



RESEARCH

Large-Loss Fires in the United States 2016

Stephen G. Badger

November 2017

Acknowledgements

NFPA would like to thank the U.S. fire service for its contributions of data, without which this report would not be possible. In some cases, the fire department, forestry officials, or government officials were unable to contribute complete details to NFPA because legal action is pending or ongoing, the incident was of a sensitive nature, or the size of the situation was overwhelming. The author also wishes to thank the staff of NFPA's Research Division for providing the support this study requires.

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NFPA Research, Data and Analytics Division
1 Batterymarch Park
Quincy, MA 02169-7471
www.nfpa.org
E-mail: research@nfpa.org
Phone: 617-984-7450

NFPA No. LLS10

INTRODUCTION

Last year, 25 fires in the U.S. resulted in losses of at least \$10 million each, for a cumulative total of \$1.4 billion in direct property losses. For a bit of perspective, though, that figure was dwarfed by a single Canadian wildfire, the Fort McMurray Fire (see page 5 for details).

NFPA reports annually on large-loss fires and explosions that occurred in the United States the year before. Those fires are defined as events that result in property damage of at least \$10 million. There were 25 such fires in 2016, resulting in a total of over \$1.4 billion in direct property losses. In order to compare losses over the past 10 years, we adjust losses for inflation to 2007 dollars. When adjusted for inflation, the number of fires in 2016 that would have been categorized as large-loss fires—that is, fires resulting in a loss of \$10 million in 2007 dollars—drops to 18, with an adjusted loss of slightly more than \$1.2 billion.

In 2016, six fires—four fewer than the previous year—resulted in more than \$20 million each in property damage. These fires resulted in a combined property loss of \$1.2 billion, or 83.2 percent of the total loss in large-loss fires and 11.4 percent of the total fire losses in the U.S. for 2016.

According to [*Fire Loss in the United States During 2016*](#), published in the September/October issue of *NFPA Journal*, U.S. fire departments responded to an estimated 1,342,000 structure and non-structure fires, which resulted in an estimated loss of \$10.6 billion. Many of these fires were small or resulted in little or no reported property damage. Although the 25 large-loss fires accounted for only 0.002 percent of the estimated number of fires in 2016, they accounted for 9.9 percent of the total estimated dollar loss. In addition, those 25 fires accounted for 14 civilian deaths, with another 183 civilians and eight firefighters injured. Last year was the eighth year out of the past 10 that a wildland/urban interface (WUI) fire topped the list of the year's biggest large-loss fires. In three of those years, 2011, 2015, and 2016, wildfires accounted for the largest and second-largest fires, and in 2007 the three largest fires in terms of estimated loss were WUI fires. In the past 10 years, there have been 33 wildland fires that accounted for more than \$10 million each in direct property losses. In human terms, these fires have been responsible for 31 deaths, 278 injuries, and \$7.3 billion in loss to property.

In each of the past 10 years, at least one fire has resulted in a loss of more than \$100 million, with a total of 26 such fires occurring over that period. Of these largest-loss fire events, 14 were WUI fires, 10 were structure fires, and two were vehicle fires. The two largest fires, both WUI fires, resulted in losses of more than \$1 billion.

In 2016, two fires with losses greater than \$100 million occurred; both were WUI fires, and one of them included losses that approached \$1 billion. That fire, the Chimney Tops 2 Fire in Tennessee, occurred in November and caused \$911 million dollars in damage, the third-highest damage total in NFPA records in the past 10 years and the eighth-highest in all NFPA records of U.S. fires. (Of those fires that were larger, six were wildfires and one was the 9/11 terrorist attack on the World Trade Center in New York.) The other 2016 fire that topped \$100 million in losses was the Clayton Fire, a California wildfire that resulted in nearly \$175 million in damage.

The Chimney Tops 2 Fire was set on Chimney Tops, a mountain in the Great Smoky Mountains National Park, and was first reported about 5:30 p.m. by park firefighters who observed smoke from the top of the hills. The fire originally involved almost inaccessible terrain distinguished by cliffs and thick vegetation, so water drops were made by helicopters to assist in extinguishment. The fire burned for several days before a weather change in the early-morning hours of November 28, including winds gusting to nearly 80 miles per hour (128.7 kilometers per hour) that blew the fire into residential and business areas of several communities outside the park. The National Weather Service had issued high-wind watches for the area on November 27 when the fire was at about 35 acres (14 hectares). The fire burned for several more days before it could be contained and extinguished, during which time evacuation orders were issued for the communities in the path of the fire. By the time the flames were extinguished, the fire had charred 17,140 acres (6,936 hectares) and destroyed 2,460 structures, including 2,100 homes and 60 businesses. The fire was responsible for 14 deaths and more than 150 injuries. Two juveniles were arrested and charged with arson, but the charges were later dropped.

The Clayton Fire broke out at about 5 p.m. on August 21 in Lake County, in Northern California. The fire was determined to be incendiary and a suspect was arrested. The fire was fought for several days until an increase in the wind speed and direction prevented firefighters from keeping up with the blaze, and the fire moved into residential areas. At this time, temperatures were in the 90s F (30s C), winds were 12 to 14 mph (19 to 23 kph) with gusts of 19 to 24 mph (31 to 39 kph), and the relative humidity dropped from 30 percent to 18 percent. By the time the fire was contained, it had charred nearly 4,000 acres (1,619 hectares) and destroyed 300 structures, damaging 28 others.

WHERE THE FIRES OCCURRED AND HOW

Of the 25 large-loss fires in 2016, 22 involved structures and resulted in a total property loss of \$348.6 million, or 24.1 percent of the combined losses for all large-loss fires. The other fires included the two WUI fires and one vehicle fire (a towboat) that resulted in combined losses of \$1.1 billion, or 75.9 percent of the losses in all the large-loss fires.

Six fires each broke out in storage properties and special properties. Of those, four were warehouses (one containing textiles, one with store merchandise, one with miscellaneous equipment, and one with unreported contents), one was a pallet storage yard, and one was a mini-storage facility. The combined losses in storage properties was \$115.5 million. In special properties, four fires occurred in structures that were under construction, including three apartment buildings and a hotel, and two occurred in properties that were under renovation, including an apartment building and a mixed-use property. The combined losses in special properties was \$87.2 million.

Four fires occurred in manufacturing plants—the facilities produced, respectively, baby food, chemicals, and vehicle parts, and one was a recycling plant—causing a combined loss of \$57.1 million.

Three large-loss fires occurred in stores and office properties, including two stores with losses totaling \$31.9 million and one office building with a loss of \$17.2 million, for a combined loss of \$49.1 million.

Two fires occurred in the WUI, resulting in combined losses of nearly \$1.1 billion, and two fires occurred in public assembly properties (both were restaurants), with total losses of \$25.5 million.

One fire each occurred in a residential property (an apartment building, with losses of \$14.2 million) and a vehicle (a towboat, with losses of \$10.2 million).

The cause and origin of fires was undetermined or reported as unknown in 17 of the fires. In several cases, the destruction was so massive that investigators could not make a definitive cause determination or could not rule out several possibilities. Other fires are still under investigation. Cause was reported for eight of the 25 fires, including six of the structure fires. Three of the structure fires were due to a mechanical failure of some sort, two were caused by torch operations too close to combustibles, and one structure fire was reportedly due to an electrical failure of unknown type. The causes of the two WUI fires and one structure fire were listed as incendiary. The property loss in the three incendiary fires totaled almost \$1.1 billion, or 76.2 percent of the losses in the 25 large-loss fires.

Operating status was reported for 14 of the 22 structure fires and the towboat fire. In 10 cases, the facility was open and operating, with eight at full operation and two in partial operation. Four were closed and the properties were unoccupied, accounting for \$69 million in losses. Five of the fires broke out between 11 p.m. and 7 a.m. These fires had a total direct property loss of \$83.5 million.

SMOKE DETECTION AND AUTOMATIC SUPPRESSION EQUIPMENT

Information about automatic fire or smoke detection equipment was reported for 15 of the 23 large-loss structure and towboat fires. Of those 15 fires, nine occurred in properties that had no automatic detection equipment installed. Six properties had smoke alarms present. Five of the systems operated as designed, and the operation in one fire was not reported.

Information about automatic suppression equipment was reported for 17 of the 23 structure and towboat fires. Of those 17 fires, seven properties had systems present and 10 had no systems. Four of the seven had wet pipe systems, one had a dry pipe system, one had a carbon dioxide system, and the type of system in the seventh fire was not reported. In three cases, the systems operated. In one of those three cases, the fire department reported that the system was ineffective due to a lack of water resulting from a pump failure during an electrical outage at a well that supplied the area. In another fire, five sprinklers operated and controlled the fire. In the third, the sprinkler system was not in the area of origin but when it operated, it did extinguish fire in its coverage area. In two fires, the systems did not operate, in one case it had been shut down prior to the fire and the other the system was installed but not completed when the fire broke out. In the remaining two incidents, the operation of the suppression system was not reported.

Of the 15 fires for which information on the presence of both detection and suppression equipment was reported, eight had neither an operational detection system nor an operational suppression system. Both types of systems were available in five incidents, and one property had only suppression equipment and one had only detection equipment.

WHAT WE CAN LEARN AND WHERE WE GET OUR DATA

Adhering to the fire protection principles reflected in NFPA's codes and standards is essential if we are to reduce the occurrence of large-loss fires and explosions in the U.S. Proper construction, proper use of equipment, and proper procedures in chemical processes, storage, and housekeeping will make fires less likely to occur and help limit fire spread should a fire occur. Proper design, maintenance, and operation of fire protection systems and features can keep a fire that does occur from becoming a large-loss fire.

NFPA identifies potential large-loss incidents by reviewing national and local news media, including fire service publications. A clipping service reads all U.S. daily newspapers and notifies NFPA's Research Division of major large-loss fires. NFPA's annual survey of the U.S. fire experience is an additional data source, although not the primary one. Web searches have proved useful in several cases where fire department and government reports have been released and published.

Once a fire has been identified, the NFPA requests information about it from the fire department or agency having jurisdiction. We also contact federal agencies that have participated in investigations, as well as state fire marshals' offices and military sources. The diversity and redundancy of these data sources enables NFPA to collect the most complete data available on large-loss fires.

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ABOUT THE AUTHOR

Stephen G. Badger is a fire data assistant in NFPA's Applied Research Group and a retired firefighter from the Quincy, Massachusetts, Fire Department.

The impact of the Fort McMurray Fire

Estimated property loss in U.S. dollars: \$3.2 billion

Estimated economic impact loss in U.S. dollars: \$8.1 billion

Estimated number of buildings destroyed: 2,400

Square miles of land burned: 2,276

Fatalities associated with the fire: Two

NFPA’s annual study on large-loss fires focuses on events in the United States, but the most severe incident by far in North America last year occurred in Western Canada, in the province of Alberta. For two months, an enormous wildfire called the Fort McMurray Fire—also known as the Horse River Fire, and nicknamed “the Beast” by locals—burned wildlands, homes, businesses, and properties, and threatened tens of thousands of residents. By the time the fire was controlled, it had become one of the largest fires in recent Canadian history, with a property loss of \$3.9 billion Canadian (\$3.2 billion U.S.).

Fort McMurray, a community of about 62,000 located at the confluence of the Athabasca and Clearwater Rivers in northeastern Alberta, is situated amid the Athabasca oilsands and has become a key part of Canada’s petroleum production industry. It is also country that is prone to wildfires. Alberta has a history of large, destructive wildland/urban interface (WUI) fires in the recent past, with significant fire events occurring in 1998, 2001, and 2011, and conditions around Fort McMurray suggested the possibility of more large fires in the area in 2016. The previous year, 2015, had been extremely dry; there had been a low snow pack over the winter, with rapid snow melt in early spring and an early onset of hot, dry, windy conditions. There had been no recent rain.

On May 1, a helicopter patrolling for wildfires spotted a new fire covering approximately four acres (two hectares) in boreal forest, located approximately four miles (seven kilometers) from Fort McMurray. Air tankers arrived within 30 minutes and ground crews responded. The following day, though, the fire had escaped initial control efforts, and a change in wind direction had helped it balloon to more than 6,400 acres (2,600 hectares). On the third day, the wind pushed the fire into the urban area of Fort McMurray, and a mandatory evacuation order was issued for nearly 88,000 people. Over the next two months, the fire would burn into communities and approach oilsands operation work camps, threatening the region’s oil production. At the fire’s height on June 3, there were 2,197 personnel working the fire, along with 77 helicopters, nine air tanker groups, and 269 pieces of heavy equipment. The fire was declared under control on July 4.

Property losses associated with the Fort McMurray Fire were among the highest ever recorded for a wildfire event—by comparison, the largest-loss wildfire in U.S. history, the 1991 Oakland Fire Storm, resulted in estimated losses of \$2.6 billion, in 2016 dollars. In addition to direct losses, the Fort McMurray Fire resulted in an estimated economic impact loss of nearly \$10 billion Canadian (\$8.1 billion U.S.). A total of 2,276 square miles, or more than 1.4 million acres (589,552 hectares) of land were destroyed. An estimated 2,400 buildings were destroyed, including nearly 2,000 residential properties. More than 3,000 structures were listed as unsafe to enter (some for environmental reasons) or total losses. There were no deaths directly attributed to the fire, but two people were killed in a vehicle crash while residents attempted to escape.

Table 1.
Large-Loss Fires of \$20 Million or More in 2016

Incident and Location	Dollar Loss
Wildfire, Tennessee	\$911 Million
Wildfire, California	\$175 Million
Warehouse fire, California	\$40 Million
Warehouse fire, Minnesota	\$25 Million
Construction site, California	\$20 Million
Mixed property structure under renovation, Washington	\$20 Million
Total Losses	\$1.19 Billion

Sums may not equal totals due to rounding errors.

Source: NFPA's Fire Incident Data Organization

Table 2.
Large-Loss Fires that Caused \$10 million or more in Property Damage, 2007-2016

Year	Number of Fires	Number of Fires Causing \$10 Million or More (in 2007 Dollars)	Direct Property Damage (in Millions)	
			Unadjusted	In 2006 Dollars
2007	45	45	\$3,393	\$3,393
2008	34	28	\$2,322	\$2,178
2009	25	21	\$950	\$879
2010	17	12	\$652	\$572
2011	23	18	\$820	\$709
2012	26	18	\$1,463	\$1,247
2013	21	15	\$845	\$697
2014	26	23	\$714	\$599
2015	27	17	\$2,535	\$2,126
2016	25	18	\$1,444	\$1,187

Note: Number of fires and unadjusted loss are based on data from studies that appeared in previous annual large-loss studies. Some of the information may differ from previously published material because material was updated after publication.

Note: Adjustment for inflation is based on the Consumer Price Index using 2007 as a base year. Note that adjustment for inflation not only reduces the total dollar loss for each year but also reduces the number of fires when adjusted losses large enough to qualify as large-loss fires.

Source: NFPA's Fire Incident Data Organization

Table 3.
2016 Large-Loss Fires by Major Property Use

Property Use	Number of Fires	Percent of Fires	Total Dollar Loss	Percent of Loss
Storage	6	24%	\$115,545,400	8.0%
Special Properties	6	24%	\$87,155,000	6.0%
Manufacturing	4	16%	\$57,100,000	4.0%
Stores and Offices	3	12%	\$49,120,182	3.4%
Wildfires	2	8%	\$1,085,615,000	75.2%
Residential	1	4%	\$14,150,000	1.0%
Public Assembly	2	8%	\$25,500,000	1.8%
Vehicle	1	4%	\$10,200,000	0.7%
Total	25	100%	\$1,444,385,582	100.0%

Sums may not equal totals due to rounding errors.

Source: NFPA's Fire Incident Data Organization (FIDO).

Figure 1
Large-Loss Fires, Unadjusted and Adjusted for Inflation (2007 - 2016)

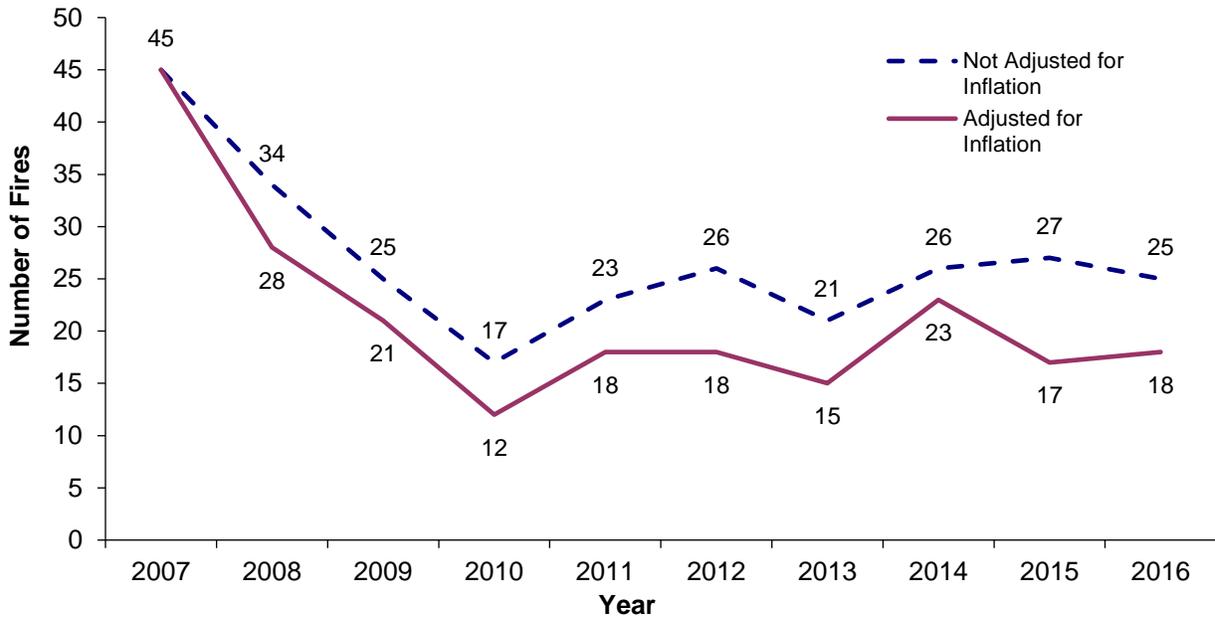


Figure 2
Direct Dollar Loss in Large-Loss Fires, Unadjusted and Adjusted (2007-2016)

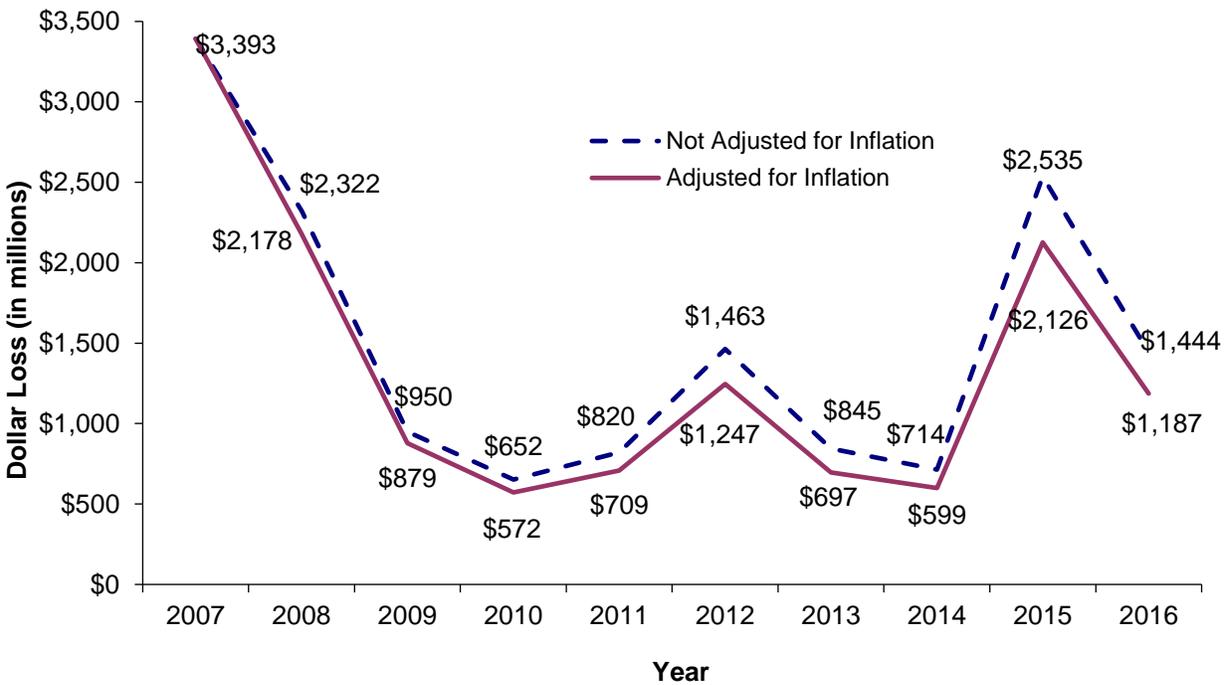
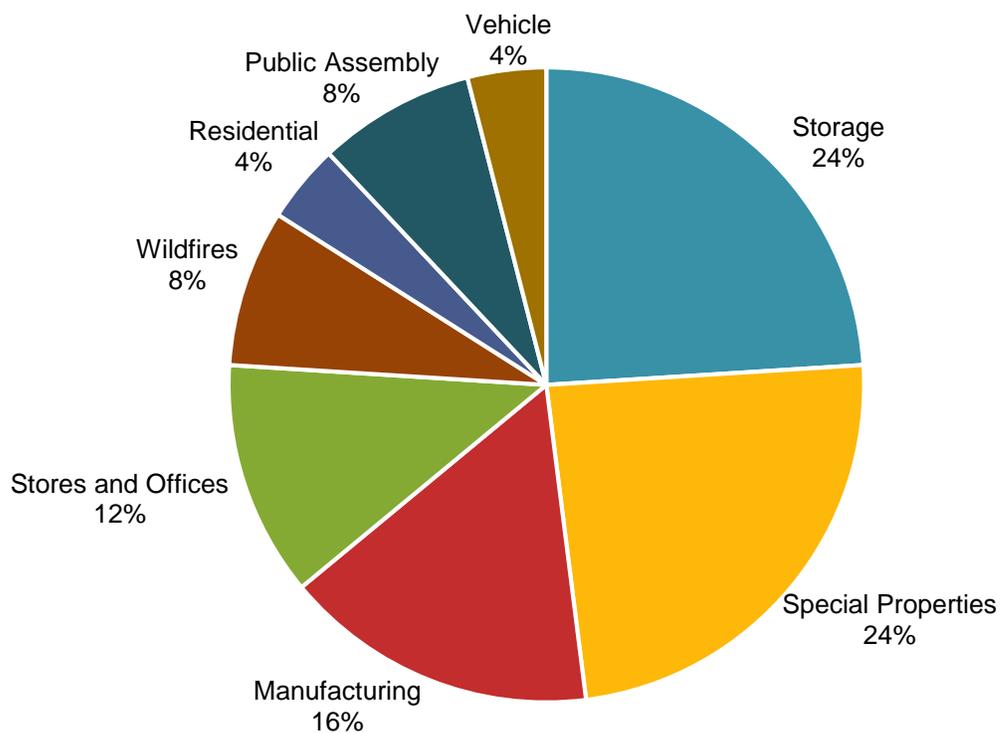


Figure 3.
Large-Loss Fires by Major Property Use – 2016



Source: NFPA's Fire Incident Data Organization (FIDO).

2016 U.S. LARGE-LOSS FIRE INCIDENTS BY OCCUPANCY TYPE

STORAGE

California

Month, Time of Alarm, Dollar Loss

March, 7:47 p.m. \$40 million

Property Characteristics and Operating Status

This was a one-story, 70,000-square-foot (6,503-square-meter) warehouse containing textiles. No information was reported on its construction or operating status.

Fire Protection Systems

No information was reported.

Fire Development

No information was reported.

Contributing Factors and Other Details

The building contained baled materials and textiles, creating a large fire load. There was partial collapse of the roof and front wall of the structure.

Minnesota

Month, Time of Alarm, Dollar Loss

September, 5:34 p.m. \$25 million

Property Characteristics and Operating Status

This was a one-story, 561,000-square-foot (52,119-square-meter) warehouse containing various products as well as food items, and was of protected, noncombustible construction. The warehouse was operating at the time of the fire.

Fire Protection Systems

There was a smoke detection system present but the coverage and operation were not reported. There was a full coverage wet pipe suppression system present. Five sprinkler heads operated and controlled the fire.

Fire Development

The only information reported was that the fire broke out in the center of the warehouse and that plastic product bulk storage was involved. The cause is undetermined.

Contributing Factors and Other Details

None reported. The loss was estimated at \$10,000 to the building and \$25 million to the contents. All contents were soot-covered.

California

Month, Time of Alarm, Dollar Loss

July, 6:47 p.m., \$15.2 million

Property Characteristics and Operating Status

This was a large wood pallet storage yard.

Fire Protection Systems

No information was reported.

Fire Development

No information was reported.

Contributing Factors and Other Details

Upon arrival, firefighters found the pallet yard fully involved and endangering six other commercial structures.

Texas

Month, Time of Alarm, Dollar Loss

November, 8:17 a.m. \$13 million

Property Characteristics and Operating Status

This was a one-story, 30,000-square-foot (2,787-square-meter) mini-storage facility of unprotected, noncombustible construction. The business was operating at the time of the fire.

Fire Protection Systems

There was no smoke or automatic suppression system present.

Fire Development

The cause is reported as undetermined.

Contributing Factors and Other Details

One firefighter was injured. The loss was estimated at \$1 million damage to the building and \$12 million to the contents, which included boats, cars, and other items.

Georgia

Month, Time of Alarm, Dollar Loss

May, 10:08 p.m. \$12 million

Property Characteristics and Operating Status

This was a one-story, 114,000-square-foot (10,591-square-meter) marine equipment and parts warehouse of unprotected, ordinary construction. The business was closed at the time of the fire.

Fire Protection Systems

A smoke/heat detection system was present. Its coverage was not reported but it did operate.

There was no automatic suppression system present.

Fire Development

The cause is reported as undetermined.

Contributing Factors and Other Details

Upon arrival, firefighters found smoke showing from one side of the warehouse. Shortly after, the fire broke through the roof and a section of wall collapsed. Firefighters were withdrawn from inside the building and went to a defensive attack. The fire also extended to an office area but firefighters were able to contain that fire. The loss was estimated at \$3 million damage to the building and \$9 million to the contents, which included various products for marine use.

Tennessee

Month, Time of Alarm, Dollar Loss

February, 6:26 p.m., \$10.3 million

Property Characteristics and Operating Status

This was a one-story, 137,472-square-foot (12,772-square-meter) warehouse. The construction type and operating status as well as the type of contents were not reported.

Fire Protection Systems

There was no automatic detection or suppression equipment present.

Fire Development

There was no information reported.

Contributing Factors and Other Details

The warehouse contained bulk storage. No additional information was reported on contributing factors. The damage was listed as approximately \$6.9 million to the structure and \$3.4 million to the contents.

SPECIAL PROPERTIES

Washington

Month, Time of Alarm, Dollar Loss

July, 3 a.m., \$20 million

Property Characteristics and Operating Status

This was a six-story, 37,129-square-foot (3,449-square-meter) mixed-occupancy building of unprotected wood-frame construction that was under renovation. No one was present at the time of the fire.

Fire Protection Systems

There was neither smoke detection nor automatic suppression equipment present.

Fire Development

The fire broke out on the fourth floor and the cause was not determined. No additional information was reported.

Contributing Factors and Other Details

None reported.

California

Month, Time of Alarm, Dollar Loss

July, 2:44 a.m., \$20 million

Property Characteristics and Operating Status

This was a six-story, 80,000-square-foot (7,432-square-meter) apartment building of unprotected wood-frame construction that was under construction. No one was at the location at the time of the fire.

Fire Protection Systems

There was no automatic detection system or suppression system present.

Fire Development

The cause and origin was listed as undetermined.

Contributing Factors and Other Details

On arrival, firefighters found heavy fire throughout the structure. A defensive attack on the fire was initiated.

Arizona

Month, Time of Alarm, Dollar Loss

April, 5:54 p.m., \$17 million

Property Characteristics and Operating Status

This was a three-story, 32,000-square-foot (2,973-square-meter) apartment building under construction. No one was on the scene at the time of the fire.

Fire Protection Systems

There was neither smoke detection nor automatic suppression equipment present.

Fire Development

Embers from a torch used earlier in the day ignited a fire on the rooftop of a one-story electrical closet attached to the side of a building under construction. Fire spread to other buildings under construction on the site.

Contributing Factors and Other Details

Nineteen buildings were under construction on this 600,000-square-foot (55,742-square-meter) site. Seventeen buildings were still in the framing stage and two had had stucco applied to their exteriors. All 19 structures were destroyed or damaged in the fire.

Arizona

Month, Time of Alarm, Dollar Loss

August, 3:30 A.M., \$10.1 million

Property Characteristics and Operating Status

This was a large nearly completed hotel that was under construction. No additional information was reported.

Fire Protection Systems

There was no information reported on smoke alarms or automatic suppression system.

Fire Development

No information was reported.

Contributing Factors and Other Details

Evacuation of a nearby hotel was reported.

Massachusetts

Month, Time of Alarm, Dollar Loss

December, 2:53 P.M., \$10 million

Property Characteristics and Operating Status

The fire originated in a three-story, 1,484-square-foot (138-square-meter) apartment building of unprotected wood-frame construction that was under renovation, and spread to surrounding structures. No information was reported on operating status.

Fire Protection Systems

There was no information reported on smoke alarms. There was no automatic suppression system present.

Fire Development

The cause and origin were undetermined and the fire is under investigation.

Contributing Factors and Other Details

Due to windy conditions, the fire rapidly spread throughout the neighborhood and destroyed or damaged 16 structures.

Arizona

Month, Time of Alarm, Dollar Loss

October, (time was not reported), \$10 million

Property Characteristics and Operating Status

This was a two- and three-story, 45,658-square-foot (4,242-square-meter) apartment building that was under construction. No information was reported on the operating status.

Fire Protection Systems

There was no smoke detection equipment present. There was a partial coverage wet pipe suppression system present. The installation was not complete and the system did not operate.

Fire Development

An incendiary fire was set on the first floor in paper and cardboard in a structure of open-frame construction.

Contributing Factors and Other Details

The fire rapidly spread throughout the open construction until it involved an additional five structures of various heights, sizes, and stages of construction.

MANUFACTURING

Mississippi

Month, Time of Alarm, Dollar Loss

June, 23, 9:48 p.m., \$17.6 million

Property Characteristics and Operating Status

This was a one-story, 250,000-square-foot (23,226-square-meter) custom vehicle wheel manufacturing plant of unprotected noncombustible construction and was in full operation.

Fire Protection Systems

There was no automatic detection or suppression equipment present.

Fire Development

A bearing failure in a high-RPM motor overheated the motor, igniting oil that then blew into the production area, spreading fire.

Details

The loss was listed as \$3.6 million to the structure and \$14 million to the contents, which were custom-made wheels.

Texas

Month, Time of Alarm, Dollar Loss

December, 6:38 p.m., \$10 million

Property Characteristics and Operating Status

This was a one-story recycling facility. The ground-floor area and operating status were not reported.

Fire Protection Systems

It was not reported if a smoke detection system was present. There was a dry pipe sprinkler system in the structure, but it had been shut down prior to the fire and did not operate.

Fire Development

The fire began in the shipping/receiving area in rubbish and trash. No further information was reported.

Contributing Factors and Other Details

The damage was listed as \$3 million to the structure and \$7 million to the contents.

Texas

Month, Time of Alarm, Dollar Loss

April 8, 10:06 a.m., \$15 million

Property Characteristics and Operating Status

This was a chemical manufacturing plant that was in operation. No other information was reported.

Fire Protection Systems

There was no information reported.

Fire Development

There was no information reported.

Details:

When the local fire department arrived, the plant fire brigade was attempting to extinguish the fire and cool nearby structures.

California

Month, Time of Alarm, Dollar Loss

July, 2:34 a.m., \$14.5 million

Property Characteristics and Operating Status

This was a one-story, 200,000-square-foot (18,580-square-meter) baby food manufacturing plant. Information on the construction type and operating status was not reported.

Fire Protection Systems

There was an automatic detection system present, but the type and coverage were not reported. The system did operate. There was a partial coverage wet pipe sprinkler system in the structure and it did operate, with 25 sprinkler heads flowing. It was reported that the system was ineffective due to an insufficient supply of water, the result of a municipal water supply pump that had been affected by a power failure.

Fire Development

The fire began in an equipment area but the cause was not determined.

Contributing Factors and Other Details

The damage was listed as \$11.4 million to the structure and \$3.1 million to the contents.

STORE AND OFFICE PROPERTIES

California

Month, Time of Alarm, Dollar Loss

July, 4:28 a.m., \$18.9 million

Property Characteristics and Operating Status

This was a one-story, 12,100-square-foot (1,124-square-meter) multi-tenant strip mall of unprotected ordinary construction. Its operating status was not reported.

Fire Protection Systems

No information was reported on automatic detection equipment. There was no automatic suppression equipment present.

Fire Development

The cause is undetermined and under investigation.

Contributing Factors and Other Details

The fire involved six businesses. Aggressive defensive operations enabled firefighters to prevent the fire from spreading to two additional businesses.

Oregon

Month, Time of Alarm, Dollar Loss

October, 9:07 a.m., \$17.2 million

Property Characteristics and Operating Status

This was an office building with businesses on ground level operating. No additional information was reported on the structure.

Fire Protection Systems

No information was reported on detection or suppression equipment.

Fire Development

A natural gas explosion occurred when gas filled the basement of the building. The cause of the ignition is still under investigation.

Contributing Factors and Other Details

Natural gas entered the basement after a contractor accidentally pulled a natural gas pipeline while digging, disconnecting the pipeline at a severed valve. Gas flowed from the pipe to a vault

next to the basement of the structure. Firefighters arrived approximately five minutes after a 9-1-1 call and were in the process of evacuating the structure when three explosions occurred. Three firefighters and five civilians were injured in the explosions.

Florida

Month, Time of Alarm, Dollar Loss

June, 12:47 p.m., \$13 million

Property Characteristics and Operating Status

This was a one-story, 126,000-square-foot (11,706-square-meter) department store of unprotected ordinary construction. It was open and fully operational at the time.

Fire Protection Systems

There was a complete-coverage smoke detection system and manual alarms present. The system operated. There was a full coverage wet pipe sprinkler system present. The system was not in the area of origin but operated and helped control the fire. Burning materials from the roof dropped into the store and activated the system, which extinguished the fire in this area.

Fire Development

The fire broke out in electrical equipment in the area of a rooftop cooling unit as the result of an undetermined electrical failure. The exact cause was not determined.

Contributing Factors and Other Details

Three firefighters were treated for heat exhaustion during the fire. The loss was determined to be \$5 million to the structure and \$8 million to the contents.

WILDLAND/URBAN INTERFACE

Tennessee

A gag order was placed on this incident so information may not be current.

Date, Time of Alarm, Dollar Loss

November, 5 p.m., \$911,000,000

Setting

This was a wildland/urban interface fire that originally broke out in a national park. After burning for five days, near-hurricane-force winds blew the fire into residential areas and private lands.

Climate

On the day the fire started, the temperature was 53 degrees F (12 degrees C), humidity was about 40 percent, winds were approximately 26 mph (42 kph), and there had been only 0.17 inches (4.3 millimeters) of rain for the month.

Fire Origin and Path

The fire was incendiary in nature. This fire burned for several days before fierce winds blew it into residential areas.

Contributing Factors and Other Details

By the time the fire was contained it had destroyed 2,460 structures—including 2,100 homes and 60 businesses—and burned 17,140 acres (6,936 hectares). Fourteen people died in this blaze.

The dollar loss was reported by the Tennessee Department of Commerce and Insurance.

California

Date, Time of Alarm, Dollar Loss

August, 4:58 p.m., \$174.6 million

Setting

This was a wildland/urban interface fire that became known as the Clayton Fire. It occurred in Northern California.

Climate

At the time, winds were 12–14 mph (19–23 kph) with gusts of 19–24 mph (31–39 kph). The relative humidity dropped from 30 percent to 18 percent. The temperature was in the 90s F (30s C).

Fire Origin and Path

The fire was incendiary in nature. During the fire, the wind shifted and the fire spread rapidly into a residential area. Firefighters were unable to keep up with the fire or protect many structures.

Contributing Factors and Other Details

When the fire was contained, it had destroyed 300 structures and damaged 28 others, and had charred almost 4,000 acres (1,619 hectares). A suspect has been charged with 17 counts of arson.

PUBLIC ASSEMBLY

Texas

Month, Time of Alarm, Dollar Loss

May, 4:31 p.m., \$15.5 million

Property Characteristics and Operating Status

This was a one-story, 13,500-square-foot (1,254-square-meter) restaurant of unprotected ordinary construction, located in a strip mall. The operating status was not reported.

Fire Protection Systems

There was no smoke detection or automatic suppression system present.

Fire Development

The fire began in the kitchen area. The cause was undetermined.

Contributing Factors and Other Details

The fire department reported that the fire extended into adjoining businesses in the strip mall. The damage was listed as \$15 million to the structure and \$500,000 to the contents.

Ohio

Month, Time of Alarm, Dollar Loss

December, 8:29 a.m., \$10 million

Property Characteristics and Operating Status

This was a two-story, 16,000-square-foot (1,486-square-meter) restaurant of heavy-timber construction. The property was operating and was also undergoing renovations.

Fire Protection Systems

There was no smoke detection or automatic suppression system present.

Fire Development

The fire began on the roof where torch work was taking place. The torch ignited insulation between a new roof and the older roof. The fire spread through the attic and down into the walls.

Contributing Factors and Other Details

The fire department reported water supply issues with a broken hydrant and firefighters were unable to shuttle enough water to control the fire. The damage was listed as \$8 million to the structure and \$2 million to the contents.

RESIDENTIAL

California

Month, Time of Alarm, Dollar Loss

June, 2:06 p.m., \$14.1 million

Property Characteristics and Operating Status

This was a two-story apartment building of unprotected wood-frame construction with businesses on the ground floor. Information on its floor size was not reported.

Fire Protection Systems

There was a smoke detection system present that operated. There was an automatic suppression system present. No information was reported on the type, coverage, or operation of the system.

Fire Development

The fire broke out in a block of attached two- and three-story structures. The fire began on the roof, in the area of several trash receptacles near a deck. The exact cause was undetermined but listed as unintentional in nature.

Contributing Factors and Other Details

The fire spread and heavily damaged six properties in this block of similar attached buildings. The damage was listed as \$11.5 million to structures and \$2.6 million to contents.

VEHICLE

Arkansas

Month, Time of Alarm, Dollar Loss

August, 11:40 a.m., \$10.2 million

Property Characteristics and Operating Status

This was a towboat pushing a flotilla of 16 barges on the Mississippi River. The boat was 129.5 feet (39 meters) long and 42 feet (13 meters) wide, with a draft of 42 feet (13 meters). There were nine crewmembers on board.

Fire Protection Systems

It was reported that a smoke/heat fire alarm system was present, but no information was reported on coverage or if it operated. There was no automatic suppression system present, but there were 16 portable extinguishers present as well a semi-portable CO₂ extinguishing system located in the upper engine room. These were not manually operated on the fire.

Fire Development

The National Transportation Safety Board (NTSB) has listed the probable cause as the failure of power assembly components on a main diesel engine.

Contributing Factors and Other Details

Combustible materials in the interior spaces and human error contributed to the spread of fire.

For additional information on this incident, see the NTSB report at

<https://www.nts.gov/investigations/AccidentReports/Pages/MAB1719.aspx>.