

U.S. Fire Administration/National Fire Data Center

# The Seasonal Nature of Fire Incidents in 2000

Topical Fire Research Series, Volume 3 – Issue 6  
*June 2004*



**FEMA**



## The Seasonal Nature of Fire Incidents in 2000

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### Findings

- In the winter, the majority of the country experiences colder and wetter weather conditions, increasing the need for structural heating and producing the peak period for heating fires.
- Warmer spring weather brings people outdoors, producing the peak period for total outdoor fires and fires caused by open flame.
- During the summer, hot weather and reduced precipitation dry out natural vegetation, producing the peak period for natural fires. Summer is also the peak period for incendiary and suspicious fires, fires associated with fireworks, and children playing with fire.
- Overall fire incidence is at its lowest in the winter as increased precipitation and cooler weather reduce the fuel available for outdoor fires and people spend more time indoors.
- The incidence of vehicle fires is relatively constant throughout the year.

Through decades of study, the incidence of fire has followed distinct patterns and trends that are seasonal in nature. Both natural occurrences and human behaviors vary with the seasons, and both are factors that affect the causes and damaging effects of fires. Changes in weather and climatological events can lengthen a season or rush the onset of a new one. Nevertheless, the individual seasons, and the U.S. population, do present certain fire profiles that are repeated year after year and can, in some measure, be predicted.

In 2000, an estimated 1.7 million fires in the United States claimed more than 4,000 lives, injured 22,350 people, and caused \$11.2 billion in property damage.<sup>1</sup> The three leading causes of fire in 2000—incendiary, cooking, and open flame—are greatly affected by seasonal human activities. This report explores fire patterns by each season in 2000; both the changes in incidence and the causes of fire are discussed. For purposes of this report, the seasons are measured in 3-month blocks: winter is December through February, spring is March through May, summer is June through August, and fall is September through November.

### SEASONAL FIRE PROFILE

Significant weather events that affected fire incidence in 2000 include a severe winter storm along the east coast in January, record high temperatures in the Southwest during May and June, a severe spring and summer drought throughout the south-central and southeastern states, and an early winter snowstorm in the Southeast.<sup>2</sup>

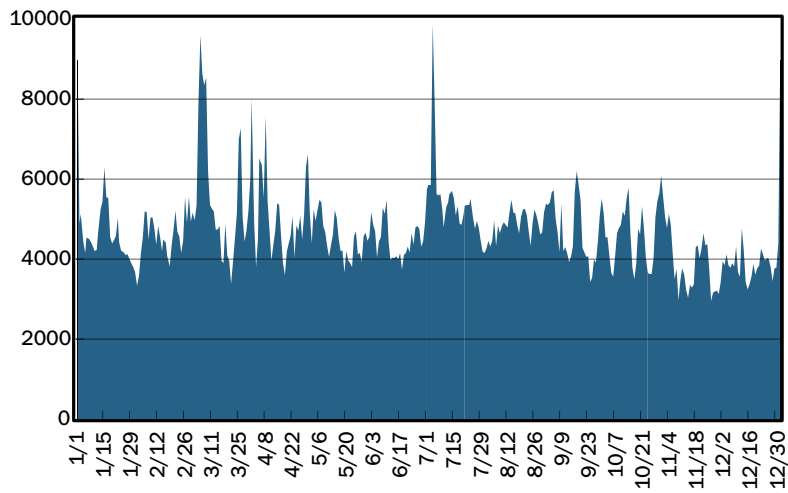
The estimated number of seasonal structure, vehicle, and outdoor fires are shown in Figure 1.<sup>3,4</sup> Outdoor fires predominate in the spring and summer, structure fires peak in the winter, and vehicle fires are highest in the summer months and fairly constant the rest of the year. Nearly half of reported fires are outside fires, which accounts for much of the variation in the total number of fires throughout the year. Figures 2 and 3 present the daily incidence of total fires and of fires by property type, respectively. Figure 4 depicts the causes of fires by season. The following seasonal sections discuss the salient issues from these figures.

**FIGURE 1. 2000 FIRE INCIDENTS BY SEASON**

	Structure	Vehicle	Outdoor and Other	Total
Winter	148,200	83,500	158,500	390,200
Spring	125,500	86,200	255,100	466,800
Summer	114,900	95,600	243,600	454,100
Fall	116,800	83,200	196,800	396,800
Total*	505,500	348,500	854,000	1,708,000

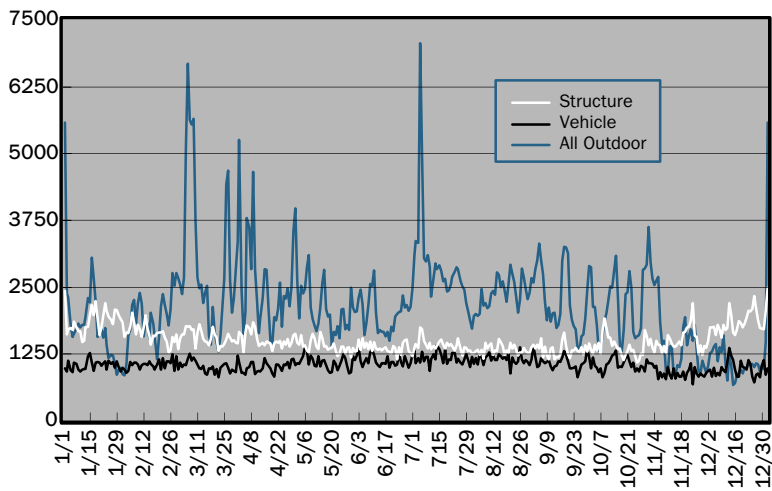
\*Estimates may not add due to rounding.  
Source: NFPA and NFIRS

**FIGURE 2. NUMBER OF FIRES EACH DAY**

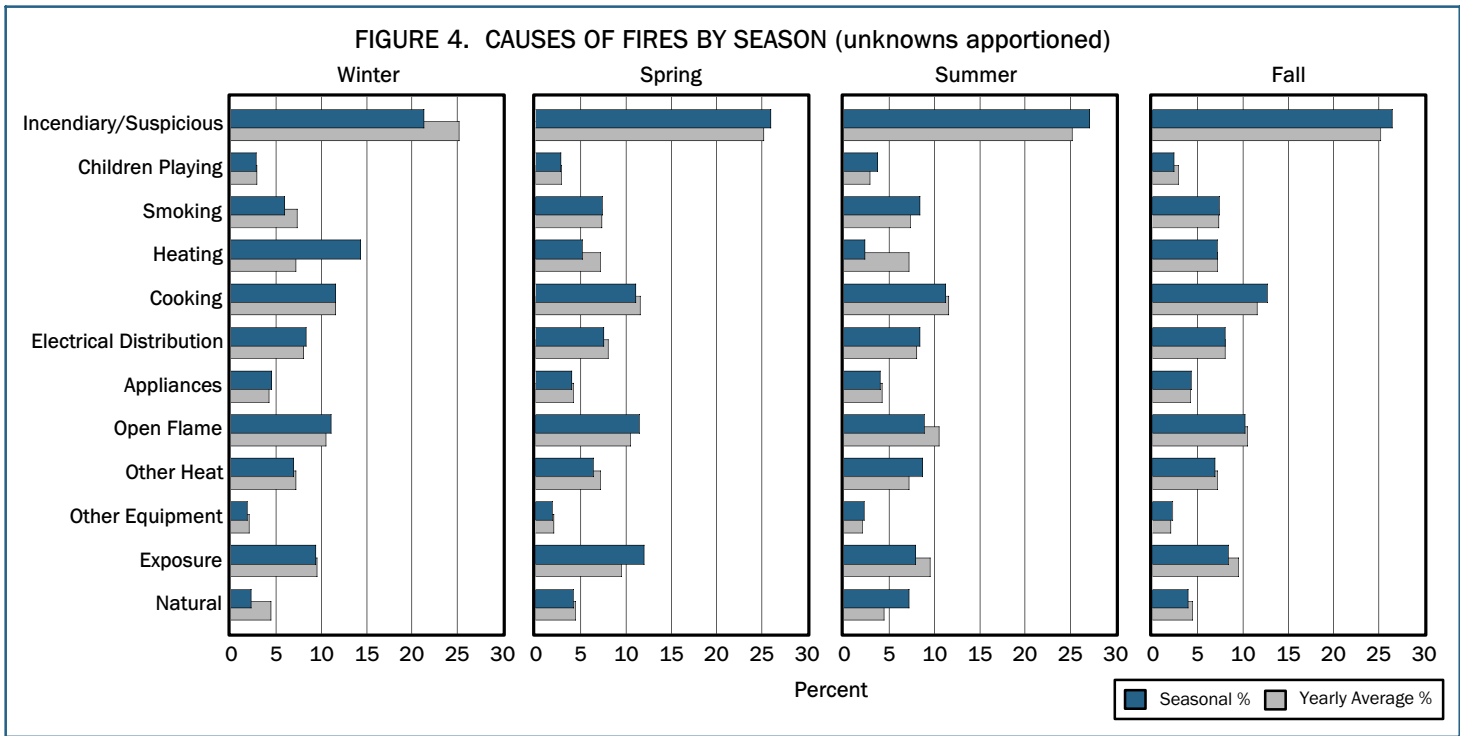


Source: NFIRS

**FIGURE 3. NUMBER OF FIRES BY PROPERTY TYPE EACH DAY**



Source: NFIRS

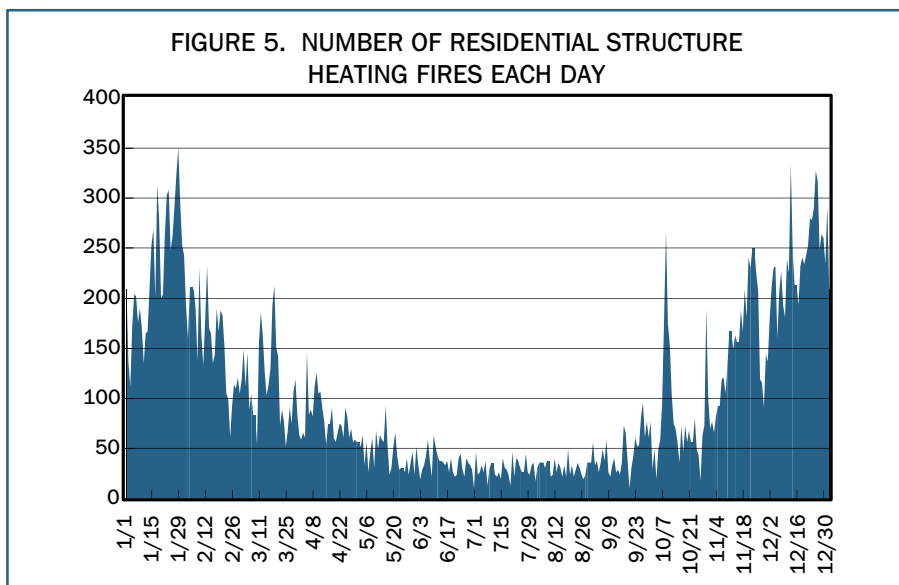


Source: NFIRS

Winter has the lowest number of fires overall; however, heating and holiday fires create a unique profile of residential structure fires during this period. Heating is the leading cause of winter residential structure fires. On average, heating causes approximately 15% of residential structure fires throughout the year, but causes 25% of such incidents during the winter months.<sup>5</sup>

**Residential Heating Fires.** Figure 5 clearly shows the daily incidence of heating fires increasing rapidly beginning in the cold weather months. (The large spike in early October was the result of multiple structure fires in Ohio and Texas.) Most homes have heating systems, but these systems range from fairly sophisticated new heating systems in the most modern homes to outdated gas, oil, or electrical heating equipment in many older homes and buildings.

A heating fire is one that is caused by central heating units, fixed or portable room-size heating units, fireplaces, chimneys, water heaters, or other devices. Maintenance is a big issue, especially among single-family homes. Oil and gas heating systems in particular rely on a burning flame to create heat. These systems must be cleaned periodically and well maintained.



Source: NFIRS

Most heating fires are initiated by space heaters (e.g., portable electric heaters, portable kerosene heaters, wood stoves, fireplaces with inserts, room gas heaters).

Residential heating fires have dramatically declined since their peak in the early 1980s, when high energy prices sparked a trend toward alternative heating sources. Yet even though the use of wood-burning stoves and other alternative heating sources has declined, the risk of loss from heating fires is still high. The types of heating equipment vary by region. Equipment involved in heating fires in the South is likely to be chimneys, or perhaps cooking ovens in poorer households. In the North, heating fires are more often caused by central or space heating systems. Weather conditions account for the differences—central heating systems are less prevalent in southern homes than those in northern climates.

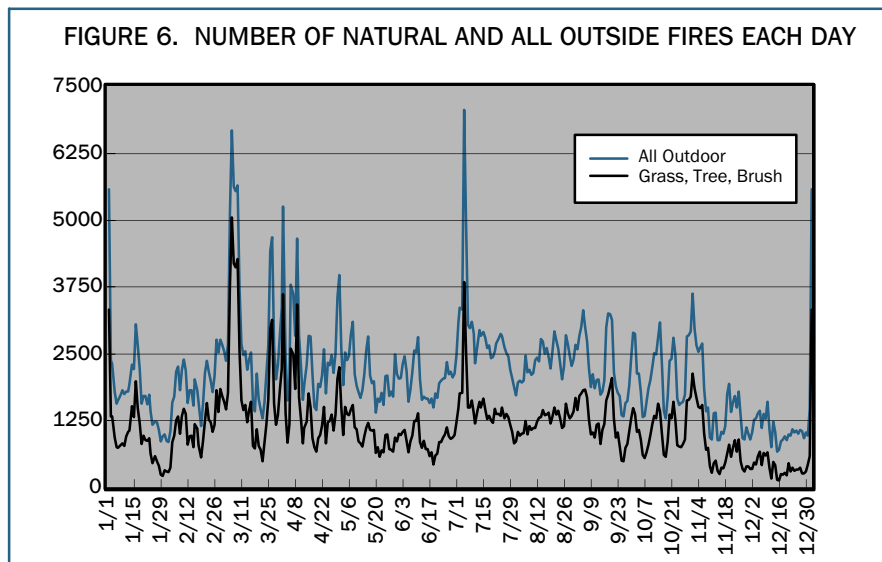
**Holiday Fires.** Cultural and religious practices greatly increase the fire risk between December 1st and January 7th each year (Figure 2). Christmas trees, candles, and easily ignited decorations commonly enjoyed in homes during the winter holidays represent a fire danger not present at other times of the year. The number of Christmas tree fires increases as the holiday season progresses because as trees and other greenery dry out they become more combustible.

Cooking presents a fire risk in residential structures over the winter holidays, with notable spikes on Christmas and New Year’s days, and an equally notable dropoff on the day after each holiday. Children playing fires also spike during the holiday season, most notably around New Year’s Eve and New Year’s Day.

Outdoor fires occur with increased frequency during the holidays. Open flame fires, those started by matches, embers, or campfires, lead the causes of outdoor winter fires. Although difficult to discern in Figure 3, there is a spike in outdoor fires around New Year’s Day due to fireworks and matches.

### SPRING FIRES

The longer days and warming temperatures of spring are responsible for the highest incidence of fire among the four seasons. This elevated fire risk is largely tied to a substantial increase in outdoor fires, which includes grass, tree, and brush fires (Figure 6). High winds and low relative humidity in the spring warm the ground and dry out fallen leaves and other fuels. Lightning also begins to present a problem in the spring. Once started, stronger winds can fan an outside fire.<sup>6</sup> Not all of these fires are due to natural causes. Warm weather brings people outside, and some of their activities—campfires, rubbish fires, outdoor grill fires—contribute to accidental fires.



Source: NFIRS

## SUMMER FIRES

Figure 4 shows that children playing, incendiary, smoking, other heat, and natural fires are at their highest in the summer. A large spike in summer fires occurs around the 4th of July. Natural fires due to lightning strikes are at their highest in the summer months, and the increasing use of gas and electric grills contribute to the summer fire problem.

Fireworks sold for July 4th celebrations pose one of summer's greatest fire risks. State laws regulating the sale of fireworks have a direct impact on the incidence of loss. A large number of states have imposed stringent laws on the sale and use of fireworks or have outlawed them altogether. As a result, fireworks injuries have decreased from a high of 12,100 in 1990 to a low of 8,500 in 1999; in 2000, there were 11,000 fireworks injuries.<sup>7</sup> The most common ignition factor for fires related to fireworks is children playing with or otherwise misusing fireworks. Injuries are far more prevalent in jurisdictions that permit some type of fireworks sales than in jurisdictions where they are illegal.

Most lightning strikes in the United States occur from June through August, igniting trees, brush, grass, or other outside materials. In 2000, several large forest fires in western states were caused by summer lightning strikes.<sup>8</sup> Lightning is also responsible for a very high number of structure fires in the summer.

Overall, grill fires have increased. Charcoal grill fires have decreased as the popularity of gas and electric grills has soared. Gas grills (liquid propane and natural gas) have a higher percentage of mechanical failures/malfunctions that result in fires than charcoal grills.

## FALL FIRES

Fire incidence is at one of its lowest levels in the fall months. Outdoor fires begin to decline due to temperate weather, increased precipitation, and the waning of outdoor activities. Cooking fires are the only cause that is higher in the fall than the other seasons. The incidence of fall cooking fires peaks on Thanksgiving Day. The leading reason for the ignition of cooking fires is food left unattended on the stove or in the oven.

## CONCLUSION

Armed with an understanding of the nature and scope of seasonal fires, the fire service has the opportunity to plan and implement specific public education, fire prevention, and other fire-related programs that address seasonal changes in fire incidence. Communities are encouraged to analyze their own seasonal and holiday fire incidence to determine how prevention initiatives and programs could best be targeted. It appears that much of the seasonality of fires is due to common behaviors and causes that are repeated each year. These repetitive causes and behaviors are candidates for clearly targeted prevention initiatives and programs. Locally as well as nationally, these initiatives and programs could have a major impact on the reduction of fire incidence.

To request additional information, comment on this report, or review the detailed methodology used in this analysis, visit <http://www.usfa.fema.gov/feedback/>.

### Notes:

1. Estimates of the U.S. fire problem are taken from the National Fire Protection Association's (NFPA's) annual survey, *Fire Loss in the United States*.
2. National Oceanic and Atmospheric Administration. <http://www.ncdc.noaa.gov>
3. National estimates are based on data from the National Fire Incident Reporting System (NFIRS) and the NFPA's annual survey. At the time of this report, NFIRS was in the process of transitioning from version 4.1 to 5.0. Approximately 79% of the fire incident data for 2000 was reported to the USFA in NFIRS 4.1 format and converted to 5.0.
4. Structure fire statistics and discussion in this report include mobile properties used as structures.
5. Distribution statistics are based on data from NFIRS.
6. Virginia Department of Forestry. <http://www.vdof.org/fire/danger-rating.shtml>.
7. Consumer Product Safety Commission 2000 Fireworks Annual Report.
8. USDA Forest Service. [http://www.fs.fed.us/pnw/pubs/journals/ferguson\\_light2000.pdf](http://www.fs.fed.us/pnw/pubs/journals/ferguson_light2000.pdf).