to be routinely examined and maintained to ensure integrity during a wildfire event.

Crockett Ranch and Kennels - Implementation of a Fire Plan

The Crockett Ranch is a commercial deer and bird hunting and dog breeding/training facility that hosts several events a year. After the Montague fires, two events had to be cancelled: Derby Classics on April 16 and Regional 7 Field Trials on April 17-19. The local economy was impacted because of these canceled events. Revenue from lodging, food and animal feed was lost.

Russ Pankey, Crockett Ranch manager, said that in keeping with the ranch's Level 2 Managed Land Deer Permit, the ranch is divided into three sections on which prescribed fires are regularly rotated. The ranch had implemented a fire plan before the Waurika Fire, which burned a half mile south of the ranch two or three years ago. The fire plan prioritizes the evacuation of animals, structure protection and assigns duties to staff members. During the April 9 wildfires, no suppression was performed on the barn and kennels; however, Russ believed the twice-daily washing down of the kennels along with the vegetation mitigation around the buildings reduced the intensity of the approaching wildfire.

Lesson learned: Having a plan and hands to help makes a difference

Russ said having ranch staff on hand to perform their assigned emergency duties was instrumental in the survivability of the ranch. He went on to state that local residents did not have this advantage. Many residents were not home when the fire started and by the time they were notified, there was nothing that could be done.

Lusk Ranch - Loss of Animal Lives

Eleven thoroughbreds were killed in the wildfire that damaged approximately 75 percent of the Lusk Ranch. The losses included Grande's Grandslam, an 8-year-old Grand Slam stallion, and 10 thoroughbred horses in training. The wildfire destroyed the stallion barn, two training barns, two trailers, tractors, tack and other equipment, some of which had been in the family for more than 50 years.

Ranch owner K. Rusk described the horrible scene, "They [the horses] were trapped in their stalls. I can still see the bodies lying in the stalls. There was no way to get out. No place to run. About 20 horses survived and all around, the pastures are just charred."

Results

Based on available data from Nortex Regional Planning Commission, 310 single-family and mobile homes existed within the total fire perimeter for all fires that occurred within Montague County. Throughout the county, 86 homes were reported lost. This means 28 percent of homes within the fire perimeters were lost. In the two hardest hit cities, Stoneburg and Montague, 71 homes were lost. Prior to the event, Stoneburg had 80 homes within the fire perimeter. The loss of 30 homes means 37 percent of the area was impacted. In Montague, prior to the event 123 homes were within the fire perimeter. A loss of 41 homes means 33 percent of the area was impacted. Since it is impossible to know the actual cause for the loss of homes, reverse risk assessments were conducted to allow us to hypothesize some causes.

- Based on the examination of the home sites, homeowner interviews and tax appraisal cards, the findings indicated that of the 86 homes lost, 61 were constructed on pier-and-beam or cinder block open foundations. It is hypothesized that accumulation of oak leaf litter and other debris were available fuels for ignition under the home foundation. Surface fires were able to move under the structures and ignite these fuels. With such extreme heat during and after the passage of the fire front, smoldering was prolonged and allowed for floorboard ignition.

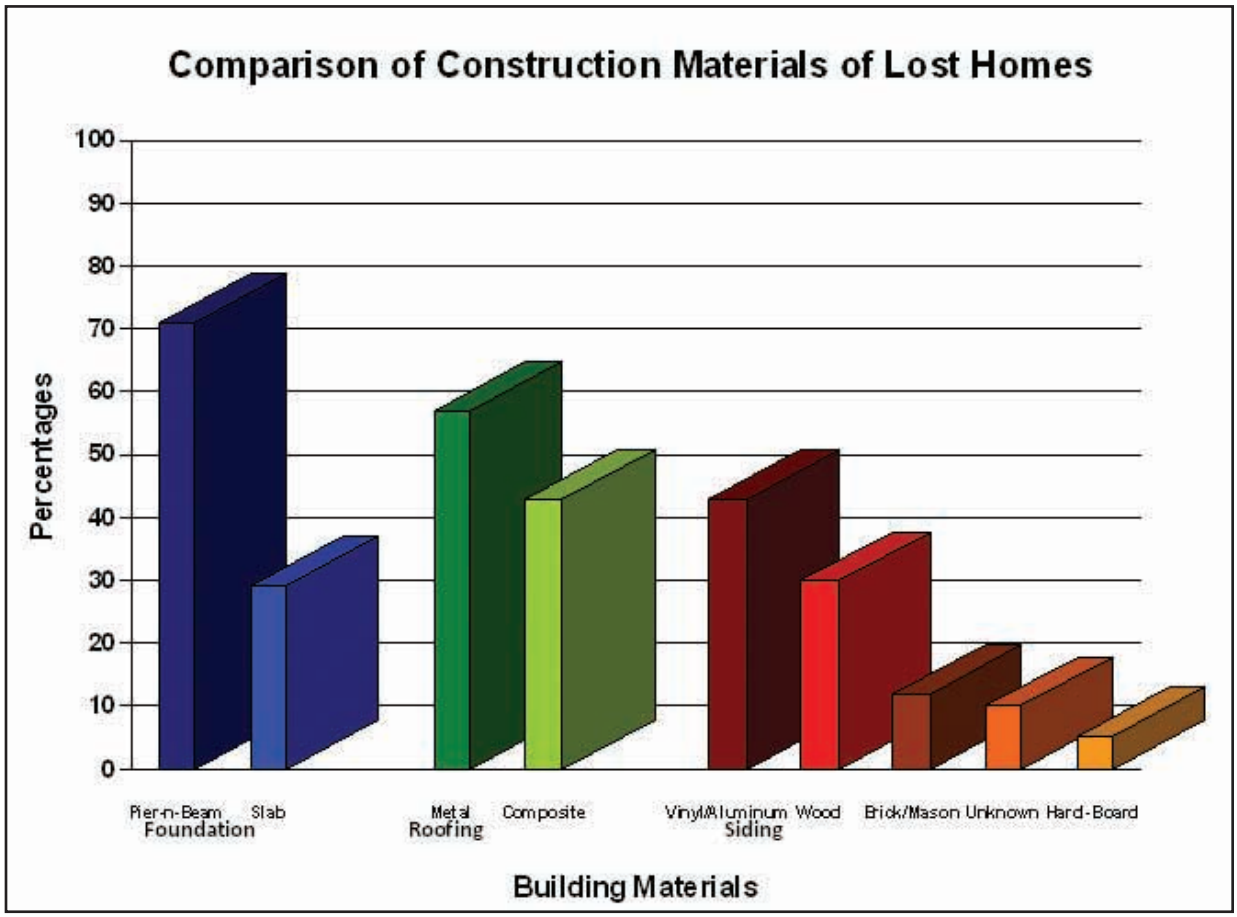
- Twenty-six of the homes were constructed with wood siding. Similar to 100-hour fuels, the wood siding dries out, making the building material parallel dried vegetation and easily ignitable after decades of drought and drying conditions. It is known that wood can achieve piloted ignition in temperature ranges of 200-250 F, depending on the species and moisture content of the wood. For ignition of wood and related combustibles to occur, the moisture must be driven off to a great degree. Wood and similar materials are not easily ignited when the moisture content is greater than 15 percent. The lower the moisture content, the easier the ignition produced by high air temperatures, prolonged drought conditions and low relative humidity.

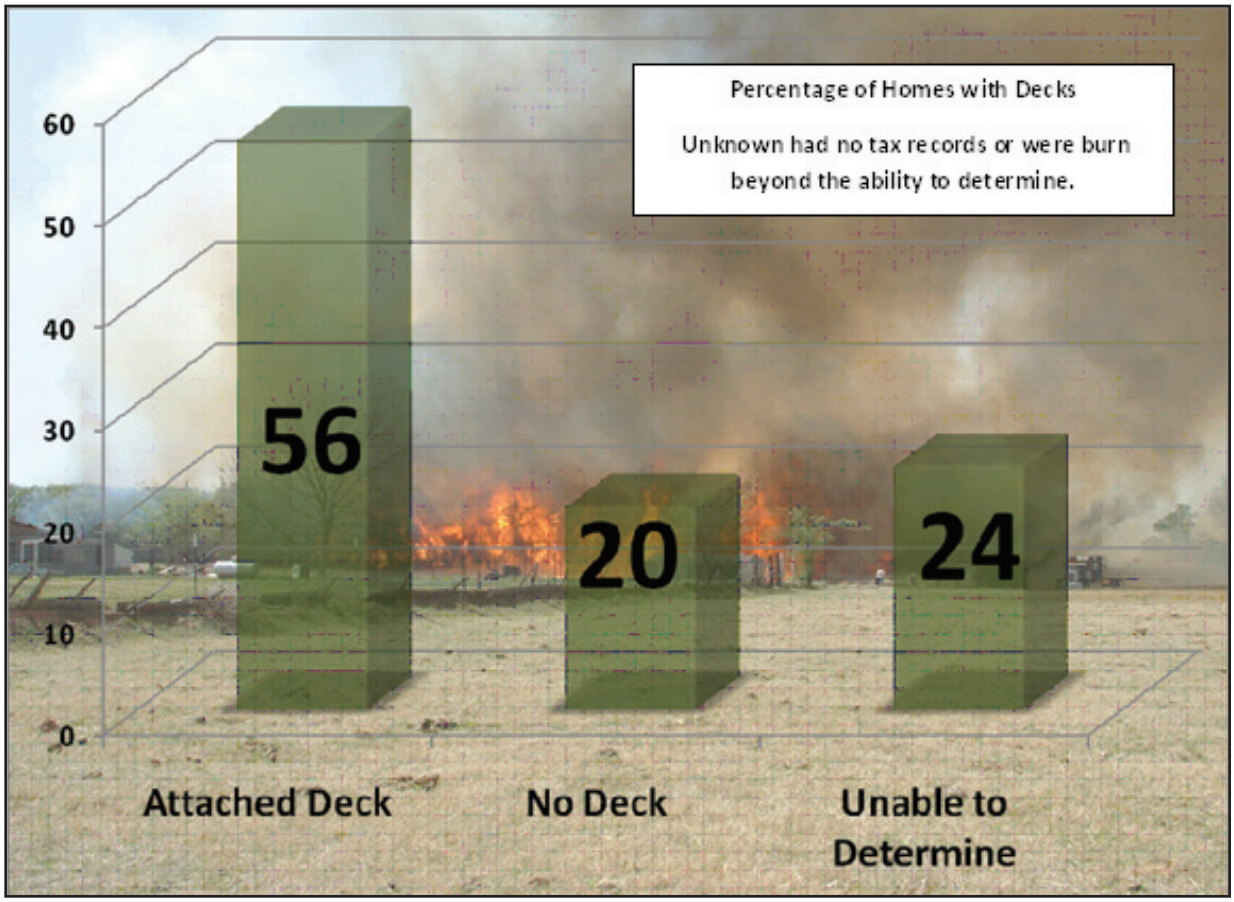
- Thirty-seven of the homes were manufactured homes constructed of vinyl or aluminum siding. Since vinyl siding and accessories will melt when exposed to a significant source of flame or heat, homeowners should take care to keep sources of easily combustible materials - such as dry leaves, mulch and trash - away from vinyl siding, when creating defensible space. Charles Parr, a Stoneburg homeowner, lost his home during the event. “It took 12 minutes for the mobile home to burn to the ground after it ignited,” Charles said.

- Fifty-six of the lost homes had an attached wooden deck, which served as a potential ignition source. Decks should be considered part of your home and combustible materials and debris that accumulate beneath it need to be routinely removed. If you replace your deck, use non-combustible materials and place boards adjacent to each other so embers cannot collect in the gaps between boards during a wildfire.

- The market value loss of homes in the Montague Complex fire is estimated at $2,281,840.00. This is only 38 percent of the total 86 homes lost, as tax cards were only available for these limited number of houses.

- The two dominate fuels that comprised the landscape in Montague were post oak woodlands and grasslands. The fire consumed approximately 21,286 acres of agriculture pasture and grasslands and 2,855 acres of post oak woodlands. The loss of such vast agriculture grasslands will impact ranchers throughout the county.


Comparison of Construction Materials of Lost Homes
Percentages
100
90
80
70
60
50
40
30
20
10
0
Pier-n-Beam
Slab
Foundation
Metal
Composite
Roofing
Vinyl/Aluminum
Wood
Siding
Brick/Mason
Unknown
Hard-Board
Building Materials


Percentage of Homes with Decks
Unknown had no tax records or were burn beyond the ability to determine.
60
50
40
30
20
10
0
56
20
24
Attached Deck
No Deck
Unable to Determine

Be prepared for the next wildfire in rural communities

1. **Reduce the fuel load.**
   Keep grasses and flammable vegetation cleared and reduced around your home. Create mosaics in your landscape to alter fire behavior as it moves through your property. Creating these mosaic areas together with the reduction of highly combustible fuels will improve your home's chance of survival during a wildfire event. Remember, keeping fuels cleared and reduced from around your home requires constant maintenance. You may clear vegetation each year for a whole lifetime, but your fire risk will increase the one year you stop.

2. **Have a working sprinkler system.**
   Stay apprised of daily weather forecasts and fire danger outlooks during fire seasons. On days of high fire risk, turn on sprinklers around your home and structures to increase vegetation moisture and wet down building materials to reduce potential ignition by embers. In the event well water is lost during a wildfire, this precautionary strategy will help reduce the chance of losing your home. If you have a generator, use it to keep sprinklers going before you evacuate.

3. **Move farm animals.**
   On days when high fire danger has been forecast, have a predetermined location to move farm animals early in the day. The area should be safe, even without any mitigation efforts. Once the fire is approaching, other issues, besides relocating animals, will take precedence.

4. **Do not have a false sense of security.**
   Just because you have insurance does not mean everything you own is protected. There are some losses that insurance simply cannot replace. Your insurance will never recompense you for all the loss and suffering that results from a massive wildfire. Can you find insurance to replace family photos and heirlooms? Find a policy that covers all essential losses of home and property. Lock it away in an off-property safe and pretend you have no insurance at all. This will cause you to be far more fire vigilant during summer.

5. **Keep records for all of your valuables.**
   Dennis Bradshaw, a Stoneburg homeowner, said that everyone should take pictures of all four walls in every room, open closets and drawers. According to the U.S. Fire Administration, one out of every 150 U.S. homes suffers a fire that destroys property that cannot be adequately identified for insurance purposes. Taking pictures can be invaluable when making insurance claims. Visual aids not only prove to the insurance company that the item claimed was owned, but they can also help jog someone's memory after the trauma of a fire.

6. **Watch for smoke.**
   Closing the blinds, switching on the air conditioner and watching TV on an extreme fire danger day can be disastrous. Be aware and do not expect to receive notification of evacuation. Dispatch centers are flooded with phone calls during large wildfire events. Their initial responsibility is to dispatch fire departments to the reported fire location. During a large wildfire, you are often on your own and the fire front will move far more quickly than the official updates that come to you. If you see smoke, evacuate your family and notify neighbors. It is better to be safe than sorry.

7. **Turn on the radio or TV.**
   As with any emergency, have a radio and back up batteries in case electricity is lost so you can stay attuned to information as it becomes available. Due to electrical pole damage, electricity was lost within the first few minutes of the Montague fires. The pole damage did not just result in home electricity loss, but also well power.

8. **Keep vehicles fueled up.**
   In rural areas where stores and gas stations can be far from your home, vehicles should be kept fueled and ready for evacuation at the first sign of a wildfire. Firefighters with years of experience and training often are pulled back to safety areas during wildfires. Do not think that you can stay and protect your home. If firefighters determine it is unsafe to continue to fight the fire, it is definitely unsafe for you.

Trail Cameras

While collecting data for the case study, several homeowners indicated they had acquired images of the Montague Complex and Cement Mountain fires from trail cameras placed around their property and within the fire perimeters. The cameras provide a firsthand view of the fire movement though the area and the images are time stamped. Currently, there is equipment that can provide superior quality images, collect data and produce scientific fire outputs for examination. However, this information comes at an extremely high cost. The use of trail cameras could provide a unique view of fire activity during an event at a low, affordable cost. The Moultrie cameras that captured photos of these two fires range in price from $50 to $150. Most of the homeowners had solar or battery backup power, which added $100 to the price.

With each series of photos, field personnel who studied areas of land after the fire were able to make visual inferences of the fire that otherwise would have not been possible. Upon early examination of images, some inferences were made in regard to fire behavior in the post oak grass understory ecosystem. It was quickly seen that leaf litter contributed to the spread of the fire at extremely high rates. Ten and 100-hour fuels exhibited complete consumption due to both radiant and convective heat, as well as residual burning. The massive heat given off by the fire created extreme heat pulses that increased the ambient air temperature by as much as 32 degrees in a matter of minutes and kept it elevated for an extended time. When these heat pulses are compared to home losses, it can be assumed that the elevated fuel temperatures experienced prior to the fire front were caused by the high ambient temperature. These elevated fuel temperatures allowed for easier fuel ignition and for the high temperature to be maintained. The high temperature allowed for re-burning of fuels even after the fire front had passed. The increased burning time of the larger fuels caused the ignition of several homes that appeared to be safe after the fire front passage.

Acquiring these cameras from homeowners after wildfire events would provide reference photos of fire behavior that can verify rates of spread, ember production, flame lengths and other fire behavior in the area. As a management tool, trail cameras could aid in validating fire progression models by providing real-time fire progression captured by systematically placed trail cameras during prescribed burns. Also, these cameras would help managers determine if prescribed fire objectives had been achieved by looking at vegetation impacts based on visual time of heat duration and visual fire intensity. Further investigation of these cameras is needed to determine how useful they could be in the study of fire behavior. The answers they may provide could aid in improving defensible space and other Firewise activities around homes and communities.

Other Losses

As homeowners attempt to rebuild their homes, barns, outbuildings and more, communities are trying to recover too. Many aspects, other than homes, are affected by wildfires. The list below illustrates some of those areas:

Oil Companies	**Damaged Incurred**
Geokinetics	48 - 660' cables, 15 boxes, 107 - 100' geosensors, 14 batteries Total loss - $108,750, not including crew cost to repair damages

Electrical Companies	**Damaged Incurred**
Wise Rural	215 poles, 3.5 miles of electrical line
Cook County Electric Coop	15 poles, some remote sites required generators
Oncor	50 poles, smoke caused faults on about 5 - 345kv lines

Telephone Companies	**Damaged Incurred**
Embarq	2 poles, 2,200 feet of cable
Windstream Communications	Minimal damage, lost 5 pedestals
AT&T	2 poles, 600 feet of aerial cable, lost 12 pedestals

These losses influence daily utility and communication needs throughout the community and surrounding areas, as well as daily workloads impacted by recovery work. As communities discuss the need to mitigate homes, the need to mitigate around essential utilities also needs to be considered.

No Wildland Urban Interface codes in Texas

The Texas political and philosophical property-right mindset is well established: Texas is a private property state. Every year, issues centered on allowing counties more authority are brought to the legislature. These issues often are met with resistance by authorities and stakeholders.

In the Texas Constitution, most counties do not have ordinance and coding authority unless it has been granted to them by the state. In some counties, Emergency Service Districts (ESD) have been formed and have the authority to enact fire codes. However, fire codes have to be recognized codes that are designed to complement state building codes. Counties that currently have an ESD could implement nationally recognized fire codes, but often do not due to the difficulty and cost associated with enforcing such codes. Building codes come first in regards to structures; fire codes then are established to maintain the building codes. Once structures have building and fire codes, they have to be inspected annually, which brings a cost to the regulating entity.

Texas law defines a subdivision as a piece of land that is divided into two or more parts. However, if an individual landowner has 10 or more acres, the county has no authority in regards to platting. The landowner can place multiple structures on the land as long as the homes are not land locked and all have access to public roads.

Counties do have the limited authority to provide prevention measures in the form of subdivision regulations. However, those regulations can deal only with planning requirements such as paving, road width, utilities and lot size.

Subdivisions that are on file with the county must have met general regulatory codes in order to have been established. The creation of progressive designs for Firewise developments depends on the cooperation of subdivision developers and county subdivision regulators who can establish guidelines for the development stage of subdivisions.

At the subdivision level, restrictions can be made in regards to covenants. There are three regulatory measures available: homeowner associations, property associations and restrictive covenants. Wildland urban interface building standards need to be established at this level to provide minimum standards for materials and material assemblies that provide a reasonable level of exterior protection for buildings in wildland urban interface areas throughout counties at risk. Ignition-resistant materials should be used and homes should be designed to resist the intrusion of flame or burning embers projected by a vegetation fire. This will prove to be the most prudent effort in regards to mitigating the losses resulting from of interface fire disasters.

As individual homeowners, we are left with the “Buyer Beware” adage. For a home to be self-sustaining during a wildfire event, the final responsibility lies in the hands of the individual homeowner. Homeowners need to educate themselves on available construction materials and design, landscaping for defensible space, and routine maintenance needs. The internet provides an unlimited source of information about Firewise design and defensible space. Local fire history, topography, vegetation, available building materials and associated costs will vary throughout the state and require each individual home have a unique plan.

Rural Communities and Mitigation

When it comes to getting help, one of the first problems facing rural areas after a wildfire is the definition of "rural." The USDA, Office of Rural Communities and Texas State Data Center each have their own definition for rural. They use terminology such as "non-metro areas," "micropolitan areas" and "noncore" to define rural communities. For this case study, the U.S. Census Bureau definition – rural areas comprise open country and settlements with fewer than 2,500 residents – will be used.

Most counties contain a combination of both urban and rural populations. Based on 2003 census data, Montague, Clay, Young and Stephens counties all are considered to be rural. Each was impacted by wildfires on April 9.

Lynn (2003) wrote, "Grants through the National Fire Plan, the Federal Emergency Management Agency (FEMA) Assistance to Firefighters Grant Program, and other local, state, and federal fire-related programs have been established to bolster community abilities to prepare for and reduce the risk of wildfires. However, while these grants and programs are available nationwide, the nation's wildfire policies and programs do not provide the consistent, meaningful, and long-term assistance needed by rural and economically distressed communities to mitigate or recover from wildfires" (p. 10).

She also wrote, "The rural poor often live in the most fire prone areas, live on properties that are most susceptible to wildfires, and have the fewest available resources to create defensible space around their homes and properties. Thus, they are more susceptible to wildfires than middle- and high-income rural residents, who often have greater access to the programs and resources needed to create defensible space" (Lynn, 2003, p. 10).

Lynn (2003) said, "Often, grants and programs rely on local financial matches to guarantee "community participation." While it is important to have the understanding and involvement of the public, such programs may exclude people or communities without the financial resources, time, or skills to meet program requirements" (p. 10).

As fire agencies across Texas continue to deliver mitigation and prevention messages to homeowners, strategies need to be developed to empower rural, isolated communities to implement fire protection programs. Assistance should be offered to those that have the least ability to reduce the risk of catastrophic wildfires. Assistance needs to be available to rural county leaders so they can be more competitive in obtaining federal funding and assistance that is available from agencies such as the Office of Rural Communities. Finally, education materials need to be created that take into account the local values and belief systems of rural communities so homeowners will be open to change and participation.

Values and Perceptions of Homeowners in the Wildland Urban Interface

Every time TFS case study crews evaluate an area after a wildfire event, they hear that people do not understand or simply ignore the wildfire risks that are inherent to where they live.

The level of risk perceived by homeowners is influenced by a variety of issues, many of which are personal. Risk is assessed both by judging the likely occurrence of a wildfire event and the likely damage that will be sustained. Research shows that wildfires are viewed as hazards that are intensive with a quick onset, short duration affecting small areas, and usually quickly forgotten. This belief comes from the idea that years of successful wildfire suppression has created a feeling of control among homeowners. They think most wildfires are reasonably limited geographically and there is generally enough warning to evacuate withoutz fatalities (McCaffrey, 2004).

People perceive risk based on their personal experiences. Homeowners whose only connection with fire is related to events such as camping and campfires do not realize a small fire can result in the destruction of thousands of acres of land and hundreds of homes. Homeowners deploy strategies to deal with abstract, unknown risks by using various mental strategies: 1) Outright denial – it won't happen to me; 2) Gambler's fallacy – if a wildfire has occurred, then it can't happen again; 3) Timeframe of exposure – fire won't occur in the foreseeable future in my neighborhood. The complexity of causation and high variability associated with wildfires means homeowners must make their risk estimates based on data they perceive as accurate and valid (McCaffrey, 2004).

The TFS post-wildfire assessment team often has been asked why one home was lost even when defensible space suggestions were followed and another an obviously high-risk structure was not destroyed. Homeowners need to understand that nothing is 100 percent and there always is risk due to the multiple and extreme variables (condition of vegetation in the geographic area, previous and current weather conditions, and topographic features) associated with wildfires. Following defensible space suggestions reduces the risk of losing your home and makes it more defendable by firefighters, but it does not guarantee that your home will not be destroyed. The homes that were spared, if closely examined, had some small factor that prevented the loss - a momentary weather change like a wind shift, brief suppression efforts by homeowners prior to evacuation or even multiple driveways allowing the fire to slow before reaching the final home in a subdivision. The risk still was high to these homes, but other factors outside of defensible space influenced their survival.

So why bother? Information about defensible space has been available since the 1970s and the message was the same then as it is today. A person's values and thoughts toward forests and wildland fire management affects their perceptions of defensible space and their intention to engage in particular activities (Bright and Burtz 2006). Distortion of information based on misunderstanding or preconceived notions forces agencies to retrofit information into new formats that will be received more readily. When agencies realize their message is not effective, they often repeat it more frequently and with more noticeable graphics in an attempt to attract attention and create an impact (Monroe and Nelson 2004). The message to homeowners needs to be localized and adjusted to meet the values and ideas for a specific geographic area. It should focus on the "whys," not just the "hows," of defensible space. We need to provide homeowners with scientific research and reasonable explanations for why events occurred during other wildfire events without dumbing down the information just to promote changes in attitudes. Messages that only give "how to" information, but not "why," may support short-term behavior change but may not help when people are challenged with conflicting information. Even with information, it might not be sufficient to create change (Monroe and Nelson 2004).

Modern lives are complicated and natural hazards generally have low priority compared to other daily events. So any wildfire and mitigation efforts tend to be tossed in the "I'll think about that later" category. When wildfires are no longer the primary focal point, daily life activities begin to take precedence over the need to create defensible space. Different motivations drive the decision to create defensible space and that requires agencies to understand the diverse populations within their area, whether long standing or newly developed, and create several approaches to encourage desired behaviors (Bright and Burtz 2006).

Fire in the Future

Climate change will bring about major shifts in worldwide fire patterns and those changes are coming fast. We should all start thinking about what that means for ecosystems and what our response should be, according to a first-of-its-kind analysis led by researchers at the University of California, Berkeley, in collaboration with scientists at Texas Tech University in Lubbock.

Researchers used thermal-infrared sensor data obtained from European Space Agency satellites between 1996 and 2006 in their study of pyrogeography – the distribution and behavior of wildfire – on a global scale. They not only got a global view of where wildfires occur, but they determined the common environmental characteristics associated with the risk of those fires.

"This is the first attempt to quantitatively model why we see fire where we see it across the entire planet," said study author Max Moritz, assistant cooperative extension specialist in wildland fire at UC Berkeley's College of Natural Resources and co-director of the UC Center for Fire Research and Outreach.

Previous models of fire activity have focused on specific regions, including southern California and Australia. Notably, scientists warned in 2006 that climate change could increase bushfire risk across southeastern Australia. Three years later, on top of years of drought, a blistering heat wave sent temperatures soaring up to 20 degrees above average in the region. These conditions, consistent with those expected under future climate change, set the stage for the deadliest fire in the country's history.

Repeated publications and research data attempt to model fires to determine their severity and locality prior to the event. This information would allow for early evacuations, resource placement and needed mitigation efforts prior to fires. Unfortunately, wildfires are random natural events. They constantly are altered by weather, topography, fuels and even people. Researchers are trying to model a random event. As climate changes occur, the stage is setting in Texas for its own catastrophic events, leaving its homeowners scratching their heads as to what needs to happen if they are to survive and protect their property. Homeowners need to understand that wildfire occurrences will continue to change – large-scale weather events such as hurricanes alter fuels, prolonged droughts increase biomass loads of dead receptive fuels and development in new areas alter the landscape and the proximity of homes to burnable fuels.

Each large-scale wildfire event will bring with it new circumstances that will affect its behavior and test the state's ability to adapt policies, tactics, equipment, firefighters and the public consciousness. Additionally, issues at the local level regarding the unique nature of rural communities, the ecosystem of the local community and the types of buildings in rural areas all need to be addressed when designing appropriate educational materials for mitigation and prevention.

Along with modeling fire behavior and understanding long-term weather trends and environmental characteristics, new research should be conducted in areas of social change to understand the need for homeowners to prepare and mitigate prior to wildfires.

Contributions

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Fred Truex - Windstream Communications

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EMERGENCY ORDER BANNING OUTDOOR BURNING

AN EMERGENCY ORDER IMPLEMENTING EMERGENCY RULES DIRECTED AT THE PREVENTION OF WILDFIRES IN THE UNINCORPORATED AREAS OF MONTAGUE COUNTY, TEXAS.

WHEREAS the Presiding Judge of the Montague County Commissioners Court has declared a local state of disaster in accordance with Section 418.108 of the Texas Government Code, for the purpose of implementing controls aimed at eliminating outdoor burning in the unincorporated areas of Montague County as a source for wildfires during the current dry weather; and

WHEREAS, the imminent threat of disaster from wildfire and drought continues to exist; and

WHEREAS, the imposition of control to mitigate the likelihood of such fires should include the prohibition of:

(1) Burning of trash and domestic waste, maintenance or land clearing, brush, and trees; and

(2) Causing a flame or spark to ignite a wild fire as a result of campfires, welding, and/or cutting operations

WHEREAS, Montague County has a local emergency management plan and a rule prohibiting such burning should be adopted.

ORDERED THIS, 9th DAY OF APRIL, 2009, AT 8:00 O'CLOCK A.M.

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BY: TED H. WINN
Montague County Judge