4.10 Urban Fires

4.10.1 Hazard Profile

Fire Fighters responding to a house fire, one of thousands that occur every year across the state

Structure fire is the fifth leading unintentional cause of injury and death in the United States, behind motor vehicle crashes, falls, poisoning by solids or liquids, and drowning. Fire kills more Americans than all natural disasters combined. It also ranks as the first cause of death for children under the age of 15 at home. Approximately 80% of all fire deaths occur where people sleep, such as in homes, dormitories, barracks, or hotels. The majority of fatal fires occur when people are less likely to be alert, such as nighttime sleeping hours. Nearly all home and other building fires are preventable, even arsons. In 2008 (the most recent year the *National Center for Health Statistics* compiled data), Oklahoma ranked second (behind only Washington, D.C.) in number of fire deaths per capita: 26.4 per million residents. The national average is 12 per million. According to the Centers for Disease Control and Prevention (CDC) someone died in a fire every 169 minutes in the year 2010.

Location

Canadian County is divided into 11 Fire Districts, as discussed in Chapter 2.6.5. Of the 11, six are participating in this Plan, and their particulars are summarized in the following table. Although Canadian County's overall Urban Fire vulnerability is High, its communities and public schools vary in vulnerability as jurisdictions, based on such things as location, the local ISO rating, the presence of sprinkler system and fire alarms in critical facilities, the size of the jurisdiction in relationship to its volunteers, stations and equipment, mutual aid agreements, transportation networks, and so forth.

Table 4–30: Canadian County Fire Districts

Fire District	Location	Stations and Equipment
Calumet	116 W. Main	One station, 15 Volunteers, 4 First Responders; 1 pump truck, 1 tanker, 3 brush pumpers, rescue trailer. ISO rating 7 inside Calumet, 9 if structure is over 1,000 feet from a hydrant, 10 if over 10 miles away.
El Reno	219 W Hayes St; 2300 Spur Ln.	Two stations, 19 firefighters, 7 EMTs, NIMS compliant; 4 pump engines, 1 ladder truck, 1 tanker, 2 brush pumpers, 2 command vehicles, emergency trailer, boat, water rescue, flood rescue. ISO rating is 4. District is 154 sq. miles.
Mustang	465 St. Hwy 152	One fire station, 15 fire fighters, 15 volunteers. Not NIMS compliant. 3 pump engines, 2 tankers, 2 grass pumpers, 3 sedans, rescue trailer, 3 generators. ISO rating is 5.
Okarche	103 W. Oklahoma St.	1 station, 20 fire fighters, 16 EMTs and First Responders, NIMS compliant; 2 pump engines, 1 tanker, 3 brush pumpers, 1 command vehicle, rescue vehicle with power plant. 186-square-mile district: 96 sq. miles in Canadian County. ISO rating is 5.
Piedmont	314 Edmond Rd. NW 220 Piedmont Rd. N.	Two stations, 4 salaried fire fighters, 16 volunteers, 13 EMTs 1 Paramedic; 3 engines, 2 tankers, 2 brush pumpers, 2 command vehicles, TNT Hydraulic Ram, RIT pack. NIMS compliant. ISO rating is 5.
Union City	675 N. US Hwy 81 SW 29th and Manning	1 station, 1 substation, 14 Volunteers, 11 First Responders, 3 EMTs; 2 two pump engines, 3 tankers, 3 brush pumpers. ISO rating is 6 in town and 9 in the rural areas. NIMS compliant. Fire station is EOC with backup generator. ISO rating is 6 in town, 9 in rural areas.

Historic properties, due to a lack of applicable modern fire codes at the time of construction, and the reliance on older building materials, are at an increased risk of fire and damage level. Alternative heating methods often used in older homes can also increase the potential for fire.

Measurement

Reports on fires are submitted by local fire departments to the State Fire Marshal's Office. This information is summarized to show community, county and state structure fire frequencies and damages. This data allows the number of fires within a community or district to be measured against state and national averages.

Frequency

According to the U.S. Fire Administration, from 1999 through 2007 there was an average 1,664,800 fires a year in the United States, 3,940 fatalities and 19,485 injuries. Average annual damage was $14.3 billion. Structure fires accounted for approximately 34.1% of all fires and 87% of all deaths and injuries. Approximately 78% of all structure fires were residential. (*Source: National Fire Protection Association Fire Loss in the U.S. 2007.)*

During the 10-year period from 2000 to 2009 (the latest year the State Fire Marshal has complete local data) Canadian County reported a total of 813 structural fires, 15 fatalities, 75 injuries, and approximately $16.95 million in fire damage, including fires in critical facilities. Given this limited data, Canadian County can expect 81.3 structure fires each year, along with 1.5 fatalities and 7.5 injuries and $1.69 million in damage.

Extent/Severity

Canadian County's structural fires between 2000 and 2009 are summarized in Table 4-31. As stated above, 813 structural fires resulted in 75 injuries, and over $16.5 million in fire damage (or $20,313 per fire), while its 45 fires in critical facilities did $430,910 in damage (or $9,575 per fire). Given this frequency, Canadian County can expect 81.3 structural fires each year that result in losses $1,651,493 annually, and $430,910 damage to critical facilities, or $43,091 in losses per year.

Various factors can determine the extent of an urban fire. The contents and age of a structure can influence the extent of an urban fire, as can local weather conditions. Damages from urban fire can range from minor to substantial with damages far exceeding the value of the structure. In recent years, the impact of urban fire has been greatly reduced due to the improvements in firefighting technology and training of local fire management officials. Improvements in building codes and technology have also enhanced a jurisdiction's ability to contain and mitigate damage caused by urban fire. Although the extent of an urban fire cannot be qualitatively measured until the fire has occurred and damage assessed, the likely impact of an urban fire can be affected by public information about common fire hazards, notification techniques and procedures, fire department response speed, structure type and age, density of development, presence of flammable substances, water pressure and availability, and the use of smoke alarms.

Fires are an excellent example of how natural hazards interact in ways that can spiral out of control. Lightning, high winds, earthquakes, winter storms and floods can all trigger or exacerbate fires. Flammable liquid containers or pipelines may be breached. Downed power lines may provide an ignition source. Leaking gas lines and damaged or leaking propane containers, tanks or vehicles may explode or ignite. In addition, when the power is out, unsafe alternative heating sources, candles, or improperly used generators may trigger fire and asphyxiation dangers. Moreover, the disaster conditions may hinder or prevent firefighters from being able to suppress or even reach a fire event.

Canadian County considers an event of minor severity to be $5,000 or less in damages and no loss of life or injury and a major severity event to be more than $5,000 in damages and/or loss of life or injury.

Impact

The impact of urban fire can be death and injury to civilians or emergency personnel, the destruction of homes and businesses, and the loss of employment and local revenue streams. The loss of homes, businesses, and jobs can be devastating to families and communities.

4.10.2 History/Previous Occurrences

Canadian County, during the 10-year period from 2000 to 2009, (the latest year the State Fire Marshal has complete local data) experienced a total of 858 (813 shown in Table 4-31 + 45 shown in Table 4-32) structural fires, 75 injuries, 15 deaths, and over $16.9 million in fire damage, including fires in critical facilities. Table 4-31 details the type and number of fires, along with damages related to non-critical facilities fires.

Table 4–31: Canadian County Urban Fire Damages 2000-2009

Year	Single Family		Apartment		Mobile Homes		Other Residential		Office/ Commercial		Warehouse/ Industrial		Total	
	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg
2000	59	$797,600	9	$13,625	6	$145,000	1	$0	4	$150,300	11	$2,149,800	90	$3,256,325
2001	71	$896,020	5	$20,210	7	$5,450	2	$500	3	$3,000	9	$24,600	97	$949,780
2002	92	$1,079,900	5	$5,500	3	$41,100	4	$46,100	7	$21,550	9	$64,500	120	$1,258,650
2003	47	$1,014,100	9	$17,000	0	$0	1	$10,000	3	$7,000	7	$85,000	67	$1,133,100
2004	66	$412,585	10	$60,650	4	$128,200	0	$0	4	$38,000	12	$170,000	96	$809,435
2005	70	$2,647,400	11	$217,060	3	$92,500	1	$0	3	$5,000	10	$156,300	98	$3,118,260
2006	16	$618,200	2	$25,500	1	$0	0	$0	0	$0	2	$1,750	21	$645,450
2007	68	$1,660,155	4	$340,000	2	$7,500	1	$0	0	$0	3	$12,100	78	$2,019,755
2008	52	$1,003,885	4	$1,388,000	3	$27,000	2	$17,500	3	$72,510	7	$38,000	71	$2,546,895
2009	59	$718,185	6	$1,700	2	$7,200	0	$0	2	$1,200	6	$49,000	75	$777,285
Totals	600	$10,848,030	65	$2,089,245	31	$453,950	12	$74,100	29	$298,560	76	$2,751,050	813	$16,514,935

Source: Oklahoma State Fire Marshal

The vulnerability of critical facilities to fire is of special importance because a fire may damage a community's ability to continue normal or emergency operations, or impact vulnerable populations. Canadian County experienced 45 fires in critical facilities from 2000-2009, which resulted in $430,910 in financial losses, as shown in Table 4-32.

Table 4–32: Canadian County Urban Fire Damages in Critical Facilities 2000-2009

Year	Nursing		Childcare		Hospitals		Correctional		School/ University		Public Assembly		Total	
	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg	#	Dmg
2000	1	$10	0	$0	0	$0	1	$0	1	$0	1	$0	4	$10
2001	1	$0	0	$0	0	$0	0	$0	1	$100	1	$500	3	$600
2002	0	$0	0	$0	0	$0	0	$0	0	$0	5	$7,500	5	$7,500
2003	0	$0	0	$0	0	$0	0	$0	3	$31,500	9	$196,500	12	$228,000
2004	1	$0	0	$0	0	$0	0	$0	1	$500	1	$75,000	3	$75,500
2005	6	$10,500	0	$0	0	$0	0	$0	0	$0	0	$0	6	$10,500
2006	0	$0	0	$0	0	$0	0	$0	0	$0	1	$45,000	1	$45,000
2007	0	$0	0	$0	1	$0	0	$0	2	$50,000	5	$13,700	8	$63,700
2008	1	$100	0	$0	0	$0	0	$0	1	$0	0	$0	2	$100
2009	1	$0	0	$0	0	$0	0	$0	0	$0	0	$0	1	$0
Totals	11	$10,610	0	$0	1	$0	1	$0	9	$82,100	23	$338,200	45	$430,910

Critical facilities that deserve special attention include nursing and retirement homes, hospitals and clinics, child care centers, correctional institutions, schools and colleges. Table 4-33 details the type and number of casualties related to the urban fires.

Table 4–33: Canadian County Urban Fire Injuries & Deaths 2000-2009

Year	Civilian Injuries	Civilian Deaths	Firefighter Injuries	Firefighter Deaths	Total Injuries	Total Deaths
2000	3	2	5	0	8	2
2001	5	1	3	0	8	1
2002	3	0	4	0	7	0
2003	2	0	2	0	4	0
2004	10	4	2	0	12	4
2005	8	4	3	0	11	4
2006	5	0	0	0	5	0
2007	3	4	4	0	7	4
2008	6	0	4	0	10	0
2009	3	0	0	0	3	0
Totals	48	15	27	0	75	15

Source: Oklahoma State Fire Marshal

Probability/Future Events

Real progress has been made nationally in reducing the number of urban fires and fire-related fatalities. Nationally, in 1977 there were 3,264,500 fires, and 5,865 fatalities. By 2008, both figures had been reduced significantly to 515,000 fires, and 2,900 fire-related deaths.

Canadian County, its Communities and Public School systems have a High probability of a future urban fire event.

4.10.3 Vulnerability

Canadian County was determined to have an overall High risk of a future Urban Fire event. This is partly because Oklahoma has become the most structure-fire prone state in the U.S. The evaluation is also based on the age of structures and the frequency of associated hazards that can contribute to structure fires, which are many. These so-called cascade events are Flood, Tornado, High Wind, Lightning, Winter Storm, Wildfire, Earthquake, Hazardous Materials and Transportation. In addition High Heat and Drought contribute to Wildfire, adding them to the potential cascade. Also important are structure density, type of construction, landscaping, the presence of fire alarms and sprinkler systems, the quality of local fire departments, and the distance of structures from these departments. It should be emphasized that a "High" Urban Fire vulnerability rating is not to be considered a rating of the local fire departments, as El Reno and some other Canadian County communities have very highly-rated departments and protection programs, but because of aging structures and the threat of cascade events, has a High vulnerability rating.

Population

In residences, the majority of fatal fires occur when people are less alert or sleeping. Victims are disproportionately children or elderly. Of the fires that kill children, two out of every five are started by children playing with fire.

One of the vulnerabilities peculiar to Oklahoma is related to power outages that often result from flooding, lightning, winter storms, etc. These can trigger urban fires, or create conditions that lead

to fire, such as the use of alternative heating sources in older homes. This peculiarity is shared by all the counties in Oklahoma.

Structures/Buildings

In many cases, communities with aging infrastructures may be more susceptible to urban fire due to the flammability of materials used in construction and number of structures built before current fire safety, plumbing and electrical codes were implemented. The National Association of Home Builders (NAHB) makes the statement in their *Housing Economics* publication:

> "An overarching cause of residential fire deaths is the age of the dwelling. Both known studies that have looked at this question have found that older structures burn much more frequently than newer ones."

Consequently, while any building is vulnerable to fire, particular attention needs to be paid to lower-income neighborhoods with older residences and commercial structures.

More than half (53.5%) of Canadian County's residential structures were built before 1970. As a result, Canadian County has a significant exposure to urban fire damage.

School facilities in Canadian County are also vulnerable to urban fires. Various factors determine the extent of an urban fire's impact on a school. The contents of a structure can influence the extent of an urban fire, as can local weather conditions and the nearness of water hydrants. The impact can also be affected by notification techniques and procedures, fire department response speed, structure type and age, density of surrounding development, presence of flammable substances, water pressure and availability, and the use of smoke alarms and sprinkler systems.

Critical Facilities

Critical Facilities are prone to the same caveats as listed under Structures/Buildings above. Many critical facilities, from retirement homes to Emergency Operations Centers, are located in older buildings with their intrinsic greater fire susceptibility. Canadian County's critical facilities are listed in Table 1-6, and are mapped in Figure 1–8.

All critical facilities within Canadian County should be considered vulnerable to the effects of an urban fire event. Structural integrity may be compromised with even a small fire, rendering the structure unusable.

Infrastructure

Water Treatment – The most significant effect during an urban fire event would be from loss of electrical power.

Wastewater Treatment – The most significant threat to the operation of Canadian County's wastewater treatment facilities during an urban fire event would be from power outages.

Utilities –The service stations and substations for utility providers would be vulnerable to the risks from an urban fire event.

> **Electricity:** During an urban fire event, providers of electrical service could experience challenges in meeting the needs of the Canadian County jurisdiction, including: destruction of distribution and transmission poles, downed broken power lines, and danger to workers derived from downed power lines.
>
> **Gas:** During an urban fire event, providers of gas service to a community could experience challenges in meeting the needs of Canadian County, including: downed power lines, inaccessibility to underground gas meters, and extreme temperatures.

Transportation Systems (Highways, Railway, Airports) – Highways and main thoroughfares in Canadian County could potentially be vulnerable to secondary effects from an urban fire event, such as reduced visibility due to blowing smoke. Depending on the location of the event, an increased presence of emergency vehicles could slow or inhibit traffic flow on main thoroughfares into and out of the city.

Emergency Services- Fire, Police and Medical services would all be similarly at risk to the secondary effects of an urban fire event. Fire fighting is one of the most dangerous jobs in a community, as indicated by the high number of firefighter injuries and fatalities. Emergency personnel on the scene are vulnerable to the cumulative affects of heat generated by the fire itself. Call volume to all emergency service agencies could increase dramatically if it is a large-scale event. Likewise, medical services in the area could become taxed should the fire event encompass several buildings and include multiple injuries.

4.10.4 Urban Fire Scenario

A worst-case fire scenario for Canadian County would be a structure fire in a business or dwelling during a water emergency, a considerable distance from a fire protection facility. In the scenario, a structural fire is caused by lightning from a dry thunderstorm in September, after a wet spring and very dry summer, as in the fires of November-December 2005. High temperatures and peak use would reduce water quantity and pressure, and the fire would quickly exceed the capacity of the tank trucks sent to the scene. The result is a complete destruction of the structure, and the spread of the fire to dry grasses and ground fuels of neighboring properties, to become a widely destructive wildland/urban interface fire. The resulting damage could be in the hundreds of thousands of dollars, if not many millions.

4.10.5 Future Trends

For information on future development areas in Canadian County, see Section 1.2.8.

Population

The populations most at risk to urban fire in the County's future development areas are those located in sections where water lines are small and pressure low during hours of peak use.

Structures/Buildings

The primary fire threat to structures in Canadian County is from low water pressure during peak usage hours, and slow response times due to the distance of the structure from fire protection facilities. Canadian County has a high percentage of structures built prior to 1970, and some derelict structures. Derelict structures in the wildland/urban fringe, in particular, can pose a fire hazard to newer homes, particularly if embers are spread during times of high wind, high temperatures and drought. Another cause of structure fires in dilapidated or abandoned houses is squatting by homeless individuals—a population that may well be on the rise.

Critical Facilities

As with other structures/buildings within Canadian County, the most severe threat to Critical Facilities is from low water pressure in some areas during periods of peak use, and the distance from a local fire department. All critical facilities should plan for the possibility of water shortages, particularly during drought events, as these could have a severe impact on fire protection.

Infrastructure

The vulnerability of future infrastructure would be related to the age and condition of the various water delivery systems. These should be reviewed to ensure they can meet the demand of

increased population. The County should encourage communities to upgrade lines where delivery systems are inadequate.

4.10.6 Conclusion

Fires occur year-round, but the rate of residential fires during the U.S. holiday season and in January is twice that of the summer months. Advances in building codes have made large inroads into the number of fire casualties and damages. In addition, public information and education on fire safety and smoke alarms have proven very successful in reducing residential fires and fire-related deaths. Information campaigns can be particularly effective if geared around those times of year and the populations outlined above.

A number of factors influence the degree of risk from urban fires for Canadian County:

- the percentage of older structures (built before 1970) is above the state average (53.5% vs. 36%);
- the history of casualties due to urban fires, listed above;
- Canadian County has a number of public information and education programs in place that include fire safety, but there could be more;
- See Section 2.1.3 for fire rating information. Individual communities have their own ISO ratings.

These factors place Canadian County's risk from urban fires in the High category. As the most common type of disaster, public information should be a strong mitigation response and other possible mitigation measures should be reviewed.

Update Changes

Identified significant changes made from previous Multi-Hazard Mitigation Plans from Canadian County, Calumet, El Reno, Mustang, Piedmont, and Union City are outlined in Appendix E. Changes are based on criteria outlined for Plan Updates in the Local Multi-Hazard Mitigation Planning Guidance document of July 1, 2008.

4.10.7 Sources

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