

United States  
Department of  
Agriculture

Forest Service

**Technology &  
Development  
Program**

5100 Fire  
March 1999  
9951-2808-MTDC



# Wildland Fire Fatalities in the United States

1990 to 1998



**Richard Mangan**  
*Project Leader (Retired)*

**USDA Forest Service  
Technology and Development Program  
Missoula, MT**

**9E92P30—Fire Entrapment Avoidance**

**March 1999**

---

The Forest Service, United States Department of Agriculture (USDA), has developed this information for the guidance of its employees, its contractors, and its cooperating Federal and State agencies, and is not responsible for the interpretation or use of this information by anyone except its own employees. The use of trade, firm, or corporation names in this document is for the information and convenience of the reader, and does not constitute an endorsement by the Department of any product or service to the exclusion of others that may be suitable.

The USDA prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, and so forth) should phone USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write: USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue SW, Washington, D.C. 20250-9410, or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.

## Introduction

**W**ildland fire operations are conducted in a high-risk environment. Individuals involved in all aspects of fire management are subject to the dangers of burnovers, vehicle and aircraft accidents, and medical emergencies. Between 1990 and 1998, 133 individuals died while involved in wildland fire activities (Figure 1). These deaths occurred on 94 separate events.

Each year, the National Wildfire Coordinating Group's (NWCG) Safety and Health Working Team prepares a "SafetyGram" documenting wildfire fatalities across the United States in all jurisdictions, including areas protected by Federal, State, city/county, rural, and volunteer firefighters. The SafetyGram contains specific information about each fatality (and nonfatal fire entrapments), but does not process, analyze, or interpret the data.

This paper will analyze the data presented in the SafetyGrams for 1990 to 1998, looking for trends and making recommendations that may be important to fire managers in their efforts to reduce future fatalities. Specific information analyzed includes: cause of death, organization, and the geographic area of the fatality.

Causes of death have been grouped into six categories:

- Heart attacks;
- Burnovers;
- Falling snags;
- Vehicles, including single- or multiple-vehicle collisions, as well as individuals struck by a moving vehicle;
- Aircraft accidents, both fixed and rotary wing, as well as aircraft-

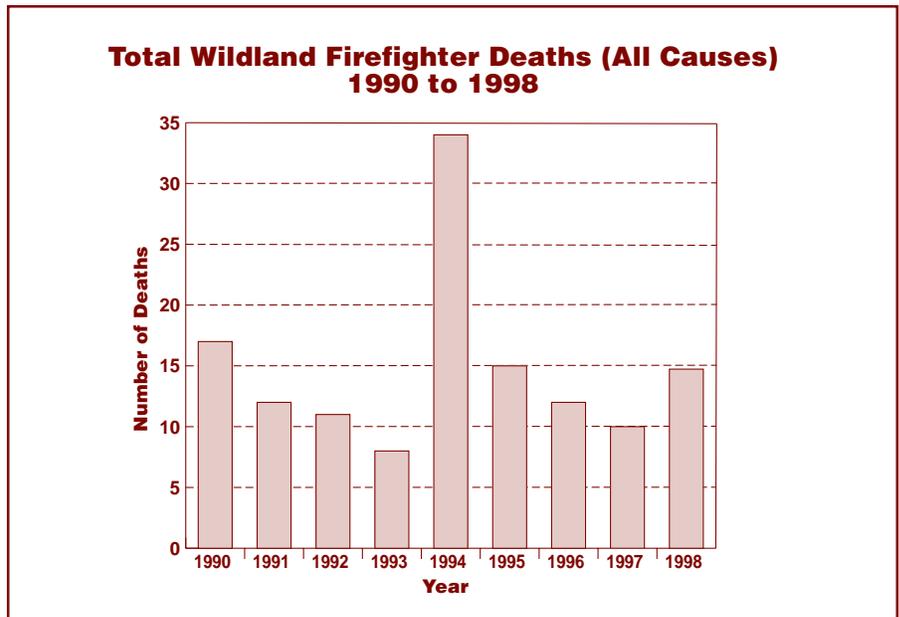


Figure 1—The annual death toll for persons who died while involved in fighting wildland fires from 1990 to 1998 (133 total deaths).

- related accidents on the ground;
- Miscellaneous causes, such as training, medical, suicide, drowning, and so forth.

Organizations of the individuals killed are broken into seven groups:

- Federal: USDA Forest Service, National Park Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, and the Bureau of Land Management;
- State forestry or fire organizations;
- City/county: Permanent employees of these jurisdictions;
- Volunteers: Members of organized departments;
- Military: Active duty, National Guard, and Army Reserve;

- Contractors: Individuals such as air tanker and helicopter pilots and crew, caterers, drivers, and organized contract fire crews;
- Private: Individuals not affiliated with other groups, but who died while fighting fires.

Two significant wildfire events had multiple fatalities during the 1990-to-1998 period: the South Canyon Fire in 1994, where 14 Federal firefighters died, and the Dude Fire in 1990, where 6 State employees perished. The data from these events are included in the analysis, but in some cases, those events are discussed separately for comparison with the baseline. 

## Cause of Death

Individuals involved in wildland fire operations died more often in burnovers than from any other cause (Figure 2). Fifteen separate burnovers led to the deaths of 39 firefighters in 13 States. Fatalities from burnovers have occurred in each year, except 1992, ranging from a high of 17 in 1994 to a low (excepting 1992) of 1 in 1997 and 1998. If the South Canyon Fire (14), and the Dude Fire (6) fatalities are removed, the total deaths from burnovers falls to 19, and the average drops to 2.1 fatalities per year. Burnovers were responsible for 29% of all fatalities in the period analyzed, even though they represented just 16% of the events causing fatalities. This demonstrates that the number of burnover fatalities is not just a function of the quality of the decisions leading to the event, but also represents the number of individuals at the scene.

Aircraft accidents are the next leading cause of fatalities among wildland fire personnel (total: 30, 23%), closely followed by heart attacks (total: 28, 21%) and vehicle accidents (total: 25, 18%).

Other causes of death on wildland fires include falling snags (total: 5, 5%), and miscellaneous (total: 5, 5%). Specific

causes in the miscellaneous category include drowning, electrocution, suicide, and training. 

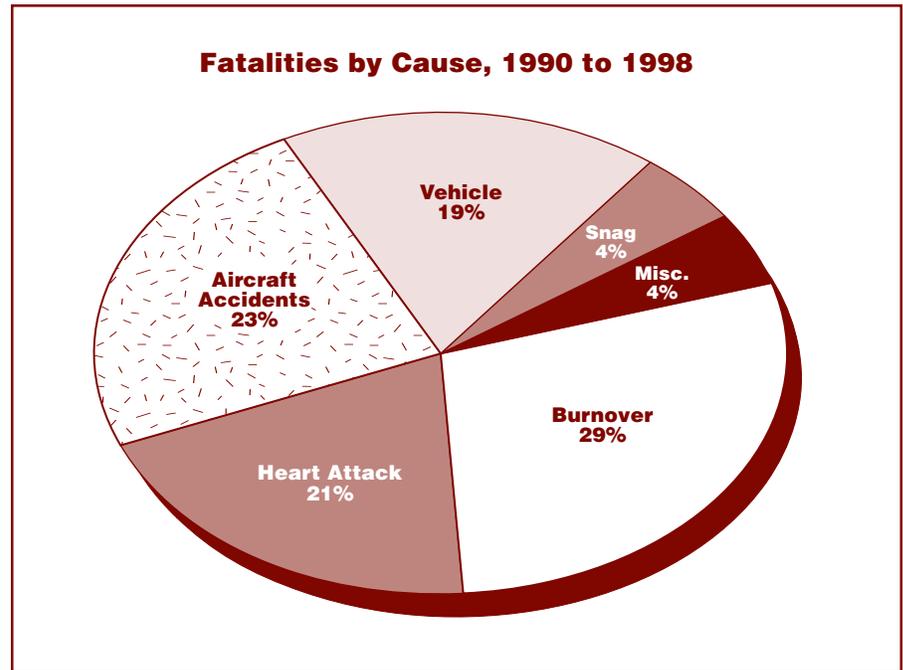


Figure 2—The causes of death for 133 persons who died while involved in fighting wildland fires from 1990 to 1998.

## Organizations

Everyone involved in wildfire activities is exposed to hazards, not just on-the-ground firefighters (Figure 3).

Volunteer firefighters were the most likely to die on wildland fire operations (total: 41, 31%). The most common causes of death were heart attacks (total: 17, 12%) and vehicle accidents (total: 18, 13%). Five volunteers died from burns, and one from electrocution (Figure 4).

Thirty-five Federal employees (26%) died during the period. Burnovers were the leading cause of death (16), including the 14 firefighters who died on the South Canyon Fire in 1994. The other causes of death were evenly distributed: heart attacks (5), vehicle accidents (4), miscellaneous (4), aircraft accidents (4), and falling snags (2). Removing the South Canyon Fire from the database would drop Federal fatalities to 21 (17% of 122 fatalities) (Figure 5).

Contractors working on wildland fire operations suffered 28 fatalities in the 1990 to 1998 period: 23 died in aircraft accidents (19 fixed wing and 4 rotary wing), with other fatalities occurring from falling snags, heart attacks, and vehicle accidents (Figure 6).

Eighteen State employees died on wildland fire operations from 1990 to 1998. Burnovers were the leading cause of death (10), and include the six State of Arizona employees killed in the Dude Fire. Other causes of death among State employees include heart attacks (2), aircraft accidents (2), falling snags (2), and heat stress (2). If the 6 fatalities on the Dude Fire were excluded, the State's fatalities would drop to 12, with 4 caused by burnovers (Figure 7).

City/county fire personnel suffered seven fatalities. Six occurred from burnovers, with five of those early in the period of this report.

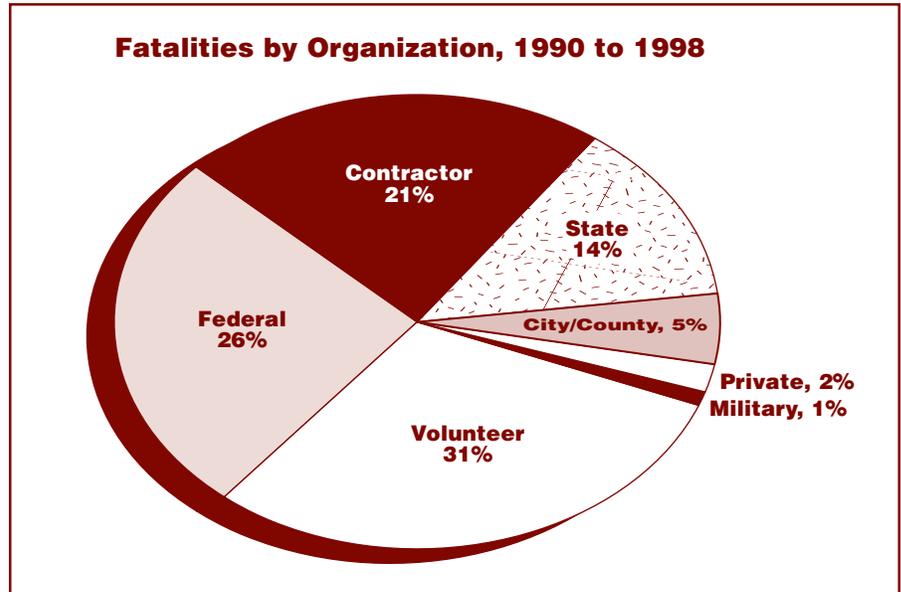


Figure 3—Fatalities grouped by the organizations of persons who died while involved in fighting wildland fires from 1990 to 1998.

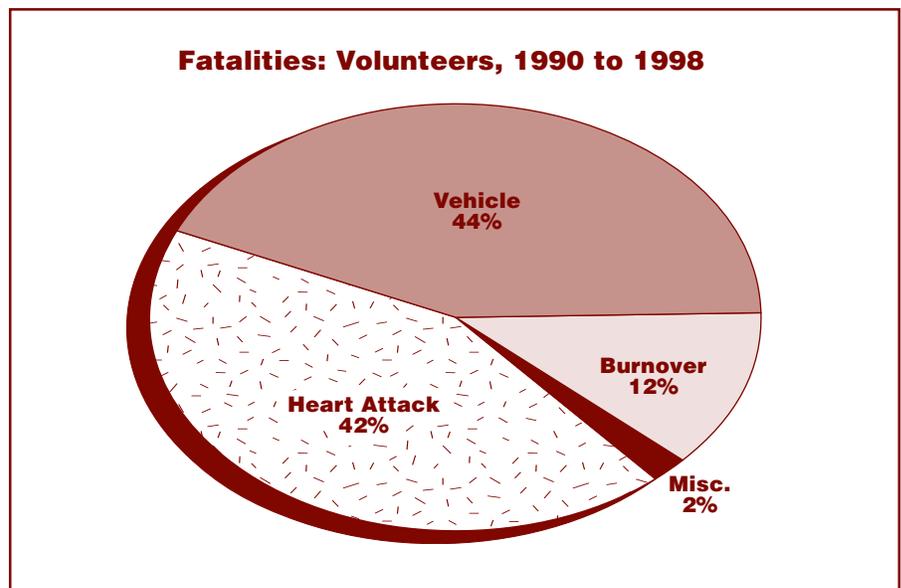


Figure 4—The causes of death for the 41 volunteers.

Two private citizens were burned over and died while attempting to suppress a wildland fire in Montana during 1996.

One person in the military was killed in a ground-based aircraft accident while supporting wildfire suppression during 1994.