



RESEARCH



BRUSH, GRASS, AND FOREST FIRES

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Findings

- Local fire departments responded to an estimated average of 306,000 brush, grass, and forest fires in the U.S. per year in 2011-2015, an average of 840 per day. These incidents accounted for almost one-quarter (23%) of the fires reported to local fire departments during this period. While most were small, 6% consumed more than 10 acres. This was true for 12% of forest fires.
- During 2011-2015, heavy or light vegetation was the item first ignited in an average of 6,200 reported home structure fires per year. These fires caused an average of seven civilian deaths, 53 civilian injuries, and \$130 million in direct property damage.
- In 2011-2015, brush, grass and forest fires caused an average of 1,330 fireground injuries to firefighters from local fire departments. Five percent of total firefighter fireground injuries from local fire departments occurred at these incidents. Volunteer firefighters accounted for a disproportionate share of these injuries.
- The vast majority of brush, grass and forest fires in 2011-2015 were caused by human activities. Leading causes include intentional fire setting, open burning of waste, smoking materials, and electrical power or utility lines.
- From 2007-2016, a total of 44 local firefighters, or an average of four per year, were fatally injured as a result of brush, grass or forest fires or prescribed fires. Just over half of the deaths (25) in total occurred while fighting the fires and the others occurred while firefighters were responding to the incidents or returning back to the station.
- These fires take a toll on fire department resources, can spread to homes, vehicles and other property, and cause injuries. Information about the causes and circumstances of these fires should be used to develop more effective prevention strategies and campaigns.



Local fire department responses To brush, grass and forest fires

While devastating fires in the wildland urban interface (WUI) have become common stories on the nightly news, many people do not realize that brush, grass and forest fires account for almost one-quarter (23%) of fires handled by local (municipal or county) fire departments.

During 2011-2015, local fire departments responded to an estimated average of 306,000 brush, grass, and forest fires per year, an average of 840 fires per day. Fires handled solely by federal and state agencies are generally not included in these estimates.

Most of the brush, grass and forest fires handled by local fire departments were small. In 60% of the brush, grass, and forest fires handled by local fire departments, less than an acre burned. Only 6% burned more than ten acres.

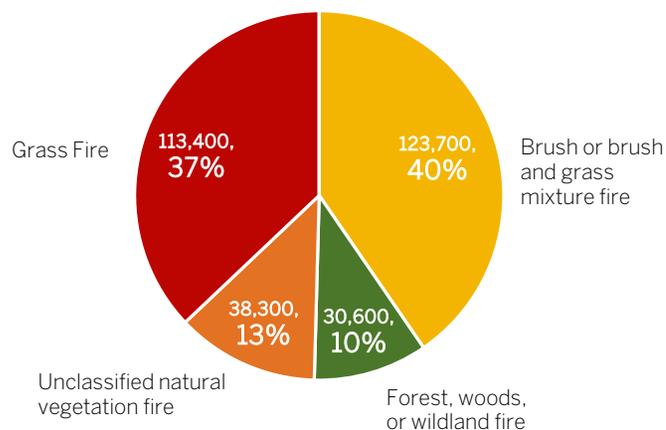
These fires can spread

Even relatively small fires have the potential to spread to homes, vehicles and other properties. More than 9,000 buildings per year, on average, were involved in these incidents. A 2017 *NFPA Journal* "Firewatch" incident description shows how these fires can turn deadly.¹ A Pennsylvania woman had been burning brush outside

her home when the fire spread out of control. She called 911 to report that her back porch was on fire. Her husband called moments later to say he could not find his wife. Smoke alarms were heard in the background of the 911 tape. When firefighters arrived, smoke was coming from the eaves as fire was coming from an open front door and a skylight. The back of the house was also burning. The woman was unable to escape the home and died in the fire.

These fires often occur on properties where people live, work, or travel. A brush, grass, or forest fire can spread to buildings or vehicles on the property. Roadway fires can make travel or escape impossible. A fire that starts outside a building can get into the concealed spaces between the exterior and interior. A fire inside the wall or attic space may not activate smoke alarms or sprinklers until it gets into the living space.

Brush, grass and forest fires
by incident type:
2011-2015 annual averages



Thousands of structure fires began with ignition of vegetation

During 2011-2015, heavy or light vegetation was the item first ignited in an average of 6,200 reported home structure fires per year. These fires caused an average of seven civilian deaths, 53 civilian injuries, and \$130 million in direct property damage.

¹ Richard Campbell, "Resident Dies when Brush Fire Spreads to Home," *NFPA Journal*, March/April 2017.

Causes of brush, grass And forest fires

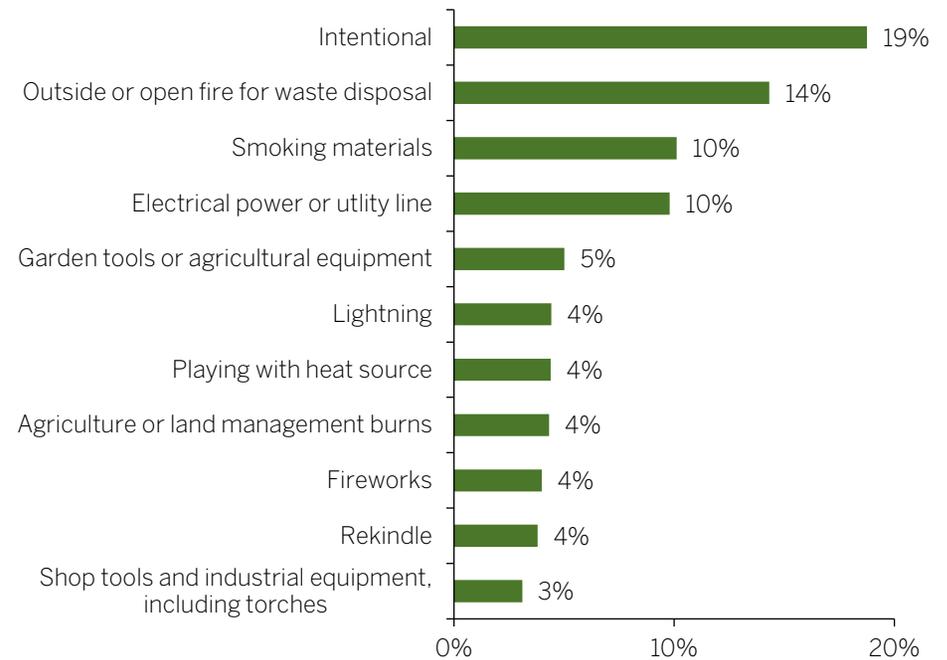
The vast majority of brush, grass and forest fires were caused by human activities. One in five of these fires were intentionally set. Other leading factors include open burning of debris, smoking materials and electrical power or utility lines. Lightning caused 17% of the forest, woods or wildland fires, but only 4% of overall brush, grass or forest fires. While lightning cannot be prevented, fire growth from outside fire can be limited by maintaining the land, getting rid of dead vegetation, and removing “ladder fuels” that provide a pathway to the tree canopy.

Fires that are caused by human activities are preventable:

- Open burning is a leading cause of these fires. Alternate methods of waste disposal requirements for safer burning can reduce these fires.
- Providing and using proper containers for discarded cigarettes can prevent smoking fires.
- Investigation of even minor intentional fires can provide a strong deterrent to other arsonists.
- Maintaining electrical power lines and keeping appropriate clearances from brush and trees can help prevent fires started by power lines.
- Avoid outside fires on dry or windy days.
- When using equipment or mowing lawns, minimize sparks and avoid such activities when the fire risk is high.
- Leave fireworks to the professionals. Keep matches, lighters and fireworks away from children.

Although high wind by itself does not start fires, it was a contributing factor in 14% of the incidents. A gust of wind can cause a campfire or a debris burn to rapidly spread out of control.

Local fire department responses to brush, grass, or forest fires by major cause: 2011-2015



Causes vary by month

Nationally, brush, grass and forest fires are most common in April, July and March. Some types of fires, such as open burning and fireworks fires show strong seasonal patterns with prevention implications.

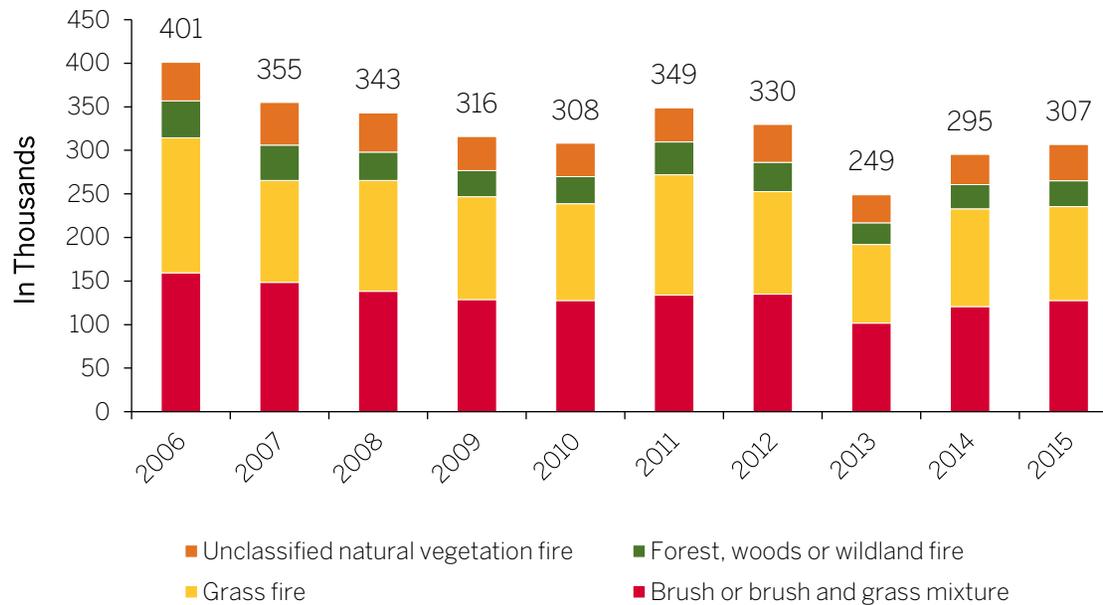
Intentional fires, fires caused by open burning for waste disposal or agricultural or land management burns, and rekindles were all most common in March and April. These patterns vary by region. Fires started by fireworks in particular, electrical power or utility lines, and garden tools or agricultural equipment were most common in July.

The Fourth of July was the peak day for these incidents, followed by July 5th. Over the five years, local fire departments responded to an average of 4,430 brush, grass, and forest fires on July 4th, more than five times the daily average of 840. An average of 2,550 fires average on July 5th was three times the daily average. Almost two-thirds of the brush, grass and forest fires started by fireworks occurred in July. Many of these involved playing with fireworks.

Trends

Over the past decade, local fire department responses to brush, grass and forest fires hit their low point in 2013 at 249,100, increasing to 306,600 in 2015.

Local fire department responses to brush, grass and forest fires, by year: 2011-2015



Firewise

[NFPA's Firewise program](#) helps people who live in wildland-urban interfaces protect their homes from wildfire. Many of the same strategies can reduce the likelihood of structural ignition or fire spread from brush, grass or forest fires around the country. Vegetation, landscaping, and garden materials can be fuel sources for fires in a wide variety of settings.

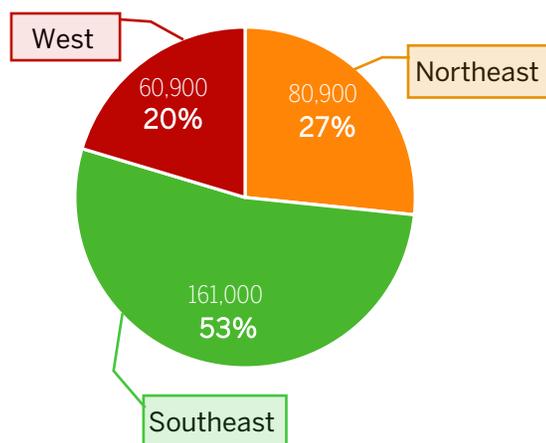
Local fire department responses to brush, grass and forest fires by National Cohesive Wildland Fire Strategy Region

The types of brush, grass and forest fires and their frequency, seasonality, causes, and circumstances can vary dramatically by and within each region, depending on land use, weather, customs and other factors. In this section, fires are broken out by the regions used by the National Cohesive Wildland Fire Strategy Regions (NCWFS), as shown below.² This information can be used to better target the content and timing of prevention activities

More than half of the local fire department responses to brush, grass and forest fires were in the Southeast. More than one-quarter were in the Northeast. Only one-fifth were in the West. Because a much larger share of land in the West is protected by federal wildland firefighting organizations instead of local fire departments, local fire departments handle a smaller percentage of fires in the region.

According to the Congressional Research Service, almost half of the land in the West is owned by Bureau of Land Management, the Forest Service, the Fish and Wildlife Service, the National Park

Local fire department responses to brush, grass and forest fires by region: 2011-2015 annual averages



Service, and the Department of Defense.³ This accounts for 93% of the land owned by these agencies in the country.

National Cohesive Wildland Fire Management Strategy Regions

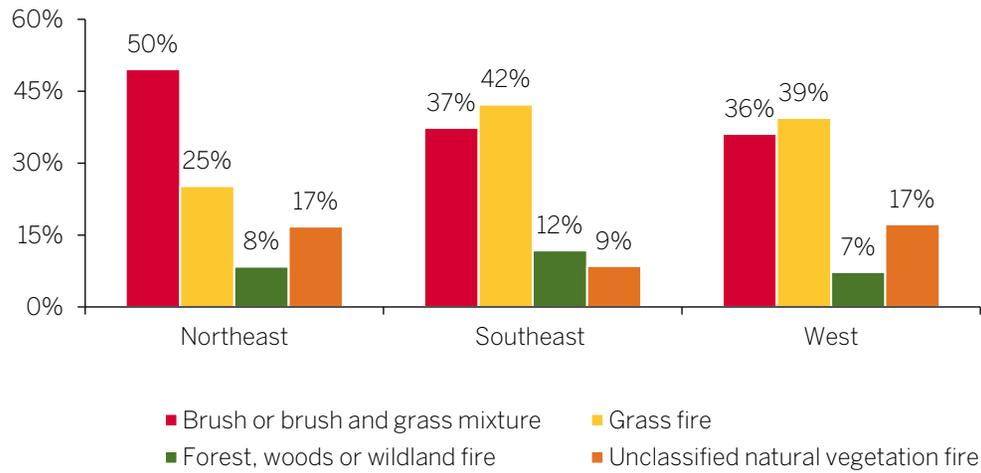


The leading type of brush, grass or forest fire varies by region. With a few exceptions, the leading causes of total brush, grass and forest fires are generally consistent across the three regions. Garden tools or agricultural equipment; agriculture and land management burns; and fireworks caused a larger percentage of fires in the West. The Northeast had smaller percentages of fires started by lightning and fireworks.

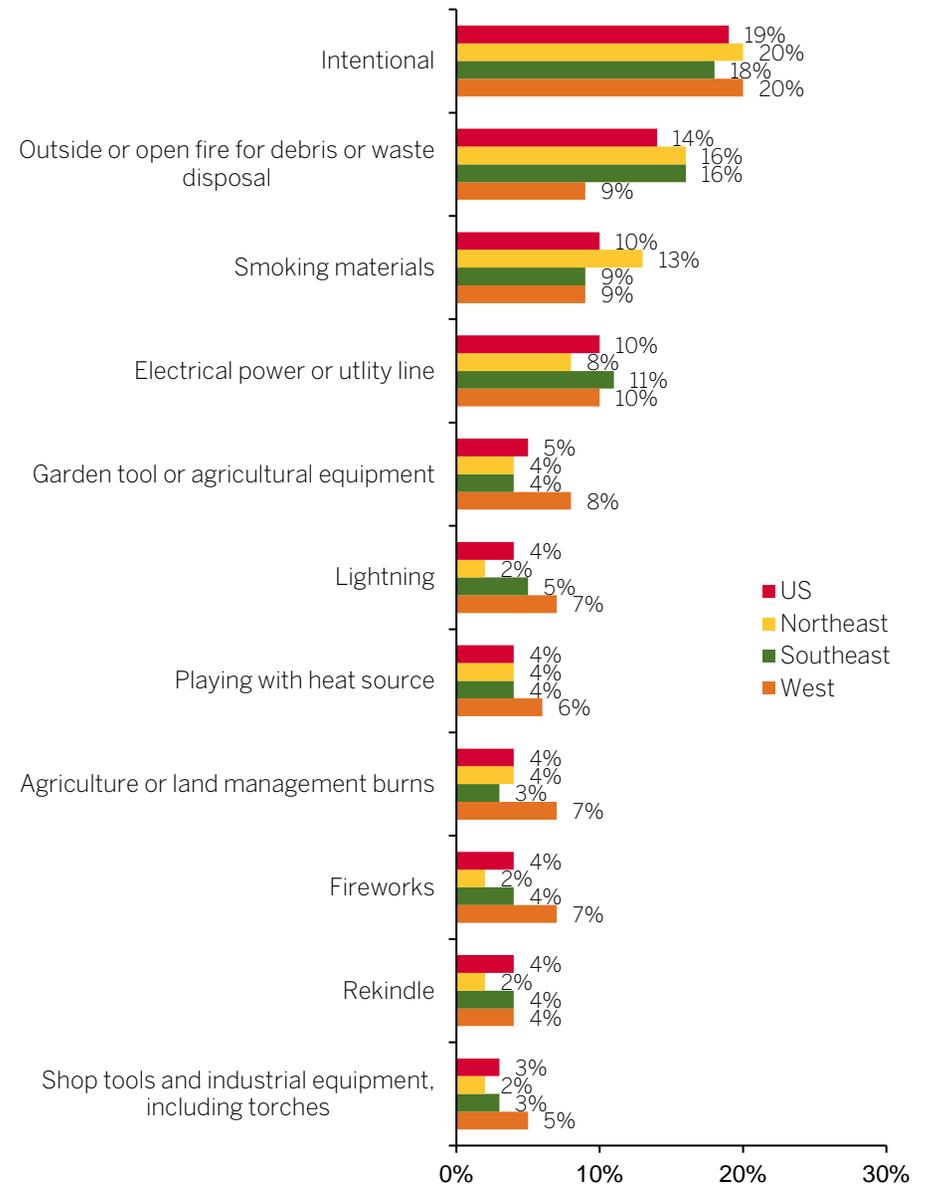
² Fires in which the incident state was coded as other or left blank were excluded from the regional analysis.

³ Carol Hardy Vincent, Laura A. Hanson, and Carla N. Argueta, "Federal Land Ownership: Overview and Data," Congressional Research Service Report no. R42346, March 3, 2017, accessed at <https://fas.org/sgp/crs/misc/R42346.pdf> on April 12, 2018.

Local fire department responses to brush, grass and forest fires by NCWFS region and type of fire: 2011-2015



Brush, grass and forest fires by incident type and major causes: 2011-2015



Local fire service casualties and needs associated with brush, grass or forest fires or wildland fires

Local firefighter fatalities

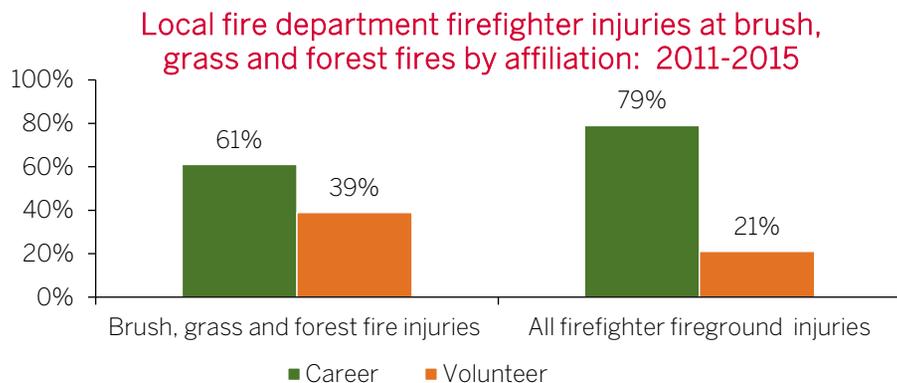
From 2007-2016, a total of 44 local firefighters were fatally injured as a result of brush, grass or forest fires or prescribed fires. Just over half of the deaths (25) occurred while fighting the fires and the others occurred while firefighters were responding to the incidents or returning back to the station.⁴

Over that 10-year period, one in nine local firefighters killed at fires were operating at brush, grass and forest fires and prescribed burns.

Local firefighter injuries

In 2011-2015, brush, grass and forest fires caused an average of 1,330 fireground injuries to firefighters from local fire departments. Five percent of total firefighter fireground injuries occurred at these incidents.

Although career firefighters accounted for the majority of firefighter injuries at these incidents, the percentage of volunteers injured was almost twice as high as at fires overall.



Uneven surfaces, including holes in the ground, were factors in one-fifth (20%) of the injuries at brush, grass and forest fires. Exhaustion or fatigue, including heat exhaustion, was seen in 10% of the brush, grass and forest fire injuries.

The rate of firefighter injuries per 1,000 fires increased with the size of the fire. Larger fires last longer and require more firefighters, effectively increasing the total personnel time needed and the opportunity for this type of injury. This is true for any type of large fire. More importantly, fighting a large outside fire requires different tactics and gear than structural firefighting.

Needs assessment

While small fires are often easily handled, the lack of specialized training and gear makes the larger brush, grass and forest fires more challenging and dangerous for local firefighters. NFPA's *Fourth Needs Assessment of the U.S. Fire Service*⁵ found that:

- Almost three-quarters (71%) of the fire departments who perform wildland firefighting or who fight structure fires in the Wildland Urban Interface (WUI) have not formally trained all their firefighters in this activity.
- Two-thirds of the departments that fight these fires have personnel who do not have personal protective clothing designed for wildland firefighting.
- Twenty-nine percent have firefighters who have not received specialized training in firefighting in the WUI.

⁴ NFPA's Fire Incident Data Organization database.

⁵ *Fourth Needs Assessment of the U.S. Fire Service: Conducted in 2015 and Including Comparisons to 2001, 2005 and 2010 Needs Assessment Surveys*. (Quincy, Massachusetts: National Fire Protection Association, 2016), 79-81: <https://www.nfpa.org/News-and-Research/Fire-statistics-and-reports/Fire-statistics/The-fire-service/Administration/Needs-assessment>.

Data sources, definitions and conventions used in this report

These statistics are derived from Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS 5.0) and the National Fire Protection Association's (NFPA's) annual fire department experience survey (FES). Fires handled by federal and state wildland fire agencies are generally not included in these statistics unless they were also reported to a local fire department.

Except for property use and incident type, fires and firefighter injuries with unknown or unreported data were allocated proportionally in calculations of national estimates.

Unless otherwise specified, the statistics in this analysis are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to federal or state agencies or industrial fire brigades. The 2011-2015 estimates are projections based on the detailed information collected in Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS 5.0) and the National Fire Protection Association's (NFPA's) annual fire department experience survey.

The major causes shown describe specific scenarios. Because the causes are pulled from different NFIRS fields (equipment involved in ignition, cause of ignition, factor contributing to ignition, and heat source), they are not mutually exclusive. Unknowns were allocated for each field separately. Additional details, including more from heat source, factors contributing to ignition, equipment involved in ignition and cause of ignition for the three major types of fire are available on line. High winds are captured under factors contributing to ignition.

[Online tables](#) are provided for total brush, grass and forest fires, and for the three specific incidents types:

- Brush or brush and grass mixture fire (abbreviated as brush fire);
- Grass fire; and
- Forest, woods, or wildland fire (abbreviated as forest fire)

Total brush, grass and forest fires include the three NFIRS incident types just discussed and other or unclassified natural vegetation fires. The latter were not analyzed separately.

NFPA Research, Data and Analytics Division

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