

Wildland Firefighter Fatalities, 1999 – 2008

**Rita F. Fahy
Fire Analysis and Research Division
National Fire Protection Association**

July 2009



**National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471
www.nfpa.org**

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

Copies of this analysis are available from:

National Fire Protection Association
One-Stop Data Shop
1 Batterymarch Park
Quincy, MA 02169-7471
www.nfpa.org
e-mail: osds@nfpa.org
phone: 617-984-7443

NFPA Index No. 1452

Copyright © 2009, National Fire Protection Association, Quincy, MA

This custom analysis is prepared by and copyright is held by the National Fire Protection Association. Notwithstanding the custom nature of this analysis, the NFPA retains all rights to utilize all or any part of this analysis, including any information, text, charts, tables or diagrams developed or produced as part hereof in any manner whatsoever as it deems appropriate, including but not limited to the further commercial dissemination hereof by any means or media to any party.

Wildland Firefighter Fatalities, 1999 – 2008

Of the 1,007 firefighters who died while on duty from 1999 through 2008, 180 (or 17.9 percent) died as a result of wildland fires or prescribed fires. (This total for on-duty deaths does not include the 340 firefighters killed at the World Trade Center in New York on September 11, 2001.) For this analysis, the term *wildland fire* is used to include forest, brush and grass fires. Some of these are wildfires that may have initially been planned as prescribed fires, set either by a land management agency or a private property owner but then got out of hand. Others were fires set by a land management agency that never went out of control, but a fatality occurred during ignition, while the fire was burning, or after extinguishment. From 1999 through 2008, there were 169 deaths associated with 124 wildfires and 11 deaths associated with nine prescribed fires.

As shown in Figure A, the number of deaths in any one year was as low as eight and as high as 26. Over the period, 28.4 percent of all fire ground deaths occurred at wildfires and prescribed fires. This examination of wildland fire deaths was prompted by the large number of firefighter fatalities in 2008 that were associated with wildfires and prescribed fires (23 out of 108 deaths, or 21 percent).

This analysis includes members of municipal fire departments who responded to grass, brush and forest fires within their jurisdictions, as well as career, seasonal and contract employees of state and federal land management agencies who were involved in assigned fire suppression activities at the time they were fatally injured. The federal land management agencies include the U.S. Forest Service, the Bureau of Indian Affairs, the Bureau of Land Management, the Fish and Wildlife Service and the National Park Service. Members of the military and prison inmate crews working on wildland fires are also included. Figure B compares the experience of wildland agency firefighters and municipal firefighters each year.

For the 69 fatal wildfires for which the cause of the fire was reported, 22 were due to lightning, 20 were due to inadequate control of burning trash, brush or campfires, 11 were incendiary or suspected of being set, six were caused by downed powerlines and three were caused by sparks from cutting equipment. The remaining causes were reported for one fire each: children playing, fireworks, hot casings from a nearby firing range, a lawn mower that caught fire, sparks from a rock in a hay baler, arcing from the top of a power pole and exposure from a burning structure.

The 182 victims in the study period ranged in age from 15 to 77 years, with a median age of 43 years. Nine of the victims were women. Almost three fifths of all wildland firefighter deaths (103) occurred during fire suppression activities and another 66 occurred when firefighters were responding to or returning from the fires. Of the remaining 11 firefighters, four were lighting prescribed fires (three died when their helicopter crashed and one died when his 4-wheeler overturned, leaving him pinned when leaking gasoline ignited), two were traveling to or from prescribed burns, two were creating fire lines, two died in their sleep at base camps and one died in a vehicle crash while transporting supplies.

Deaths on the Fire Ground

The breakdown of causes of fatal injuries on the fire ground is shown in Figure C. Thirty firefighters were killed in 20 fire department vehicle crashes during fire suppression activities, including 24 in 16 aircraft crashes. Nineteen of those 24 victims were contractors (mostly pilots) working for state and federal land management agencies. The others were employees of state and federal land management agencies.

Overexertion, stress and related medical issues accounted for the next largest proportion of deaths. Sudden cardiac death accounted for 25 of these 26 fatalities; one firefighter died of heat stroke.

The third largest proportion of deaths during fire suppression activities occurred when firefighters were caught or trapped by fire progress (25 deaths). Seventeen of them died as a result of burns; eight died of asphyxiation.

Eleven firefighters were struck by objects -- five by a tree or snag, three by vehicles, one by a rock, one by a section of an exploding storage tank and one by a rope that snapped while he was trying to tow a stuck apparatus at a wildfire.

Seven firefighters were electrocuted – five came into contact with downed power lines and two were struck by lightning.

Two firefighters fell from cliffs and two fell from apparatus during fire ground operations.

State and federal land management agencies enforce rigorous fitness requirements for their employees and contractors, which may lower the risk of sudden cardiac deaths among firefighters under their

jurisdiction. For this analysis then, the fire ground deaths were broken down by type of department, i.e., career or volunteer fire department, state or federal land management agency, or industrial fire department or industrial fire brigade. A profile of the 103 fire ground victims show that 47 were members of municipal fire departments (41 were volunteer firefighters and six were career firefighters). Another 55 were career, seasonal or contract employees of state and federal land management agencies. (The remaining firefighter was employed by a paper company and was a member of his company's fire brigade.)

As shown in Table 1, sudden cardiac death accounted for almost half of the fatalities of municipal firefighters during fire suppression activities, while most of the deaths to state and federal employees were due to internal trauma and burns. Of the nine municipal heart attack victims for whom medical documentation was available, six had severe arteriosclerotic heart disease, five had had prior heart attacks or bypass surgery, four had hypertension and one was diabetic. The municipal firefighters who suffered fatal heart attacks ranged in age from 27 to 76, with a median age of 58 years. Medical documentation was available for one of the two wildland firefighters who experienced sudden cardiac death – he had severe arteriosclerotic heart disease. The two were aged 42 and 46 years. One was an employee of a federal land management agency and the other was the supervisor of an inmate fire crew.

The lower proportion of sudden cardiac deaths among land management agency firefighters may be a result of stricter fitness requirements, but it could also be a function of age. Older firefighters are more likely to suffer heart attacks, and if the land management agencies employ a significantly lower percentage of older firefighters, their experience would reflect this. Other factors besides age and fitness requirements that may impact the incidence of sudden cardiac death at wildland fires include the protective equipment provided. In several of the incidents handled by municipal firefighters, those involved in fighting the fire did so in protective clothing designed for structural firefighting, while wildland firefighters wear clothing, helmets and boots designed for that work environment.

Deaths While Responding to or Returning from Alarms

Of the 66 firefighters who died while responding to or returning from wildfires, 38 of the victims were responding to fires and 26 were either en route from fires or back at the station or fire camp when they died. Two were in an air tanker traveling between two wildfires. The breakdown of deaths while responding to or returning from alarms is shown in Figure D.

Fifty-one of the victims were involved in vehicle crashes, including 17 in five aircraft crashes. In the two most serious road crashes, 13 firefighters were killed in two crashes involving vans.

Thirteen firefighters died as a result of overexertion, stress and related medical issues -- 12 of the 13 experienced sudden cardiac death and the other suffered a stroke. One firefighter was caught and trapped underwater and drowned while en route to a wildland fire on foot. One firefighter returning from duty on a wildland fire was struck and killed by a semi-trailer truck while crossing an interstate near his motel late in the evening.

Experience in 2008

In 2008, 14 firefighters were killed in three crashes and one firefighter suffered sudden cardiac death while responding to or returning from wildfires. In one of the crashes, two pilots and seven federal contractors died when their helicopter crashed just after take-off. The firefighters were being ferried back to their base camp when the aircraft experienced a loss of power to the main rotor during the initial climb, crashing into trees and terrain in a remote wildland area. Four others on the helicopter survived. Three firefighters died when their air tanker crashed just after take-off on its way to drop a load of fire retardant on a wildland fire. An engine fire was observed just before the plane crashed. Two firefighters responding in a wildland fire apparatus driven at excessive speed for road conditions died instantly when their vehicle slammed into an embankment. Due to poor visibility in smoke, they did not notice that a bridge they were approaching had burned and collapsed. They were not wearing seatbelts. One was partially ejected.

In addition, seven firefighters were killed while operating on wildland fires. Two suffered sudden cardiac death, one fell down a cliff, one was struck by a tree, one died when his air tanker crashed, one was overrun by fire, and one had an allergic reaction to an insect bite while operating on a wildland fire and was killed in a helicopter crash while he was being transported to a hospital for treatment.

Another firefighter died when he jumped from a road grader when its brakes failed and it started to roll backwards.

This made 2008 one of the deadliest years for firefighters involved with wildland fires, with a total of 23 deaths associated with wildland fires. Of the 23 victims in 2008, 12 were contractors with federal land management agencies, four were local volunteer firefighters, three were employees of federal agencies,

one was an employee of a state land management agency, one was a member of a Native American wildland firefighting crew, one was the supervisor of an inmate fire crew and one was a career firefighter.

NFPA Standards

NFPA also publishes several standards related to road safety issues. NFPA 1002, *Standard on Fire Apparatus Driver/Operator Professional Qualifications*, identifies the minimum job performance requirements for firefighters who drive and operate fire apparatus, in both emergency and nonemergency situations. NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*, provides for the development of a written vehicle operations training program, including the organizational procedures for training, vehicle maintenance, and identifying equipment deficiencies. NFPA 1911, *Standard for the Inspection, Testing, Maintenance and Retirement of In-Service Automotive Fire Apparatus*, details a program to ensure that fire apparatus are serviced and maintained to keep them in safe operating condition. NFPA 1901, *Automotive Fire Apparatus*, addresses vehicle stability to prevent rollovers, and gives manufacturers options on how to provide it, and the latest edition requires reflective striping for visibility and that ANSI 207-compliant breakaway high-visibility vests be carried on all new fire apparatus. NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, provides information regarding apparatus construction for water tankers.

NFPA has several standards that focus on the health risks to firefighters. For example, NFPA 1582, *Comprehensive Occupational Medical Program for Fire Departments*, outlines for fire departments the procedures for screening candidate firefighters and handling health problems that might arise during an individual's fire service career. NFPA 1500, *Fire Department Occupational Safety and Health Program*, calls for fire departments to establish a firefighter health and fitness program based on NFPA 1583, *Health-Related Fitness Programs for Fire Fighters*, and requires that firefighters meet the medical requirements of NFPA 1582.

The provisions of NFPA 1500 also include requirements that operators successfully complete an approved driver training program, possess a valid driver's license for the class of vehicle, and operate the vehicle in compliance with applicable traffic laws, with all vehicle occupants seated in approved riding positions and secured with seatbelts before drivers move the apparatus. If members are authorized to respond to incidents or to fire stations in private vehicles, the fire department must establish specific rules, regulations, and procedures relating to the operation of private vehicles in an emergency mode.

Among the standards relevant to wildland firefighting, NFPA 1143, *Wildland Fire Management*, provides minimum requirements to fire protection organizations on the management of wildland fire, including prevention, mitigation, preparation, and suppression, specifying management practices and policies necessary for a fire protection organization to develop a wildland fire management program. NFPA 1051, *Wildland Fire Fighter Professional Qualifications*, identifies the minimum job performance requirements (JPRs) for wildland fire duties and responsibilities. NFPA 1977, *Protective Clothing and Equipment for Wildland Fire Fighting*, specifies the minimum design, performance, testing, and certification requirements for items of wildland firefighting protective clothing and equipment, including protective garments, helmets, gloves, footwear, goggles, chain saw protectors, and load carrying equipment.

Table 1
Wildland Firefighter Fatalities on the
Fire Ground by Nature of Fatal Injury, 1999 - 2008

	Federal and State Land Management Agencies	Municipal Volunteer	Career	Total
Internal trauma	33	4	1	38
Sudden cardiac death	2	23	0	25
Burns	12	5	1	18
Asphyxiation/smoke inhalation	4	2	2	8
Electric shock	2	4	1	7
Crushing	0	3	0	3
Heat stroke	0	0	1	1
Drowning	1	0	0	1
Hemorrhaging	1	0	0	1
Total	55	41	6	102

Note: The remaining fire ground victim was a member of a paper company fire brigade who was crushed by his bulldozer after it left the road and slid down a hill.

Figure A
U.S. Firefighter Deaths in Wildland Fires
1999-2008

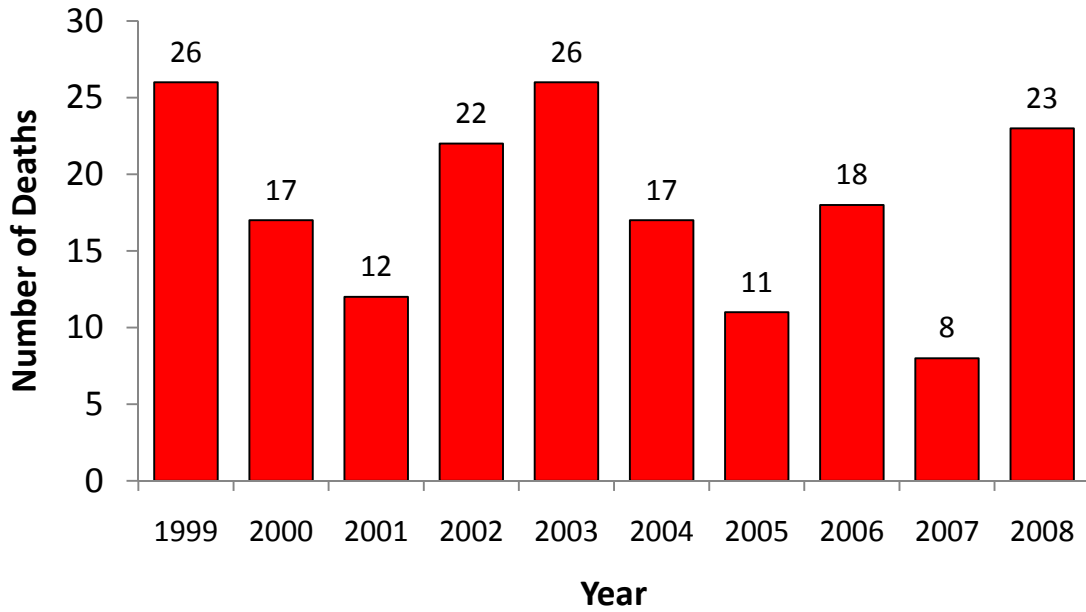


Figure B
Firefighter Fatalities in Wildland Fires 1999-2008
by Jurisdiction

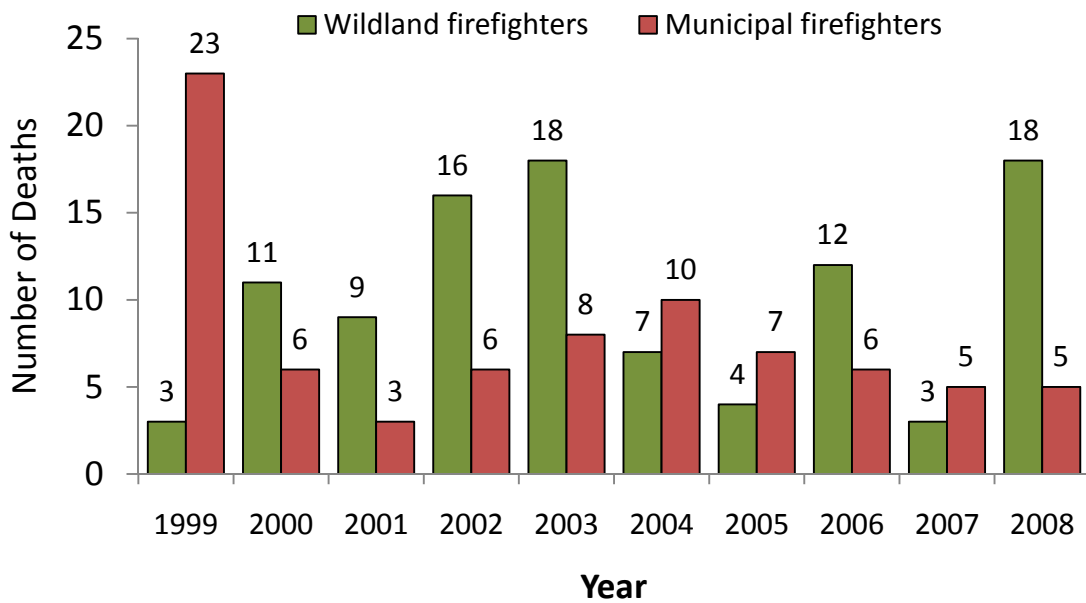


Figure C
Firefighter Fatalities on the Fire Ground at Wildland Fires
1999 - 2008

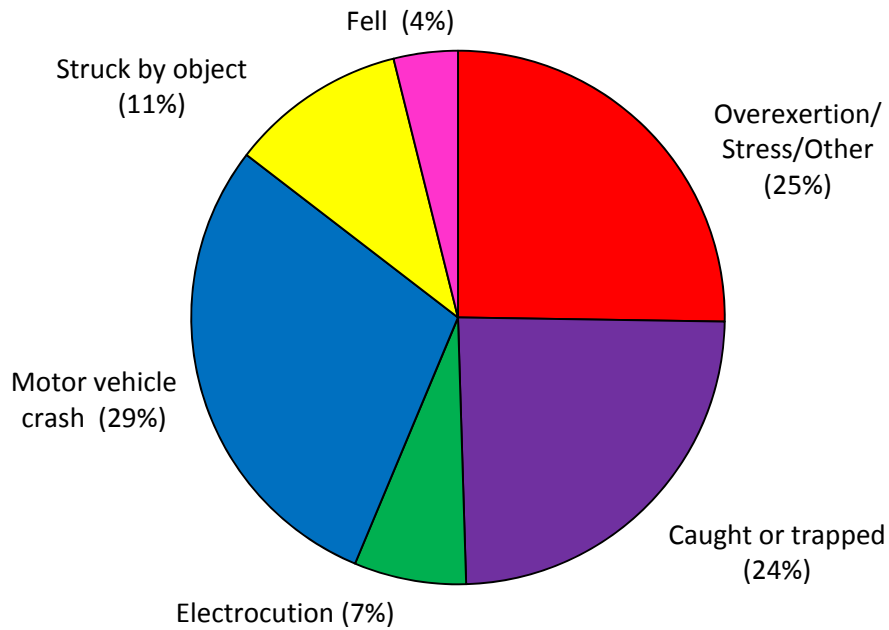


Figure D
Firefighter Fatalities Responding to or
Returning from Wildland Fires by Cause of Injury
1999 - 2008

