# USDA Forest Service
# National Fire Operations Safety
# Information Briefing Paper

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**Topic:** Trends in wildland fire entrapment fatalities.

**Background:** Wildland firefighters today are spending more hours fighting fires than ever before, and they are tackling fires of historic magnitude. The risk environment associated with wildland fire is being re-defined, and firefighters too have begun to redefine their own culture as a professional endeavor. This exercise of redefinition is not new.

With the upcoming 10-year anniversary of South Canyon and the impacts from the Thirtymile and Cramer Fires still fresh, the interest in lessons learned in the past will be intense, and scrutiny of the safety and effectiveness of wildland firefighting agencies will continue to increase. Part of this process requires we examine our hard won lessons in a different light.

Even though the wildland fire environment continues to increase in complexity there is a steady, downward trend in the overall frequency of fire entrapment fatalities. Because doctrinal change and its effects are slow, this longer view is important. It is important to articulate progress is being made in the very hazardous, high risk / high consequence work environment of wildland fire. It inspires us to maintain improvement efforts by seeing that doctrinal and organizational changes made over the years have made a difference.

**Key Points:**

An analysis of fire entrapment fatalities in relation to significant doctrinal and organizational changes in wildland fire suppression from 1933 through 2003 is the basis of this paper. Since 1933, U.S. Forest Service firefighter entrapment fatalities decreased from an annual rate of 3.65 per year (1933-1956) to 0.67 per year (1995-2003). During this same period for all wildland firefighting agencies combined, the rate of firefighter entrapment fatalities decreased from 6.39 to 2.0 per year.

- 1933 – 1956 1933 was chosen as the baseline year as this was the advent of organized, wildland fire suppression crews through the Civilian Conservation Corps (CCC). This is also the year reporting data for wildland firefighting fatalities begins to show continuity. The years 1933 to 1956 were characterized by firefighting efforts primarily staffed with CCC crews, pick-up civilian laborers, or inmates supervised by agency fire overhead. This same period saw the beginnings of the Smokejumper (1940) and Hotshot (1948) programs. Forest Service firefighter entrapment fatality rate was 3.65 per year.
- 1957 – 1966 The key event that denotes the start of this period is the *Report of the Task Force to Recommend Action to Reduce the Chances of Men Being Killed by Burning While Fighting Fire, 1957*. Two significant changes resulted from this report. The "Standard Firefighting Orders" and "Situations that Shout Watch Out" were established, and the first formal fire behavior courses were developed and delivered to wildland firefighters in the field. Wildland firefighting was characterized by an increase in dedicated agency initial attack resources, the advent of effective aviation assets, and start of the Interregional Crew concept (1961). Forest Service firefighter entrapment fatality rate was 3.00 per year.

- 1967 – 1979 The key event that begins the third time period is the *Report of the Fire Safety Review Team – A Plan to Further Reduce the Chances of Men Being Burned While Fighting Fires, 1967*. Among several recommendations from this report were three significant changes: the Downhill Line-Construction Checklist, an emphasis on portable weather equipment including direction and training for firefighters to use belt weather kits on the fireline, and the push to develop more effective fire shelters and fire resistant clothing. The Boise Interagency Fire Center was established in 1965, and the participation of non-federal firefighting agencies was increased. Forest Service firefighter entrapment fatality rate was 2.08 per year.

- 1980 – 1994 Several key efforts that were un-related but concurrent denote the start of this period. These include the U.S. Forest Service Region 5 *Safety First* initiative and FIRESCOPE project, Carl Wilson's research paper titled *Fatal and Near-Fatal Forest Fires – The Common Denominators*, and finally the *Report of the Task Force on Study of Fatal and Near Fatal Wildland Fire Accidents*. A number of significant changes grew out of these efforts and research: the national S-course training system that included a series of formal fire behavior courses, requirements for all firefighters to wear fire resistant clothing and carry fire shelters, establishment of the national fire-radio cache system, and the Incident Command System. This time period saw the evolution from firefighting to fire management, and increased interagency cooperation. The national mobilization system came of age with expansion of the incident management team concept and interagency hotshot crew program. Wildland / urban interface became a top priority in fire management decisions at all levels. Forest Service firefighter entrapment fatality rate was 1.6 per year.

  Of particular note is the Region 5 *Safety First* initiative. This was an overhaul of the entire fire management program region-wide. It required several years to implement and one of the primary goals was to insure that all leadership positions in the fire organization were staffed by full-time employees with no collateral duties. During the 40 years prior to the *Safety First* program, Forest Service Region 5 fire personnel had incurred 87 fire entrapment fatalities (1933 to 1973). In the 30 years since the *Safety First* program was initiated, Forest Service Region 5 fire personnel have incurred just one fire entrapment fatality (1974 to 2003).

- 1994 – 2003 The key event that begins this final period is the South Canyon Fire and the follow-up found in *Interagency Management Report Team, 1995* and *Wildland Firefighter Safety Awareness Study, 1995-1998*. Many significant recommendations were offered in these reports that helped wildland fire agencies to become better funded and more professionally staffed. Equally important was the 1995 Human Factors Workshop that generated an awareness of the need to better prepare firefighters for the leadership and decision-making demands of the fireground, and eventually evolved into a formal leadership development program for wildland firefighters. This has been a time of constant changes in policy and process. Wildland fire agencies have come under intense political and public scrutiny following the Cerro Grande, Thirtymile, and Cramer fires. Forest health has emerged as the number one issue affecting fire management efforts. The standing doctrine for firefighting rules of engagement have been questioned and debated, with one of the outcomes being the acceptance of the L.C.E.S. and Risk Management concepts alongside the Firefighting Orders and the Watchouts. Forest Service firefighter entrapment fatality rate was 0.67 per year.

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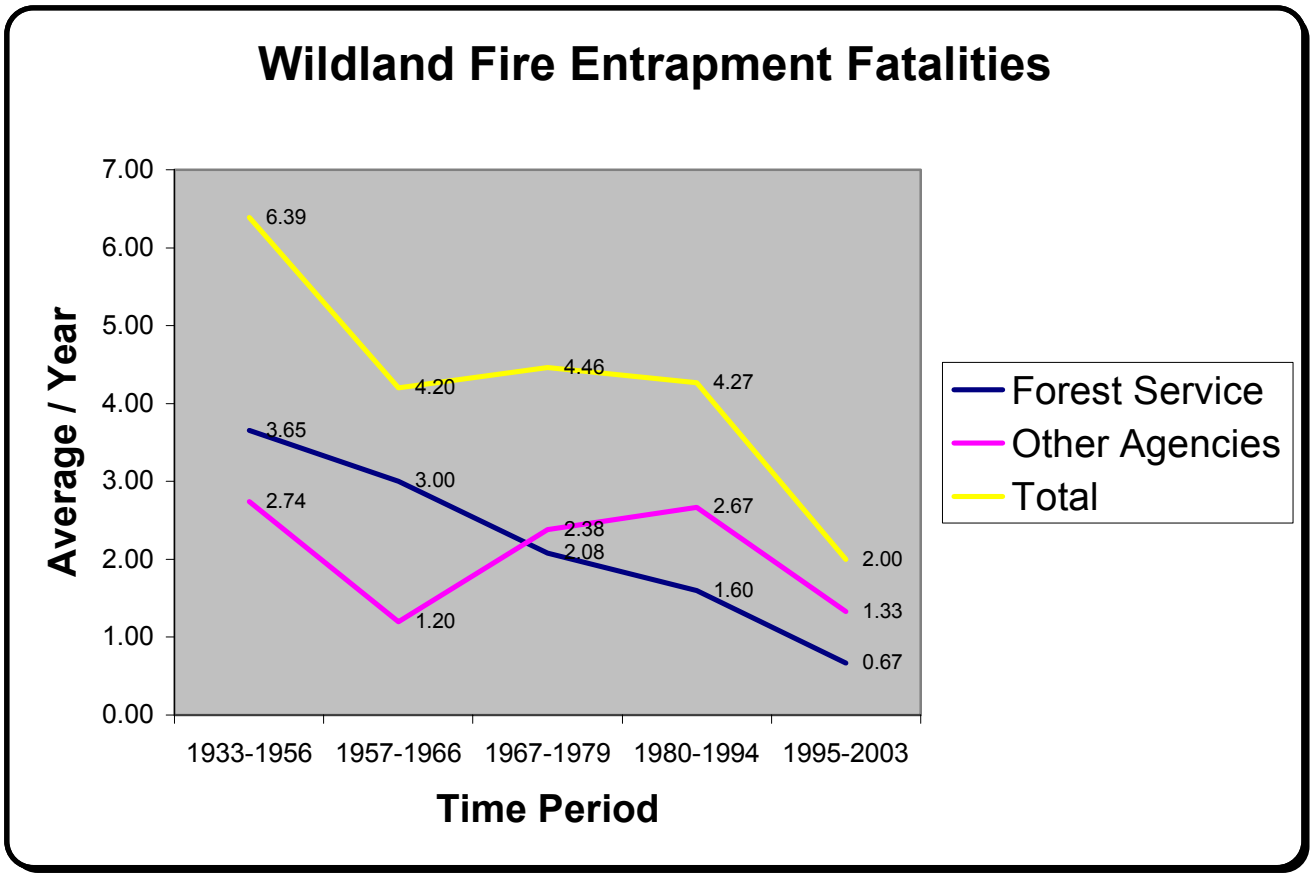
The following graph illustrates the trend in wildland firefighter entrapment fatalities from 1933 to 2003. It should be noted that fire entrapment is only one of four major fatality mechanisms in the wildland fire environment and accounts for 35% of all fatalities. Gravity (hazard trees, rolling rocks, and falls), transportation (vehicle and aircraft incidents), and fitness (heart attack and heat stress) account for the majority of wildland firefighter fatalities.



Wildland Fire Entrapment Fatalities – 1933-2003

| Year | USFS | Other | All | Significant Fires |
|---|---|---|---|---|
| 1933 | 2 | 25 | 27 | Griffith Park-25 (CA) |
| 1936 | | 5 | 5 | Chatsworth-5 (NJ) |
| 1937 | 16 | | 16 | Blackwater-15 (WY) |
| 1938 | | 8 | 8 | Pepper Run-8 (PA) |
| 1939 | 5 | 1 | 6 | Rock Creek-5 (NV) |
| 1940 | 1 | | 1 | |
| 1941 | | 2 | 2 | |
| 1943 | 12 | 3 | 15 | Hauser Creek-11 (CA) |
| 1945 | | 1 | 1 | |
| 1947 | 1 | | 1 | |
| 1948 | 1 | | 1 | |
| 1949 | 15 | | 15 | Mann Gulch-13 (MT) |
| 1950 | | 5 | 5 | Pelitor-4 (CA) |
| 1952 | | 3 | 3 | |
| 1953 | 15 | 1 | 16 | Rattlesnake-15 (CA) |
| 1954 | 3 | 3 | 6 | Gap Creek-3 (TN) / Tunnel-3 (CA) |
| 1955 | 1 | 6 | 7 | Hacienda-5 (CA) |
| 1956 | 12 | | 12 | Inaja-11 (CA) |
| Total 1933-1956 | 84 | 63 | 147 | |
| | 3.65 / yr | 2.74 / yr | 6.39 / yr | |

| Year | USFS | Other | All | Significant Fires |
|---|---|---|---|---|
| 1958 | 2 | | 2 | |
| 1959 | 7 | 3 | 10 | Decker-6 (CA) |
| 1960 | 1 | 2 | 3 | |
| 1961 | 3 | 1 | 4 | |
| 1962 | 4 | | 4 | Timberlodge-4 (CA) |
| 1964 | 1 | 2 | 3 | |
| 1965 | | 4 | 4 | Fairview Hollow-3 (KY) |
| 1966 | 12 | | 12 | Loop-12 (CA) |
| Total 1957-1966 | 30 | 12 | 42 | |
| | 3.0 / yr | 1.2 / yr | 4.2 / yr | |

| Year | USFS | Other | All | Significant Fires |
|---|---|---|---|---|
| 1967 | 4 | 4 | 8 | |
| 1968 | 9 | 3 | 12 | Canyon-8 (CA) |
| 1970 | 1 | | 1 | |
| 1971 | 5 | 1 | 6 | Romero-4 (CA) |
| 1972 | | 1 | 1 | |
| 1973 | | 1 | 1 | |
| 1975 | | 2 | 2 | |
| 1976 | 3 | 1 | 4 | Battlement Creek-3 (CO) |
| 1977 | 4 | 10 | 14 | Bass Rvr-4 (NJ) / Honda Cyn-3 (CA) / Cart Cr-3 (UT) |
| 1978 | | 2 | 2 | |
| 1979 | 1 | 6 | 7 | Spanish Ranch-4 (CA) |
| Total 1967-1979 | 27 | 31 | 58 | |
| | 2.08 / yr | 2.38 /yr | 4.46 / yr | |

Wildland Fire Entrapment Fatalities – 1933-2003

| Year | USFS | Other | All | Significant Fires |
|---|---|---|---|---|
| 1980 | 1 | 1 | 2 | |
| 1981 | 1 | 3 | 4 | |
| 1982 | | 1 | 1 | |
| 1983 | | 9 | 9 | |
| 1984 | 2 | 5 | 7 | |
| 1985 | | 5 | 5 | |
| 1987 | | 1 | 1 | |
| 1988 | | 1 | 1 | |
| 1989 | | 2 | 2 | |
| 1990 | 6 | 5 | 11 | Dude-6 (AZ) |
| 1991 | | 1 | 1 | |
| 1993 | 1 | 2 | 3 | |
| 1994 | 13 | 4 | 17 | South Canyon-14 (CO) |
| Total 1980-1994 | 24 | 40 | 64 | |
| | 1.6 / yr | 2.67 / yr | 4.27 / yr | |

| Year | USFS | Other | All | Significant Fires |
|---|---|---|---|---|
| 1995 | | 2 | 2 | |
| 1996 | | 2 | 2 | |
| 1998 | | 1 | 1 | |
| 1999 | | 2 | 2 | |
| 2000 | | 2 | 2 | |
| 2001 | 4 | 1 | 5 | 30Mile-4 (WA) |
| 2003 | 2 | 2 | 4 | Cramer-2 (ID) |
| Total 1995-2003 | 6 | 12 | 18 | |
| | 0.67 / yr | 1.33 / yr | 2.0 / yr | |

| | | | | |
|---|---|---|---|---|
| Total 1933-2003 | 171 | 158 | 329 | |
| | 2.4 / yr | 2.2 / yr | 4.6 / yr | |