USDA
United States Department of Agriculture

# Fire Management today

SEPTEMBER 2019 • VOL. 77 • NO. 3

Improving the Wildland Fire System

Firefighter Fatalities

Firefighter Entrapment Survivability and more ...

FOREST SERVICE
USDA
DEPARTMENT OF AGRICULTURE

# Fire Management today

***Fire Management Today*** is published by the Forest Service, an agency in the U.S. Department of Agriculture, Washington, DC. The purpose of ***Fire Management Today*** is to share information related to wildland fire management for the benefit of the wildland fire community. No longer appearing in print, ***Fire Management Today*** is available onine at *www.fs.fed.us/managing-land/fire/fire-management-today*.

Victoria Christiansen, Chief
Forest Service

Shawna A. Legarza, Psy.D., Director
Fire and Aviation Management

Kaari Carpenter, General Manager • Hutch Brown, Editor



SEPTEMBER 2019 • VOL. 77 • NO. 3

## On the Cover:

*First detected in August 2017, the Tappan Fire was managed by the Forest Service to return the natural ecological role of fire to landscapes in a wilderness area on the Salmon–Challis Natonal Forest in Idaho. Responders traveled to the remote area on horseback to monitor the fire. Photo: USDA.*

# IN THIS ISSUE

SEPTEMBER 2019
VOL. 77 • NO. 3



## Firefighter and public safety is our first priority.

The USDA Forest Service's Fire and Aviation Management Staff has adopted a logo reflecting three central principles of wildland fire management:

- **Innovation:** We will respect and value thinking minds, voices, and thoughts of those that challenge the status quo while focusing on the greater good.
- **Execution:** We will do what we say we will do. Achieving program objectives, improving diversity, and accomplishing targets are essential to our credibility.
- **Discipline:** What we do, we will do well. Fiscal, managerial, and operational discipline are at the core of our ability to fulfill our mission.

**GUIDELINES** for Contributors

# Back to the Basics

**By Shawna A. Legarza, Psy.D.**
*Director, Fire and Aviation Management*
*Forest Service*

During my 1989 rookie school for wildland firefighters, we were required to memorize the 10 Standard Fire Orders and the 18 Watch Out Situations. We chanted them loudly during our physical training sessions and we quizzed each other constantly. If we missed a word, we did pushups. We struggled to understand them; instead, we memorized the words. We put stickers on our helmets and on the backs of our radios.

We also really tried to understand the somewhat mysterious intent behind each statement. For instance, take "Fight fire aggressively, having provided for safety first." For me as a young 18-year-old firefighter, that was a difficult statement to understand. Was I to be aggressive in order to be safe … or be safe in order to be aggressive? And despite my inner turmoil, fire order 6 told me this: "Be alert. Keep calm. Think clearly. Act decisively." What a confused kid I was!

Upon reflecting on my experiences, I remember different levels of leadership and learning as I tried to understand the meaning behind the word "safety"—to do no harm. To be frankly honest, when I was 18 years old working on a fire engine, I really didn't understand the concept behind fireline safety. In those days, I thought safety meant survival—not getting caught in a bad situation. So to mitigate my lack of understanding, I did what my boss told me and didn't ask many questions. Understanding safety was as complex then as it is today.

**Understanding safety was as complex then as it is today.**

In 1990, my second year in fire, the Dude Fire occurred. It was a fatality fire in which six inmate crew members perished. It was puzzling for me and, I imagine, for others. I wondered how something so awful could happen. After this fire, Paul Gleason developed "LCES" (Lookouts, Communication, Escape Routes, Safety Zones). Then, in 1994, the South Canyon Fire took more lives. Once again, I asked myself: How could this happen?

As my career advanced, I started to more fully understand what safety meant. I learned that understanding safety means understanding the fire triangle, the basics of wildland firefighting—fuels, weather, and topography. It meant that, when scouting line, you always looked back where you came from, having one foot in the black and eyes forward on indirect attack. It meant feeling the pine needles or caribou moss to understand the fuel moistures. It meant learning about the weather and the power of Mother Nature. It meant "lick and go," runny noses and watery eyes, and loud cracks from snags falling. It meant always knowing our escape route. It meant finding a safety zone when there were no safety zones. It meant listening to those little voices in your head proclaiming the right thing to do. If it was safe, we did it; if it wasn't, we didn't.

Now, when I think about safety as the Forest Service's National Fire and Aviation Director, I think about the challenges of working in the wildland–urban interface, excessive fuel loading, extreme weather events, fatigue, stress management, emotional intelligence, improving the wildfire system, enhanced training and decision making, and taking care of our people.

The wildland fire system is complex. Please help me ensure that all wildland firefighters understand the basics of how the 10 and 18 and LCES tie to the challenges faced today.

# Opportunities To Improve the Wildland Fire System*

Victoria Christiansen

*Vicki Christiansen, Chief of the Forest Service.*

My personal passion is connecting people with their natural resources, including the natural ecological role of wildland fire and the challenges of wildland fire management. The solutions come in the context of a wildland fire system that is increasingly complex and difficult. To get to the solutions, we have to understand the wildland fire system we have today.

## WILDLAND FIRE SYSTEM

Historically, wildland fire fundamentally shaped the American landscape, and it continues to do so today in a highly modified environment. Forest, brush, and range fires were common in "presettlement" times, and the American Indians realized the important role fire played in revitalizing and reinvigorating landscapes. They used fire for purposes ranging from shaping habitats for desired species to reducing fuels to protect communities.

Sound familiar?

Today, our Nation has over a billion "burnable" acres of vegetated landscapes, most of them naturally adapted to periodic wildland fire. And as our Nation has changed, so has our ability to live with wildland fire.

In the wildland fire system we have today, a full suite of environmental, social, political, financial, and cultural factors all drive outcomes in the wildland fire environment (fig. 1). With pieces connected to civil society, responders, communities, and landscapes, our wildland fire system is extremely complex.

**Our Nation has over a billion "burnable" acres of vegetated landscapes, most of them naturally adapted to periodic wildland fire.**

So is our operating environment. For one thing, forces are at play over which we have little or no control. For another, a broad set of stakeholders is involved, which presents both challenges and opportunities.

## CHALLENGES

One challenge is fire seasons that now span the whole year, along with wildfires that have grown in frequency, size, and severity. Forty years ago, a wildfire larger than 10,000 acres (4,000 ha) was relatively rare. Twenty years ago, a wildfire larger than 100,000 acres (40,000 ha) was relatively rare. Today, we talk of megafires, and we see them every year. In 2017, we had 12 fires that burned more than 100,000 acres (40,000 ha) and an additional 39 fires that burned more than 40,000 acres (16,000 ha) (NICC 2018).

Those megafires cost. The fires that escape initial attack are only 2 to 3 percent of all the fires we fight at the Forest Service, but they take up 30 percent of our suppression budget. In 2017, the Thomas Fire near Ventura was

*Vicki Christiansen is the Chief of the Forest Service, Washington Office, Washington, DC.*

** The article is adapted from a speech by the author at the Fire Continuum Conference in Missoula, MT, on May 21, 2018.*

**Year after year, fires have been taking up growing shares of our budget and growing numbers of our personnel.**

the largest in California history up to that point. It burned for more than a month, covered more than 280,000 acres (112,00 ha), and destroyed more than a thousand structures. Each year, U.S. taxpayers lose $20 billion to $100 billion in wildfire-related damages to infrastructure, public health, and natural resources.

The year 2017 was one of the largest fire years in recent history. More than 10 million acres (4 million ha) burned, the second most since 1960, and more than 12,000 structures were destroyed. At peak fire activity, our Nation had 28,000 firefighters in the field, and it was the costliest fire year to that date. The Forest Service alone spent more than $2.4 billion.

That was more than half of our entire agency budget. Year after year, fires have been taking up growing shares of our budget and growing numbers of our personnel. That has come at the expense of everything else we do—forest health, outdoor recreation, forest products, watershed restoration, and all the rest.


**Figure 1**—*The wildland fire system we have today includes environmental, social, political, financial, and cultural factors that drive outcomes in the wildland fire environment.*

But the most tragic cost by far is in terms of lives lost to wildfire, and that is another growing challenge in our wildland fire environment. In 2017, 14 wildland firefighters lost their lives. Since 1910, there have been more than 1,000 wildland firefighter fatalities, with rising rates of firefighter fatalities from the 1920s to the 2000s (fig. 2). In recent years, scores of other people tragically perished in wildfires as well, including more than 80 fatalities on the 2018 Camp Fire in California alone.

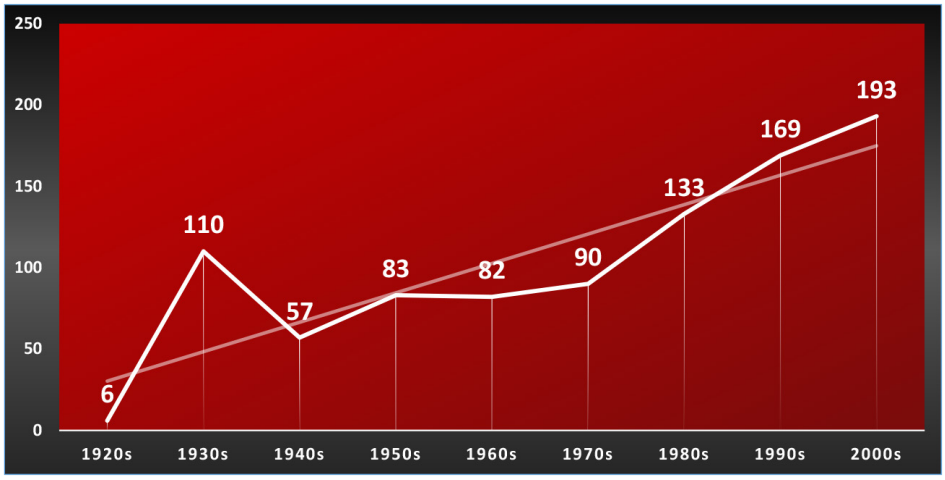



**Figure 2**—*Wildland firefighter fatalities by decade, 1920s to 2000s. The pink trendline shows a rising number of fatalities, particularly after 1980. Source: National Interagency Fire Center (2016).*

So these are the challenges we face … deaths from wildfire entrapments, growing fire years, soaring suppression costs, rising fire size and severity, and growing damage to homes, communities, watersheds, habitat, and timber.

The primary drivers are hazardous fuel buildups, the effects of a changing climate, and increasing development in the wildland–urban interface, all of which are expected to continue. Climate models project warmer and drier conditions across large parts of the West and large increases in the area burned.

And that's just it. Warmer and drier are becoming the new normal, something we can't control. We also face the challenge of increased development in the wildland–urban interface. An estimated 120 million people in over 44 million homes are at varying levels of risk from wildfire, especially in the West (Martinuzzi and others 2015). Less than 2 percent of the communities at risk are prepared as Firewise communities.

*Damage from the 2017 Thomas Fire near the Los Padres National Forest in California. Structures survived the fire due to defensible space. Photo: USDA Forest Service, Stuart Palley (December 22, 2017).*

## WHAT WE *CAN* DO: FIRE RESPONSE

So these are the challenges—drought, fuel buildups, growth in the wildland–urban interface—a legacy of fire exclusion compounded by a changing climate and homes spreading into fire-prone landscapes. This is the wildland fire environment we are in, and it contributes to the growing complexity of the wildland fire system we have: those social, political, and cultural factors we must work within, including the ones we can't control.

**In our complex wildland fire system, the Cohesive Strategy has become our foundational doctrine.**

But there are things we can do. At the Forest Service, we are convinced that continual learning and adaptation are key to keeping pace with the rising complexity of the wildland fire system. We need to focus on the factors in the system that we *can* control, such as the quality of our relationships, understanding that State, local, and Tribal governments have different objectives and missions in response to fire. This is a part of the complexity of the wildland fire system, and in this system, the Cohesive Strategy has become our foundational doctrine.

Since 2009, the broader fire community has stepped forward to strengthen relationships and coordination through the National Cohesive Strategy for Wildland Fire Management. Fire should unite us across the landscape through our common goals for the watersheds we share.

The wildland fire system required a new approach. All stakeholders came together to develop a national strategy that was truly shared. We created an all-lands national blueprint for further dialogue between local communities and national policymakers based on three national goals:

1. Restoring and maintaining healthy fire-adapted landscapes. This might look different based on different land management objectives in different parts of the landscape.
2. Creating fire-adapted communities—not fireproof but adapted to living with fire.
3. An effective, safe, and risk-based wildfire response. (By response, I do not necessarily mean wildfire suppression). Again, this might look different based on different land management objectives in different landscapes—conceivably even on the same fire. But it always means safe and effective wildfire response based on risk analysis for all ownerships.

All three goals need to work together across broad landscapes, inclusive of communities. The goals need to create synergies, where we work with partners ranging from national to local. Guiding principles and shared core values

include improved risk management and active management, using every tool at our disposal to make the landscape more resilient.

At the Forest Service, we are committed to doing our part:

- We are accelerating the treatment of the landscapes we manage to improve forest and grassland conditions and create greater resilience,
- We are helping communities become fire adapted, and
- We are working with our partners to develop a shared risk-based response to wildfire.

All of this needs to be done *before* a fire comes!

## RISK-BASED RESPONSE TO WILDFIRE

Let's focus for a moment on risk-based response to wildfire. For some, a narrative has formed that Forest Service firefighting is not aggressive enough. To frame this up, I will talk about three different decision points and outcomes for wildland fire management:

1. Fire is an important land treatment tool to reduce fuel loads and achieve beneficial natural resource outcomes. In many landscapes in the South and West, fire is *the* major land treatment tool. Planned ignitions are one way to get fire on the landscape under conditions we choose. Additionally, unplanned ignitions, especially on Federal lands where we are the land manager *and* the fire manager, are an important land treatment tool when executed under the right conditions and when we comanage the risk with our neighbors, accepting short-term risks for longer term reductions in risk. Such fires each year are few.
2. When a fire seems likely to threaten lives, homes, or neighboring property, we suppress it as fast as we can and prioritize our resources accordingly. We make that decision while the fire is still small, and our rate of suppression success is nearly 98 percent. These are the overwhelming majority of the fires on national forest land, about 7,000 fires annually.
3. Two to 3 percent of the fires we fight escape our control. These few fires typically become very large, often due to extreme conditions of fuels, weather, and topography.

**We neither expect nor allow firefighters to risk their lives attempting the improbable.**

**Figure 3**—*Firefighter using a driptorch during a firing operation on the 2017 Thomas Fire, the largest in California history. Photo: USDA Forest Service, Los Padres National Forest (December 21, 2017).*

Our Leader Intent for fire response has been consistently clear: even on wildfires close to homes and communities, safety is our highest priority. No home is worth a human life. We will commit firefighters only under conditions where they can actually have a chance of succeeding in protecting important values at risk.

The Forest Service has always expected firefighters to be aggressive in taking necessary action using tactics that have a high probability of success. We are a can-do organization, and that hasn't changed.

But we also expect our responders to accept the situation when all we can do is point protection until the fuels or weather changes, using burnouts and other tactics to steer fire around homes, infrastructure, and other values at risk (fig. 3). We neither expect nor allow firefighters to risk their lives attempting the improbable. Any other policy would be unconscionable and unacceptable to the wildland fire community and to the people we serve.

We are assisting line officers and incident commanders with decision-making tools, enhanced analytics, and alignment needed for making risk-informed choices when responding to wildfires. Our goal is to allow managers to better examine alternative strategies and to take into account the inherent tradeoffs between exposure, risk, and highly valued assets and opportunities for fire benefits.

We are working with our partners to increase our focus on prefire work to develop strategies to ensure that we are all on the same page before fires occur.

## FIRE FUNDING FIX

Another thing in our fire environment that we *can* control is the way we work together to create more resilient landscapes. In 2018, Congress gave us a big push to treat more lands and improve forest conditions.

The omnibus spending bill for 2018 will help the Forest Service stabilize our budgets for firefighting after decades of spiraling out of control. In 2017, firefighting claimed 56 percent of our budget—up from just 16 percent in 1995. At the rate we were going, fire would have taken up two-thirds of our budget by 2021. And as firefighting funds have run out, the Forest Service has had to cover the shortfall by taking funds from nonfire programs.

Through the omnibus bill, Congress resolved the dilemma beginning in 2020. First, our regular firefighting appropriation will be frozen at the 2015 requested level so it will no longer grow at the expense of everything else we do. Second, Congress created a separate fund to cover firefighting costs during severe fire years so that we no longer have to raid our nonfire programs. Of course, none of this kicks in until 2020.

The omnibus also represented new investments by Congress in the health of Federal lands. It gave the Forest Service an additional $40 million for hazardous fuels reduction, for a total of $430 million in 2018, and it fully funded the Collaborative Forest Landscape Restoration Program (CFLRP) at $40 million.

Together, the Forest Service's Hazardous Fuels program and the CFLRP are already reducing the risk of severe wildfires, especially in the West. In fiscal year 2017, we treated 3.2 million acres (1.3 million ha) across the National Forest System to reduce fuels and improve ecological conditions.

Through the omnibus bill, Congress also gave the Forest Service several new tools to help us reduce wildfire risk by improving forest conditions.

**If we want a permanent fire funding fix, then we need to be accountable for our fire spending.**

- One tool was amending the Good Neighbor Authority to help us work more efficiently with States to maintain the health of forests by allowing road maintenance and reconstruction in the good neighbor agreements.
- Another tool was our expanded ability to use stewardship contracts by extending their maximum duration from 10 years to 20 years. This will allow industry to create additional markets for wood products in areas where mills are scarce.
- The omnibus also authorized the use of new categorical exclusions for wildfire resilience projects on Federal lands. With this new tool, projects for hazardous fuels reduction can be started and completed more quickly.

By giving us new tools and more funds, along with a fire funding fix, the omnibus will help the Forest Service to stabilize our programs. It will also extend our ability to work with neighbors and partners under the Cohesive Strategy to meet our shared goals—to help us learn to live with wildland fire (fig. 4).

## WITH TRUST COMES ACCOUNTABILITY

In the years to come, it will be up to the Forest Service to make good on that promise. The fire funding fix will go for 8 years, from 2020 to 2028, but it comes with a caveat: no blank check. If we want a permanent fix, then we need to be accountable for our fire spending. Congress will be watching.

**Figure 4**—*Prescribed fire to restore a healthy, resilient ponderosa pine woodland on the Deschutes National Forest in Oregon, part of the Greater La Pine Basin Cohesive Strategy Project. The partnership project is designed to reduce fuels to protect homes in the wildland–urban interface and to improve forest conditions across shared landscapes in multiple ownerships. Photo: USDA Forest Service.*

So the Forest Service has taken a close look at our fire spending systems, and we are introducing reforms to improve our accountability. Central to our success will be a system of key performance indicators to help us evaluate the cost-effectiveness of our asset use.

In all of this, we ask for the help and support of our partners. The omnibus spending bill has created opportunities that have been years in the making by giving us a fire funding fix and new authorities. But with new opportunities comes the challenge of living up to the expectations of the people we serve.

Now we have more opportunities to pursue our goals under the Cohesive Strategy: healthy, resilient fire-adapted landscapes; communities that are adapted to living with fire; and safe, effective, risk-based wildfire response. Our success in delivering all these things will vindicate the trust that Congress has placed in us, on behalf of the people we serve.

I will close with a couple of quotes. To paraphrase Senator Gaylord Nelson (D–WI), the founder of Earth Day, it is up to all of us, working together, to create an environment of decency, quality, and mutual respect.

And the Father of Conservation and founder of the Forest Service, Gifford Pinchot, had this to say about the future of conservation: "The vast possibilities of our great future will become realities only if we make ourselves, in a sense, responsible for that future" (Pinchot 1910).

## LITERATURE CITED


Martinuzzi, S.; Stewart, S.I.; Helmers, D.P. [and others]. 2015. The 2010 wildland–urban interface of the conterminous United States. Res. Map NRS–8. Newtown Square, PA: USDA Forest Service, Northern Research Station. http://www.fs.fed.us/nrs/pubs/rmap/rmap_nrs8.pdf. (29 May 2018).

NICC (National Interagency Coordination Center). 2018. Wildland fire summary and statistics annual report, 2017. https://www.predictiveservices.nifc.gov/intelligence/2017_statssumm/intro_summary17.pdf. (29 May 2018).

NIFC (National Interagency Fire Center). 2016. Wildland fire accidents and fatalities by year. https://www.nifc.gov/safety/safety_documents/year.pdf. (29 May 2018).

Pinchot, G. The fight for conservation. New York: Doubleday, Page and Company. 152 p.


# Fuels Management Bibliography: Another Erratum

The winter 2007 issue of *Fire Management Today* included a subject-indexed fuels management bibliography of previously published articles in *Fire Control Notes* and its predecessors dating back nearly 70 years (Alexander 2007).

A year later, I issued an erratum to the bibliography in the form of an omission under the firebreaks and fuelbreaks heading (Alexander 2008). I've since discover another important reference (Andersen 1971) that should have been included under this same subject area. This second erratum to the bibliography is issued in the interest of completeness.

## LITERATURE CITED


Alexander, M.E. 2007. A fuels management bibliography with subject index. Fire Management Today. 67(1): 44–48.

Alexander, M.E. 2008. Fuels management bibliography: an erratum. Fire Management Today. 68(1): 32.

Andersen, E.V., Jr. 1971. Shaded fuel-breaks: fire control and timber both benefit. Fire Control Notes. 32(2): 11–12.



*Dr. Marty Alexander, a semiretiree, is the Proprietor of Wild Rose Fire Behaviour and resides on an acreage in Leduc County in central Alberta, Canada.*

*Marker for a fallen firefighter on the Mann Gulch Fire. On August 5,1949, 15 Forest Service smokejumpers and a Helena National Forest fire guard were entrapped by a wildfire in Mann Gulch along the Missouri River in Montana. Twelve jumpers and the forest guard paid the ultimate price. Photo: USDA Forest Service.*

# Wildland Firefighter Fatalities: Pivotal Meeting of Wildland Fire Leaders*

**Tom Harbour**

Fires that occur outside buildings, improvements, and structures, whether fueled by grass, brush, forest, timber, or other materials, are the wildland fires we deal with in the fire service. A wildland fire can take many forms: thousands of acres of trees on fire; the purposeful burning we do to improve ecosystems; even a small vacant-lot grass fire. We refer to all these as wildland fires.

These were the fires confronted by our ancestors, and we continue to struggle with them to this day. With more than 1 billion burnable acres (400 million ha) of wildlands in the United States,

**Too many in the fire service are dying in the line of duty while fighting fire in the wildland environment.**

every day of the year some part of the American fire service is dealing with a wildland fire.

Too many of our brothers and sisters in the fire service are dying in the line of duty while fighting fire in the wildland environment. Data suggest that wildland firefighters die at a higher rate than their counterparts in structural fire response, and the emotional, social, and fiscal costs of wildland firefighter deaths, accidents, and injuries weigh heavily on each of us. These costs have generations-long impacts that are too devastating to absorb as simply "the price of doing business."

Unless we choose to change the ways in which we operate, too many wildland firefighters will continue to die in preventable incidents. We need change—positive change. We need to improve our strategies, tactics, and human-factors training in wildland fire so more of us live long and healthy lives after engaging.

## NATIONAL FALLEN FIREFIGHTERS FOUNDATION INITIATIVE

The National Fallen Firefighters Foundation (NFFF) has taken on the task of working to coalesce the many voices of wildland fire in support of reducing line-of-duty deaths, accidents, and injuries among wildland firefighters. As a first step, the NFFF conducted a wide-ranging needs assessment of all populations involved in wildland fire response, including natural resource management organizations. After a year of focused inquiry, the NFFF presented its findings and engaged a representative

---

*Tom Harbour, now retired, was the director of Fire and Aviation Management for the Forest Service, Washington Office, Washington, DC.*

** The article is adapted from a submission by the author on May 20, 2018, to the* International Journal of Wildland Fire.

sample of American wildland fire leaders in a discussion at a meeting held outside Washington, DC, on April 17, 2018, ahead of the Congressional Fire Service Institute's annual National Fire and Emergency Services Dinner and Symposium.

This group of leaders was asked to respond to the NFFF's needs assessment with inputs, reviews, comments, and commitment to a series of actions and recommendations emanating from the assessment. The event began with thoughtful opening comments by leaders from the NFFF, U.S. Fire Administration, Wildland Firefighter Foundation, Congressional Fire Service Institute, U.S. Department of Agriculture (home to the Forest Service), and U.S. Department of the Interior (home to four other Federal wildland fire organizations). Attendees represented a broad range of additional stakeholder organizations, including:

- The National Volunteer Fire Council,
- The International Association of Fire Chiefs,
- The International Association of Fire Fighters,
- The International Association of Wildland Fire,
- The International Fire Service Training Association,
- The National Fire Protection Association,
- The National Institute for Occupational Safety and Health/ Center for Disease Control,
- The National Institute of Standards and Technology,
- The National Wildfire Suppression Association, and
- State forestry organizations.

**One resounding theme was the need to end the perceived "worlds apart" between wildland and structural firefighters and organizations.**

This diverse group of leaders met in both the large group and smaller, more focused discussion sessions. The NFFF clearly intended to form and sustain collaborative relationships and build coalitions among organizations to support national efforts to reduce wildland fire line-of-duty deaths. Widely acknowledged for reducing line-of-duty deaths among structural firefighters through programs under the Everyone Goes Home® umbrella, the NFFF was now proposing to use its strengths and resources to do the same for wildland firefighters. The NFFF's assets and expertise include:

- More than a decade of experience focusing on firefighter health and safety;
- A broad array of tools, programs, and resources that can be easily adapted for use by the wildland fire community; and
- A proven track record of working with diverse agencies around the common goal of reducing firefighter fatalities.

The NFFF is known for its efforts in recognizing each agency's unique organization and culture, then tapping into those characteristics to build a cohort that strengthens partnerships and collaboration—keys to successful change.

## THEMES FOR DISCUSSION

At the April meeting, leaders heard the results of the NFFF's comprehensive survey of stakeholders, as well as a detailed report on six "listening sessions." The sessions were a series of focus groups held across the country to solicit direct feedback from firefighters representing the range of departments and organizations that deal with wildland fire.

One resounding theme was the need to end the perceived "worlds apart" between wildland and structural firefighters and organizations. Firefighters acknowledged the need to work and train collaboratively across organizations; they want to build bridges and bring both worlds together. From the leadership level on down, there is consensus that we need to bridge the thinking that separates natural resource organization firefighters from those in

*Water Tower Fire burning near Alpine, UT, in 2017. Reducing risk from wildfires to communities is critical to the wildland fire community. Photo: USDA.*

*A member of the Boise Interagency Hotshot Crew during a burnout on the Trinity Fire in Idaho in 2013. Wildland firefighting always means managing risk. Photo: USDA Forest Service, Tim Mason (February 2, 2013).*

the structural fire service. The more they come together to mitigate incidents, the stronger their collaboration can be in reducing line-of-duty deaths and injuries.

Community risk reduction was also a common topic at the listening sessions. Participants acknowledged the need to engineer a future when wildlands are less flammable and communities better equipped to deal with wildfire. However, participants recognized that the "Design it Out" option for wildland fire is a strategic vision on a grand scale that will take an extensive investment of time, people, and funding. Those investments suggest far-reaching resolutions in the wildland fire environment that will not likely transpire in the immediate future. Although the participating firefighters want leaders to continue to advance advocacy for these efforts at the State, local, and Federal levels, they recognize that they can't wait for that future to become reality. Other, more immediate actions are needed to improve their safety.

**Another dominant topic at the listening sessions was risk management.**

Participants stressed the need for accountability at all levels and the willingness to "do more" at the individual, crew, and company level to increase personnel safety. Firefighters recognize that reducing fatalities is intertwined with other issues, including:

- The lack of access to good data,
- The need for firefighter physicals and fitness testing to develop a baseline for health and wellness, and
- A growing awareness of the gaps in available resources supporting the emotional wellness of personnel and their families.

## RISK MANAGEMENT

Another dominant topic at the listening sessions was risk management. While risk management is a well-known concept in the structural fire service, natural resource management agencies with wildland fire responsibility are just now using the term more frequently. It is evident, however, that the specifics of applying risk management are neither understood nor used across organizations.

All of us involved in wildland fire know that risk is inherent to our profession. Firefighters, fire managers, fire leaders, fire chiefs, and others all purposefully engage in a hazardous activity, whether it is the planned fire we light (prescribed fire) or the unplanned fire we fight or otherwise manage (wildfire). Currently, our willingness to accept risk in response to wildfire is out of alignment with the biophysical reality we face. We still respond to fire in the same manner we always have, without adjusting to the reality of today's fires.

We routinely accept risk, but we never accept loss. But doesn't accepting risk mean that we are accepting the chance of suffering loss? There is a clear and evident need to have the difficult conversations surrounding risk. This will include frank discussions about what the fire community is willing to risk and what the community is willing to lose when fighting a wildfire. That discussion, not yet had, and multiple other factors continue to cloud the application of risk management within wildland fire response. The corresponding ambiguity leads to uncertainties:

- There is no commonly accepted definition of risk management and no common way of applying risk management principles within the wildland fire community, including among the final decision makers (agency administrators).
- Expectations regarding the acceptance of risk differ between those protecting public lands and those protecting private lands.
- Managing fuels through the use of prescribed fire reduces risk but is often not an option. Laws, rules, regulations, common practice, and other influences often limit wildland fire management.

- Managing community-building practices reduces risk but is often difficult to achieve.
- Individual tolerances for risk vary widely and are influenced by many factors.
- Perceptions of risk levels and risk tolerances can vary between levels of leadership on the fireground and between leaders and firefighters.
- The public seems conflicted about risk, and therefore firefighters are conflicted about risk.
- Having a partner or group of partners perceived as risk averse can lead to additional risk burdens for firefighters, landscapes, and communities.

The discussion around risk management will be critical, affecting wildland fire policies and tactics for decades to come. The sooner the dialogue can start, the sooner the wildland community can begin to establish a common vision. All stakeholders (firefighting personnel, agency and political leaders, the public, and researchers) need to be at the table to discuss values at risk (monetary values, biological values, egos, landownerships, and so forth).

One of the core questions to ask is, "What are we protecting or not protecting, and what are the positive and negative effects of these decisions in the long and short term?" We should be clearly asking up front whether the gains are worth the exposures; the discussion about values and tradeoffs is critical.

## RECOMMENDATIONS

The wildland fire service leadership at the April 2018 meeting was able to reach consensus on initial steps to improve the health and safety of wildland firefighters. Below is a series of recommendations for steps that the agencies represented can take, guided by the experience and oversight of the NFFF, to begin to reduce injuries, deaths, and accidents among wildland firefighters.

**1. Bring the "two worlds apart" closer together.**

Natural resource management and fire service organizations need to become worlds that learn to support one another in wildland fire management work.


*Historical marker—gravesite of firefighters who died in the Big Blowup of 1910, Coeur d'Alene National Forest, Idaho. Photo: USDA Forest Service, C.K. McHarg (1921).*

**The discussion around risk management will be critical, affecting wildland fire policies and tactics for decades to come.**

**2. Increase marketing efforts for the Cohesive Strategy.**

There is little overall awareness of the National Cohesive Strategy for Wildland Fire Management. Where it has been implemented, the strategy has demonstrated its effectiveness. These "points of light" (including central Oregon and Flagstaff, AZ), where the "worlds apart" are now working together, can be used to model implementation.

**3. Increase the application and understanding of risk management concepts.**

**4. Reconcile data problems.**

Although the National Fire Protection Association has done much work in this area, there is no authoritative national consensus on data for wildland firefighters across the spectrum of agencies and organizations.

**5. Continue to focus research and prevention on the major categories of line-of-duty deaths and/or injuries in wildland fire accidents, including:**

- Medical incidents such as cardiac events, rhabdomyolysis, hyperthermia, and occupational cancers;
- Motor vehicle accidents, including unsafe driving, lack of seat belt use, and so forth;
- Burnovers/entrapments;
- Aviation accidents; and
- Snags/rocks/rolling debris.

**6. Adapt effective Everyone Goes Home® tools for wildland fire management use, and target marketing of these tools to wildland fire agencies/organizations.**

Existing and future tools can be made more inclusive of wildland firefighters and organizations. Targeted marketing efforts, beginning at the State wildland fire academy level, will broaden exposure of wildland firefighters to these tools.

**7. Utilize State advocates of Everyone Goes Home® for outreach to wildland fire organizations.**

The NFFF's well-developed network of State-based volunteers can be used to advocate for the Everyone Goes Home® program and provide training to wildland fire organizations. Special effort also needs to be made to recruit additional advocates from within the wildland fire community.

**8. Increase awareness of the 16 Firefighter Life Safety Initiatives among wildland firefighters.**

The 16 initiatives are strategies for implementing the Everyone Goes

Home® program but are not well known among wildland firefighters.

To broaden awareness and utilization, we can:

- Explore whether the 16 initiatives can be tweaked to become more broadly inclusive of wildland fire culture,
- Better explain the interaction between the 16 initiatives and the wildland fire community's well-known 10/18/LCES, and
- Develop materials to explain implementation of the 16 initiatives within a wildland fire context.

**9. Change the wildland fire paradigm from, "Can we accomplish the mission?" to "Can we survive the mission?"**

As a profession, we need to ask, "How can we respond in a manner that protects citizens, sustains landscapes, and manages reasonable risk for responders?"

**10. Change the expectation that we can succeed on every wildland fire mission all the time.**

**11. Introduce results of research products and findings at all levels of the organization, down to the lowest applicable level.**

A tremendous amount of good science information is not being effectively used. This information should be used to inform and improve practices, training, and education.

**How can we respond in a manner that protects citizens, sustains landscapes, and manages reasonable risk for responders?**

**12. Increase the use of medical screenings and fitness/wellness programs to improve the health and safety of all firefighting personnel.**

Identification of preexisting risk factors through medical screenings and increased adoption of holistic health programming, such the Fire Service Joint Labor Management Wellness Fitness Initiative, should be prioritized.

**13. Enhance the ability of the wildland fire service to take care of its people prior to and in the aftermath of a firefighter injury or fatality.**

Firefighters want access to tools to support emotional wellness for themselves and their families, such as those developed by the NFFF.

## CALL TO ACTION

The session closed with an inspirational call to action from the State Forester of Florida, chair of the National Association of State Foresters Wildland Fire Committee. He stated that there is significant work to do to effect change; yet change we must.

Every year, wildland fires engage thousands of firefighters from Federal, State, local, and private entities. Firefighters understand the need to "take action at the lowest level" to improve their own health and safety, but the NFFF's listening sessions revealed that firefighters also have high expectations for leaders. They are counting on us!

This revelation demands that the wildland fire community embark on a more vigorous campaign to reduce line-of-duty deaths, which is a worthy goal for all and a common starting point for better collaboration. We need to enlist everyone's help and have every agency with an interest in the wildland fire problem engaged.

Fortunately, we can rely on the NFFF to lead the way.

# Assessing Wildland Firefighter Entrapment Survivability

Wesley G. Page and Bret W. Butler

**Figure 1**—*Firefighters deploying fire shelters on the Santiago Fire in Orange County, CA, on October 22, 2007. Photo: Karen Tapia-Anderson. Copyright © 2014 Los Angeles Times. Used with permission.*

Wildland firefighters work in complex and dynamic environments, with many dangers that pose serious threats to their safety. Falling snags and rocks, steep and rugged terrain, and rapid increases in fire behavior are just some of the dangers that affect wildland firefighters. Because of the many possible ways that firefighters have been or could be injured, various safety protocols have been developed in the United States to help mitigate the hazards, including the standard firefighting orders (McArdle 1957) and LCES (lookouts, communications, escape routes, and safety zones) (Gleason 1991). Two key elements of the safety protocols are the identification of escape routes and safety zones because past firefighter entrapments have repeatedly demonstrated the value of having a designated place of refuge to retreat to when fire behavior abruptly changes.

Since the late 1990s, safety zone size (that is, the minimum separation distance between firefighters and flames needed to minimize the threat of burn injury) has been estimated as four times the height of the flames (Butler and Cohen 1998). However, recent research has updated how we determine safety zone size by incorporating the effects of slope and wind on convective heating (Butler 2014). While identifying or constructing safety zones of suitable size is and will remain an essential part of firefighter safety, it is also important to recognize that not all goes according plan. For various reasons, firefighters' escape routes to their safety zones can be unexpectedly cut off (fig. 1).

When faced with such a situation, firefighters might have a small but important window of opportunity to select one of several deployment sites. In addition to the recommendations listed in the "Last Resort Survival"

**Our analysis found that fire shelter use, slope steepness, flame height, and the separation distance from flames were key variables influencing entrapment survivability.**

*Wesley Page is a research forester for the Forest Service, Fire Sciences Laboratory, Rocky Mountain Research Station, Missoula, MT; and Bret Butler is a research mechanical engineer for the Forest Service, Fire Sciences Laboratory, Rocky Mountain Research Station, Missoula, MT.*

section of the Incident Response Pocket Guide (NWCG 2014), recent research may further aid in selecting a suitable deployment site. Specifically, we utilized data contained within entrapment investigation reports to understand the factors that influence firefighter survivability (Page and Butler 2017). Our analysis found that fire shelter use, slope steepness, flame height, and the separation distance from flames were the key variables influencing entrapment survivability. This analysis provides an opportunity to discuss and reiterate important concepts related to firefighter entrapments and to demonstrate the potential use of data gleaned from entrapment investigations to enhance future firefighter safety.

## LEARNING FROM PAST ENTRAPMENTS

Through a shift in culture and enactment of recommendations compiled following firefighter fatalities (see, for example, TriData 1998), the U.S. wildland firefighting community has made organizational learning a major priority. Organizational learning encompasses several tasks, but the ability to acquire and transfer new information to others within the organization is essential (Zimmerman and Sexton 2010). The creation of the Wildland Fire Lessons Learned Center (https://www.wildfirelessons.net) in 2002 represented a major step in helping to ensure that organizational learning would become a reality by providing useful and relevant products and services to the wildland fire community.

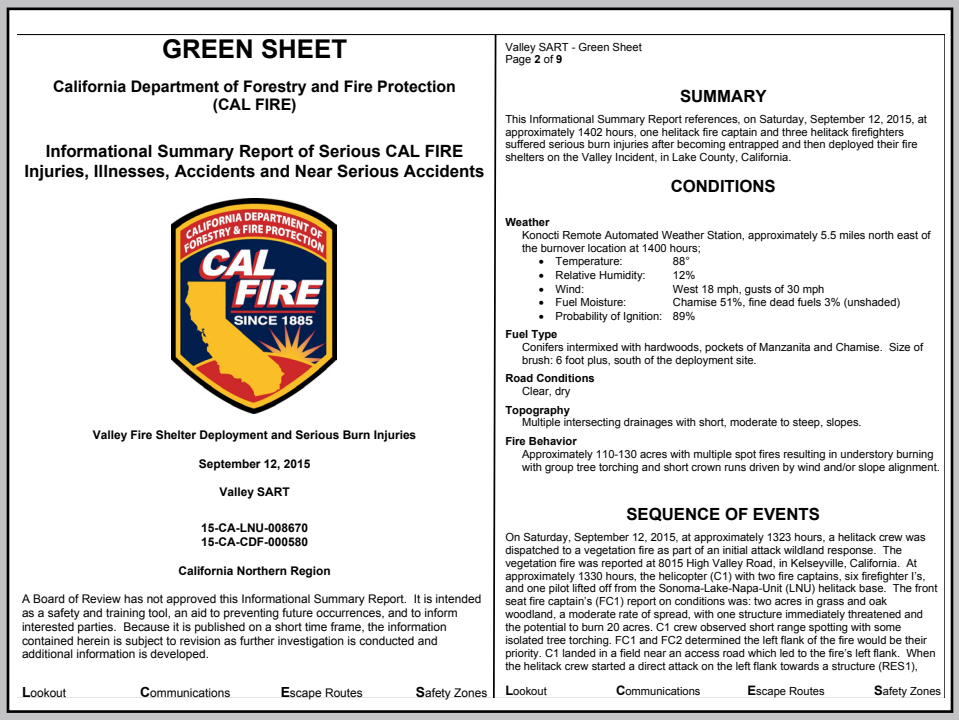
**We confirmed that fire shelter use significantly increased the likelihood of surviving an entrapment.**

One particularly useful product of the center has been the Incident Review Database, which houses collections of reports, reviews, and investigations related to incidents that involve wildland firefighters. We used the documents in this database to analyze and evaluate the factors that influence firefighter survivability during an entrapment (Page and Butler 2017). Specifically, we compiled and statistically analyzed data related to the fire environment (fuels, weather, and topography) in and around the entrapment area as well as data on how the entrapped firefighters were affected physically (whether there was an injury or fatality).

An important part of such an analysis is relying on the entrapment reports to provide accurate and complete information. Our study revealed that the quality and completeness of investigations related to firefighter entrapments varies widely and that many of the reports failed to provide detailed information about the entrapment area (such as size and shape) (Page and Butler 2017). Additionally, basic information about the fire environment at the time of the entrapment (fuel moisture, wind speed, and so on) was sometimes entirely omitted or buried in the documents, with no standardized format.

However, we found the Green Sheets produced by the California wildland firefighting agency, Cal Fire, to be notable exceptions. The Green Sheets generally follow a standardized format, with clear, concise summaries of the key environmental variables near the beginning of the document (fig. 2). In contrast, Federal agency Learning Reviews or Facilitated Learning Analyses don't share a common organization, are mostly written in a long narrative format, and lack comprehensive summaries. While narratives may be essential in providing adequate context for an incident, they also make it difficult to extract basic information about important aspects of the entrapment, such as the fire behavior and the particulars of the fire environment at the time of the entrapment.

In addition to being difficult to extract from the entrapment reports, the data usually represent only a portion of the range of values needed to produce high-quality statistical models. Owing to the nature of the circumstances in which



**GREEN SHEET**

**California Department of Forestry and Fire Protection (CAL FIRE)**

**Informational Summary Report of Serious CAL FIRE Injuries, Illnesses, Accidents and Near Serious Accidents**

**Valley Fire Shelter Deployment and Serious Burn Injuries**

**September 12, 2015**

**Valley SART**

**15-CA-LNU-008670**
**15-CA-CDF-000580**

**California Northern Region**

A Board of Review has not approved this Informational Summary Report. It is intended as a safety and training tool, an aid to preventing future occurrences, and to inform interested parties. Because it is published on a short time frame, the information contained herein is subject to revision as further investigation is conducted and additional information is developed.

Lookout Communications Escape Routes Safety Zones

Valley SART - Green Sheet
Page **2** of **9**

**SUMMARY**

This Informational Summary Report references, on Saturday, September 12, 2015, at approximately 1402 hours, one helitack fire captain and three helitack firefighters suffered serious burn injuries after becoming entrapped and then deployed their fire shelters on the Valley Incident, in Lake County, California.

**CONDITIONS**

**Weather**
Konocti Remote Automated Weather Station, approximately 5.5 miles north east of the burnover location at 1400 hours;
- Temperature: 88°
- Relative Humidity: 12%
- Wind: West 18 mph, gusts of 30 mph
- Fuel Moisture: Chamise 51%, fine dead fuels 3% (unshaded)
- Probability of Ignition: 89%

**Fuel Type**
Conifers intermixed with hardwoods, pockets of Manzanita and Chamise. Size of brush: 6 foot plus, south of the deployment site.

**Road Conditions**
Clear, dry

**Topography**
Multiple intersecting drainages with short, moderate to steep, slopes.

**Fire Behavior**
Approximately 110-130 acres with multiple spot fires resulting in understory burning with group tree torching and short crown runs driven by wind and/or slope alignment.

**SEQUENCE OF EVENTS**

On Saturday, September 12, 2015, at approximately 1323 hours, a helitack crew was dispatched to a vegetation fire as part of an initial attack wildland response. The vegetation fire was reported at 8015 High Valley Road, in Kelseyville, California. At approximately 1330 hours, the helicopter (C1) with two fire captains, six firefighter I's, and one pilot lifted off from the Sonoma-Lake-Napa-Unit (LNU) helitack base. The front seat fire captain's (FC1) report on conditions was: two acres in grass and oak woodland, a moderate rate of spread, with one structure immediately threatened and the potential to burn 20 acres. C1 crew observed short range spotting with some isolated tree torching. FC1 and FC2 determined the left flank of the fire would be their priority. C1 landed in a field near an access road which led to the fire's left flank. When the helitack crew started a direct attack on the left flank towards a structure (RES1),

Lookout Communications Escape Routes Safety Zones

**Figure 2**—*The first two pages of the Green Sheet produced for the Valley Fire Shelter Deployment on September 12, 2015, by Cal Fire. Note the organization and summary information.*

the data were gathered—that is, either a fatality or a near-miss situation—the data tend to represent the extreme end of survivability in terms of the various environmental variables. When safety zones perform as designed and no significant injuries occur, the details regarding the size of the safety zone and the environmental conditions are less likely to be reported. Capturing the details associated with these "nonevent" entrapments is important, however, because they contain vital information needed to help define various fire and environmental thresholds that affect entrapment survivability.

## LESSONS LEARNED

Despite the challenges of analyzing entrapment investigation reports, we made several important findings that both confirm long-held beliefs and provide additional insights related to surviving an entrapment. Although firefighter training emphasizes the importance of fire shelters, there haven't been any quantitatively based assessments of their ability to enhance survivability during actual entrapments. We confirmed that fire shelter use significantly increased the likelihood of surviving an entrapment (Page and Butler 2017). This information is already well ingrained into wildland firefighter training and only confirms what was previously suspected: that fire shelters save lives.

**It is important to recognize the dangers that steep slopes pose and to avoid placing firefighters there whenever possible.**

Slope steepness has been thought to influence firefighter safety because of its effects on fire spread rate and fire intensity and its common association with previous firefighter fatalities (Wilson 1977). The Incident Response Pocket Guide identifies slope steepness in excess of 50 percent as an indicator of extreme fire behavior, and analyses related to the "trench" or "Coandă" effect suggest that slopes greater than 45 percent are the most prone to flame attachment and thus rapid increases in fire behavior (Gallacher and others 2018).

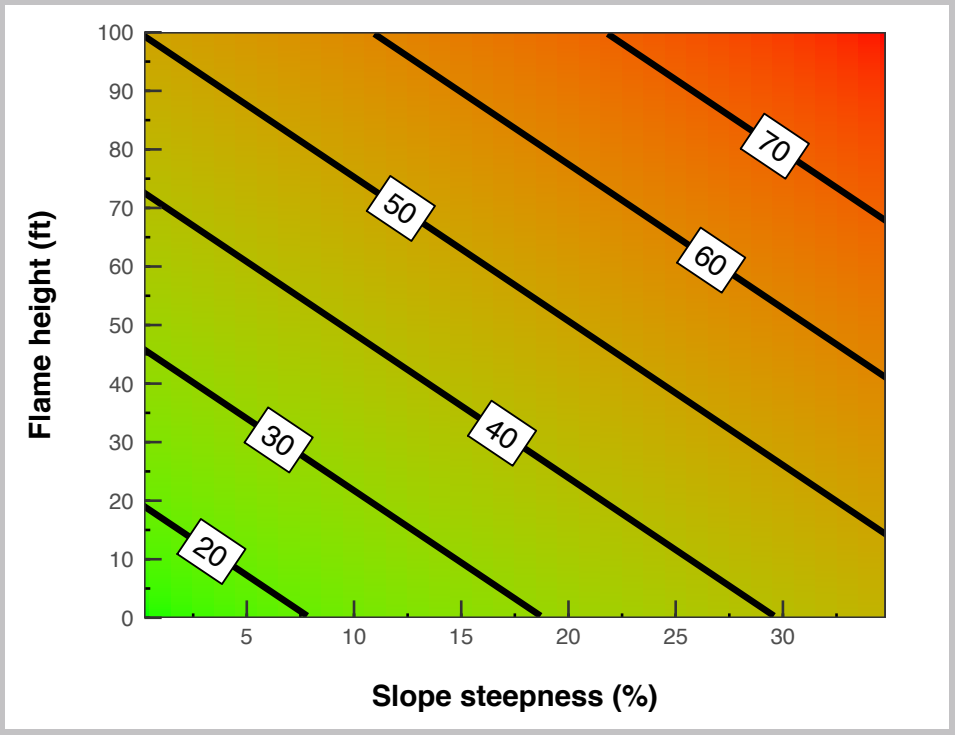



**Figure 3**—*Separation distances (in feet) needed to ensure a 95-percent probability of surviving an entrapment with a fire shelter deployed. Note that these are distances for surviving an entrapment with a fire shelter and do not represent safety zone separation distances.*

Our analysis confirmed the danger posed by steep slopes and suggested that for each unit increase in slope percent, the odds of a fatality during an entrapment increase by 3 percent (Page and Butler 2017). Additionally, we found that steep slopes limit fire shelter effectiveness, probably due to the effects of increased convective heating on the fire shelter material (Butler and Putnam 2001). It is therefore important to continue to recognize the dangers that steep slopes pose and to avoid placing firefighters on steep slopes whenever possible.

Flame height and separation distance were also two key variables that influenced entrapment survivability. As expected, increasing flame height and decreasing distance between firefighters and flames result in a lower likelihood of survival. One benefit of a quantitatively based assessment of entrapment survivability is that it becomes possible to estimate the separation distances needed to ensure a certain likelihood of survival under a given set of environmental conditions.

Figure 3 shows one such relationship in graphic form. The figure displays the separation distances required to have a 95-percent chance of surviving an entrapment with a fire shelter. These separation distances are generally much less than would be required for a safety zone and would thus probably result in a nonfatal injury for those entrapped. Such a figure is useful for relaying the importance of selecting deployment zones as far away from the flames as possible and on terrain that is as flat as possible.

## LOOKING AHEAD

Using the data contained within entrapment investigation reports to ask and answer specific questions not only helps fulfill the promise of organizational learning but also can provide firefighters with useful information. Our analysis shows one

potential avenue for using such data (Page and Butler 2017), but no doubt several others exist. For example, compiling information on the spatial location of firefighter entrapments may help identify areas that may be particularly susceptible to fatal burnovers, such as canyons or drainages, which could then be mapped (see, for example, Page and Butler 2018). Additionally, compiling and analyzing data related to other accident types, such as tree-felling accidents, may also yield useful insights.

In order to facilitate the type of data analysis needed to make quantitatively based assessments, it is important to realize the benefits of adopting a more systematic and comprehensive way to describe, analyze, and store specific information contained within investigation reports. Long narrative documents tend to make gathering data more cumbersome, and the lack of summary information sometimes forces the reader to make generalizations or interpretations that would be better made by the investigation team. While narratives have several benefits, the addition of short summaries with detailed environmental information will no doubt facilitate future analyses.

## ACKNOWLEDGMENTS

This work was supported by the Joint Fire Science Program, the National Fire Plan through the Washington Office of Forest Service Research, the National Wildfire Coordinating Group Fire Behavior Subcommittee, and the Wildland Fire Management Research Development and Application Program.

## LITERATURE CITED

Butler, B.W. 2014. A study of the impact of slope and wind on firefighter safety zone effectiveness. Missoula, MT: USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory; final report; Joint Fire Science Program, project 07–2–1–20.

Butler, B.W.; Cohen, J.D. 1998. Firefighter safety zones: How big is big enough? Fire Management Notes. 58(1): 13–16.

Butler, B.W.; Putnam, T. 2001. Fire shelter performance in simulated wildfires: an exploratory study. International Journal of Wildland Fire. 10(1): 29–44.

Gallacher, J.R.; Ripa B.; Butler, B.W.; Fletcher, T.H. 2018. Lab-scale observations of flame attachment on slopes with implications for firefighter safety zones. Fire Safety Journal. 96: 93–104.

Gleason, P. 1991. LCES—a key to safety in the wildland fire environment. Fire Management Notes. 52(4): 9.

McArdle, R.E. 1957. Standard firefighting orders. Fire Control Notes. 18(4): 151–152.

NWCG (National Wildfire Coordinating Group). 2014. Incident response pocket guide. PMS 461. [Place of publication unknown]: [Publisher unknown]. https://www.nwcg.gov/sites/default/files/publications/pms461.pdf. (7 March 2018).

Page, W.G.; Butler, B.W. 2017. An empirically based approach to defining wildland firefighter safety and survival zone separation distances. International Journal of Wildland Fire. 26(8): 655–667.

Page, W.G.; Butler, B.W. 2018. Fuel and topographic influences on wildland firefighter burnover fatalities in Southern California. International Journal of Wildland Fire. DOI: 10.1071/WF17147.

TriData. 1998. Wildland firefighter safety awareness study: phase 3—implementing cultural changes for safety. Arlington, VA: TriData Corporation. 48 p. *https://www.nifc.gov/safety/safety_documents/phase3/1Acknow-Sum-WFSAS.pdf*. (4 April 2018).

Wilson, C.C. 1977. Fatal and near-fatal forest fires: the common denominators. The International Fire Chief. 43(9): 9-10, 12–15.

Zimmerman, T.; Sexton, T. 2010. Organizational learning contributes to guidance for managing wildland fires for multiple objectives. Fire Management Today. 70(1): 8–14.

# Improving Safety Outcomes at the USDA Forest Service: 1994–2018

The culture of the USDA Forest Service has been shaped by the maxim "Certainly it can be done" (Pinchot 1947), borrowed from the Coast Guard by the agency's first Chief, Gifford Pinchot (1905–10). From the moment employees joined the Forest Service beginning in 1905, they regarded conservation as a noble cause and their work as critical to national well-being. They took pride in overcoming difficulty and danger to accomplish their work, which often took place in high-risk environments, particularly on wildland fires. The agency's "can-do" culture emboldened employees, including firefighters, to take risks to get the job done.

## CRISIS OF CONFIDENCE

So it's no surprise that injuries and fatalities have long bedeviled the Forest Service. Overall fatality rates for the Forest Service held steady in the 1970s–2000s at about eight per year (USDA Forest Service 2018a), but fatality rates for firefighters across all agencies were rising. The number of firefighter fatalities more than doubled from the 1970s to the 2000s, climbing from 90 to 193 per decade (NIFC 2018a). For Federal firefighters alone, the number of burnover fatalities averaged 15 per decade in the 1990s–2000s (NIFC 2018b), with high-profile tragedy fires (burnover fires costing lives) that included Dude (1990), South Canyon (1994), Thirtymile (2001), Cramer (2003), and Esperanza (2006). The Forest Service's fatality rate overall was several times higher than for the National Park Service or the Bureau of Land Management (USDA Forest Service 2016).

Alarmed, Forest Service leaders tried holding employees more accountable for violating safety rules. Investigations following South Canyon, Thirtymile, and Cramer led to repercussions for some Forest Service fire personnel. As a result, large parts of the wildland fire community lost confidence in the serious accident investigation process, and some Forest Service employees launched grassroots reforms with the goal of learning from accidents rather than placing blame and taking punitive actions.

In the mid-2000s, Forest Service leaders launched a parallel effort to change the Forest Service's safety culture. Changing a culture as old and powerful as the Forest Service's is difficult, yet it seems to be working.

What has improved? How did it come about? What are the indications of organizational change?

## HISTORY OF FIRE-RELATED SAFETY CONCERNS

The Forest Service has a long history of concern about firefighter safety, beginning with the Big Blowup of 1910. It was a year of great fires across the United States, with an estimated 50 million acres burned (Pyne 2001). In August, great firestorms swept over more than a million acres in the Northern Rockies in a matter of days. The fires burned into towns, and people fled the flames on crowded trains. Eighty-four firefighters, trapped in the mountains while battling the blazes, paid the ultimate price (NICC 2018).

One lesson was that no single entity could control fires alone, setting the stage for the Weeks Act of 1911, which authorized the cooperative wildland fire management organization the Nation has today. The Forest Service also adopted a policy of suppressing every fire by 10 a.m. on the morning after it was first reported. For decades, Forest Service crews tried to put out every fire, no matter how remote. Fire exclusion allowed fuels to build up, creating explosive situations under severe fire weather conditions and heightening risks for wildland firefighters, especially in the backcountry but also near homes and communities.

**In 2006, Chief Dale Bosworth launched an agencywide effort to create a "Safety Culture for the 21st Century."**

Fuel buildups contributed to dozens of tragedy fires. Table 1 shows tragedy fires with 10 or more firefighter fatalities, some of which led to program reviews and reforms. For example, the 16 tragedy fires from 1937 to 1956 (including the 5 shown in table 1) motivated Forest Service leaders to

*Hutch Brown is the editor of* Fire Management Today *and a program specialist for the Forest Service, Office of Communication, Washington Office, Washington, DC.*

adopt the 10 Standard Fire Orders in 1957, later supplemented by the 18 Situations That Shout "Watch Out!," guidelines to help firefighters recognize and manage risk.

Technology development made a huge difference, saving lives and preventing injuries on the fireline. Over the years, the Forest Service's technology and development centers invented various kinds of safety gear. Federal firefighters today wear gloves, goggles, hardhats, special boots, and fire-resistant clothing when fighting fires, and they carry fire shelters to use in an emergency. Before deploying on the fireline, they also undergo rigorous training and a test for strength and fitness.

However, the accident investigation reports in the 20th century were largely limited in scope. They focused entirely on physical factors—fire behavior, resources used, firefighter tactics, and the like. The corresponding safety reforms focused on the same physical circumstances, leading to a steady growth in rules, technologies, and training materials for wildland firefighting. A familiar pattern emerged, with one or more tragedy fires and accident investigation reports leading to reforms and new rules and technologies—until the next tragedy fire.

By the 1990s, the prevailing approach to safety in wildland fire management had hardened into following a set of rules. The mantra became "the rules are firm—we don't bend them and we don't break them" (Holdsambeck 2018). The rules-based approach presumed that firefighters following safety rules and using the appropriate safety gear would be safe from harm on the fireline. Accordingly, accident investigation reports following the South Canyon (1994), Thirtymile (2001), and Cramer (2003) Fires placed blame on some of the fire personnel involved, shaming them for violating rules like the "10 and 18." Punitive measures followed in some cases.

**Table 1—*Wildfires with 10 or more firefighter fatalities, 1905–2018.***

| Year | Number of fatalities | Name of fire | Location of fire |
|---|---|---|---|
| 1910 | 84 | Big Blowup | Northern Rockies |
| 1933 | 29 | Griffith Park Fire | Los Angeles, CA |
| 1937 | 15 | Blackwater Fire | Near Cody, WY |
| 1943 | 11 | Hauser Creek Fire | Near San Diego, CA |
| 1949 | 13 | Mann Gulch Fire | Helena National Forest, MT |
| 1953 | 15 | Rattlesnake Fire | Mendocino National Forest, CA |
| 1956 | 11 | Inaja Fire | Near San Diego, CA |
| 1966 | 12 | Loop Fire | Near Los Angeles, CA |
| 1994 | 14 | South Canyon Fire | Near Glenwood Springs, CO |
| 2013 | 19 | Yarnell Hill Fire | Yarnell, AZ |

Source: Gabbert (2013).

## CHANGING THE SAFETY CULTURE

By the 1990s, visionary wildland fire professionals were already questioning the rules-driven approach to safety on the fireline (Holdsambeck 2018). In 1991, based on his experience on the Dude Fire (1990), hotshot superintendent Paul Gleason boiled the "10 and 18" down into a shorter formula easier to remember: LCES (lookouts, communications, escape routes, and safety zones). Gleason was committed to learning from entrapments like Dude, which cost six firefighters their lives, and doing what he could to help firefighters make sense of the changing situations they faced on the fireline.

Following the South Canyon Fire in 1994, other fire professionals in the field launched similar learning-based initiatives (Holdsambeck 2018). They went beyond the traditional focus on rules and physical factors on the fireline to raise social and psychological questions about human performance in stressful situations under rapidly changing conditions. Ted Putnam of the Missoula Technology and Development Center, for example, organized a "wildland firefighters human factors" workshop, with findings that included "too many rules" and the need to boil them down to something like LCES (Putnam 1995).

Putnam and others focused on creating long-term solutions leading to cultural change (Holdsambeck 2018), such as:

- a performance-based training system (task books);
- an interagency Wildland Fire Leadership Development Program, inaugurated in 2002 (WFLDP 2018); and
- a world-class interagency Wildland Fire Lessons Learned Center, also established in 2002 (WFLLC 2018).

The early leaders in formulating alternatives to the traditional rules-based approach strove to create a learning culture within the wildland fire community. Drawing on the experience of high-reliability organizations working in high-risk environments (Putnam 1995; Weick and Sutcliffe 2008), they advocated for making every accident and incident an opportunity for learning rather than an occasion for finding fault, placing blame, and holding individuals accountable for breaking rules.

Despite the winds of change blowing from the field, national leaders

continued to embrace the traditional rules-based approach (Holdsambeck 2018). A tipping point came in 2004 when the Forest Service, in concert with the Office of Inspector General, brought criminal charges against an employee involved in managing the Cramer Fire. The move eroded employee trust in senior leadership and discouraged fire personnel from cooperating with accident investigators, undermining the agency's incipient learning culture.

In 2005, members of the Forest Service's Risk Management Council, acting without official authority but supported by representatives of the union (the Forest Service affiliate of the National Federation of Federal Employees), set out to repair the damage (Holdsambeck 2018). They proposed replacing the rules-based serious accident investigation process with a learning-based "Just Culture," a system of protecting employees from blame, shame, and punitive actions. Just Culture offered employees social rewards for fully participating in reporting on incidents and accidents and for joining in the agency's safety learning culture.

The Just Culture process gave birth to the facilitated learning analysis (FLA) (Holdsambeck 2018), a learning-based approach to accident investigations founded on "doctrine" rather than rules (Hollenshead 2006). Tested and validated on burnovers in 2005 and 2006, the FLA gradually gained support from regional fire directors, some Regional Foresters, the director of Fire and Aviation Management in the Washington Office, and the Deputy Chief for State and Private Forestry. In 2009, despite ongoing resistance from some Washington Office directors, the Deputy Chief for State and Private Forestry formally endorsed the FLA process.

## CULTURAL DYSFUNCTIONS

By then, the Forest Service's national leaders had embraced the need for change, in part because of an annual fatality rate that remained stubbornly high. Based on figures from the Occupational Safety and Health Administration, the overall fatality rate for Forest Service employees from 1998 to 2006 was 63, or about 6.4 fatalities per year (Dialogos International 2007). In 2006, Forest Service Chief Bosworth (2001–07) launched an agencywide effort to create a "Safety Culture for the 21st Century." "At the end of the day," he told the National Leadership Team (now known as the National Leadership Council, or NLC), "I want everyone to go home to their families" (Dialogos International 2007).

**In 2010, Chief Tom Tidwell made safety the first of five national priorities for the Forest Service and launched an agencywide "Safety Learning Journey."**

In accordance with one of the recommendations by the 1995 Wildland Firefighters Human Factors Workshop (Putnam 1995), the Forest Service hired the consulting firm Dialogos International to study the agency's safety culture. Researchers held group sessions and interviews with about 400 Forest Service employees from across the agency to "identify underlying core dynamics that may be causing challenges around safety" (Dialogos International 2007). Dialogos International (2007) found widespread disagreement among employees about what the Forest Service's safety goals should be, with some embracing zero fatalities as "an obvious and absolute ambition" and others rejecting zero fatalities as "noble sounding but unattainable." Many employees still regard Forest Service activities, especially on the fireline, as inherently dangerous and fatalities as an inevitable part of the job, whereas others sharply disagree (DeGrosky 2016; Smith 2016).

With opinions divided about such crucial matters, Dialogos International (2007) concluded that "deeper underlying cultural and organizational patterns … have kept the agency from dealing effectively with safety and other significant challenges." Studies of Forest Service culture in relation to both workplace safety and workforce diversity have found a cycle of organizational dysfunction (Dialogos International 2007; Metropolitan Group 2014), with conformity to traditional values and resistance to change embedded at several points.

For example, the Forest Service has a tradition of decentralized decision making, with most decisions made by local line officers (Kaufman 1960). The original ranger compounds were farflung, with travel largely limited to horseback, so local decision making only made sense. Moreover, decentralized decision making accords with the principle of subsidiarity in American democracy (whereby governance is as close as possible to the point of service delivery), and it maximizes the flexibility of land management and its responsiveness to public input.

Although decentralization has served the agency well (Blum and others 2008), it has also produced cultural resistance to change and obstacles to safety. One obstacle was what Dialogos International called "addiction to autonomy," giving local line officers considerable latitude to keep things the way they are. Employees traditionally believed that decisions should be left up to local line officers based on local circumstances. The local line officer knows best and will make the right decision, so the thinking went, even if it means exposing employees to needless risk.

The Forest Service also has powerful traditions of conforming to authority and rallying around the cause (Kaufman 1960, 1997; Pinchot 1947), leading to a "taboo against dialogue." As Gifford Pinchot explained, the agency was "engaged in a great and necessary undertaking in which the whole future of the country was at stake" (Pinchot 1947). Imbued with "the zest of the

pioneer," Forest Service employees held "a strong belief that whatever the Service set out to do, that it could and would accomplish" (Pinchot 1947). The "can-do" culture made employees uncomfortable with voicing disagreement or raising controversial topics, believing that it would only upset people and undermine the teamwork needed for success. Local line officers will make the decisions anyway, or so the thinking went; raising safety concerns won't change anything, and it might even get you in trouble for not being supportive enough.

Both elements of Forest Service culture—habituation to autonomy and the taboo against dialogue—can lead to poor risk management. Local line officers or other decision makers might not understand the risks they are asking employees to take, and employees might not feel comfortable with raising concerns that their supervisors might not be willing to hear. As a result, employees might believe that they are on their own to make the best of a situation. When getting the job done takes precedence over taking a moment to stop, think, and talk before acting, then safety can be compromised. A former director of Fire and Aviation Management in the Forest Service's Washington Office put it this way: when "can do" becomes "make do," people on the fireline can get hurt (Williams 2002).

## SAFETY LEARNING JOURNEY

In response to the findings by Dialogos International (2007), Forest Service leaders began emphasizing safety as a core value and learning as the basis for safety, in part by adding safety briefings to meeting agendas and by hiring more safety personnel. Chief Gail Kimbell (2007–09) asked the NLC to continue the safety initiative launched by Chief Bosworth and to encourage cultural change at the regional level (USDA Forest Service 2016).

In 2008, the Forest Service established a Safety Working Core Team to give strategic direction to Forest Service safety initiatives. The team met to discuss a disconnect between fire managers and line officers, and National Incident Management Organization teams led simulations on units of the National Forest System to engage fire managers, line officers, dispatch personnel, and other partners in practicing and learning together.

In 2009, Dialogos International completed a followup report on the Forest Service's safety culture. The report presented elements of organizational dysfunction and resistance to change, including habituation to autonomy and the taboo against dialogue. It noted ongoing distrust between managers and employees and the importance of establishing a safety culture based on learning.

**After the Safety Learning Journey began in 2010, the 5-year running average number of work-related fatalities began to drop.**

In 2010, Chief Tom Tidwell (2009–17) set a national goal of zero work-related fatalities, and he made safety the first of five national priorities for the Forest Service. Under his leadership, the Forest Service embarked on an agencywide "Safety Learning Journey" to become a safer organization. Picking up on a recommendation by the 1995 Wildland Firefighters Human Factors Workshop (Putnam 1995), NLC members visited seven organizations that also work in high-risk environments and that were known for their outstanding safety records (USDA Forest Service 2016). The agency compared itself to these high-reliability organizations and moved to change its safety culture accordingly.

By 2010–11, the Forest Service was taking an FLA approach in responding to all fire-related accidents, with the assurance of no punitive actions, blame, or shame (Holdsambeck 2018). A learning culture was finally taking root. Through the Wildland Fire Lessons Learned Center, firefighters could openly—and without fear of reprisal—report on accidents and close calls as learning opportunities for the organization as a whole. Chief Tidwell officially endorsed the FLA, and soon thereafter, the Forest Service took the next step by working with partners in the wildland fire community to develop the coordinated response protocol (CRP) to replace the serious accident investigation system. The CRP demonstrated national leadership's commitment to learning from tragedy while also supporting employees and their families, a major step forward embraced by employees (Holdsambeck 2018).

In 2011, Forest Service employees across the Nation participated in the first "Safety Engagement" sessions, which "effectively launched the agency's collective effort across all levels of the agency to create a safety culture in the Forest Service" (USDA Forest Service 2016). Many employees took training in becoming attuned to safety issues and in personally managing risk, including refusing to engage in unsafe behaviors, even when asked to by leaders. By using a Safety Empowerment Authority card, every employee was now entitled to stop any work that he or she believed to be unsafe.

In 2012, the NLC launched a second round of Safety Engagement sessions, this time holding "leader-to-leader" meetings throughout the Forest Service, followed by "leader-to-employee" meetings to help overcome challenges and improve safety in local units (USDA Forest Service 2016, 2018a). In addition, the Forest Service began to develop a process of checking employees in and out during field assignments to ensure that everyone goes home safely. The agency also distributed emergency locator devices for employees in remote locations and gave employees the ability to use offline maps on handheld

devices. Units formulated projects for improving safety and began holding sessions for new employees that focused on safety as a core value (USDA Forest Service 2016). National new employee orientation sessions incorporated an hour-long safety component (USDA Forest Service 2018a).

In 2014–15, the NLC initiated a third round of Safety Engagement sessions (USDA Forest Service 2016). Using a standard meeting facilitation guide, session leaders focused on "personal and organizational resilience and the workload-safety balance" (USDA Forest Service 2016). As in the first two rounds, leaders reported employee feedback to the NLC, along with summaries of local actions taken.

In 2015, the Forest Service formed research units at the Rocky Mountain Research Station to study safety-related ways of improving organizational performance and work outcomes. The agency also established a Safety Boot Reimbursement Program and an electronic program called eSafety to integrate the reporting of injuries and illnesses with the process for filing workers' compensation claims.

In 2015, the NLC formed working groups to complete a programmatic safety analysis for Emergency Medical Services and to recommend actions to increase the chances of survival and rapid recovery for Forest Service employees who become seriously ill or get injured on the job. The NLC also decided to make elements of the Safety Learning Journey part of the agency's normal business operations, with biannual sessions planned to coincide with the arrival and departure of seasonal and temporary employees.

Tragically, after several years of safety improvements, the Forest Service suffered seven fatalities in fiscal year 2015. Seven firefighters paid the ultimate price, including three fatalities in an entrapment on the Twisp River Fire in Washington. For Chief Tidwell and other Forest Service leaders, the Twisp tragedy fire came as a shock. Twisp and the loss of seven lives in a single year were stark reminders of the urgent need for changing the agency's safety culture.

In 2016, driven by the need for change, the Forest Service adopted a set of wildland fire risk management protocols. The protocols included a "vision for risk management in fire" based on three principles: (1) "Life First—everyone goes home;" (2) a focus on the safety of initial responders to emergencies; and (3) reaffirmation of the goals of the National Cohesive Wildland Fire Management Strategy, including "safe, effective, efficient risk-based wildfire management decisions."

In 2016, the first biannual gatherings for seasonal and temporary employees were held, and they became known as Life First engagements. Focusing on wildland firefighters, Life First aimed to increase the odds that everyone goes home safely by avoiding needless exposure to risk (USDA Forest Service 2016). Over 900 employees and stakeholders participated, including agency administrators, wildland fire responders, wildland fire leaders, and wildland fire partners and community leaders. Participants were invited to "Stop, Think, and Talk before Acting" in situations involving exposure to risk.

In 2017, the Forest Service formed a team of experts from the Safety Engagement and Life First sessions to design "Life-Work Dialogues," with the goal of continual improvement in creating safe, rewarding, and resilient workplaces. The dialogues were envisioned as part of a future all-employee engagement. They were to focus on building trust, managing exposure to hazards of any kind, and better learning from each other.

In 2018, the Forest Service launched its Stand Up for Each Other initiative, with multiple sessions for all employees. Although focused on workforce diversity, the initiative has a strong safety component: it introduced safety as one of five core values for the Forest Service (in addition to conservation, service, interdependence, and diversity). Stand Up for Each Other also shared the Safety Learning Journey goal of creating a safe, rewarding, and resilient work environment for everyone—an environment for learning to anticipate and avoid unwanted outcomes of all kinds.

## POSITIVE SAFETY OUTCOMES

Launched in the 1990s through individual and group initiatives in the field, the Forest Service's journey toward adopting a learning-based safety culture has benefited from a signature characteristic of decentralized organizations (Blum and others 2008): the power of grassroots action to effect organizational change. The unsung heroes who responded to a punitive rules-based safety culture in the 1990s through pushback from below helped to change the game, putting the Forest Service on the road to becoming a learning organization (Holdsambeck 2018; Hollenshead 2006; Putnam 1995; Weick and Sutcliffe 2008).

One early indication of change in the Forest Service's safety culture was rapid expansion of the agency's safety personnel after 2000 (USDA Forest Service 2018a). The number of Forest Service safety professionals grew from less than 20 in 2000 to more than 160 in 2018.

In 2015, in another sign of progress, the Office of Personnel Management ranked the Forest Service's Health and Wellness Program in the top 10 of 291 programs representing 36 Federal agencies (USDA Forest Service 2016). The Forest Service program ranked number five, with a score of 97.5 percent, compared to an average score of 62 percent.

Perhaps the strongest sign of success was a decline in fatality rates for the Forest Service (fig. 1). From 1969 to 2009, the Forest Service averaged seven to eight work-related fatalities per fiscal year (USDA Forest Service 2018b). After 2010, the 5-year running average number of work-related fatalities, which had held steady in the 2000s, began to drop. It never again topped 4 per year after 2012, and the Forest Service achieved

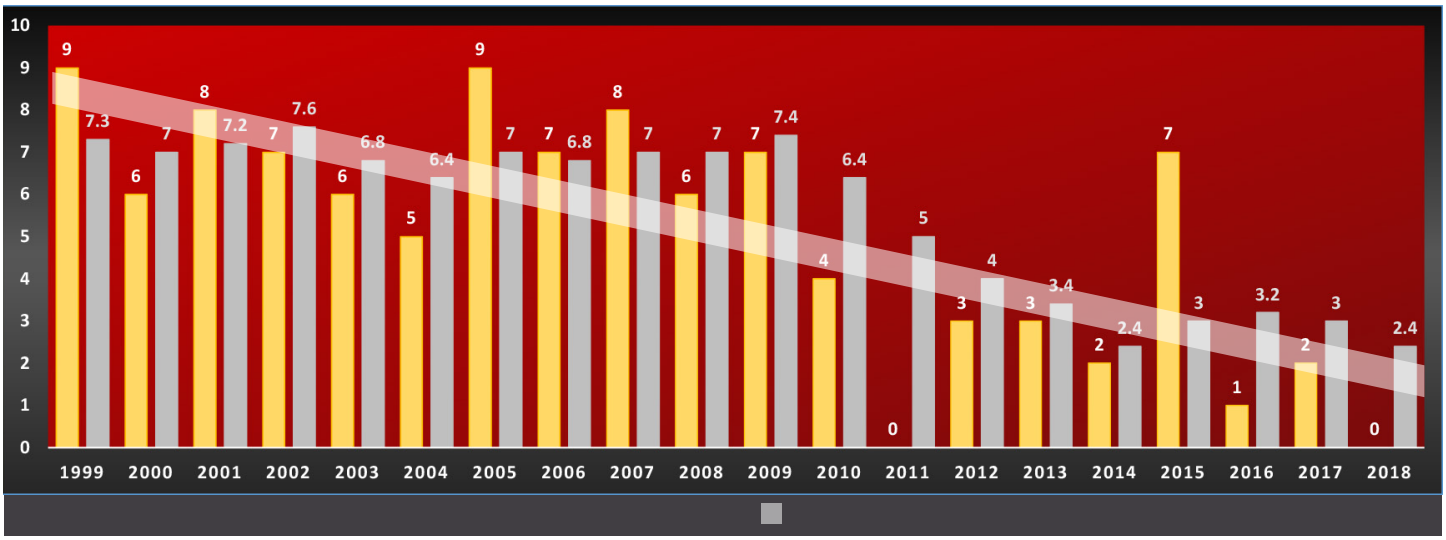



**Figure 1**—*Forest Service work-related fatalities began to decline after the Safety Learning Journey began in 2010, suggesting program success. Source: Occupational Health and Safety Administration, cited in USDA Forest Service (2018a).*

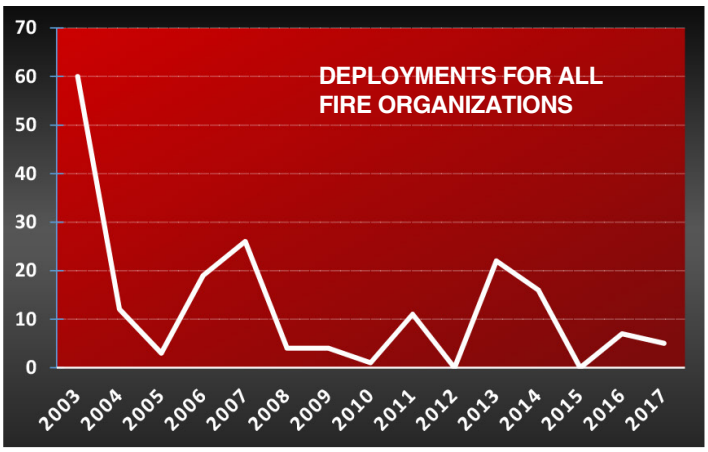
its goal of zero fatalities nationwide in fiscal year 2011 and again in 2018, when the 5-year average dipped to 2.4.

Another indication of success was the declining number of fire shelter deployments across the wildland fire community (fig. 2, left) as well as for the Forest Service alone (fig. 2, right). Since the late 1980s, the number of deployments has fallen overall (Holdsambeck 2018; RMC 2018), indicating a declining number of entrapments and burnovers.

Part of the reason for the declining fatalities was a drop in the rate of aviation accidents (fig. 3), a major source of Forest Service fatalities. From 2000 to 2009, fatalities associated with aviation, vehicles, and personal health and fitness together accounted for 82 percent of all wildland firefighter fatalities (NIFC 2018b), with aviation alone accounting for almost a third (32 percent).

In the 5-year period from 2006 to 2010, the Forest Service had 28 aviation accidents, compared to 19 from 2011 to 2015 and only 4 since then (USDA Forest Service 2018b) (fig. 3, left). The number of associated fatalities fell from 23 in the 5-year period from 2006 to 2010 to 4 from 2011 to 2015 and none thereafter. In the 57-year period from 1961 to 2018, the average annual number of aviation accidents was 7.35, compared to 1.3 in the last 10 years (fig. 3, right). The equivalent numbers for aviation fatalities were 3.8 per year and 1 per year, a steep decline.

In accordance with falling numbers of work-related fatalities (fig. 1), circumstantial evidence suggests a drop in workplace injuries for the Forest Service in the 2010s. New workers' compensation claims filed since 2010 have declined by 36.5 percent (USDA Forest Service 2018b), a sign that fewer employees have suffered injuries on the job. Accordingly, the associated costs have also declined. Despite rapidly rising medical treatment costs, the Forest Service paid $3.1 million less in compensation costs in 2015 (the most recent reporting period) than it paid in 2010.



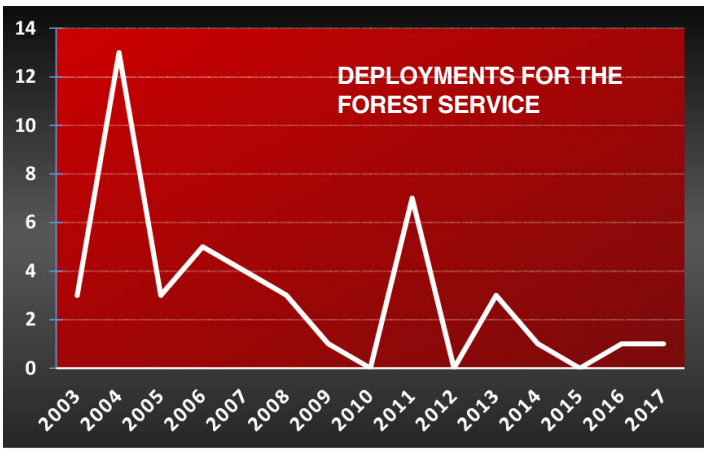




**Figure 2**—*Fire shelter deployments for all fire organizations (left) and for the Forest Service (right) have fallen sharply since 2003, indicating declining numbers of firefighter entrapments and burnovers. Source: RMC (2018).*

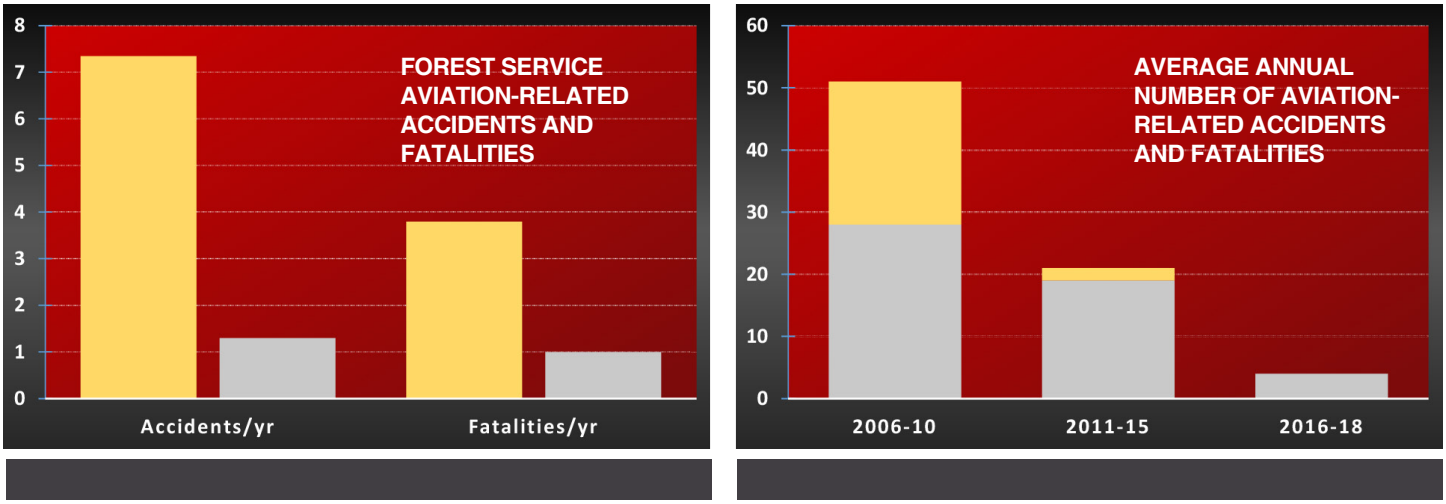



**Figure 3**—*Forest Service aviation-related accidents and fatalities have fallen sharply in the 2010s (left). So has the average annual number of aviation-related accidents and fatalities (right). Source: USDA Forest Service (2018b).*

## CULTURAL CHANGE?

Employee surveys suggest that a change in the Forest Service's safety culture might be contributing to declining numbers of work-related fatalities (USDA Forest Service 2018b). Since 2010, the Forest Service has conducted three all-employee safety surveys. In the latest survey (conducted in 2015), employees strongly agreed that:

- "I have support from my supervisor or manager to improve safety where I work,"
- "I have the responsibility to pause and discuss any work activity that looks or feels unsafe," and
- "I take personal responsibility for my own and my coworkers' safety at work."

The surveys suggest, despite the Forest Service's traditional cultures of "can do" and habituation to autonomy, that local decision makers are placing safety first. Moreover, employees seem to feel authorized to raise concerns about unsafe behaviors and situations, despite the cultural taboo against dialogue in Forest Service culture.

## ACKNOWLEDGMENTS

The author thanks Forest Service safety professionals for furnishing the information and materials for this article and for reviewing and improving it, especially Steve Schlientz, Director of the Office of Safety and Health, USDA Forest Service, Washington Office, Washington, DC; and Steve Holdsambeck, Branch Chief, Risk Management, USDA Forest Service, Fire and Aviation Management, Washington Office, Tucson, AZ.

## LITERATURE CITED

Blum, G.; Brown, H.; Cutts, J. [and others]. 2008. Decentralization in the Forest Service: origins, implications, and prospects. 60 p. Unpublished report, Senior Leader Program, class 5, action learning team project. On file with: USDA Forest Service, Washington Office, Washington, DC.

DeGrosky, M. 2016. The biggest lie never told. Wildfire. 25(4): 10–11. http://wildfiremagazine.org/article/the-biggest-lie-never-told/. (27 September 2018).

Dialogos International. 2007. Integrating mission accomplishment with safety at the U.S. Forest Service: diagnostic memo. Discussion draft, April 25. USDA Forest Service, Washington Office, Washington, DC.

Gabbert, B. 2013. How today's Yarnell tragedy fits into the history of multiple fatality wildland fires. 30 June. Wildfire Today. https://wildfiretoday.com/2013/06/30/history-of-multiple-fatality-wildland-fires/. (25 October 2018).

Holdsambeck, S. 2018. Personal communication. Branch Chief, Risk Management, Fire and Aviation Management, USDA Forest Service, Washington Office, Tucson, AZ.

Hollenshead, E. 2006. Why we need doctrine now. Fire Management Today. 66(2): 7–8.

Kaufman, H. 1960. The forest ranger: a study in administrative behavior. Washington, DC: Resources for the Future. 259 p.

Kaufman, H. 1996. The paradox of excellence: remarks upon receiving the Dwight Waldo Award of ASPA, June 30. Public Administration Review. 56(6): ii.

Metropolitan Group. 2014. Decoding the diversity challenge. USDA Forest Service, Leadership Forum, 21 April, Washington, DC.

NIFC (National Interagency Fire Center). 2018a. Wildland fire accidents and fatalities by year. https://www.nifc.gov/safety/safety_documents/year.pdf. (23 October 2018).

NIFC (National Interagency Fire Center). 2018b. Wildland fire fatalities by type of accident. https://www.nifc.gov/safety/safety_documents/Fatalities-Type-of-Accident.pdf. (6 November 2018).

Pinchot, G. 1947 [reprinted in 1998]. Breaking new ground. Washington, DC: Island Press. 522 p.

Putnam, T. 1995 [updated in 1996]. Findings from the Wildland Firefighters Human Factors Workshop. Tech. Rep. 9551–2855–MTDC. Missoula, MT: USDA Forest Service, Missoula Technology and Development Center. 74 p.

Pyne, S.J. 2001. Year of the fires: The story of the great fires of 1910. New York, NY: Viking.

RMC (Risk Management Committee). 2018. RMC safety gram archive. National Wildfire Coordinating Group. https://www.nwcg.gov/committees/risk-management-committee/resources/rmc-safety-gram-archive. (7 November 2018).

Smith, M. 2016. The big lie. Wildland Fire Leadership, 16 June. http://wildlandfireleadership.blogspot.com/2016/06/the-big-lie.html. (27 September 2018).
USDA Forest Service. 2016. Background. In: USDA Forest Service. Safety engagement: appendix F. 5 p. Unpublished report. On file with: USDA Forest Service, Washington Office, Washington, DC.
USDA Forest Service. 2018a. Forest Service safety journey. National New Employee Orientation, October. Stock presentation. On file with: Steve Schlientz, USDA Forest Service, Washington Office, Washington, DC.
USDA Forest Service. 2018b. 2007-2016: a decade of investment leading to improved workplaces. Workplace Dialogues 2018, briefing paper. 3. 4 p. Unpublished report. On file with: USDA Forest Service, Washington Office, Washington, DC.
Weick, K.; Sutcliffe, K.M. 2008. Organizing for higher reliability: lessons learned from wildland firefighters. Fire Management Today. 68(2): 13–19.
WFLDP (Wildland Fire Leadership Development Program). 2018. WFLDP background. https://www.nwcg.gov/wfldp#collapse2. (6 November 2018).
WFLLC (Wildland Fire Lessons Learned Center). 2018. Latest discussions/Recent lessons learned. https://www.wildfirelessons.net/home. (6 November 2018).
Williams, J. 2002. Lessons from Thirtymile: transition fires and fire orders. Fire Management Today. 62(3): 6–8.

# Emotional and Social Intelligence Competencies in Incident Command

A.E. Black, R.E. Boyatzis, K. Thiel, and K. Rochford

Effective leadership of wildland fire operations requires paying careful attention to the fire itself and to relationships both internal and external to the incident. At the center of the action is the incident commander (IC), who must integrate her or his skill in managing the technical aspects of wildland fire operations with relationship management as well as motivational and negotiating skills.

The set of competencies required to manage and lead others effectively is referred to as emotional and social intelligence (ESI) (Boyatzis 1982, 2018; Goleman, 1998). These competencies have been found to predict outstanding leadership across a variety of professions, from large Federal agencies (including the military) (Boyatzis 1982; Koman and Wolff 2008), to product innovators (Dreyfus 2008; Kendall 2016), to family business leaders (Miller 2016), to higher education administrators (Babu 2016), to knowledge worker teams (Mahon and others 2014) and pastors (Boyatzis and others 2011). This article provides a brief overview of the first study of ESI in wildland fire management (Boyatzis and others 2017) and explores the possible applications for training and development.

**The successful incident commander plays a number of roles at different points in time—as executive, as innovator, as teacher, and as pastor.**

As a leader of a diverse set of formal and informal teams, the successful IC needs to be able to play a number of roles at different points in time—as executive, as innovator, as teacher, and as pastor. The IC supervises and directs a variety of specialists drawn from a variety of organizations—Federal, State, local, and/or county. Additionally, she or he interacts with a multitude of partners, community-based groups, interested citizens, residents, and business owners. The ability to switch among various roles and appeal to people from various backgrounds and stakeholder groups would seem to require a high and sustained level of ESI, in addition to a high degree of technical competence in wildland fire behavior and wildland fire management strategies and tactics.

Previous applied research into successful team dynamics in wildland fire management—mostly through the lenses of high-reliability organizing (see, for example, Black and McBride 2013; Black and others 2012; Fox and others 2017; Jahn and Black 2017; Useem and others 2005; Waldron and Ebbeck 2015) and learning organizational theory (see, for example, Black 2009; Black and Dether 2006)—confirms that high-performing teams and their leaders need to display openness, nondefensiveness, and a willingness and ability to consider and integrate diverse perspectives. These are core ESI behaviors (Druskat and Wolff 2001). Since ESI competencies can be acquired through training as well as nurtured through experience, the first author was curious about which ESI competencies are most valuable in incident command, how well the current wildland fire training and development system is nurturing these important skills, and where we might look for future improvements. To find out, the first author contracted with the second, a leading scholar in the study of ESI and leadership competencies and performance at Case Western Reserve University, to conduct a study of the ESI necessary in incident command (Boyatzis 1982, 2018).

## BRIEF REVIEW OF THE STUDY

Boyatzis and others (2017) interviewed ICs[1] using a critical incident technique in which each IC was asked to tell

1 Although the target population was ICs (type 1 and 2 and Area Command), due to restrictions on use of the Resource Ordering Supply System (which tracks qualifications for wildland fire personnel in the United States), only current Federal employees with an agency email address were eligible to participate.

*A.E. Black is a social science analyst for the Forest Service, Rocky Mountain Research Station, Missoula, MT; R.E Boyatzis is a distinguished university professor of Organizational Behavior, Psychology, and Cognitive Science and K. Thiel is a doctoral candidate in Organizational Behavior at Case Western Reserve University, Weatherhead School of Management, Cleveland, OH; and K. Rochford is an assistant professor in the Department of Management, Eccles School of Business at the University of Utah, Salt Lake City, UT.*

a story about a time when "he/she felt effective (then ineffective) as an IC." Interviews were recorded and transcribed, then coded for presence and frequency of each of the 12 ESI competencies most consistently related to effectiveness of leaders in various fields (Boyatzis 2018; see the sidebar):

1. Adaptability,
2. Emotional self-control,
3. Emotional self-awareness,
4. Positive outlook,
5. Achievement orientation,
6. Empathy,
7. Organizational awareness,
8. Inspirational leadership,
9. Influence,
10. Coaching and mentoring,
11. Conflict management, and
12. Teamwork.

Interviews were also coded for possible emergent themes that were important for IC performance but not among the 12 ESI competencies.

To determine whether some skills are particularly important, Boyatzis (1982) recommended comparing "outstanding" performers to others. "Outstanding" performers were identified by collecting nominations from peers, bosses, and subordinates (Lewin and Zwany 1976). The sample representing "outstanding" performers was drawn from those nominated by multiple sources. The comparison sample was drawn from the remaining group. This resulted in a list of 34 ICs (17 from each group); however, due to travel, prior obligations, and other difficulties, results were based on interviews of 15 ICs (split between the two samples). Interviewers and coders were blind to which performance group participants were assigned. Only nonagency researchers interacted with the ICs and the resulting data after the initial project invitation.

In terms of the 12 ESI competencies, according to Boyatzis and others (2017), analysis showed the following:

> Emotional self-control, adaptability, empathy, coach and mentor, and inspirational leadership distinguish outstanding [performance]. … Meanwhile, achievement orientation, organizational awareness, influence, conflict management, and teamwork [were] necessary competencies for achieving average performance, but not sufficient alone to enable outstanding performance. … Two competencies—emotional self-awareness and positive outlook—were not found to be either distinguishing or threshold competencies.

Boyatzis and others (2017) identified two emergent themes that provide additional insight into behaviors that distinguish outstanding from average performance among ICs:

1. "[A]ppreciation of interpersonal dynamics, demonstrated by the use of pre-season time to focus on building trust among possible team members … [and] to build relationships and educate agency staff and administrators;" and
2. The tendency among outstanding performers to describe "others in more humanizing terms" by emphasizing the relationship between the speaker and subject, such as referring to fireline personnel as "kids out there" or to the public as "families." Dehumanizing language is less personal and turns people into categories, such as referring to fireline personnel simply as "resources."

Given the multiple diverse groups involved in any incident, effectiveness

## Emotional and Social Intelligence Competencies Important for Incident Commanders

| Competencies associated with average and outstanding performance | Competencies associated with outstanding performance |
|---|---|
| **Achievement Orientation:** Striving to improve or meeting a standard of excellence. | **Emotional Self-Control:** Keeping disruptive emotions and impulses in check. |
| **Organizational Awareness:** Reading a group's emotional currents and power relationships. | **Adaptability:** Flexibility in handling change. |
| **Influence:** Wielding effective tactics for persuasion. | **Empathy:** Sensing others' feelings and perspectives and taking an active interest in their concerns. |
| **Conflict Management:** Negotiating and resolving disagreements. | **Coaching and Mentoring:** Sensing others' development needs and bolstering their abilities. |
| **Teamwork:** Working with others toward shared goals. Creating group synergy in pursuing collective goals. | **Inspirational Leadership:** Inspiring and guiding individuals and groups. |

*Note: The emotional self-awareness and positive outlook competencies were not found to be either distinguishing or threshold competencies for incident commanders.*

*Sources: Definitions are from the scales of the Emotional and Social Competency Inventory (Boyatzis 2009; Boyatzis and Goleman 1996); the associations with performance are adapted from Boyatzis and others (2017).*

requires the IC to "see" people—her or his team, line officers, cooperators, and others—sensitively to be able to build relationships. The use of the empathy competency helps, but the use of time, a coaching attitude, and even simple word choice suggest that the outstanding ICs see others more personally.

Results suggest, as evidenced by the presence of five important competencies (sidebar on previous page), that the quality of training and development of fire personnel as they come up through the ranks is good. At the same time, results also suggest an opportunity for more targeted training to consistently cultivate specific ESI skills. This is evidenced by the greater number of ESI competencies and frequency of their use found among the ICs regarded as outstanding by their peers, subordinates, and supervisors.

## POSSIBLE APPLICATIONS

The wildland fire community could use these insights in complementary ways, including:

- Conducting a followup study to confirm these results and test the emergent hypotheses; and
- Reviewing existing training and development programs to identify ways in which the current process might be enhanced to further develop the full complement of ESI competencies.

One way to consider these results is through the lens of new neuroscience research, which indicates that the human brain makes a tradeoff between efforts to carry out a task and efforts to relate to others (Boyatzis and others 2014; Jack and others 2013a; Rochford and others, in press). This emerging work suggests that our brains cannot simultaneously complete both technical and emotional tasks (Boyatzis and others 2014). That is, we can apply information already in our heads to complete a task (called the Task Positive Network, or TPN) *or* we can be open to new stimuli (such as new information, called the Default Mode Network, or DMN) but not both at the same time (Jack and others 2013a, 2013b). Learning by paying attention to emotions and to the subtle dynamics of social relationships *only* occurs when our brains are operating in DMN.

In comparing the lists of ESIs for average and outstanding performers (sidebar on previous page), it could be postulated that the ESIs for average performance are more task focused than the ESIs for outstanding performers, which *add* ESIs associated with relationships. The two emergent themes support this, suggesting that outstanding performers deliberately pay more attention to relationship building and coaching and mentoring, in other words, use more of the DMN (Boyatzis and others 2017). Obviously, both modes are needed for successful incident management; the suggestion here seems to be that effectiveness depends on whether the appropriate mode is selected and how rapidly one is able move between the TPN and DMN.

Let's consider current training and development in light of this. Current wildland fire training and development in the United States rely on both traditional learning (classroom and/or online) and practice (monitored on-the-job training) (NWCG 2018). One could consider these phases as "educational" and "practical," with the combination intended to ensure both cognitive knowledge and demonstrated ability. Ample evidence over the past 32 years in leadership and education studies indicates that a combination of these can effectively develop ESI in adults (Boyatzis and others 2002) and that these improvements can be sustained (Boyatzis 2008). Research suggests that functional performance (that is, the ability to quickly toggle between the DMN and TPN) can be intentionally built as well through deliberate, specific practices (Boyatzis and others 2014). Thus, the current system seems structurally capable of developing ESI competencies. The question is: Do the content and evaluation also support this?

Given the gap between average and outstanding performance in ESI competencies, in addition to ensuring that the current training and development intentionally target task-related technical skills, the wildland fire community could consider ways to deliberately train and support the development of emotional and social skills such as coaching and mentoring. Lessons learned in executive education highlight the significant role of peers as coaches and mentors, particularly when the focus is on positive reinforcement and joint development, as opposed to focusing on gaps and weaknesses (Boyatzis and others 2013). Although coaching and mentoring comprise only one of the competencies observed in participating ICs, this one competency enables the others to be developed and therefore needs special attention.

Many of the National Wildfire Coordinating Group's (NWCG's) training efforts are focused on building requisite technical skills. However, the interagency wildland fire community, with the NWCG at the center, has also explicitly sought to identify and build leadership competencies (NWCG 2003). Even a brief survey of the NWCG's training and development curricula reveals a system that is constantly being updated, with many updates having the potential to incorporate the kinds of insights discussed here. For example, expansion of the peer networks and ongoing benchmarking and learning established under the "Leadership is Action" framework (NWCG 2008) and expanding the availability of the curricula to nonoperational fire personnel (such as Command and General staff (NWCG 2010, 2014)) have the potential to provide the training and practice grounds for developing critical DMN/ESI skills and the functional capacity to toggle quickly between task- and relationship-focused leadership.

Thus, it is apparent that training and development structures useful for developing ESI competencies exist. Could they, and how might they, be further optimized to ensure development of *all* critical ESIs?

## LITERATURE CITED


Babu, M. 2016. Characteristic of effective leadership of community college presidents. 200 p. Cleveland, OH: Case Western Reserve University.

Black, A.E. 2009. The key decision log: facilitating high reliability and organizational learning. Fire Management Today. 69(2): 5–10.

Black, A.; Dether, D. 2006. Learning from escaped prescribed fires—lessons for high reliability. Fire Management Today. 66(4): 50–56.

Black, A.E.; McBride, B.B. 2013. Safety climate in the U.S. Federal wildland fire management community: influences of organizational, environmental, group, and individual characteristics. International Journal Wildland Fire. 22(6): 850–861.

Black, A.E.; Saveland, J; Thomas, D; Ziegler, J. 2012. Using escaped prescribed fire reviews to improve organizational learning. Final report. JFSP project 10–2–05–1. Boise, ID: Joint Fire Science Program. 31 p.

Boyatzis, R.E. 1982. The competent manager: a model for effective performance. New York, NY: John Wiley and Sons. 342 p.

Boyatzis, R.E. 2008. Leadership Development from a Complexity Perspective. Consulting Psychology Journal. 60(4):298-313.

Boyatzis, R.E. 2009. A behavioral approach to emotional intelligence. Journal of Management Development. 28: 749–770.

Boyatzis, R.E. 2018. The behavioral level of emotional intelligence and its measurement. Frontiers in Psychology. DOI: 10.3389/fpsyg.2018.01438

Boyatzis, R.E.; Goleman, D. 1996. Emotional and Social Competency Inventory. Boston: Hay Group/Korn Ferry.

Boyatzis, R.E.; Stubbs, E.C.; Taylor, S.N. 2002. Learning cognitive and emotional intelligence competencies through graduate management education. Journal on Learning and Education. 1(2): 150–162.

Boyatzis, R.E.; Brizz, T.; Godwin, L. 2011. The effect of religious leaders' emotional and social competencies on improving parish vibrancy. Journal of Leadership and Organizational Studies. 18(2): 192–206.

Boyatzis, R.E.; Smith, M.; Van Oosten, E.; Woolford, L. 2013. Developing resonant leaders through emotional intelligence, vision and coaching. Organizational Dynamics. 42: 17–24.

Boyatzis, R.E.; Rochford, K.; Jack, A.I. 2014. Antagonistic neural networks underlying differentiated leadership roles. Frontiers in Human Neuroscience. 8(114). DOI: 10.3389/fnhum.2014.00114.

Boyatzis, R.E.; Thiel, K.; Rochford, K.; Black, A.E. 2017. Emotional and social competencies of incident team commanders fighting wildfires. Journal of Applied Behavioral Sciences. 53(4): 498–516.

Dreyfus, C. 2008. Identifying competencies that predict effectiveness of R and D managers. Journal of Management Development. 27(1): 76–91.

Druskat, V.U.; Wolff, S.B. 2001. Building the emotional intelligence of groups. Harvard Business Review. 79(3): 81–90.

Fox, R.; Gabor, E.; Thomas, D.; Ziegler, J.; Black, A. 2017. Cultivating a reluctance to simplify: exploring the radio communication context in wildland firefighting. International Journal of Wildland Fire. 26(8): 719–731.

Goleman, D. 1998. Working with emotional intelligence. New York: Bantam. 383 p.

Jack, A.I.; Dawson, A.; Begany, K. [and others]. 2013a. fMRI reveals reciprocal inhibition between social and physical cognitive domains. Neuroimage. 66: 385–401.

Jack, A.I.; Dawson, A.J.; Norr, M. 2013b. Seeing human: distinct and overlapping neural signatures associated with two forms of dehumanization. NeuroImage. 79(1): 313–328.

Jahn, J.; Black, A.E. 2017. A model of communicative and hierarchical foundations of high reliability organizing in wildland firefighting teams. Management Communication Quarterly. DOI: 10.1177/0893318917691358.

Kendall, L. 2016. A theory of micro-level dynamic capabilities: how technology leaders innovate with Human Connection. 292 p. Cleveland, OH: Case Western Reserve University. Ph.D. dissertation.

Koman, L.; Wolff, S. 2008. Emotional intelligence competencies in the team and team leader, Journal of Management Development. 12(1): 56–75.

Lewin, A.Y.; Zwany, A. 1976. Peer nominations: a model, literature critique and a paradigm for research. Personnel Psychology. 29(3): 423–447.

Mahon, E.; Taylor, S.; Boyatzis, R. 2014. Antecedents of organizational engagement: exploring vision, mood, and perceived organizational support with emotional intelligence as a moderator. Frontiers in Psychology. 5(1322). DOI: 10.3389/fpsyg.2014.01322. eCollection 2014.

Miller, S.P. 2014. Next-generation leadership development in family businesses: the critical roles of shared vision and family climate. Frontiers in Psychology. 5(1335). DOI: 10.3389/fpsyg.2014.01335.

NWCG (National Wildfire Coordinating Group). 2003. Leadership curriculum design and delivery strategy. NWCG Curric. Mgt. Issue Pap. 40. 3 p. Unpublished paper. On file with: NWCG.

NWCG (National Wildfire Coordinating Group). 2008. Establishing the framework for "Leadership is Action." NWCG Curric. Mgt. Issue Pap. 93. 2 p. Unpublished paper. On file with: NWCG.

NWCG (National Wildfire Coordinating Group). 2010. Assignment of course name and number for S–580 replacement course. NWCG Curric. Mgt. Issue Pap. 107. 1 p. Unpublished paper. On file with: NWCG. *https://www.nwcg.gov/sites/default/files/issue_papers/IssuePaper107.pdf*. [Date accessed unknown].

NWCG (National Wildfire Coordinating Group). 2014. Assignment of course name and number for the new leadership course. NWCG Curric. Mgt. Issue Pap. 124. 2 p. Unpublished paper. On file with: NWCG. *https://www.nwcg.gov/sites/default/files/issue_papers/IssuePaper124.pdf*. [Date accessed unknown].

NWCG (National Wildfire Coordinating Group). 2018. National Incident Management System: Wildland Fire Qualification System Guide. PMS 310–1. *https://www.nwcg.gov/sites/default/files/publications/pms310-1.pdf*. (24 October).

Rochford, K.; Boyatzis, R.E.; French, S.; Jack, A. [In press]. Neural roots of ethical leadership and the development of better leaders: the default mode network versus the task positive network. Journal of Business Ethics.

Useem M.; Cook J.; Sutton L. 2005. Developing leaders for decision making under stress: wildland firefighters in the South Canyon Fire and its aftermath. Academy of Management Learning and Education. 4(4): 461–485.

Waldron, A.L.; Ebbeck, V. 2015. The relationship of mindfulness and self-compassion to desired wildland fire leadership. International Journal of Wildland Fire. 24(2): 201–211.

# Managing Unplanned Ignitions: Staff Ride for Leadership Training

Lincoln Bramwell, Anne Buckelew, Mike Elson, Cavan Fitzsimmons, Jada Jackson, Kevin Khung, Erica Nevins, and Ellen Shaw

**Restoring more natural conditions and reducing hazardous fuels is now a major focus of Federal land managers in the Southwest.**

The history of wildland fire management in the Southwest—and northern Arizona in particular—has been well researched and well documented (Cooper 1960; Covington and Moore 1994; Finney and others 2005; Pyne 2016; Swetnam and Baisan 1996). Prior to Euro-American settlement, frequent surface fires in the ponderosa pine zone kept forest conditions open and ground fuel accumulations low. Ponderosa pine is well adapted to frequent surface fires; with thick bark and self-pruning lower branches, mature trees rarely succumb to surface fires.

Over the last 150 years, the normal fire interval has been disrupted by grazing and other impacts of settlement. As a result, tree densities are now much higher and the accumulation of ground fuels and ladder fuels leads to catastrophic crown fires under dry and windy conditions. These changes have also resulted in drastically different habitat conditions for plants and animals, and the resulting high-intensity fires can lead to severe flooding, loss of soil, and impairment of watershed functions.

Ponderosa pine forests recover slowly after severe fire and may not return to prefire conditions for hundreds of years, if ever. Several large fires in the Flagstaff, AZ, area and throughout the Southwest have illustrated the risk posed by these conditions and the urgency of addressing the situation. Restoring more natural conditions and reducing hazardous fuels are now a major focus of Federal land managers in the area. Mechanical removal prior to burning is used when possible, but the limited value of the material has made landscape-level mechanical treatment challenging. Prescribed fire and managing natural ignitions are currently the only ways to improve conditions across significant acreages in this region.

## UNPLANNED FIRE FOR RESOURCE BENEFITS

The Forest Service changed its full-suppression policy in 1978 to give line officers more options to manage unplanned wildfires (Nelson 1979). The policy was founded on the knowledge and understanding that, under the right

*The authors were members of an action learning team as part of the Forest Service's Senior Leader Program in 2017. The group project focused on leadership training issues associated with managing natural ignitions for resource benefits on wildland fires. Lincoln Bramwell is the chief historian, Washington Office (detached), Fort Collins, CO; Anne Buckelew is an assistant budget coordinator, State and Private Forestry, Office of the Deputy Chief, Washington, DC; Mike Elson is the district ranger, Flagstaff Ranger District, Coconino National Forest, Flagstaff, AZ; Cavan Fitzsimmons is the staff officer for Recreation, Lands, Minerals, and Heritage, Tongass National Forest, Ketchikan, AK; Jada Jackson is the coordinator of the Forest Legacy Program, Northeastern State and Private Forestry, Princeton, NJ; Kevin Khung is the district ranger, Pagosa Ranger District, San Juan National Forest, Pagosa Springs, CO; Erica Nevins is the director of Program Development, Budget, and Accountability, Pacific Southwest Region, Vallejo, CA; and Ellen Shaw is the deputy director of the Partnership Office, Washington Office, Washington, DC.*

conditions, fire can result in a positive effect on wildland resources. However, the goal of returning fire to the landscape to serve the ecological health of forest lands proved so elusive to professionals in the field that Congress, in the Federal Land Assistance, Management and Enhancement Act of 2009, directed the wildland fire community, in association with State and local partners, to develop a National Cohesive Wildland Fire Management Strategy (WFLC 2010, 2012, 2015). That strategy focuses on:

- Safely and effectively extinguishing fire;
- When needed, using fire where allowable;
- Managing natural resources; and
- As a Nation, living with wildfire.

The Flagstaff Ranger District (on the Coconino National Forest in Arizona) managed a natural ignition for resource benefit for the first time in 2009. The 1987 Coconino National Forest Plan and fire management plan permit this management approach outside of designated wildland–urban interface areas and congressionally designated wilderness areas, where more restrictive standards apply. Over the succeeding years, the district became more and more experienced and active in using this tool, with increasing numbers and sizes of managed natural fires, as conditions and locations allowed.

**Line officers tend to be keenly aware of the risk they are assuming for an action that is essentially voluntary.**

For example, the 2016 Mormon Fire was a lightning-ignited wildfire located on the southwest side of Mormon Mountain on the Flagstaff district. Consistent spring rain and snowfall moderated seasonal conditions on the Coconino National Forest. This led to decreased fire intensity, which opened a window of opportunity to successfully allow the Mormon Fire to achieve objectives outlined in the forest's 1987 land and resource management plan (fig. 1).

**Figure 1**—*The Mormon Fire, a managed unplanned ignition, cleaning up pine needles, old logs, and dead grasses that would otherwise contribute to wildfire danger. Photo: True Brown, Coconino National Forest (June 2, 2017).*

## DILEMMA: SUPPORTING LINE OFFICERS' TOUGH DECISIONS

Although the Southwestern Region of the Forest Service had seen successes and had policies in place to support using unplanned ignitions to treat fuels that had accumulated over many years, regional leadership felt that opportunities to responsibly use natural ignitions were being missed. A number of factors were likely responsible, but lack of line officer confidence and perceived lack of support for a line officer's decision may have been the most important reasons for not choosing to manage unplanned wildland fires for resource benefits. Line officers tended—and still tend—to be keenly aware of the risk they are assuming for an action that is essentially voluntary.

Our Senior Leader Program action learning team interviewed regional fire leaders in the Southwestern Region and found a need to increase line officers' skills and confidence in managing unplanned ignitions in order to safely return more fire to the landscape. Our team wanted to develop a product to meet the following objectives:

- Build practical familiarity with the use of naturally ignited wildfire;
- Demonstrate what success looks like;
- Illustrate the region's interest in developing line officers; and
- Encourage peer-to-peer learning.

## SOLUTION: POSITIVE-OUTCOME STAFF RIDE

We understood that setting goal-driven policy, on its own, did not achieve goals. To achieve goals, we needed to teach and encourage goal-aligned behavior. With the intent of shaping goal-aligned behaviors, our team borrowed the wildland fire organization's staff ride concept and took line officers and fire

managers step-by-step through the process of successfully managing an unplanned wildland fire on their unit.

The military originally developed the staff ride concept for studying leadership decisions made during a battle when alternative decisions could have been made. A staff ride requires active participation and immersion in the event being studied. The staff ride develops leaders by exposing them to hard truths in an experiential learning environment. It conveys lessons from the past to present-day leaders by emphasizing "learning" rather than "training."

Borrowing the concept, the Forest Service generated staff rides on disaster fires (such as the 1953 Rattlesnake Fire in California, the 1990 Dude Fire in Arizona, and the 2012 Cramer Fire in Idaho (Wildland Fire LLC 2013)), with the intent of learning from past mistakes. Our action learning team adapted the approach and designed a staff ride around a successfully managed unplanned wildfire to demonstrate what a favorable outcome looks like. The result is a learning tool that can be adapted to any region and utilized to produce goal-aligned behaviors across our organization.

## THE MORMON FIRE STAFF RIDE

Our group worked with the Southwestern Region to identify a successfully managed unplanned wildfire. The regional office supplied us with information on a number of such wildfires managed by its employees, with varying levels of size and complexity. We settled on the 2016 Mormon Fire on the Coconino National Forest primarily for its complexity—we did not want to showcase a fire where the decisions were easy.

The Mormon Fire offered every conceivable roadblock to managing an unplanned ignition, including:

- Overgrown forest surrounding a large exurban community;
- Protected activity centers for threatened Mexican spotted owl; and
- Occurrence during the summer tourist season in Flagstaff and Sedona, AZ, which would suffer from smoke impacts.


*Participants on the staff ride in August 2017 discuss management dilemmas on the Mormon Fire. Photo: USDA Forest Service, Brady Smith.*

The challenges were great but the potential rewards were even greater. The Coconino National Forest effectively managed the Mormon Fire and treated over 7,800 acres (3,200 ha) over the course of the 2-week incident.

As our team began to interview the staff, line, and fire managers who participated in managing the fire, four themes arose again and again:

- Communication,
- Relationships,
- Trust, and
- Team ownership.

These themes were critical to creating a successful atmosphere and enabled everyone involved to give each other space when things inevitably did not go as planned on the incident. These themes truly form the building blocks for managing any unplanned ignition.

We divided the fire into four key events and built the stops (or "stands," as they are called on staff rides) around critical moments that participants identified as key to their success in managing the fire:

- Initial decision;
- Collaboration with external partners;
- Discussions about exposure to risk; and
- Adaptability in decision making.

The stands take participants through the many decisions and the extensive foundational work that should happen well before the first smoke appears. In traveling from stand to stand, the participants see the need to work across resource areas both internally and with external partners. They witness the process of weighing safety and resource risk management decisions, and they learn the need for dealing with constantly changing conditions on the ground.

Our team conducted a pilot staff ride on the Coconino National Forest on the site of the Mormon Fire near Flagstaff in August 2017. We had 6 experts

and staff hosting the staff ride for the 26 participants who took part in the 2-day ride. The staff ride concept was already familiar to the participants, who accepted and embraced it as a way of simulating the tension, anxieties, and decisions that occur before, during, and after managing incidents. Our pilot ride provided a proof of concept from the field. Participants in the August staff ride, along with our partners and advisors, provided feedback and comments that encouraged further use and development of the Mormon Fire Staff Ride.

## EXPERIENCE THE STAFF RIDE VIRTUALLY

Through the course of staff ride development, our team produced several products that are available to view, download, and use. It is our hope and intent that the Mormon Fire Staff Ride will be a template, providing an example of how to use the staff ride concept to highlight and teach experiences from other events that had positive outcomes.

### *THE MORMON FIRE STAFF RIDE FACILITATOR GUIDE*

The staff ride is designed to be led by a facilitator who sets the stage for discussions at each stand and leads the group through questions designed to get them to think for themselves about the leadership decisions they would make. A facilitator's guide gives direction and background on how to successfully facilitate the Mormon Fire Staff Ride. You can find the guide at: *https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd580562.pdf*.

### *THE MORMON FIRE STAFF RIDE PARTICIPANT'S GUIDE*

The target audience for the Mormon Fire Staff Ride is the line officer. The event focuses on helping line officers gather information about an unplanned ignition and experience the dilemmas associated with the major decisions made during the Mormon Fire. They use a participant's guide for a description of each stand, of the situation at a particular time on the fire, and of the dilemma associated with the decision to be made. The guide presents questions for the group to discuss, and it includes maps and directions. You can find the guide at: *https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd580563.pdf*.

**The staff ride concept is a familiar method for simulating the tension, anxieties, and decisions that occur before, during, and after managing incidents.**

### *THE MORMON FIRE STORY MAP*

For those unable to travel to the site of the Mormon Fire, our team worked with the Southwest Fire Science Consortium to craft a story map. The map is an online tool that shares the content of the Mormon Fire Staff Ride Participant's Guide, combined with background reading, videos, maps, and photos. It allows anyone to experience the positive-outcome staff ride from their home units. You can find the story map at: https://arcg.is/1PLaqf.

## LESSONS LEARNED

In preparing the Mormon Fire Staff Ride, we identified a number of issues that are relevant in today's fire management world. First, managing wildfire incidents for ecological effect is a complex issue that is national in scope. Every region deals with this challenge and opportunity, and through this project we underscored and validated known risks and hurdles and offered a fresh look at addressing them.

Second, feedback from the pilot staff ride provided a framework for using this tool—a safe learning environment for line officers to confidently practice making and implementing leadership decisions, with consideration and respect for lives and risk.

Third, our work reinforced the importance of partnerships: we accomplish work more successfully when we involve all our stakeholders and partners. The Mormon Fire illustrated the practice of working across boundaries and across landscapes to achieve common goals. We cannot do this work without our partners.

Finally, leadership intent was the inspiration for this project. Southwestern Regional Forester Cal Joyner and his regional fire team provided clear and direct information about their needs and what we could produce to help their efforts.

## ACKNOWLEDGMENTS

This work would not have been possible without professional support, input, time, and skills from the Coconino National Forest, the Forest Service's Southwestern Regional Office, the School of Forestry at Northern Arizona University, the Southwest Fire Science Consortium, and the Wildland Fire Lessons Learned Center. We are grateful for their inspiration, assistance, and encouragement for this project. Their dedication to protecting lives and managing natural resources in the Southwest is the story we sought to share through this staff ride.

## LITERATURE CITED

Cooper, C.F. 1960. Changes in vegetation, structure, and growth of southwestern pine forests since White settlement. Ecological Monographs. 30: 129–164.

Covington, W.W.; Moore, M.M. 1994. Southwestern ponderosa pine forest structure: changes since Euro-American settlement. Journal of Forestry. 92(1): 39–47.

Finney, M.A.; McHugh, C.W.; Grenfell, I.C. 2005. Stand- and landscape-level effects of prescribed burning on two Arizona wildfires. Canadian Journal of Forest Research. 35(7): 1714–1722.

Nelson, T.C. 1979. Fire management policy in the national forests—a new era. Journal of Forestry. 77(11): 723–725.

Pyne, S.J. 2016. The Southwest: a fire survey. Tucson, AZ: University of Arizona Press. 206 p.

Swetnam, T.W.; Baisan, C.H. 1996. Historical fire regime patterns in the

Southwestern United States since AD 1700. In: Allen, C.D., ed. Fire effects in southwestern forests: Proceedings of the Second La Mesa Fire Symposium. Gen. Tech. Rep. RM–GTR–286. Missoula, MT: USDA Forest Service, Rocky Mountain Research Station: 11–32.

WFLC (Wildland Fire Leadership Council). 2010. A National Cohesive Wildland Fire Management Strategy. http://www.forestsandrangelands.gov/strategy/documents/reports/1_CohesiveStrategy03172011.pdf. (2 April 2018).

WFLC (Wildland Fire Leadership Council). 2012. A National Cohesive Wildland Fire Management Strategy: phase II report. http://www.forestsandrangelands.gov/strategy/documents/reports/phase2/CSPhaseIIReport_FINAL20120524.pdf. (2 April 2018).

WFLC (Wildland Fire Leadership Council). 2015. The national strategy: the final phase in the development of the National Cohesive Strategy for Wildland Fire Management. https://www.forestsandrangelands.gov/strategy/documents/strategy/CSPhaseIIINationalStrategyApr2014.pdf. (2 April 2018).

Wildland Fire LLC (Lessons Learned Center). 2013. Cramer Fire staff ride [Video]. YouTube. https://www.youtube.com/watch?v=xrIhJVHJ07Y. [Date accessed unknown].

*Firefighters in 1911 suppressing a wildfire on an unknown national forest in the Forest Service's Northern Region. Suppressing all fires was the Forest Service's standard policy until the 1970s. Photo: USDA Forest Service.*

# Using Unplanned Ignitions: Evolution of Forest Service Policy

**Hutch Brown**

In the last 50 years, Federal fire policy has undergone tremendous change. Some people (including the author) can still remember when the goal of wildland firefighting was simple: put out every fire by 10 a.m. on the morning after it was first detected. Since then, Federal policy for wildland fire management has grown more complex. The changes triggered shifts in terminology, such as "wildfire" versus "wildland fire." (For some of the definitions currently in use, see the sidebar.)

When and why did changes in Federal fire policy occur? This article focuses on the evolution of the Forest Service's policy of using unplanned ignitions to reduce fuels and allow fire to play its natural ecological role.

## THE FIRE REVOLUTION

In the 19th century, according to the fire historian Stephen J. Pyne, the United States was "the Brazil of its day" (Pyne, n.d.). More than a quarter of the original U.S. forest estate, mostly in the East, was cleared away, partly through the use of fire. Farmers, settlers, and others spread fire across vast landscapes, and huge areas went up in flames.

The early conservation movement espoused fire control to protect America's remaining forests. The first national parks were founded in the late 1800s, including Yellowstone National Park in 1872, and the U.S. Army assigned units to protect the parks by suppressing fires wherever they could (van Wagtendonk 2007).

*Hutch Brown is the editor of Fire Management Today and a program specialist for the Forest Service, Office of Communication, Washington Office, Washington, DC.*

### WILDLAND FIRE TERMINOLOGY

**As fire management policy has shifted, wildland fire terminology has changed. In current usage, based on Fire Executive Council (2009) and National Wildfire Coordinating Group (2018):**

- *Wildland fire* is any nonstructure fire that occurs in vegetation or natural fuels. Wildland fire includes prescribed fire and wildfire.
- *Wildfire* is an unplanned ignition of a wildland fire (such as fires caused by lightning or volcanoes or unauthorized and accidental human-caused fires). Wildfires includes escaped prescribed fires.
- *Unplanned ignition* is the initiation of a wildland fire that was unplanned, regardless of cause.
- *Prescribed fire* is any fire intentionally ignited by management actions in accordance with applicable laws, policies, and regulations to meet specific objectives.
- *Use of wildland fire* is management of either wildfire or prescribed fire to meet resource objectives specified in land and resource management plans.

*Note: Under policies before FEC (2009), the use of unplanned natural ignitions was called "prescribed natural fire" (NWCG 1995) and later "wildland fire use" (NWCG 2003).*

Established in 1905, the Forest Service followed suit, vigorously suppressing wildland fires (Graves 1919; Pinchot 1905). After the Big Blowup in the Northern Rockies in 1910 resulted in 84 firefighter fatalities (NICC 2018), the agency virtually went to war against wildfire, creating a Forest Service identity around fire exclusion (Egan 2009; Pyne 2001).

Then came what Pyne (2015) called a fire revolution—a rejection of fire exclusion in favor of restoring fire to fire-adapted ecosystems. Decades in the making (Arno 2014; Carle 2002), with origins dating to fire use by American Indians and the "light burning" practiced by private and Tribal forest landowners in the early 20th century (Komarek 1962; Stoddard 1962), the fire revolution began with several landmark events (Pyne, n.d.):

- In 1962, the Tall Timbers Research Station in Florida held the first in a series of fire ecology conferences, and The Nature Conservancy initiated its signature prescribed fire program.
- In 1963, an advisory board commissioned by the U.S. Department of the Interior released a report on the ecological role of wildland fire (Leopold and others 1963), prompting the National Park Service to begin using lightning-ignited fires in 1968 (fig. 1).
- In 1964, Congress passed the Wilderness Act, followed in 1972 by programs launched by the Forest Service to use lightning-ignited fires in wilderness areas.

In 1978, the Forest Service officially joined the fire revolution by formally abandoning its policy of fire control (the 10 A.M. Policy and its variant, the 10 Acre Policy). The change came in response to an inquiry by the Office of Management and Budget. An agency study team concluded that the policy of fire control "fails to recognize any benefits from fire, or the existence of those resources which do not need total (or any) fire protection" (Pyne 2015). Fire control was deemed not to be cost-effective because it led to needless spending on firefighting.

**The 1995 policy urged Federal fire managers to consider "all wildland fires, regardless of ignition source, as opportunities to meet management objectives."**

The Forest Service replaced fire exclusion with a policy of "appropriate suppression action." Line officers and fire managers could use wildland fire within limits set by land and resource management plans (forest plans, for short) and of fire management plans tiered to the forest plans. For example, the Salmon National Forest in Idaho, in its forest plan from 1988, dictated a "suppression strategy" at lower elevations outside wilderness areas while allowing "containment or confinement strategies" on natural ignitions at higher elevations under limited conditions (SNF 1988).

## JOINT FEDERAL FIRE POLICY

Then came the Yellowstone Fires of 1988. The conflagrations resulted in part from lightning ignitions designated by the National Park Service as "prescribed natural fires"—that is, the use of unplanned ignitions as a form of "biotic management" for a "realistic presentation of primitive America" (Leopold and others 1963). Recognizing the role of wildland fire in shaping and sustaining natural systems, the National Park Service used—and still uses—lightning ignitions for resource benefits.

However, national headlines about Yellowstone National Park going up in flames, along with an escaped prescribed natural fire on the Bob Marshall Wilderness in Montana, fed a public backlash (van Wagtendonk 2007). The controversy led to a report in 1989 by an interagency review team commissioned by the U.S. Secretaries of Agriculture and the Interior. The team reaffirmed the Federal policy of using natural ignitions for resource benefits (FMPRT 1989). The public controversy might have discouraged some land managers from risking the use of prescribed natural fire, but Federal policy continued to allow for it.

## 1995 POLICY REVIEW

The next Federal fire policy review came in 1995, prompted by more severe wildfires. In 1994, the number of fires that burned 1,000 acres (400 ha) or more reached 162, an unusually high number for the time (Truesdale and others 1995). Federal firefighting costs soared to a record $918 million (NIFC 2017a), and a wildfire blowup on the South Canyon Fire in Colorado resulted in 14 firefighter fatalities. Altogether, 35 wildland firefighters perished in 1994, the highest number of firefighter fatalities since 1910 (NICC 2018).

In response, the National Wildfire Coordinating Group released a report outlining a joint policy for the Federal agencies with wildland fire management responsibilities (NWCG 1995). The report stressed public and firefighter safety. However, it also called wildland fire "an inevitable natural force" that has "shaped ecosystems through time" (NWCG 1995). The policy proposed:

- Incorporating the "role of wildland fire as an essential ecological process and natural change agent … into the planning process" by integrating fire "as a critical natural process" into forest plans; and
- Using fire "to protect, maintain, and enhance resources" and allowing fire "as nearly as possible … to function in its natural ecological role."

The 1995 report went so far as to urge Federal fire managers to consider "all wildland fires, regardless of ignition source, as opportunities to meet management objectives" (NWCG 1995). Nevertheless, any response to wildland fire had to align with "approved fire management plans" tiered to forest plans. That left the "appropriate


**Figure 1**—*Lodgepole pine in Yellowstone National Park regrowing following stand replacement fires in 1988. Lodgepole pine has serotinous cones with seeds released by severe fire, allowing the forest to naturally regenerate. Many landscapes are naturally adapted to severe fire. Source: Federal Joint Fire Science Program (NRFSN 2015).*

suppression response" up to individual line officers and fire managers.

## 2001 POLICY REVISION

The next policy review came in 2001, following yet another exceptional fire year. In 2000, for the first time since 1963, more than 7 million acres (2.8 million ha) burned in a single fire season (NIFC 2017b). Moreover, an escaped prescribed fire on the Bandelier National Monument in New Mexico became the Cerro Grande Fire, which caused enormous damage to the city of Los Alamos. The 47,650-acre (19,060-ha) fire destroyed 235 homes.

In response, the National Wildfire Coordinating Group released a report outlining a review and update of the 1995 Federal fire policy (NWCG 2001). The report found that the 1995 policy "is still generally sound and appropriate," and it recognized "the role of fire in sustaining healthy ecosystems." It called for fire management plans incorporating "the role of wildland fire as an essential ecological process and natural change agent," declaring that "wildland fire will be used to protect, maintain, and enhance resources and, as nearly as possible, be allowed to function in its natural ecological role" (NWCG 2001).

However, the 2001 policy placed special emphasis on protecting the wildland–urban interface (WUI). In view of the Cerro Grande Fire and the rising number of homes destroyed by wildfire across the Nation, the 2001 report concluded that the "fire hazard situation in the Wildland Urban Interface is more complex and extensive than understood in 1995" (NWCG 2001). Echoing the National Fire Plan (USDA/USDI 2001), the 2001 report called the WUI "a major fire problem that will escalate as the nation moves into the 21st Century" (NWCG 2001). Accordingly, the 2001 report emphasized hazardous fuels treatments, declaring that "fuels management is an important aspect of vegetation management and is integral to restoring and maintaining ecosystems." The report urged land managers to focus on protecting the WUI.

In stressing "hazardous fuels reduction," the 2001 report conflated "treatment of fuels" with "ecosystem sustainability" (NWCG 2001). Fuels treatments to protect the WUI are not always the same thing as vegetation treatments to sustain or restore healthy, resilient fire-adapted ecosystems (DellaSala and others 2003; Keegan and Fiedler 2000; Reinhardt and others 2008). Moreover, fuels treatments have nothing to do with the use of wildland fire to restore naturally dense forest types in fire regimes with relatively long fire-return intervals, such as mixed conifer, lodgepole pine, and spruce–fir. In such vegetation types, "ecosystem sustainability" and "the use of wildland fire" mean allowing fire "to function in its natural ecological role" rather than suppressing fire or reducing fuels (fig. 1).

The 2001 report also called for clarification of such terms as "wildland fire," "wildfire," and "fire use" to avoid "confusion and misunderstanding within the agencies and among cooperators, partners, and the public" (NWCG 2001). In its glossary, the report defined wildland fire as "any nonstructural fire that occurs on wildland," and it defined prescribed fire as "any fire ignited by management actions to meet specific objectives." However, the report gave no definitions for wildfire or fire use, and the term "prescribed natural fire" appeared nowhere in the report.

## 2003 POLICY IMPLEMENTATION

In 2003, an interagency team sought to clarify the terminology. Chartered by the National Wildfire Coordinating Group, the team published a report outlining a strategy for implementing the 2001 Federal fire policy (NWCG 2003). Based on the definitions of wildland fire and prescribed fire in the 2001 report, the 2003 strategy described three types of wildland fire:

- Wildfire—"an unplanned and unwanted wildland fire … where the objective is to put the fire out;"
- Wildland fire use—the use of a naturally ignited wildland fire "to accomplish specific resource management objectives;" and

**With the 2009 strategy, what was formerly known as "wildland fire use" became the use of wildfire to achieve objectives stated in forest plans.**

- Prescribed fire—"any fire ignited by management actions to meet specific objectives."

The 2003 strategy thereby officially did away with the term "prescribed natural fire," replacing it with the term "wildland fire use," which led to awkward formulations like "wildland fire use fires" (NIFC 2009).

According to the 2003 strategy, "appropriate management response" applied to every wildland fire based on the forest plan and the corresponding fire management plan. Every human-caused fire not "ignited by management actions" automatically became a wildfire, with an appropriate management response of suppression at minimum cost. When a prescribed fire or a natural ignition designated for wildland fire use was no longer achieving its objectives and could not be brought back into prescription, it became a wildfire. Once declared a wildfire, a fire could not be redesignated as anything else. Moreover, every wildland fire could be only one type of fire; if any part of a prescribed fire or wildland fire use fire could not be brought back into prescription, then it became—and remained—entirely a wildfire, to be suppressed at minimum cost.

## 2009 REVISED STRATEGY

In 2009, the interagency Fire Executive Council (part the Wildland Fire Leadership Council) released "guidance" with modifications to the 2003 strategy for implementing the 2001 Federal fire policy (FEC 2009). Designed to give fire managers more flexibility, the 2009 guidance:

- Eliminated the term "wildland fire use" and reduced the types of wildland fire from three to two:
  - » Wildfires—"unplanned ignitions or prescribed fires that are declared wildfires," and
  - » Prescribed fires—"planned ignitions to meet specific objectives;"
- Allowed line officers to use both "planned and unplanned ignitions to achieve land and resource management goals;" and
- Permitted fire managers to manage a single wildland fire for multiple objectives, such that part of a fire might be managed as a wildfire (that is, suppressed at minimum cost) and another part of the same fire might be managed for resource benefits (that is, allowed to function in its natural ecological role).

The 2009 guidance—the policy currently in place—is to use wildland fire as a "tool in the restoration process" through the "management of either wildfire or prescribed fire to meet resource objectives" specified in forest plans (FEC 2009). In managing wildland fire for the "role of fire as an essential ecological process and natural change agent," preference is to be given to "natural fire." The "initial action" on "human-caused wildfire" is "to suppress the fire at the lowest cost"—in effect, fire control.

However, line officers and fire managers can use the decision-support process to manage any wildfire, no matter what the cause, for the purpose of restoring or maintaining "the natural fire regime where safe and possible." Thus, the 2009 policy circled back to the 1995 Federal fire policy, which urged line officers and fire managers to consider "all wildland fires, regardless of ignition source, as opportunities to meet management objectives" (NWCG 1995).

So what was formerly known as wildland fire use has now become the use of wildland fire to achieve management goals, with wildfire

*The Ibex Fire in the Frank Church–River of No Return Wilderness on the Salmon–Challis National Forest in Idaho. Ignited by lightning and detected in July 2017, the unplanned ignition was monitored and managed by the Forest Service to return the natural ecological role of fire to a landscape of conifers (subalpine fir and lodgepole pine). Photo: USDA.*

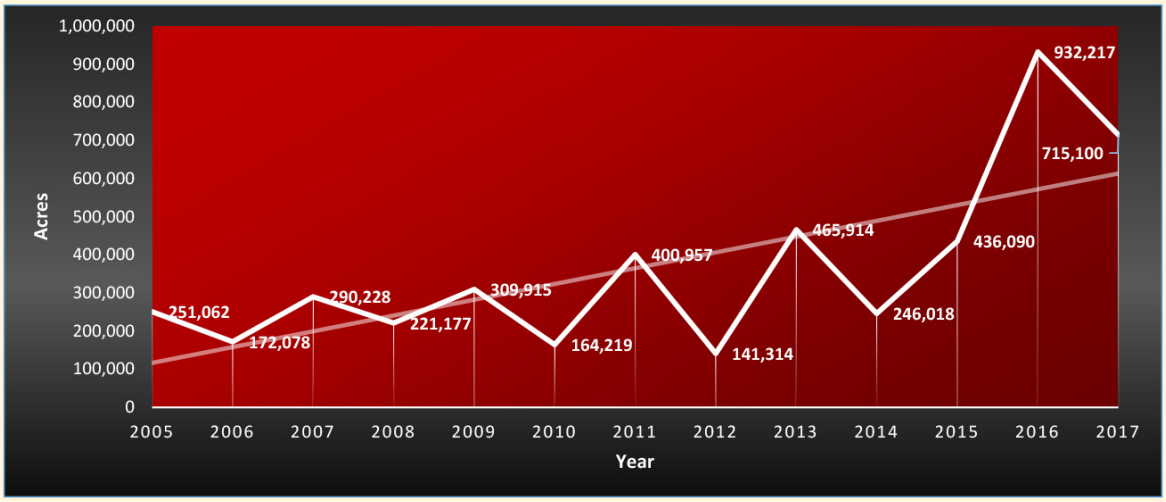



**Figure 2**—*Annual acres treated through the use of unplanned ignitions, 2005–17. The trend shows steady growth, especially after 2014. Source: USDA Forest Service (2017).*

no longer defined as an "unwanted wildland fire" but rather as "an unplanned ignition." The switch from a pejorative to a neutral definition of wildfire gave line officers the flexibility to use both planned and unplanned ignitions, even accidental human ignitions, to achieve objectives stated in forest plans.

## FOREST PLAN REVISIONS

Forest plans are key. No matter how much latitude managers have under Federal fire policy (FEC 2009), forest plans limit the extent of allowable fire use. So when the Cramer Fire broke out on the Salmon–Challis National Forest in 2003, fire managers had no choice but to suppress it. The fire was burning at an elevation well below the 8,000-foot (2,438-m) threshold allowed for the use of wildland fire, so firefighters were dispatched to the scene, even though no values were at risk in the steep and roadless terrain other than the lives of the firefighters themselves. Two helirappelers were assigned to clear a helispot near the top of a ridge, and when the fire burned into the drainage below them, a fatal entrapment ensued.

The Forest Service's 2012 planning rule requires land managers to revise forest plans to give fire managers more flexibility (USDA Forest Service 2012). The rule calls for plan components that "maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area" by taking into account "wildland fire and opportunities to restore fire-adapted ecosystems" (paragraph 219.8(a)(1)(v)). In effect, the planning rule encourages individual units to fold the 2009 strategy into their forest plan revisions, giving local line officers and fire managers more flexibility to use both planned and unplanned ignitions for management purposes.

Under the 2012 planning rule, the Salmon–Challis National Forest and other units have revised or are revising their forest plans accordingly, partly by including the language of planned and unplanned ignitions. For example, the draft revised forest plan for the Okanogan–Wenatchee National Forest in Washington, site of a fatal entrapment on the 2001 Thirtymile Fire, stated that "vegetation management activities may include use of planned and unplanned fire ignitions" and that "more unplanned fires will be managed instead of being suppressed due to limited firefighting resources" (OWNF 2011). And the draft revised forest plan for the Cibola National Forest in New Mexico stated that the "goal is to improve ecosystem health by restoring fire to the landscape in the form of planned and unplanned ignitions" (CNF 2016).

Will forest plan revisions lead to more instances of the Forest Service letting wildland fire play its natural ecological role? Figure 2 shows a rising trend in the use of unplanned ignitions, particularly since 2014. One benefit might be fewer risky deployments of firefighters to remote locations where no values are at risk. The results remain to be seen.

## ACKNOWLEDGMENTS

The author thanks Russ Briggs and Emily Platt for reviewing and commenting on an early version of this article. Russell D. Briggs is the director of the Division of Environmental Science at the College of Environmental Science and Forestry, State University of New York, Syracuse, NY; and Emily K. Platt is a district ranger for the Forest Service on the Mount Adams Ranger District, Gifford Pinchot National Forest, Trout Lake, WA. The author is solely responsible for any errors.

## LITERATURE CITED

Arno, S.F. 2014. Slow awakening: ecology's role in shaping forest fire policy. Peeling Back the Bark. Blog. 16 October. Durham, NC: Forest History Society. https://fhsarchives.wordpress.com/2014/10/16/6295_arno_role_of_ecology_in_shaping_forest_fire_policy/. (4 April 2018).

Carle, D. 2002. Burning questions: America's fight with nature's fire. Westport, CT: Praeger Publishers. 322 p.

CNF (Cibola National Forest). 2016. Cibola National Forest Mountain Ranger Districts plan revision—preliminary draft land and resource management plan.

Albuquerque, NM: USDA Forest Service. 192 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd510428.pdf. (4 April 2018).
DellaSala, D.A.; Martin, A.; Spivak, R. [and others]. 2003. A citizen's call for ecological forest restoration: forest restoration principles and criteria. Ecological Restoration. 21(1): 14–23.
Egan, T. 2009. Teddy Roosevelt and the fire that saved America. New York, NY: Houghton Mifflin Harcourt. 324 p.
FEC (Fire Executive Council). 2009. Guidance for implementation of the Federal Wildland Fire Management Policy. Washington, DC: U.S. Department of Agriculture/U.S. Department of the Interior. 20 p. https://www.nifc.gov/policies/policies_documents/GIFWFMP.pdf. (4 April 2018).
FMPRT (Fire Management Policy Review Team). 1989. Final report. NPS D–392. Denver, CO: National Park Service. 21 p. https://www.doi.gov/sites/doi.gov/files/uploads/final_report_fire_management_policy_1989.pdf. (4 April 2018).
Graves, H.S. 1919. A policy of forestry for the nation: the statement of a policy presented before forestry conferences of 1919. Washington, DC: USDA Forest Service. 11 p.
Keegan, C.E.; Fiedler, C.E. 2000. Synergy between ecological needs and economic impacts of ecosystem restoration. In: Smith, H.Y., ed. The Bitterroot Ecosystem Management Research Project: What we have learned. Symposium proceedings. RMRS–P–17. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station: 74–76.
Komarek, E.V. 1962. The use of fire: an historical background. In: Tall Timbers Fire Ecology Conference Proceedings. Tallahassee, FL: Tall Timbers Research Station and Land Conservancy: 7–10. Vol. 1. http://talltimbers.org/publications/tall-timbers-fire-ecology-conference-proceedings-volume-1/. (4 April 2018).
Leopold, A.S.; Cain, S.A.; Cottam, C.M. [and others]. 1963. Policies of park management. In: Wildlife management in the national parks. Advisory Board on Wildlife Management. U.S. Department of the Interior, Washington, DC. https://www.nps.gov/parkhistory/online_books/leopold/leopold5.htm. (5 November 2018).
NICC (National Interagency Coordination Center). 2018. Wildland fire accidents and fatalities by year. https://www.nifc.gov/safety/safety_documents/year.pdf. (5 November 2018).
NIFC (National Interagency Fire Center). 2009. Wildland fire use fires (1998–2008). https://www.nifc.gov/fireInfo/fireInfo_stats_fireUse.html. (4 April 2018).
NIFC (National Interagency Fire Center). 2017a. Federal firefighting costs (suppression only). https://www.nifc.gov/fireInfo/fireInfo_documents/SuppCosts.pdf. (4 April 2018).
NIFC (National Interagency Fire Center). 2017b. Total wildland fires and acres (1960–2016). https://www.nifc.gov/fireInfo/fireInfo_stats_totalFires.html. (4 April 2018).
NRFSN (Northern Rockies Fire Science Network). 2015. Fire history and fire ecology in Yellowstone—a field tour. http://www.nrfirescience.org/event/fire-history-and-fire-ecology-yellowstone-field-tour. (4 April 2018).
NWCG (National Wildfire Coordinating Group). 1995. Federal wildland fire management policy and program review. Boise, ID: National Interagency Fire Center. https://www.forestsandrangelands.gov/strategy/documents/foundational/1995_fed_wildland_fire_policy_program_report.pdf. (4 April 2018).
NWCG (National Wildfire Coordinating Group). 2001. Review and update of the 1995 federal wildland fire management policy. [Place of publication unknown]: [Publisher unknown]. 76 p. https://www.nifc.gov/PIO_bb/Policy/FederalWildlandFireManagementPolicy_2001.pdf. (4 April 2018).
NWCG (National Wildfire Coordinating Group). 2003. Interagency strategy for implementation of the Federal Wildland Fire Management Policy. [Place of publication unknown]: [Publisher unknown]. 57 p. https://www.sierraforestlegacy.org/Resources/Community/SmokeManagement/AirQualityPolicy/FedWldFireMgmtPolicy.pdf. (4 April 2018).
NWCG (National Wildfire Coordinating Group). 2018. Glossary of wildland fire management terminology. PMS–205. https://www.nwcg.gov/glossary/a-z. (4 April 2018).
OWNF (Okanogan–Wenatchee National Forest). 2011. Proposed action for forest plan revision. Portland, OR: USDA Forest Service, Pacific Northwest Region. 89 p. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5312322.pdf. (4 April 2018).
Pinchot, G. 1905 [reprinted 2005]. The use of the national forest reserves: regulations and instructions. Loveland, CO: Western Heritage Company. 142 p.
Pyne, S.J. [N.d.]. After the fire: the still small voice and the still burning landscape. Presentation, Public Education, National Fire Protection Association, Washington, DC.
Pyne, S.J. 2001. Year of the fires: the story of the great fires of 1910. New York, NY: Viking. 322 p.
Pyne, S.J. 2015. Between two fires: a fire history of contemporary America. Tucson, AZ: The University of Arizona Press. 552 p.
Reinhardt, E.D.; Keane, R.E.; Calkin, D.E.; Cohen, J.D. 2008. Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States. Forest Ecology and Management. 256: 1997–2006.
SNF (Salmon National Forest). 1988. Final forest land and resource management plan: fire planning and suppression. Salmon, ID: USDA Forest Service: IV-68–IV-71. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5310596.pdf. (4 April 2018).
Stoddard, Sr., H.L. 1962. Use of fire in pine forests and game lands of the Deep Southeast. In: Tall Timbers Fire Ecology Conference Proceedings. Tallahassee, FL: Tall Timbers Research Station and Land Conservancy: 31–42. Vol. 1. http://talltimbers.org/publications/tall-timbers-fire-ecology-conference-proceedings-volume-1/. (4 April 2018).
Truesdale, D.; Bradshaw, B.; Burgess, T. [and others]. 1995. Fire suppression costs on large fires: a review of the 1994 fire season. Washington, DC: USDA Forest Service, Fire and Aviation Management. 18 p.
USDA Forest Service. 2012. National Forest System land management planning. The Federal Register. 77(68): 21162–21276. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5362536.pdf. (4 April 2018).
USDA Forest Service. 2017. Forest Service hazardous fuels treatment acres accomplished by FY, region, and method. http://fsweb.wo.fs.fed.us/fire/fam/fuels/hazardous.html. (22 October 2018).
USDA/USDI (U.S. Department of Agriculture/U.S. Department of the Interior). 2001. Managing the impacts of wildfires on communities and the environment. Washington, DC: USDA/USDI. 35 p. https://clinton4.nara.gov/CEQ/firereport.pdf. (4 April 2018).
van Wagtendonk, J.W. 2007. The history and evolution of wildland fire use. Fire Ecology. 3(2): 3–17.

# The 1994 Guide Fire: A Tragedy Revisited

**Figure 1**—*Aldo Leopold Wilderness, McKnight Mountain, New Mexico. The wilderness area has an active program for using unplanned ignitions, helping to sustain a resilient and biodiverse landscape. Note the various vegetation types and stages, indicating staggered disturbance effects over time. Source: Forest Service, Wildernet; photo: R. Wilkerson.*

Since the 1990s, USDA Forest Service employees and leaders have taken steps to improve the agency's safety record (USDA Forest Service 2018), resulting in a declining number of fatalities since 2010. Yet wildland firefighter entrapments have persisted (NIFC 2018), despite the safety measures, safety training, and personal protective equipment adopted by the wildland fire community.

The single greatest common denominator for entrapments is the presence of firefighters on a particular fireground. That raises a policy question: Why and under what circumstances do fire managers try to control wildland fires?

## A CHANGING POLICY

Under Forest Service policy until the 1970s, the answer was simple: fire exclusion (Pyne 1982, 2015). With limited exceptions for prescribed fire, the Forest Service pursued a policy of suppressing every wildland fire by 10 a.m. on the morning after it was first reported.

**Evolving policy iterations directed that wildland fire will "as nearly as possible, be allowed to function in its natural ecological role."**

In 1968, the National Park Service adopted a policy of using lightning-ignited fires in fire-adapted ecosystems for ecological benefits, a practice known at the time as prescribed natural fire. In the early 1970s, the Forest Service pioneered similar programs in wilderness areas. In 1978, the agency replaced fire control altogether with a flexible policy of "appropriate suppression action," which could range from fully suppressing a fire to confining a fire in a certain place under certain conditions.

Depending on the circumstances, local land managers could now monitor a lightning-ignited wildland fire, using it for ecological benefits. Evolving policy iterations directed that wildland fire will "as nearly as possible, be allowed to function in its natural ecological role" (FEC 2009; NWCG 2001; WFLC 2003). Many national parks and wilderness areas have benefited as a result (Wells 2009).

## AVIATION FATALITIES

Beginning in the 1970s, the Forest Service developed a robust prescribed natural fire program in New Mexico's wilderness areas. To this day, the Gila National Forest has a powerful culture of using unplanned ignitions in its wilderness areas (Pyne 2015).

In June 1995, the Forest Service managed a lightning ignition in one of them, the Aldo Leopold Wilderness (fig. 1). The agency spent $100,000 to monitor the Bonner Fire, which burned 28,500 acres (11,500 ha) before rains finally extinguished the flames in July (Ganey and others 1996). The fire returned natural processes to high-elevation ecosystems that needed them in a successful instance of using unplanned ignitions for resource benefits.

A year earlier, however, the Forest Service decided to suppress another lightning fire in almost the same location (Ganey and others 1996). The

*Hutch Brown is the editor of Fire Management Today and a program specialist for the Forest Service, Office of Communication, Washington Office, Washington, DC.*

agency spent $7.5 million in trying to control the Pigeon Fire in 1994, an effort that ultimately failed. The fire burned 8,000 acres (3,200 ha) in the Aldo Leopold Wilderness before finally going out in July rains.

During the Pigeon Fire, lightning ignited another fire not far away in the same wilderness area. For unclear reasons perhaps related to the decision to suppress the Pigeon Fire, the Forest Service decided to attack what became known as the Guide Fire.

Ignited in the Black Range (a mountain range straddled by the Aldo Leopold Wilderness), the Guide Fire started on July 12, 1994, at an elevation of about 8,500 feet (2,600 m). The weather on that summer afternoon was hot and dry, with temperatures at about 90 °F (32 °C) (Rock FitzPatrick, n.d.). The fire was burning in tinder-dry fuels loosely described as "fir" and "pine" (Rock FitzPatrick, n.d.), probably mixed conifer, which has historically burned in fires of low to high severity at intervals ranging from 15 to 400 years (Hunter and others 2014). Located in a wilderness area, the site had no human habitations or other development anywhere nearby.

**The landing failed and the helicopter crashed, killing the pilot and two of the four firefighters aboard.**

The Forest Service dispatched a four-person helitack crew to begin suppressing the Guide Fire (Rock FitzPatrick, n.d.). A Bell 206 LIII initial-attack helicopter arrived over the fire at about 3 p.m. After assessing the fire, the helicopter pilot approached a helispot at an elevation of about 9,520 feet (2,900 m) in steep terrain about a quarter mile (0.4 km) away from the fire. The landing failed and the helicopter crashed, killing the pilot and two of the four firefighters aboard. Tragically, pilot Robert Boomer and firefighters Anthony Sean Gutierrez and Sam "Vinagron" Smith paid the ultimate price.

A summary of the incident in an agencywide compendium of aviation accidents from 1979 to 2000 attributed the accident to pilot error (Rock FitzPatrick, n.d.). The account was in the Forest Service tradition, in accident investigation reports, of focusing entirely on the particulars of an incident. It did not ask why a national forest with an active fire use program in the Aldo Leopold Wilderness decided to suppress the Guide Fire in the first place.

*In 1994, following the burnover of 14 firefighters on the South Canyon Fire, a helicopter drops off an investigation team. Photo: Steve Kautz, USDA Forest Service.*

## EXCEPTIONAL FIRE YEAR

However, the year of the Guide Fire was exceptional in the annals of wildland fire management. The number of wildland firefighter fatalities in 1994 reached 35, more than in any year since 1910 (NIFC 2016). The U.S. Fire Administration attributed the unusually high number of fatalities to "elevated fire severity and frequency" (TriData Corporation 1995):

> In 1994, the weather conditions were unusually dry in the western United States and the fire season was described as the worst on record in terms of the number of fires and, particularly, the number of large fires that occurred. These fires caused tens of thousands of firefighters to be deployed to an estimated 74,000 fires over a five-month period, including more than 100 that were described as major fires. The number of fires and the commitment of resources to attempt to control them were estimated as four to five times greater than most years.

A week before the Guide Fire, a wildfire blowup on Storm King Mountain in Colorado had caused 14 firefighter fatalities. With resources overextended on other fires, the small South Canyon Fire had slowly backed downhill for days before initial attack could begin, contributing to conditions that caused the blowup (Butler and others 2001).

Alarmed by the number of firefighter fatalities—and by the exceptionally high number of large fires that year (Truesdale and others 1995)—officials might have discouraged fire use anywhere, including in New

**The Guide Fire was in a remote wilderness area with fire-adapted ecosystems and nothing obvious to protect, other than the lives of the firefighters themselves.**

Mexico's wilderness areas. In a similar situation in 2012, the Forest Service's Deputy Chief for State and Private Forestry, anticipating a severe fire season and seeking to focus the Forest Service's limited resources on wildland firefighting, sent out an agencywide "2012 Wildfire Guidance" letter forbidding the use of unplanned ignitions except as approved by a Regional Forester (Hubbard 2012).

## A FATEFUL TRAGEDY

Conditions in 1994, especially following the South Canyon tragedy, might have contributed to the decision to suppress the Guide Fire. By contrast, conditions in 1995 again allowed for the use of unplanned ignitions in the Aldo Leopold Wilderness. Alternative fire management approaches in the same area in consecutive years had strikingly different outcomes.

In the same area as the 1994 Pigeon Fire, the use of a natural ignition on the Bonner Fire a year later was cheaper and more effective than wildland fire suppression. Using a wildland fire rather than suppressing it restored the benefits of fire to more than three times the land area at a tiny fraction (1.3 percent) of the total cost. Moreover, the decision to suppress the Guide Fire inadvertently contributed to a tragedy that cost three firefighters their lives.

Accordingly, the Guide Fire might hold a safety lesson for the Forest Service along the lines of the agency's Life First engagements (USDA Forest Service 2018). In 2018, in the spirit of Life First, Forest Service Chief Vicki Christiansen directed fire personnel "to 'stop, think and talk' before 'acting' in any circumstance that may represent unnecessary exposure" (Christiansen 2018). Under some circumstances, suppressing a wildland fire rather than managing it for resource benefits—*if* line officers have the decision space necessary, which they often do not under their land and resource management plans—"may represent unnecessary exposure." Indeed, it might be the riskiest and most expensive decision that fire managers can make.

## LITERATURE CITED


Butler, B.W.; Bartlette, R.A.; Bradshaw, L.S. [and others]. 2001. The South Canyon Fire revisited: lessons in fire behavior. Fire Management Today 61(1): 14–20.

Christiansen, V. 2018 (2 April). Letter to Regional Foresters, Station Directors, IITF Director, Deputy Chiefs, and WO Directors. Chief's letter of intent for wildland fire – 2018. On file with Office of Communication, Washington Office, Washington, DC.

FEC (Fire Executive Council). 2009. Guidance for implementation of the Federal Wildland Fire Policy. Washington, DC: Fire Executive Council. 20 p.

Ganey, J.L.; Block, W.M.; Boucher, P.F. 1996. Effects of fire on birds in Madrean forests and woodlands. In: Ffolliott, P.F.; DeBano, L.F.; Baker, Jr., M.B. [and others], tech. coords. Effects of fire on Madrean Province ecosystems: a symposium proceedings. Gen. Tech. Rep. RM–GTR–289. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station: 146–154.

Hubbard, J. 2012 (25 May). Letter to Regional Foresters, Station Directors, Area Director, IITF Director, Deputy Chiefs and WO Directors. 2012 wildfire guidance to Regional Foresters, Station Directors, Area Director, IITF Director, Deputy Chiefs and WO Directors. On file with: Policy Analysis Staff, Forest Service, Washington Office, Washington, DC. https://www.documentcloud.org/documents/407523-2012-wildfire-guidance-memo-may-25.html. (5 October 2017).

Hunter, M.E.; Iniguez, J.M.; Farris, C.A. 2014. Historical and current fire management practices in two wilderness areas in the southwestern United States: the Saguaro Wilderness Area and the Gila-Aldo Leopold Wilderness Complex. Gen. Tech. Rep. RMRS–GTR–325. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 38 p. https://www.fs.fed.us/rm/pubs/rmrs_gtr325.pdf. (12 April 2018).

NIFC (National Interagency Fire Center). 2018. Wildland fire fatalities by year. Boise, ID: National Interagency Fire Center. 23 p. https://www.nifc.gov/safety/safety_documents/Fatalities-by-Year.pdf. (25 October 2018).

NWCG (National Wildfire Coordinating Group). 2001. Review and update of the 1995 federal wildland fire management policy. Boise, ID: National Interagency Fire Center. 76 p.

Pyne, S.J. 1982. Fire in America: a cultural history of wildland and rural fire. Seattle, WA: University of Washington Press. 654 p.

Pyne, S.J. 2015. Between two fires: a fire history of contemporary America. Tucson, AZ: The University of Arizona Press. 512 p.

Rock FitzPatrick, C.S., comp. [N.d.]. Bell 206LIII, July 12, 1994, Southwest Region. In: USDA Forest Service fatal aviation accident history (1979–2000). Washington, DC: USDA Forest Service, Fire and Aviation Management: 69–71. http://www.fs.fed.us/fire/av_safety/assurance/mishaps/fatal_aviation_accident_history.pdf. (5 October 2017).

TriData Corporation. 1995. Analysis report on firefighter fatalities in the United States in 1994. Arlington, VA: TriData Corporation; final report; contract no. EMW–95–C–4713. Submitted to: United States Fire Administration, Federal Emergency Management Agency, Washington, DC. 64 p. https://www.usfa.fema.gov/downloads/pdf/publications/ff_fat94.pdf. (5 October 2017).

Truesdale, D.; Bradshaw, B.; Burgess, T. [and others]. 1995. Fire suppression costs on large fires: a review of the 1994 fire season. Washington, DC: USDA Forest Service, Fire and Aviation Management. 18 p.

USDA Forest Service. 2018. The USDA Forest Service's safety journey: 1994–2008. Communication aid. 12 p. Unpublished paper on file with the USDA Forest Service, Washington Office, Office of Communication, Washington, DC.

Wells, G. 2009. Wildland fire use: managing for a fire-smart landscape. Fire Science Digest. Boise, ID: Joint Fire Science Program. 4 (January): 1–11.

WFLC (Wildland Fire Leadership Council). 2003. Interagency strategy for implementation of the Federal Wildland Fire Management Policy. Washington, DC: Wildland Fire Leadership Council. 57 p.

# Fuel Breaks Work in Colorado

*Fuel breaks on the White River National Forest in Colorado protected homes in the community of Silverthorne, CO, during the Buffalo Fire in June 2018. Photo: USDA.*

When the Buffalo Fire in Colorado sparked on the White River National Forest on June 12, 2018, the flames stopped short of nearly 1,400 residences near Silverthorne, CO.

Two mountain subdivisions were threatened by catastrophe. It wasn't just the air support from firefighting helicopters and airtankers and more than 150 firefighters on scene that helped save the communities. Part of the success was due to proactive work over the last decade to build fuel breaks and reduce hazardous fuels where homes meet wildlands—the wildland–urban interface.

Bill Jackson, a district ranger for the Forest Service on the White River National Forest, listed the benefits from the work: "The fuel breaks reduced the number of trees available to burn next to homes; gave firefighters safe spots to aggressively fight the fire; and provided for effective fire retardant drop zones. Without the proactive forest treatments, we likely would have lost homes."

> **"Without the proactive forest treatments, we likely would have lost homes."**
>
> –Bill Jackson, district ranger

The fuel breaks are open spaces 300 to 500 feet (90–150 m) wide, where lodgepole pines killed by mountain pine beetle had stood, ripe for ignition. Separating the subdivisions from the surrounding forest, the fuel breaks were built as part of larger proactive forest management programs in Colorado's Summit County and throughout the watershed around the Dillon Reservoir.

"Wildfires don't know boundaries," said Christina Burri, watershed scientist

---

*At the time this article was written, Holly Krake was the acting regional press officer for the Forest Service, Rocky Mountain Region, Lakewood, CO.*

*Airtanker pilots were able to effectively drop fire retardant (pink foreground) while ground crews used the fuel breaks as a safe place to engage the Buffalo Fire near Silverthorne, CO, on June 13, 2018. Photo: USDA.*

**The fuel breaks are open spaces 300 to 500 feet wide, where lodgepole pines killed by mountain pine beetle had stood, ripe for ignition.**

for Denver Water, "so when it comes to forest management in Denver Water's priority watersheds, we take an all-hands, all-lands approach. By partnering with all the landowners, from Federal, State, local, and private, we're able to better protect all of our interests from catastrophic wildfires and extend our investment and reach throughout the entire area."

One such partnership is the From Forests to Faucets program, a forest management partnership created in 2010 between Denver Water and the Rocky Mountain Region of the Forest Service. Since 2010, Denver Water and the Forest Service have invested about $33 million in treatments across 70,000 acres.

According to Jackson, "From Forests to Faucets helps us identify areas where we have common interests in limiting high-intensity wildfires and improving forest and watershed health. The partnership helped us stretch our funds to treat more acres in Summit County."

In this case, the Forest Service was able to invest in 900 acres (364 ha) of hazardous fuels-reduction projects next to the Wildernest and Mesa Cortina neighborhoods above Silverthorne, projects that saved an estimated $913 million worth of homes and infrastructure from the Buffalo Fire.

The Colorado State Forest Service and the Natural Resources Conservation Service joined From Forests to Faucets in 2017 to allow forest managers to take even more of an "all-hands, all-lands" approach. Funds will go to forest treatments on nonfederal and private lands as well as on national forests.

*A helicopter drops water to cool off hot spots at the edge of a fuel break on the Buffalo Fire, June 12, 2018. Photo: USDA.*

*A large smoke column builds over the Methow Valley from a type 1 incident, which compounded problems with the availability of resources following a lightning bust on August 11, 2018. Photo: USDA Forest Service.*

# Wildfire Run Halted by Proactive Fuels Treatments

To firefighters and communities across the West, the words "Red Flag Warning" mean trouble, with extreme fire behavior from a combination of warm temperatures, very low humidities, and strong winds. Existing wildfires might make large runs into unburned areas and increase the risk to firefighters, and any new ignitions can quickly turn into the next large wildfire to threaten a community. In other words, a Red Flag Warning spells trouble with a capital T.

**What made the difference? Proactive hazardous fuels reduction on nearby national forest lands.**

Yet in a small community nestled in the dry forests of the eastside Cascade Mountains, two Red Flag Warnings within a week didn't result in a single home lost or in unacceptable risk to firefighters, despite a 4,000-acre (1,600-ha) wildfire burning just north of Winthrop, WA.

What made the difference? Proactive hazardous fuels reduction on nearby national forest lands.

"Since 2004, we've been proactively thinning and burning strategic areas north of Winthrop to reduce risk and help restore the forest," said Matt Ellis, a district fire management officer with the Okanogan–Wenatchee National Forest. "These efforts were tested and tried in a critical 24-hour period as the McLeod Fire threatened to race down a critical drainage and into folks' backyards. Instead of 100-foot [30-m] flames, the fire laid down to just a few feet—we caught and held it there."

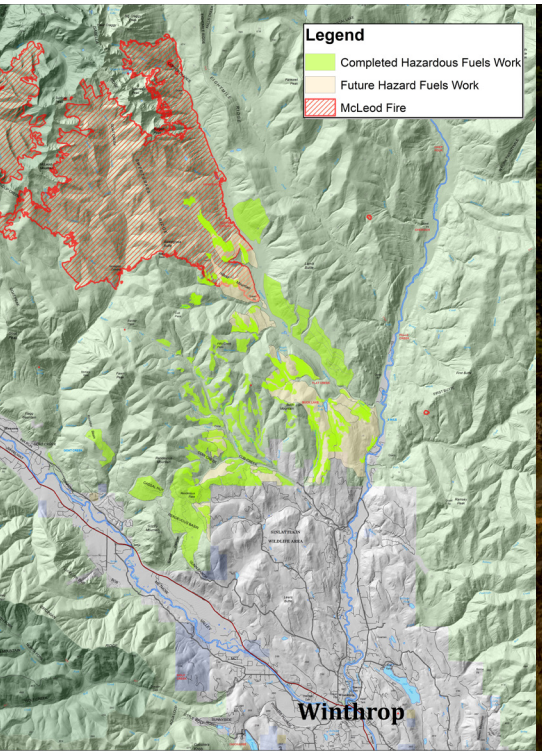
But the story started with all the elements of a looming disaster:

- Heavy dead and down timber,
- Rugged terrain,
- Very limited crew availability, and
- A big "lightning bust" (multiple "dry lightning" strikes from a storm with little or no rain reaching the ground).

In fact, during Red Flag conditions on August 11, 2018, a lightning bust resulted in 21 new fire starts in the Methow Valley on the Okanogan–Wenatchee National Forest. Firefighters suppressed 17 of the starts within 48 hours, but 4 fires quickly grew together in rugged fuel-heavy terrain to become the McLeod Fire. By August 16, the fire had grown to nearly 4,000 acres (1,600 ha) and was threatening to run down a drainage into the community of Winthrop. A second Red Flag Warning came in the next 24 hours, and the fire more than doubled in size as it pushed down the drainage, driven by winds blowing at 30 miles per hour (48 km/h).

Driving along the edge of the fire area in his pickup, Ellis pointed out the green canopy and large trees still intact. "Ground crews were successful in making a stand along containment lines anchored into more than 2,700 acres [1,100 ha] of hazardous fuel treatments," he noted. "We knew the chance of success was high while

*Holly Krake is the public affairs officer for the Forest Service, Okanogan–Wenatchee National Forest, Wenatchee, WA.*




*Previous thinning and prescribed fire work (green on left, photo on right) on the Okanogan–Wenatchee National Forest allowed firefighters to hold the McLeod Fire (red lines on left) and keep it from threatening the community of Winthrop, WA (gray on left), in August 2018. Source: left—Tom Delph, USDA Forest Service; right—Kari Greer, USDA Forest Service.*

the risk to firefighters was less. These treatments gave us the margin to have the right plan at the right place for the right reasons."

As of late October 2018, the fire remained held along containment lines 11 miles (18 km) from the community of Winthrop.

The fuels treatments were an integral part of the Okanogan County Wildfire Protection Plan to create cross-boundary defensible space and reduce wildfire risk. Since 2004, 2,700 acres (1,100 ha) of National Forest System lands in the area have been thinned and/or burned for as little as $100 per acre. This represents a good return on investment in mitigating wildfire risk and increasing safety. As of October 2018, the McLeod Fire had cost more than $14 million to suppress—a cost that likely would have been much higher without the investment in hazardous fuels treatments.

*A crew of firefighters on the McLeod Fire on August 22, 2018. Firefighters were exposed to less risk due to decreased fire behavior and lower rate of spread as a result of years of proactive thinning and prescribed fire (the open area to the right of the group). Photo: Kari Greer, USDA Forest Service*

*Tom Vail from Cisco Systems setting up a wireless access point on the Rattlesnake Fire in Arizona. Photo: Donavan Albert, USDA Forest Service.*

# Technology Use on Wildfire: Case Study on the Rattlesnake Fire

The need for modern technology in wildland fire management grows every day with each new incident. Keeping up with new technology advances as well as providing a portable, solid, yet adaptive and responsive information technology (IT) network at the incident command post can be challenging, especially in remote environments. Although IT support is critical to the success of incident management teams in supporting firefighters on the ground, the role of an IT support specialist (ITSS) can go unnoticed unless technology issues or problems arise.

## IT SUPPORT TEAM

Serving as an ITSS on a fire management team is not just about being technically savvy. It is more about being a collaborative, resourceful, and technically fluent member of a highly responsive, goal-oriented team. It's about knowing where, how, and whom to reach out to for timely assistance, if needed.

**No one IT specialist has the answers to every solution, contrary to the expectations of many.**

Contrary to expectations, IT specialists do not have technical solutions to every business need. But having the skills to rapidly know how to exploit and leverage technology to its fullest extent is a huge bonus. The ITSS's responsibilities range from defining a management team's IT strategy for an incident to providing timely, tactical technology solutions throughout the entire fire assignment, often working 16-hour days for 14 days straight. So the demands can be intense.

## THE RATTLESNAKE FIRE

The Rattlesnake Fire began on April 11, 2018, about 25 miles (40 km) southwest of Alpine, AZ. The fire burned through forest litter and dead and downed fuels, mostly ponderosa pine. As of May 7, the fire was 90 percent contained after burning more than 26,000 acres (10,400 ha) on the Apache–Sitgreaves National Forest, San Carlos Apache Reservation, and White Mountain Apache Reservation.

The fire challenged the incident management team in many ways, especially in the arena of IT. Factors that made the incident especially complex included:

- The remoteness of the incident command post location at Josh Ranch on the Apache–Sitgreaves National Forest;
- The lack of team-networking equipment;
- The involvement of three host agencies;

*Donavan Albert, the national web manager for the Forest Service, Office of Communication, Washington Office, Washington, DC, has served as an incident technology support specialist for incident management teams throughout the Nation, but most recently in the Southwest for more than 10 years.*

*(left) Team 5's e-Isuite server, CradlePoint router, and Network Attached Storage. (right) The laptop was used every morning to livestream the morning briefing to key stakeholders. Photos: Donavan Albert, USDA Forest Service.*

- A couple of remote spike camps;
- Drive times of 4 to 5 hours to get from one side of the fire to the other;
- Weather conditions that ranged from high wind to snow; and
- Wildlife such as elk and deer all over the road system, especially at dawn and dusk.

## ACHIEVING IT GOALS ON THE FIRE

Due to the remoteness of the fire and the size of its perimeter, the team's incident commander and plans section chief expressed a couple of visionary IT goals:

1. Remote database connectivity so that team members who were not at the incident command post could process and view incident data remotely; and
2. A live video stream of the morning and afternoon fire briefings.

Achieving both of these goals greatly helped reduce drive times for agency administrators, incident management team members, and firefighters, thereby reducing the risk associated with driving in remote, wildlife-inhabited areas. There were also efficiency gains when the team enabled remote access, eliminating the need for a paperwork courier or for requiring firefighters to make a 5-hour drive to the incident command post.

**The Rattlesnake Fire provided plenty of opportunities for improving the quality of IT services on incidents.**

To establish a solid network infrastructure at the incident command post, Cisco Tactical Operations was invited to come out to Josh Ranch to demonstrate its latest network technology. Within 36 hours, a systems engineer from Cisco arrived, tent in hand. He stayed two nights at Josh Ranch, helping to deploy the latest wireless technology for the team to use. The team returned the equipment in Phoenix, AZ, following its 14-day assignment on the fire.

The team also leveraged WebEx (web conferencing software) as a way to make the fire briefings available through a live video stream. Every day at 7 a.m. and 6 p.m., agency administrators, Tribal representatives and members at the San Carlos Apache Reservation, the incident business advisor, and others participated in these meetings without having to be physically at the incident command post.

## BUILDING ON SUCCESS

One of the most important takeaways from this incident is the goal of building incrementally on each technology success. The Rattlesnake Fire provided numerous opportunities for improving the quality of IT services on incidents, especially for incidents where firefighters and team members are geographically dispersed. By identifying areas in need of further improvement through additional planning or testing, the team will be prepared for the next "roll," wherever that may be.


*Rescue equipment acquired in 2016 by the Sundown Volunteer Fire Department through a grant for $15,000 from the Rural Volunteer Fire Department Assistance Program. Photo: Texas A&M Forest Service.*

# Texas A&M Forest Service: Building Capacity at Local Fire Departments

**Texas A&M Forest Service offers an aggressive suite of programs aimed at building the capacity of local volunteer fire departments.**

There's a little bit of everything inside the 268,597 square miles (695,663 km$^2$) of Texas landscape. With sizable metropolises, large trade corridors, competitive ports, 130 million acres (52.6 million ha) of farmland and ranchland, and over 28 million people scurrying about some of the most varied geography in the country, it's easy to say that the emergency response needs of the State are diverse.

Fortunately, Texas recognizes that the volunteer fire department is the front line of defense for all-hazard emergency response. As such, Texas A&M Forest Service offers an aggressive suite of programs aimed at building the capacity of local fire departments through training, equipment, grants, and insurance.

## RURAL VOLUNTEER FIRE DEPARTMENT ASSISTANCE PROGRAM

The most widely used assistance program administered by Texas A&M Forest Service is the Rural Volunteer Fire Department Assistance Program. Commonly known as "2604" (after the House Bill under which it passed during the 2001 Texas legislative session), the Rural Volunteer Fire Department Assistance Program awards cost-share grants to help volunteer and eligible combination fire departments purchase firefighting vehicles, fire and rescue equipment, protective clothing, and dry-hydrants. The grants also help cover the purchase of library materials and training aides and tuition related to recognized training programs, such as the wildland fire academies hosted by Texas A&M Forest Service and the annual fire training schools put on by Texas A&M Engineering Extension Service.

The program is funded primarily through an assessment on certain property and casualty insurance providers licensed by the Texas Department of Insurance. Funding is supplemented by Volunteer Fire Assistance grants from the USDA Forest Service. From its inception in September 2002 through March 2018, the assistance program funded over 30,000 requests totaling almost $258 million. Of the funded requests:

*Jason Keiningham is head of the Capacity Building Department, Texas A&M Forest Service, College Station, TX.*


*Texas A&M Forest Service presenting the Galena Park Volunteer Fire Department with funds from the Rural Volunteer Fire Department Assistance Program to help acquire a new pumper/tender. Photo: Texas A&M Forest Service.*

- 1,816 were for firefighting apparatus;
- 4,662 were for fire and rescue equipment such as slip-on units, self-contained breathing apparatus, and extraction equipment;
- 4,351 were for structural and wildland personal protective equipment;
- 1,323 were for library materials and training aides; and
- 20,568 went toward training tuition for 76,287 firefighters.

In 2016, Texas A&M Forest Service added an all new element to the Rural Volunteer Fire Department Assistance Program by offering a $20,000 grant toward slip-on units for departments that received a 2.5-ton-cargo, a 5-ton-cargo, or a tractor-style U.S. Department of Defense Firefighter Property Program truck. This element launched in 2016, during which 95 such grants have been awarded (included in the tally of awarded fire and rescue equipment shown above).

## ADDITIONAL PROGRAMS

The Rural Volunteer Fire Department Assistance Program and the Firefighter Property Program make up the bulk of assistance awarded to volunteer fire departments in Texas, both in number of requests and in value. However, Texas A&M Forest Service has six additional programs to assist in building capacity for Texas fire departments.

**The most widely used assistance program administered by Texas A&M Forest Service is the Rural Volunteer Fire Department Assistance Program.**

The Texas Intrastate Fire Mutual Aid System (TIFMAS) Grant Assistance Program awards reimbursement grants to career fire departments and to combination departments not eligible for assistance under 2604. The program delivers $1 million in grant assistance annually, with $800,000 dedicated to TIFMAS vehicles and $200,000 to training tuition grants.

The Helping Hands Program allows donations of gently used fire and rescue equipment, fire trucks, and other items. The State makes the items available to fire departments while providing liability relief to the donor. Since 1997, the Helping Hands Program has received over $42.8 million in donated equipment from 802 generous donors. Through their donations, 27,474 requests were filled as of March 2018.

Texas A&M Forest Service also has the Fire Safe Program and the Fire Quench Program. Through these programs, fire departments are able to purchase personal protective clothing, water handling equipment, and class A foam at discounted rates.

The agency also provides assistance to fire departments in the form of vehicle insurance. Nonprofit volunteer fire departments operated by members are eligible for insurance on their vehicles through Texas A&M Forest Service's Motor Vehicle Self Insurance Program. Coverage is at levels of $100,000 per person for bodily injury, with a maximum of $300,000 per



*(left) Military truck acquired by the Cameron Volunteer Fire Department through the Firefighter Property Program and converted with assistance from the Rural Volunteer Fire Department Assistance Program. (right) Five-ton military truck acquired by the Panhandle Volunteer Fire Department through the Firefighter Property Program and converted with assistance from the Rural Volunteer Fire Department Assistance Program. The department chose the color scheme to match the local school colors. Photo: Texas A&M Forest Service.*

**For over 60 years, Texas A&M Forest Service has partnered with the USDA Forest Service to transfer excess U.S. Department of Defense property to emergency service providers.**

occurrence; and $100,000 for property damage, with a maximum of $100,000 per occurrence. This program has saved volunteer fire departments in Texas an estimated $3 million in premiums since 1995.

The Rural Volunteer Fire Department Insurance Program, created in 2001 by the 77th Texas Legislature, is funded by a 2-percent sales tax on the sale of fireworks. This program provides reimbursement grants for Texas firefighters to obtain workers' compensation and death and disability insurance from private insurance companies. The program reimburses 100 percent of the cost of eligible insurance coverage up to a yearly maximum of $125 per covered fire department member. Each year, more than 600 fire departments and 14,000 firefighters take advantage of the program.

## LONG-TERM PRIORITY

Population growth, changes in land use, and unmitigated fuel loads from recent drought conditions have led to increased wildfires, 80 percent of which burn within 2 miles (3.2 km) of a community. Texas fire departments are the primary emergency response providers for more than 85 percent of the state. For that reason, Texas A&M Forest Service's work to protect lives and property through building the capacity of the local fire departments is and will remain a priority for years to come.

*Randall Thomas in a Bell 206 Jet Ranger helicopter while he was on the National Park Service helitack crew at the Ash Mountain helibase outside of Three Rivers, CA, in the summer of 1985. Photo: Randall Thomas, USDA Forest Service.*

# The Huey on the Hill

During the summer of 1986, I was a young and energetic firefighter working for the National Park Service in central California in the Sierra Nevada. I was on a prescribed burn crew. The previous year, for the National Park Service, I had been on a helitack crew (also described as a helicopter initial attack crew, used to transport people and crews to a fire). On my days off in 1986, I would help out the helicopter crew, and my overtime and hazard pay would help pay for college in the fall, with money left over to help repair my 1969 Mustang (always heavily on my mind).

## ACCEPTING RISK

On July 4, 1986, I had a very interesting experience. Three of us plus the pilot lifted off in a helicopter from the heliport to respond to a fire reported to be only a few minutes away. A fellow helicopter crew member and I were assigned to initial attack on the fire under the direction of the flight manager. The helicopter we were in was a Bell UH–1, nicknamed "Huey."

**Upon later reflection, I concluded that I could have refused to take the risk of walking uphill in front of the Huey.**

As we approached the fire, we were facing a steep and challenging slope. The helicopter pilot did what's called a toe-in, putting the front of the skids against the angled slope and trying to hold the ship in that position, in a hover, while maintaining clearance for the main rotor blades from the steeply angled slope. My coworker exited the helicopter on the left side and slipped down the slope parallel to but not in the path of the tail rotor.

I was sitting in the back on the right side of the helicopter, and I was ordered to exit and walk around the front of the helicopter on the uphill side, under the spinning rotor blades. As I did so, I could see the flight manager give me some type of hand signal, looking me straight in the eye with a glare. In my training, I had been taught to make eye contact with the pilot whenever near the front of the helicopter, and the flight manager was seated next to the pilot, so

*Randall Thomas is the lead fire dispatcher for the Forest Service at the Coeur d'Alene Interagency Dispatch Center in Hayden, ID, currently on detail in the supervisor's office of the Idaho Panhandle National Forests, Coeur d'Alene, ID.*

I paused to try and understand what he was communicating to me.

Then I continued walking around to the left side of the helicopter, where I unloaded some firefighting gear, chainsaws, and equipment, and we started to make a helispot. Other folks hiked in from a road, probably about a 45-minute hike.

Soon, a Bell Jet Ranger, the park helicopter, came over the fire. There was still not enough open area to land, so a park employee jumped off the helicopter when the skids were a few feet off the ground. After a while, the landing zone was cleared, and other firefighters were shuttled in by the Huey. Within one operational period, the fire was under control and the initial attack operation had succeeded.

Upon later reflection, I concluded that I could have refused to take the risk of walking uphill in front of the Huey. I accepted the risk to my personal safety because I felt the need to complete the mission. Also, the flight manager had asked me to do it, and I wanted to meet the challenge and prove myself to be a can-do kind of guy.

## BETTER MANAGING RISK

Many of the safety problems that we encountered during this aerial initial attack could have been prevented if we had used the Incident Response Pocket Guide (IRPG) we have today for wildland fire suppression and aviation operations. Published by the National Wildfire Coordinating Group, the IRPG contains phrases and examples that can help in understanding the incident I described.

Before liftoff from the helipad, we could have done a quick briefing checklist. The area we were going to was just a few miles from the heliport, the flight manager had good knowledge of the local area, and he knew the terrain very well. The IRPG section called "Situation Terrain Influences" would have played a major role in the safety of our operation.

Once over the fire, we should have taken risk management more seriously. A steep slope on a hillside with heavy vegetation hampered our access. The IRPG outlines Aviation Watch Out situations, many of which were overlooked.

**The Incident Response Pocket Guide requires an after-action review, and we never really had one.**

For example, the Watch Outs include "Was this flight necessary?," "Are any guidelines being ignored or policies being broken?," and "Is there a better way to do it?" It took a ground crew only about 45 minutes to hike into the location. Once on the scene, the ground troops alone could have safely built a good landing zone in plenty of time for helicopter shuttling operations and then started initial attack.

The IRPG asks, "Are you driven by an overwhelming sense of urgency?" Yes, we were. It was the Fourth of July, and our fire managers wanted to use plenty of resources to quickly suppress any fires on a high-profile holiday, with the fire danger it entailed. I watched my coworker slip and fall downslope after he exited the helicopter. I wanted to offload equipment so we could make a good landing zone and start initial attack, and I assumed that my coworker was not seriously hurt, but in retrospect I am not sure how I could be so certain.

The IRPG requires an after-action review, and we never really had one. A few days later, I asked the flight manager what he had been trying to convey to me while I was walking uphill around the front of the helicopter. He had been trying to tell me to keep my head down. I was crouched down, but he thought I might stand up and get hit in the head by the spinning rotor blades. He said it was good helicopter crew member training that kept me safely crouched down.

## AVOIDING NEEDLESS RISK

In conclusion, some people tell stories of facing unsafe situations, walking away unscathed, and seeming proud of it (even when they say they will never do it again). Not me. I made a foolish decision. I was part of an event in which people took unnecessary risk and did not take the time to carefully analyze the risk and the ramifications of their actions.

If you are going to be involved in fire and aviation management, pay attention to your IRPG and other safety manuals. It only makes sense. As it states in the IRPG under "Integrity": "Set the example. Choose the difficult right over the easy wrong." ■

# This Day in History: Cramer Fire, 22 July 2003

**Editor's note:** The piece is adapted from 6 Minutes for Safety, a program and website managed by the 6 Minutes for Safety Subcommittee under the guidance of the NWCG Risk Management Committee. "This Day in History" is a brief summary of a powerful learning opportunity and is not intended to second-guess or judge decisions and actions.

Put yourself in the following situation as if you did not know what the outcome would be. What are the conditions? What are you thinking? What are *you* doing?

## INCIDENT SUMMARY

In 2003, central Idaho, including the Salmon–Challis National Forest, has been in a 4-year drought. Spring and summer rainfall has lagged.

A fire is reported on July 20 at 4:30 p.m. in the area of Cramer Creek, a steep and arid drainage into the nearby Salmon River.

Jumpers size up the Cramer Fire at 3 acres (1.2 ha), with high spread potential. High winds keep them from engaging the fire.

Firefighters are flown into a helispot (H–1) on a ridge sloping down toward the Salmon River between the Cramer drainage and the Cache Bar drainage to the west. Due to fire behavior, the firefighters don't engage the fire. The fire burns actively until 2:30 a.m. on July 21.

By morning, the fire has spread over 35 acres (14 ha).

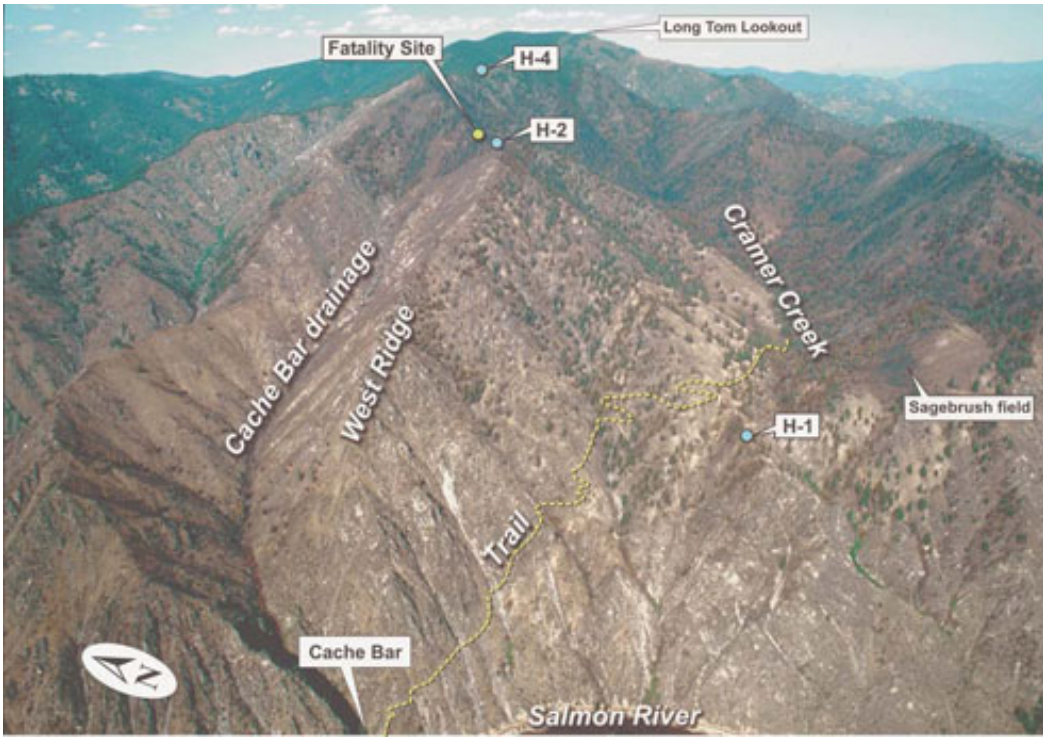
In addition to other air and ground resources, the Indianola helicopter H193 and helitack crew report to the fire on July 21 at 3:15 p.m. By 5:52 p.m., the fire is at 200 acres (80 ha).

At 8 p.m., the fire intensity is reported to be low; due to a thermal belt, however, the fire burns actively until 3 a.m. on July 22.

At around 9:30 a.m. on July 22, H193 rappels two helitack firefighters into a new helispot (H–2) up the ridge from H–1. Air attack reports that the fire perimeter is now over the ridge and in the Cache Bar drainage. The fire is now on both sides of the ridge that the helispots are on, with fire active below H–1.

At H–2, the two helitacks are falling large trees to clear room for medium helicopters ordered for a crew shuttle.

At 11:27 a.m., H193 transitions to bucket work on H–1. Minutes later, the firefighters on H–1 pull back and retreat down a trail toward the Salmon River. Within 20 minutes, H–1 is burned over. Fire activity is reported as intense.




*Topography of the Cramer Fire tragedy on the slopes of Long Tom Mountain overlooking the Salmon River in central Idaho. The fatal burnover occurred on July 22, 2003, near H–2. The fire began on July 20 in the Cramer Creek drainage, then spilled over West Ridge into the Cache Bar drainage to the west, where flames later sped uphill and overran H–2. Source: Cramer Fire Accident Investigation Report.*

By 2:30 p.m., the fire in the Cache Bar drainage, having spilled over from the Cramer Creek drainage, has become an active fire front. At 2:47 p.m., plans are made to remove the helitack crew from H–2.

At 3 p.m., the fire on both sides of the ridge begins to spread rapidly. Both helicopters assigned to the fire are at the helibase 15 minutes away for refueling and maintenance when the helitacks call for an immediate pick up.

At 3:05 p.m., they call again for immediate pickup. At 3:09 p.m., they call for immediate pickup and report that they are fine but taking a lot of smoke. At 3:13 p.m., the helitacks report fire and smoke below them and request immediate pickup.

At 3:19 a.m., the helitacks contact the helibase, asking about the status of the helicopter. Arriving at the fire, the helicopter is unable to land due to smoke.

Both rappellers leave H–2 at 3:20 p.m. At 3:24 p.m., the Cache Bar drainage is fully engulfed in fire. The rappellers make a final call for immediate pickup … both die soon thereafter.

## HISTORY

The Salmon River Breaks in central Idaho, including the Salmon–Challis National Forest, have a long history of entrapping firefighters: 161 to date. Steep slopes predispose the area to rollout and rapid uphill fire growth, commonly leading to extreme fire behavior and difficult conditions for suppression.

*How can information about an area's fire history help your situational awareness?*

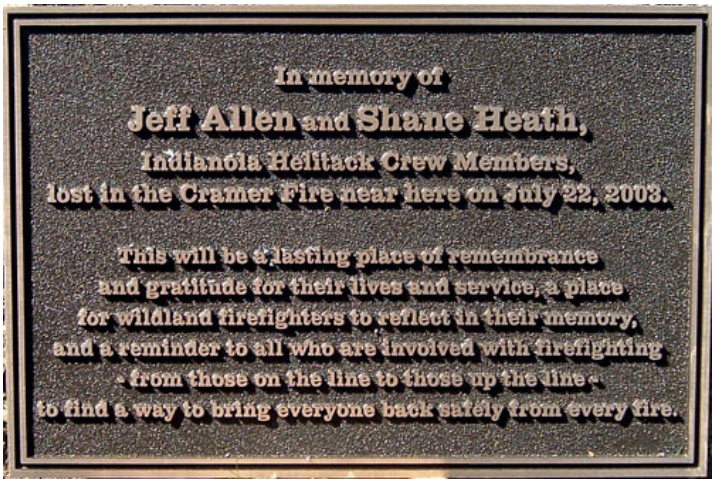
## SIZEUP

On July 22, crews are informed at the morning briefing that conditions will be getting progressively warmer and drier than on previous days. Temperatures surpass 100 °F (38 °C) and set record highs. Relative humidities are 10 to 15 percent.

Fuels in the Cache Bar drainage are short grass on the south aspects and nearly continuous fields of ceanothus on the north. Live fuel moistures are critically low and the Burn Index and Energy Release Component indicate dangerous conditions.

*Based on the predicted weather and the fire information above, what are your concerns?*

*How could you and your crew safely engage a fire in a similar situation?*




## LOOKOUTS, COMMUNICATIONS, ESCAPE ROUTES, SAFETY ZONES

**L**—The investigation report states that there were no effective lookouts for the rappellers at H2. It is not uncommon to assign small squads to isolated tasks such as cutting helispots. The rappellers on H2 were clearing large trees to make a larger helispot.

*How would you and your crew maintain situational awareness of the fire and the felling operation at the same time?*

**C**—The rappellers were made aware of the low-intensity fire in the Cache Bar drainage as soon as they were dropped off. However, the development of an active fire front in the Cache Bar drainage was observed by the leadplane and air attack 50 minutes before the fire reached H–2, yet it was never communicated to them.

*What will you and your crew do during any fire assignment to get accurate information about current fire behavior?*

**E and S**—There were no effective safety zones for the rappellers at H–2. After H–1 below them burned over, the only way out was a helicopter.

Helicopters have become a common resource on fires, transporting firefighters to and from remote locations as well as delivering food, water, supplies, and medevac.

*What would you do if the helicopter couldn't come? Discuss why depending on helicopters as an escape route is a bad idea.*

## INCIDENT COMPLEXITIES

On any incident, firefighters may or may not be aware of problems with incident management effectiveness, adequacy of resources, and other big-picture details.

*Discuss how you and your crew will maintain safety without knowing these things.*

## REFERENCES

USDA Forest Service. 2003. Accident investigation factual report: Cramer Fire fatalities, North Fork Ranger District, Salmon-Challis National Forest, Region 4. 0351–2M48–MTDC. Missoula, MT: Missoula Technology and Development Center. 70 p.

National Interagency Fire Center. 2013. Cramer Fire case study (2013 refresher) [Video recording]. YouTube. https://www.wildfirelessons.net/orphans/viewincident?DocumentKey=becb12c6-c45f-46ff-8e5a-9be16da1db9e. (29 May 2018).


*The author in 1985 with a Bell 206 Jet Ranger, the park's exclusive-use helicopter, Ash Mountain Helibase, Sequoia and Kings Canyon National Park, California. Photo: Randall C. Thomas.*

# My Great Encounter With the Aviator

Early in the summer of 1985, I had just started my summer job on the helitack crew for Sequoia and Kings Canyon National Park in the southern Sierra Nevada. I had duties such as fighting fires, but my main job was much like that of a flight crewmember on a helicopter: I was to ensure safe and efficient transportation for personnel and cargo on the parks' exclusive-use helicopter, a Bell 206 Jet Ranger.

One of the first missions I was assigned to was transporting a California conservation trail crew and its supplies to a location in the park called Crabtree Meadows. The first flight transported just the camp crew cook and me so that I could be in position to unload supplies and direct people in getting off the helicopter. I would need to ensure that folks exited the helicopter in a safe manner, unload the cargo, and ensure that the doors were properly latched and everything was secured before the ship lifted off again to get the next load.

**I had a big grin on my face, barely able to believe that I was talking with one of the greatest pilots the world has ever known.**

As the cook and I were waiting at the helicopter landing zone, I noticed a couple of gentlemen walking up to us. One looked like he was in his sixties and the other might have been 30 to 40 years old.

During helicopter operations, onlookers sometimes want to see what's going on and maybe take a few pictures. I wondered whether these two gentlemen would somehow interfere with our helicopter operations because we were so close to our helicopter landing zone. But my fears quickly faded as we engaged in friendly conversation.

I explained what our mission was and what role I specifically played. The older gentleman took notice of my green Nomex flight suit, commenting that he used to wear "one of those suits." I introduced myself, and as he shook my hand, he said, "My name is Chuck Yeager."

I almost fell over. I said, "Chuck Yeager—you're the one who broke the sound barrier?"

General Chuck Yeager was a famous World War II ace fighter pilot and later a test pilot. By coincidence, I had read an article about Chuck Yeager only a couple of weeks earlier.

I was very excited. I had a big grin on my face, barely able to believe that I was talking with one of the greatest pilots the world has ever known. And earlier I had been apprehensive about these folks walking up to us! What an idiot I was! I really felt stupid.

---

*Randall Thomas is on detail in timber contracting and land use permits for the Forest Service, Idaho Panhandle National Forests, Coeur d'Alene, ID.*

Fire Management today

# GUIDELINES for Contributors

***Fire Management Today*** (FMT) is an international magazine for the wildland fire community. The purpose of FMT is to share information and raise issues related to wildland fire management for the benefit of the wildland fire community. FMT welcomes unsolicited manuscripts from readers on any subject related to wildland fire management.

However, FMT is not a forum for airing personal grievances or for marketing commercial products. The Forest Service's Fire and Aviation Management staff reserves the right to reject submissions that do not meet the purpose of FMT.

## SUBMISSIONS

Send electronic files by email or traditional mail to:

**USDA Forest Service**
***Fire Management Today***
201 14th Street, SW
Washington, D.C. 20250
Email: **SM.FS.FireMgtToday@usda.gov**

Submit electronic files in PC format. Submit manuscripts in Word (.doc or .docx). Submit illustrations and photographs as separate files; do not include visual materials (such as photographs, maps, charts, or graphs) as embedded illustrations in the electronic manuscript file. You may submit digital photographs in JPEG, TIFF, or EPS format; they must be at high resolution: at least 300 dpi at a minimum size of 4 by 7 inches. Include information for photo captions and photographer's name and affiliation at the end of the manuscript. Submit charts and graphs along with the electronic source files or data needed to reconstruct them and any special instructions for layout. Include a description of each illustration at the end of the manuscript for use in the caption.

For all submissions, include the complete name(s), title(s), affiliation(s), and address(es) of the author(s), illustrator(s), and photographer(s), as well as their telephone number(s) and email address(es). If the same or a similar manuscript is being submitted for publication elsewhere, include that information also. Authors should submit a photograph of themselves or a logo for their agency, institution, or organization.

## STYLE

Authors are responsible for using wildland fire terminology that conforms to the latest standards set by the National Wildfire Coordinating Group under the National Interagency Incident Management System. FMT uses the spelling, capitalization, hyphenation, and other styles recommended in the U.S. Government Printing Office Style Manual, as required by the U.S. Department of Agriculture. Authors should use the U.S. system of weight and measure, with equivalent values in the metric system. Keep titles concise and descriptive; subheadings and bulleted material are useful and help readability. As a general rule of clear writing, use the active voice (for example, write, "Fire managers know…" and not, "It is known…"). Give spellouts for all abbreviations.

## TABLES

Tables should be logical and understandable without reading the text. Include tables at the end of the manuscript with appropriate titles.

## PHOTOGRAPHS AND ILLUSTRATIONS

Figures, illustrations, and clear photographs are often essential to the understanding of articles. Clearly label all photographs and illustrations (figure 1, 2, 3; photograph A, B, C). At the end of the manuscript, include clear, thorough figure and photo captions labeled in the same way as the corresponding material (figure 1, 2, 3; photograph A, B, C). Captions should make photographs and illustrations understandable without reading the text. For photographs, indicate the name and affiliation of the photographer and the year the photo was taken.

## RELEASE AUTHORIZATION

Non-Federal Government authors must sign a release to allow their work to be placed in the public domain and on the World Wide Web. In addition, all photographs and illustrations created by a non-Federal employee require a written release by the photographer or illustrator. The author, photograph, and illustration release forms are available upon request at **SM.FS.FireMgtToday@usda.gov**.

Chuck talked about breaking the sound barrier and about his military career. At the time, he still flew jets, but as a civilian.

I asked Chuck about the movie *The Right Stuff*. I was very interested in how they portrayed him in the movie. Chuck told me that he himself was in one scene of the movie, as a bartender in Pancho Barnes's bar. I made sure to look for him next time I watched the movie.

Chuck and his party were camping nearby, and they just happened to be on a hike when I met him. After I told my coworkers about my meeting with General Chuck Yeager, they told me that Chuck visited the park quite frequently and that other National Park Service personnel had met and visited with him as well.

It was really great for a young guy like me to have the chance to meet and visit with someone so famous, someone who made aviation history. As a country boy from the mountains of northwestern Montana, I never imagined that I would meet someone like Chuck Yeager, much less in a remote part of the Sierra Nevada in California. I will cherish the memory for the rest of my life. ■