Fire Management today

Volume 73 • No. 1 • 2013

The Long and Winding Road

United States Department of Agriculture
Forest Service

Fire Management Today is published by the Forest Service of the U.S. Department of Agriculture, Washington, DC. The Secretary of Agriculture has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department.

Fire Management Today is for sale by the Superintendent of Documents, U.S. Government Printing Office, at:
Internet: bookstore.gpo.gov Phone: 202-512-1800 Fax: 202-512-2250
Mail: Stop SSOP, Washington, DC 20402-0001

Fire Management Today is available on the World Wide Web at <http://www.fs.fed.us/fire/fmt/index.html>.

August 2013

Fire Management today

Volume 73 • No. 1 • 2013

On the Cover:

Aerial view of firefighters en-route to base camp in Forest Service vehicles on the Gladiator Fire, Prescott National Forest, Arizona, May 24, 2012.
Photo by Kari Greer

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.

Firefighter and public safety is our first priority.

Contents

Anchor Point: Risk Management–A Better Future 4
Tom Harbour

Applied Risk Management: Southwest Idaho Area Command Team (ACT) 6
Jeff Whitney

The Emerging Wildfire Air Quality Response Effort 13
Peter Lahm and Mark Fitch

Developing Standardized Strategic Response Categories for Fire Management Units 18
Matthew P. Thompson, Crystal S. Stonesifer, Robert C. Seli, and Marlene Hovorka

Intentional Retention: Roadmapping Your Fire Career 25
Ken Frederick

Prevention and Education Teams—A Valuable Resource . . . 29
Jim Funk

Firefighter Property Program Deemed a Success in Texas 33
April Saginor

Fire Shirts for Safety, Not Fashion: Proper Use of PPE To Prevent Thermal Heat Burn Injuries 36
Fred J. Schoeffler

2013 Smokey Bear Award Winners 41
Gwen Beavans

Short Features

Success Stories Wanted 17

Contributors Wanted 40

Photo Contest Announcement 47

Anchor Point

by Tom Harbour
Director, Fire and Aviation Management
Forest Service

Risk Management—A Better Future

For anyone who has spent any amount of time working in the world of wildland fire management, it is not news that wildland fire management is a risky business—that risk is inherent in our work.

In July 1994, 14 elite firefighters died on the South Canyon Fire, and the interagency wildland fire community suffered its worst fatality loss on a single incident in decades. At the end of the 1994 fire season, 34 wildland firefighters had perished—prompting numerous reviews of multiple agency fire management programs and ultimately the development of the first cohesive Federal wildland fire management policy. This succinct policy has a strict emphasis on firefighter safety as its foundational pillar.

Of the numerous studies and reports resulting from that tragic season, Tri-data's *Wildland Fire Safety Awareness Study* <http://www.nifc.gov/safety/safety_phases_study.html> and the *Interagency Management Review Team Report on the South Canyon Fire* (IMRT) now serve as the benchmark studies that sparked the most pertinent and imperative changes needed in wildland firefighting philosophy. They also helped manifest a new wildland fire management doctrine for the Forest Service, the *Suppression, Aviation and Fuels Foundational Doctrine* (known as "Doctrine")<http://www.fs.fed.us/fire/doctrine/index.html>.

Out of the Doctrine came the agency's philosophical shift to management for risk and hazard mitigation, promotion of culture change, and empowerment of decisionmaking. The Doctrine raised the bar for front-line wildland firefighters, enabling them to make more effective tactical decisions and strategic judgments and to increase their focus on heightening situational awareness.

During the Doctrine process, we adopted the principles of high-reliability organization, safety systems management, and development of a learning culture. The Doctrine helped restore trust, promoted diversity, and even now sets the tone for the wildland fire management organization of the future.

The Doctrine made the break from traditional wildfire suppression and large wildfire management production goals by placing unquestionable emphasis on firefighter safety—through implementation of changes that no longer infer "business as usual" and through refusal to continue to make the same mistakes that history reveals as recurrent and inherently insurmountable.

This is not to say that the Doctrine changed all things at once. The Doctrine is still evolving, and there is still room for improvement. But the Doctrine has caused us to examine systems that aren't working well, seek solutions to make them work better, and design and implement new processes and procedures that bring real change to fire management safety—both on the ground and in the air.

The Doctrine was not dictated from the top down. Its roots are deeply embedded in knowledgeable and experienced field practitioners who took their passion for safety to the field and who ultimately rebuilt trust with participation from the ground level. The Doctrine prompted tremendous individual leadership efforts and unique thinking from outside the box, engaging experienced people who made decisions and acted to make changes. Out of the Doctrine came a new focus on risk management, human performance, and employee and workforce development.

In the two decades since 1994, there has been a noticeable cultural shift within the interagency wildland fire community. No longer is safety practiced by slogans, banners, and posters. Risk management has become a core pillar—a new cultural thinking. Risk management is inclusive. Risk

management is diverse. Risk management is the steel core of our safety blanket and the voice of our wildland firefighters. Risk management is the one tangible program that provides assurances that safety is unified both organizationally and individually; it is our collective professional commitment.

The Doctrine empowers; risk management encourages. New principles, revised core values, and a focus on what can be changed are all critical elements of the risk management philosophy.

More than 100 years of fire experiences have brought us to this new benchmark in evolution of wildland fire culture, policy, and safety. Transparency, education, and decisive action are inseparable from the core values of duty, respect, and integrity. Even without a mandate, risk management has evolved into something recognizable, tangible, and sensible, with measurable results.

Our future is framed around two basic fundamental ideas of the Doctrine:

- *"No resource or facility is worth the loss of human life; however, the wildland fire suppression environment is complex and possesses inherent hazards that can—even with reasonable mitigation—result in harm to firefighters engaged in fire suppression operations. In recognition of this fact, we are committed to the aggressive management of risk."*
- The definition of success—"*to safely achieve reasonable objectives with the least amount of firefighter exposure necessary, while enhancing stakeholder support for our management.*"

Given those markers, we strive for a new operational reality. Instead of using overwhelming mass everywhere, every time, all the time, we apply wildfire response assets sufficient to accomplish agency administrator-defined objectives. Our focus is to allow the "boots on the ground" the ability to do their work more effectively as we recommit to caring for the land and serving the people.

We enjoy working in a noble profession. To maintain that nobility demands that we think and execute a better future. Our evolutionary path is clear. We will continue on this safety journey, impeded by nothing other than our willingness to change. This issue of *Fire Management Today* deals with one of the ways we can make a better future for wildland fire management. I invite you to help make our future the best. ■

On June 30, 2013, the interagency wildland fire community suffered another devastating loss when 19 members of the Granite Mountain Interagency Hotshot Crew (IHC) perished on the Yarnell Fire in Arizona. Our hearts go out to their families, friends, and coworkers, as they grieve, and we grieve with them.

Firefighting is a dangerous occupation—one that is chosen by those who put others above themselves.

As we remember the members of the Granite Mountain IHC and all those who have gone before them, we must refocus on why the Wildfire Suppression Fire Doctrine was originally developed and how the Doctrine raises the bar for front-line wildland firefighters, enabling them to make more effective tactical decisions and strategic judgments and increasing their focus on heightening situational awareness.

The days ahead will be hard, but we must continue our safety journey, learn from what happened, and continue to make it our first priority to ensure that every firefighter returns home safely at the end of each shift.

Applied Risk Management: Southwest Idaho Area Command Team (ACT)

Jeff Whitney

The manner with which we manage large fires in the United States continues to evolve. Many of the factors contributing to this evolution include the changing nature of wildland fire, agency policies, and the perceptions and expectations of cooperators and the public. A more strategic and integrated approach in all areas of our response to wildfire is more vital than ever. Relying on the time-tested management approaches as a foundation of our response to wildland fire is a given. We continue to develop approaches to risk management; strategic thinking; opportunity recognition; and management of exposure to our firefighters, the general public, and threats to our valued natural and cultural resources. All factor into improvements to our collective response to wildfire today.

This case study looks at how policy, risk management, strategic thinking, and rules of engagement were applied to as many as 17 ongoing large fires within southwest Idaho in mid-August 2012, in the midst of an extremely active western fire season. Demand for firefighting resources was high. The increasing number of additional new large fires continued, primarily in the Great Basin, Northern Rockies, and the California and Pacific Northwest geographic areas.

A more strategic and integrated approach in all areas of our response to wildfire is more vital than ever. Relying on the time-tested management approaches as a foundation is a given.

The 2012 western fire season provided opportunities to apply concepts and recommendations for Area Command within the Evolving Incident Management (EIM) framework adopted by the National Wildland Fire Coordinating Group (NWCG) in 2011. The transition from development to implementation is underway with completion expected no later than 2016.

EIM describes Area Command as an oversight group providing strategic planning, risk management, command, control, coordination, information management, and preparedness support. Area Command Teams will be expected to be a source for innovative processes, procedures, and applied technology to support incident objectives.

These EIM components were included in the Southwest Idaho Area Command (ACT 4) mission delivery; they also provided for the development, application, or integration of innovative processes, procedures, and technology to support incident objectives along with traditional roles and functions of Area Command.

During peak fire activity in early August, ACT 4 was ordered to manage all type 1 and type 2 fires in Idaho. ACT 4 received Delegations of Authority (DOAs) from:

1. Forest Service Intermountain Region (Boise, Salmon-Challis, and Sawtooth National Forests);
2. Bureau of Land Management (BLM), Idaho State Office (Minidoka/Springs only); and
3. Idaho Department of Lands (Southwest Protection District).

Common objectives were to assume full authority and responsibility for the management and coordination of all type 1 and type 2 fires in Idaho and to prioritize and allocate critical resources. Three specific

Jeff Whitney recently retired as the Executive Director for Fire Program Analysis (FPA), a data and modeling system, and was employed by both the Forest Service and U.S. Department of the Interior's Office of Wildland Fire, serving the five Federal wildland fire management bureaus. As area commander of Area Command Team 4 (ACT4), Whitney brought more than 40 years of wildland fire experience. He also possesses advanced degrees in both biology (B.S., 1977) and natural resources management (M.S., 1996), focusing on ecological considerations and the integration of Remote Sensing and Geographic Information Systems.

expectations were provided in the delegations to ACT 4:

1. Develop and implement clear objectives;
2. Continue and strengthen agency administrator–incident commander partnerships in effective management; and
3. Create, discuss, and document risk management through the use of the risk decision framework.

Each incident management team (IMT), along with the associated agency administrators and their representatives, were well engaged in meeting policy expectations and in the application of sound response techniques on their respective fires; they performed well in meeting incident objectives safely. The primary purpose for ACT 4, while assigned, was to coordinate and manage all of the current and emerging fires while ensuring availability of resources to respond to other fires locally, regionally, and nationally.

Recognizing changing times and expectations, ACT 4 facilitated the increased agency administrator/IMT engagement and developed or updated the Wildland Fire Decision Support System (WFDSS), including the risk decision framework, with each IMT, as appropriate. This was accomplished by creating a Strategic Decision Support Unit (SDSU). The SDSU was a fundamental addition to the ACT structure and provided in-depth, near- and long-term strategic planning. The SDSU included a strategic operational planner, a fire behavior analyst/long-term analyst, a geospatial information specialists accessing Geographic Information Systems (GIS), and an infrared imagery and smoke monitoring coordinator.

ACT 4 also developed a common operating picture (COP) in Google Earth™ as a way to organize and display a wide array of available information in one place for strategic planning, decisionmaking, and communication among those involved at the time in southwest Idaho and for enhanced situational awareness locally, as well as with State, regional, and national offices.

> We continue to develop approaches to risk management; strategic thinking; opportunity recognition; and management of exposure to our firefighters, the general public, and threats to our valued natural and cultural resources.

ACT 4 was further expected to facilitate communication and coordination between the agency administrators on the Boise National Forest, the Salmon-Challis National Forest, the Sawtooth National Forest, and the Payette National Forest in the Forest Service Intermountain Region and the Bitterroot National Forest in the Forest Service Northern Rockies Region; Idaho Department of Lands (IDL); and the Idaho State Office of the BLM, Twin Falls District and Boise District Offices. All of these entities had portions of their land that had already been burned or was continuing to be threatened by fire.

ACT 4 was responsible for the overall management of the incidents and coordination of the fires; ensuring the development of initial attack protocols in support of affected agency units; coordinating with three expanded dispatch offices, the East Great Basin Coordination Center, and the Great Basin Multi-Agency Coordinating group; conducting in-briefing and closeouts for IMTs; issuing and rescinding delegations of authority for IMTs within the Area Command; and coordinating the completion of performance evaluations for the IMTs within the Area Command.

Background and Synopsis of Events

All the fires assigned to ACT 4 had ignited and were staffed by August 8. These included 5 large, single wildfires or complexes (a total of 17 fires and 2,500 personnel) assigned (figure 1). The geographic area had multiple other initial attack fires and emerging extended attack and large fires (table 1). Most of these fires were managed by type 3 organizations. The Great Basin geographic area was at preparedness level 5 (PL5), the highest level; the national preparedness level was at 4.

An in-briefing was provided to members of ACT 4 at 12:00 p.m. on August 10, and the team assumed command at 6:00 a.m. on August 11. The ACT re-delegated authority to the IMTs assigned over the ensuing 4 days. Closeouts, performance reviews, and re-delegations occurred, as appropriate, over time as fires either concluded or IMT rotations and transfers of command occurred.

Once ACT 4 was established, it was apparent that the traditional

24/48/72-hour planning timeframes should be extended to a 3/7/14/30-day timescale for more effective strategic thinking and planning to occur. Incident priorities were developed; and resource allocations of crews, aviation, and other assigned resources were based upon risk analyses, which included threats, objectives, strategies, and probabilities of success. The highest priority fires were the Minidoka and Springs Fires, which had the highest of probabilities of meeting their objectives for successful containment. The other three fires (Mustang, Halstead, and Trinity) were also allocated critical resources but were lower priorities. All but the Halstead Fire were initially managed for full suppression. As predicted, all of the fires grew considerably over successive days as a result of extreme fire behavior. Strategies were adjusted and the remaining fires were placed in long-duration management status, as the Minidoka and Springs Fires were contained.

Minidoka Complex: Lund's Type 1 IMT

The Minidoka Complex (figure 2), composed of five fires, was initially the only complex of fires identified. Lund's Type 1 IMT was managing multiple active fires with threats to private lands using mostly local initial attack resources. Extensive

Table 1.—*Fires located within the Great Basin Geographic Area.*

Priority	GACC	Incident	State	Unit	Descriptive location	Size	24-hr change	Percent contained	Expected contain date	Team	IC	Crews		Helicopters		
1	Initial attack and emerging fires											T1	T2/ T2IA	T1	T2	T3
1a	WB	Bull Run Complex	ID	No 209, Initial Attack in Area. Will include Browns Gulch, Lime, Homer, and Initial Attack. Mandatory evacuations in effect												
2	EB	Minidoka Complex	ID	STF	15 mi SE of Twin Falls	49,259	16,906	10%	8/20/12	Type 1	Lund	1	3	0	0	1
3	EB	Pinyon	UT	NWS	1 mi NW of Eagle Mountain	5,684	1,184	30%	8/12/12	Type 3	Sanders	1	3	0	1	1
4	WB	Frazier	NV	BMD	30 mi NE of Eureka	13,000	2,000	30%	8/12/12	Type 3	Ahlvers (T)	0	7	1	0	1
5	WB	Holloway	NV	WID	26 mi E of Denio	152,110	28,559	5%	8/22/12	Type 2	Ourada	5	3	1	2	2
6	EB	Springs	ID	BOF	6 mi W of Garden Valley	3,500	650	25%		Type 3	McKibbin	6	4	2	1	1
7	EB	Trinity Ridge	ID	BOF	7 mi NW of Featherville	30,000	6,357	5%		Type 2	Suwyn	1	10	1	0	1
8	WB	Gilbert	NV	BMD	40 NW of Austin	29,000	4,000	55%	8/12/12	Type 3	Brit	1	5	0	0	0
9	EB	Mustang	ID	SCF	28 air mi W of N Fork	3,032	601	0%		Type 2	Adell	0	4	1	1	0
10	WB	Willow	NV	NNS	40 mi N of Battle Mountain	23,000	-	50%	8/12/12	Type 3	Rader	2	7	2	0	1
11	EB	Grasshopper	ID	BOD	28 mi SSE of Jordan Valley	332	0	60^	8/12/12	Type 4	Dickson	0	0	2	0	1
12	EB	Halstead	ID	SCF	18 mi NE of Stanley, ID	36,814	2,793	3%	10/16/12	Type 1	Houseman	4	4	2	0	1
13	EB	Flat Top 2	ID	TFD	10 mi N of Kimama	140,000	5,000	60%		Type 3	McCoy	0	0	0	0	1
14	WB	Del Fire	NV	ELD	20 mi SE of Alamo	23,680	0	99%	8/13/12	Type 4	Karl	0	0	0	0	0
15	EB	Faust	UT	SLD	9 mi NW of Vernon	22,616		45%	8/12/12	Type 3	Hunter	2	9	0	0	3
16	EB	Hwy 30	ID	TFD	3 mi W of Bliss	1,887	387	100%		Type 3	Brinkley	0	0	0	0	0
*	EB	Hot Well	ID	TFD	8 mi E of Burley	3,056	56	40%		Type 3	Loucks	0	0	0	0	0
**	WB	Browns Gulch	NV	HTF	½ m NE of Mtn City	2,750		0%		Type 3	Uhlig	0	1	0	0	0
**	WB	Lime	NV	EKD	5 mi SW of Bull Run Reservoir	15,000		0%	8/12/12	Type 3	Reid	0	0	0	0	2
**	WB	Homer	NV	NNS	7 mi NW of Wilson Reservoir	3,000		15%	8/11/12	Type 5	Hoene	0	0	0	0	0
*Hot Well was incorporated into the Minidoka Complex																
**Browns Gulch, Lime, and Homer included in the Bull Run Complex																

fire growth occurred but was effectively impeded on all fires within the complex, using the assigned resources. The fires were the first to be returned to the local agencies.

Springs Fire: Hahnenberg's Type 1-IMT

The Springs Fire (figure 3) was a high-priority incident because of high-value IDL timber land, BLM grazing resource values, river recreation, and three threatened adjacent mixed interface communities. The Springs incident commander and long-term analyst (LTAN) presented projections to ACT 4 that identified potential threats from fire spread along with several potential courses of action including values threatened and resources needed to contain fire spread. As a result of this analysis and discussion, critical resources were re-assigned or diverted from other ongoing fires within ACT 4's theater of operation. Based upon the information provided by the IMT, and the resulting strategies, tactics supported by re-assigned resources from the Minidoka Complex and these actions contributed to successful containment within several days and the fire was returned to the local agencies and the IMT left the incident.

The alternative "worst-case scenario" presented by the incident commander if resources were not re-assigned suggested that a significant loss of structures in the Garden Valley, ID, area Wildland Urban Interface would occur and require the commitment of an additional 8 to 10 Inter-regional Hotshot Crews (IHC) for up to 2 weeks.

Mustang Fire: Adell's Great Basin Type 2 IMT

The Mustang Fire (figure 4) was also a complex, in actuality, consisting of eight proximal small fires in steep inaccessible terrain with

Figure 1.—*Central Idaho fires location map.*

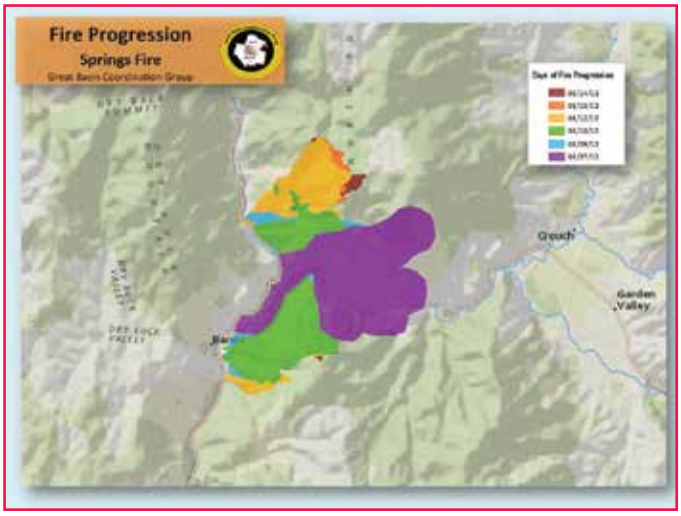


Figure 3.—*Fire progression, Springs Fire.*

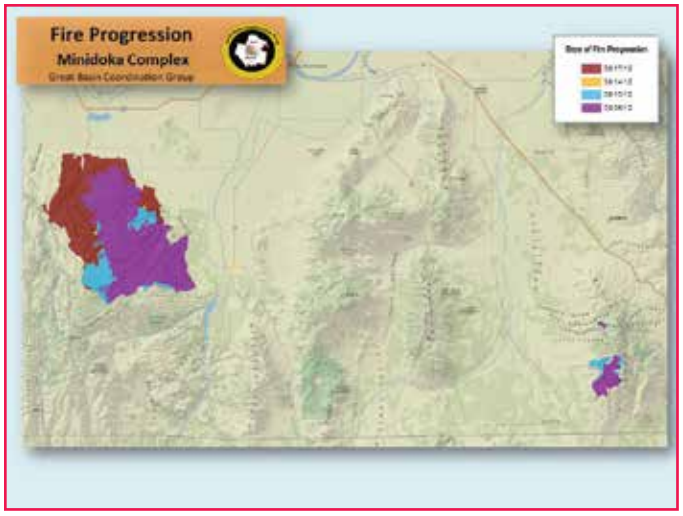


Figure 2.—*Fire progression, Minidoka Complex.*

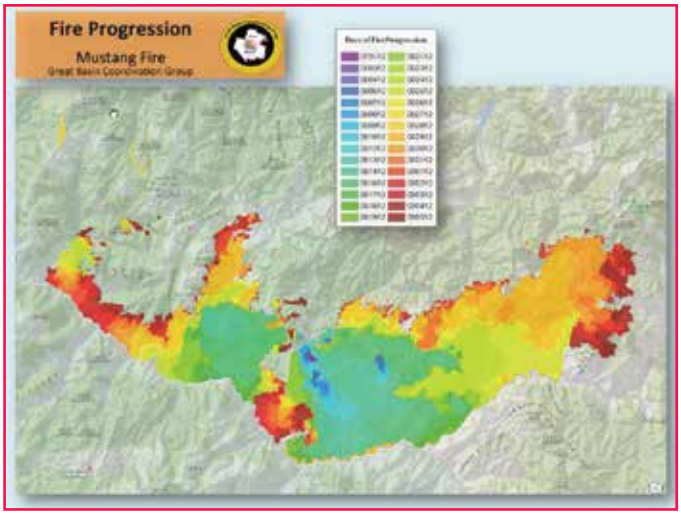


Figure 4.—*Fire progression, Mustang Fire.*

heavy fuels. Mustang Complex included the Lost Packer, Cayuse, Roan, Boulder, Horse Butte, East Butte, and Filly Fires, as well as the Mustang Fire. Significant impacts to the local Salmon River recreational economy were of key concern, as was the past history of fire shelter deployments and fatalities within the fire area. The eight fires ultimately grew together and were managed as one long-duration fire. In addition to the Salmon Challis National Forest, the Mustang fire also affected the Forest Service Northern Region's Bitterroot National Forest, Clearwater-Nez Perce National Forest, Payette National Forest, and the Beaverhead-Deerlodge National Forest. Significant fire spread increased the complexity, and the decision was made to replace Adell's T2 IMT with Joseph's Type 1 IMT. Blume's Type 1 IMT and Sciacca's Type 1 IMTs transitioned successively over the course of the 3-month duration of this incident.

Once ACT 4 was established, it was apparent that the traditional 24/48/72-hour planning timeframes should be extended to a 3/7/15/30-day timescale for more effective strategic thinking and planning to occur.

Halstead (including the Bench and Merino fires): Houseman's National Incident Management Organization (NIMO)

The Halstead Fire on the Salmon/Challis National Forest (figure 5) was started by lightning on July 27. The Halstead Fire was actively managed as a long-duration fire within days of the fire start. The incident management organization assigned to manage the Halstead Fire was also managing the Merino and Bench Fires, following ACT 4 delegation. Houseman's National Incident Management Organization (NIMO) was assigned and remained on the incident until late in the season managing risk and exposure throughout.

Trinity Ridge Fire; Suwyn's Great Basin Type 2 IMT/ Harvey's Type 1-IMT

Trinity Ridge Fire (figure 6) was an emerging Type 1 fire when ACT 4 was assigned. Transition between Suwyn's Type 2 IMT and Harvey's Type 1 IMT was underway as ACT 4 was assigned. Resource availability, threats to communities, rapid fire growth, access, and limited visibility due to heavy smoke over the entire fire area were the principal issues. Following several week's, Harvey transitioned with Lund as resources became available and conditions moderated. Shortly thereafter, the fire was zoned with Quisenberry's Type 1 IMT in large measure to address the span of control and the potential threat to Idaho City to the northeast of the fire.

Despite high fire activity across the theater of engagement and owing to excellent management by the respective IMTs, the Minidoka Complex was the first to be contained, followed shortly by containment of the Springs Fire. Each successive containment, allowed for re-allocation of assigned resources and the return to station of the local initial attack resources that played a key role on both Minidoka and Springs Fires. The Trinity Ridge Fire was zoned to two type

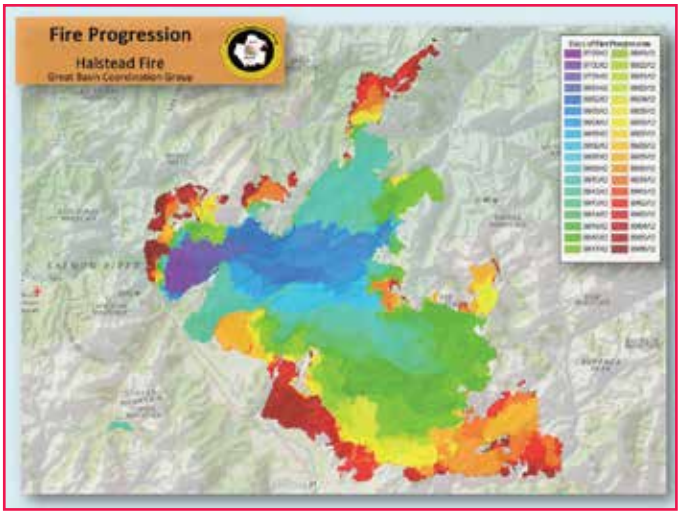


Figure 5.—*Fire progression, Halstead Fire.*

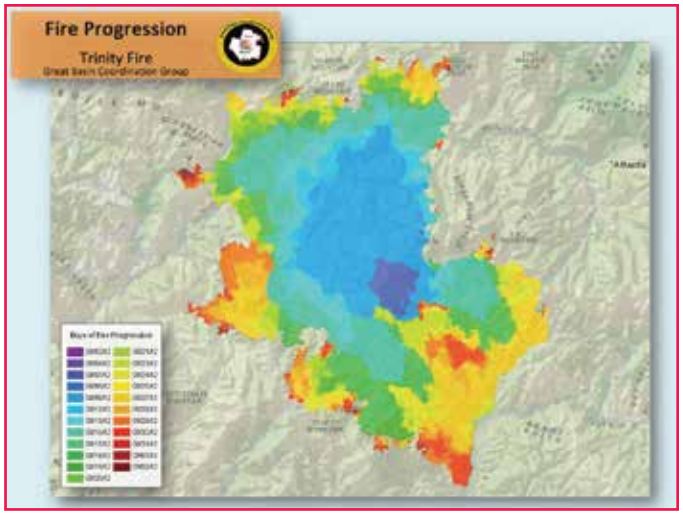


Figure 6.—*Fire progression, Trinity Ridge Fire.*

1 IMTs (Lund and Quisenberry), owing to rapid growth over successive burning periods. The Mustang Fire's complexity increased, and a Type 1 team (Joseph) was ordered assigned and in-briefed.

Mission Specific Requests (MSR)

ACT 4 was notified on August 12 by the East Basin Coordination Center (GBCC) that the National Multi-Agency Coordinating Group (NMAC) was asking the incident management organizations of all Great Basin fires to complete a mission specific request (MSR) form for submission to NMAC in order to justify the allocation or retention of any critical aerial and crew resources. This began a 10-day exercise working with the IMTs, Area Command plans and Area Command logistics, the expanded dispatches, and the GBCC to develop an additional process beyond the one ACTs typically use for critical resource allocation and dispatch support process. A viable process remained a work in progress when the NMAC discontinued the use of the MSR on August 29.

ACT 4 accomplished its assigned expectations over the course of a little more than 2 weeks. As conditions moderated in the Great Basin, a transition plan was provided to GBCC along with long-term plans for the remaining long duration fires (Halstead, Trinity, and Mustang), including projected resource needs and costs. As a part of the transition, ACT 4 provided the necessary expertise required to enable GBCC to continue aviation coordination, management for the COP, smoke monitoring and coordination expertise, along with staffing to bolster GBCC's capacity to take on the additional coordination workload inherent in managing multiple long-duration fires.

Lessons Learned

The policy and direction for 2012 and the application of risk management considerations provided a pathway for risk-informed decisions to be used in setting priorities to reduce the number of fires and in longer term strategic thinking associated with long-duration fires, emerging fires, and initial attack.

Agency administrator involvement is maturing and worked well at both the IMT/local and ACT/regional levels. There is a significant workload in this quality of agency administrator engagement in both the day-to-day activities and in the priority-setting process, but it serves the intent of engagement and the risk sharing well.

WFDSS continues to mature and is a valuable tool to assist in risk-informed decisionmaking. The addition of the risk decision framework facilitated communication as to factors considered by decision-makers; it also helped in the formulation of near-term objectives and strategies and in the development of long-term plans.

Building upon the traditional roles and responsibilities of Area Command to manage multiple ongoing incidents, the SDSU—including a strategic operational planner, LTAN, GIS specialist, and other technical specialists—proved to be an effective opportunity to further the development of more in-depth strategic planning and coordination for ongoing and long-duration event planning.

Area Command provided important capacity to meet the high level of complexity presented by the situation. The EIM components strengthened Area Command's role as an oversight group, providing strategic planning, risk management, command, control, coordination, information management, and preparedness support. EIM components also strengthened Area Command's role as a source for innovative processes, procedures, and technology to support the objectives included in ACT 4's mission delivery along with traditional roles and functions of Area Command. This worked well considering the high volume of activity and the associated tasks.

ACT 4 successfully developed and employed a COP to provide a secure, single, easily accessible repository of considerable information in a single location using Google Earth™ as the geospatial backbone. COP proved useful in conference calls and later on in tactical LiveMeeting briefings and priority-setting sessions. COP also proved useful in storing information for use by the multiple layers

The 2012 western fire season provided opportunities to apply concepts and recommendations for Area Command within the Evolving Incident Management (EIM) framework.

of agency and coordinating tiers locally, regionally, and for NMAC and national office briefings.

The coordination between Area Command, the IMTs, and the local units, with efforts to identify values at risk and management action points, was greatly improved through creation of a SDSU. This capability was further enhanced once a strategic operational planner and decision support specialists were assigned to each of the incidents.

A dedicated LTAN proved valuable for focused attention to strategic operational planning and decision support focusing on fuels, weather, and fire behavior as product delivery.

Having a dedicated GIS specialist to support the strategic planning effort was also essential; this specialist also generated specific incident maps when necessary.

Use of the air quality specialist from the National Interagency Fire Center proved invaluable in establishing and strengthening relationships with State and local offices for air quality monitoring and for public air quality notifications.

Expanding our thinking from the standard 72-hour construct to a 3/7/14/30-day paradigm provided the basis for longer term strategic thinking and planning. Once a week or following a significant fire spread event, the 14- and 30-day WFDSS fire spread probability (FSPro) modeling products were updated on each incident in order to assure better situational awareness of multiple large fires occurring within a relatively close proximity.

Attempts were made to connect mission specific requests to the management action points, fire projections, fire probability, and strategic direction provided by the incidents. The exercise proved cumbersome, difficult, and time-consuming to link. It was worth the effort overall, and the mission specific requests have potential for a finer scale in the decisionmaking process either at the geographic area or ACT level.

> EIM components strengthened Area Command's role as an oversight group, and as a source for innovative processes, procedures, and technology.

Initial delegations to communicate expectations required site visits and briefings to each incident, which was time-consuming. Shared situational awareness improved over time as the delegations were updated and relationships, processes, and communication pathways were established. COP and Web meetings facilitated improved execution of information sharing, coordination, prioritization, and decisionmaking.

Coordination and resource tracking was greatly facilitated by having two dedicated support dispatchers assigned to ACT 4. These individuals interacted throughout each day with the IMTs, local dispatch centers, and GBCC.

Area Command information support personnel were very effective in providing daily information sharing and in providing a clear synopsis of current, ongoing, and anticipated events and concerns through focused briefings to media and leadership at local, State, regional, and national levels. Overall, ACT 4's assignment provided valuable examples of how to implement current policy through the application of risk management, strategic thinking, opportunity recognition, and changing rules of engagement in our ongoing response to unwanted wildland fire. ■

Did You Know

The Forest Service and its partners originally developed the Incident Command System (ICS) to respond to firefighting emergencies. Today, the ICS is used to respond to emergencies of all kinds. Admired for its efficiency and flexibility, ICS has been adopted as the Nation's system for emergency response. The Forest Service gives ICS training to emergency responders at every level nationwide. Through the ICS, the Forest Service is poised to respond to any emergency.

The Emerging Wildfire Air Quality Response Effort

Peter Lahm and Mark Fitch

The wildfire season of 2012 marked the first year of a coordinated interagency and programmatic effort to address air quality impacts of wildfires on a national scale, both on incidents and at area command levels. Previously, individual efforts to address smoke from wildfires had been the norm. On State and local levels, air resource specialists from land management agencies, as well as air quality regulators, had always sought to address smoke impacts, which at high levels can be hazardous to public health. But air resource specialists had been responding to *specific* incidents, such as the Rodeo-Chediski Fire in 2002, the regional northern California fires in 2008, and numerous Southwest fires in 2011, including the record-breaking Wallow Fire and other fires that had serious multi-State air quality impacts.

Building a New Approach

The effort in 2012 built on these earlier efforts and focused on three key air quality impacts from wildfires to public health, transportation safety, and personnel exposure.

Peter Lahm is the air resource specialist, Forest Service, Fire and Aviation Management, Washington, DC, and chairs the National Wildfire Coordinating Group's Smoke Committee.

Mark Fitch is the lead smoke management specialist for the National Park Service, Fire and Aviation Management, Fire Management Program Center, Boise, ID.

A technical specialist position of air resource advisor (ARA) was identified, drawing on mostly Federal and State land management agencies that maintain personnel who manage smoke from prescribed fire programs at State and national levels.

ARAs have knowledge about wildland fires, fuels, emissions, smoke forecasting and meteorology, air quality prediction modeling, air quality monitoring, and the rules and regulations driven by the Clean Air Act.

> A critical role of the air resource advisor is the coordination and development of public messages about air quality impact from wildland fires.

An ARA uses air quality monitoring data and equipment from the national cache of 15 E-samplers maintained in Boise, ID. A critical role of the ARA is the coordination and development of public messages about air quality impact from wildland fires, with partners such as regulatory agencies, the U.S. Environmental Protection Agency (EPA), and the National Weather Service (NWS). An ARA also uses the latest and most advanced developing research tools for smoke impact prediction when on assignment at an incident or area.

The dispatch of ARAs is managed by a Forest Service, Fire and Aviation Management, air resource specialist, in a similar fashion to the NWS Incident Meteorologist (IMET) program (<http://innovation.srh.noaa.gov/imethistory>). In 2012, ARA assignments included incidents in the Southeast, where concerns about smoke impacts on visibility on roads is a critical life-threatening concern; a number of incidents in the West; and multiple incidents coordinated by the North Zone California Geographic Coordination Center and a Wildfire Decision Support Center in the Forest Service Rocky Mountain Region.

ARAs use air quality modeling skills for on-site predictions, along with support from off-site services. They have the capability to deploy monitoring equipment and interpret data to inform smoke impact predictions and guide incident response and planning as it pertains to smoke. They also are critical to the development of coordinated messaging that translates wildfire activity, planned response strategy, and actions into potential air quality impacts.

These air quality impact assessments and messages reduce the risks faced by the public and fire personnel from wildfire smoke, allowing for opportunities to respond and reduce exposure accordingly. Monitoring, assessing, and mitigating potential air quality impacts on public health, transportation safety (through visibility reduction), or fire personnel

(through direct exposure to smoke on the line or in base camp and other incident operations) contribute to the improvement of safety, coordination, and collaboration called for in the *2009 Guidance for Implementation of Federal Wildland Fire Management Policy* and the most recent findings of the *National Cohesive Wildland Fire Management Strategy*.

The Air Resource Advisor in Action: An Example From Southwest Idaho

The responsibility of the ARA assigned to an incident or area command can include developing and presenting a short weather synopsis with an air quality overview both locally and regionally at morning briefings. For the Southwest Idaho Area Command (ID AC), the weather discussion in 2012 was a general overview of mid-latitude synoptic wind patterns and movement of upper level synoptic weather patterns. The intent of the discussion was not to infer local fire behavior but rather to point out any shifts in wind speeds or direction and smoke dispersion capability of the atmosphere.

The responsibility of the air resource advisor can include developing and presenting at morning briefings a short weather synopsis with an air quality overview both locally and regionally.

A key concern in such discussions is whether a system will become stationary and, if so, how long it may last. Such conditions can lead to very high smoke concentrations, which can adversely affect public health, transportations safety, or even aviation operations and personnel exposure to smoke. The

Predicting Smoke Impacts

Predicting smoke impacts is a unique multiprogram effort for providing the best air quality information for decisions and outreach. Air quality modeling is highly specialized and complex, and it builds on the already challenging behind-the-scene efforts at incidents to predict fire behavior and weather. Air quality predictive capability has grown in skill and complexity over time, as a result of work spearheaded by the Forest Service's PNW AirFire Team. These capabilities are now available to incident commanders and ARAs. Significant operational support was provided to the prediction of air quality impacts of the 2008 northern California wildfires, the Southwest wildfires in 2011, and wildfires that had ARAs assigned in 2012. Air quality modeling is highly specialized and complex; it builds on the already challenging behind-the-scene efforts at incidents to predict fire behavior and weather (figure 1).

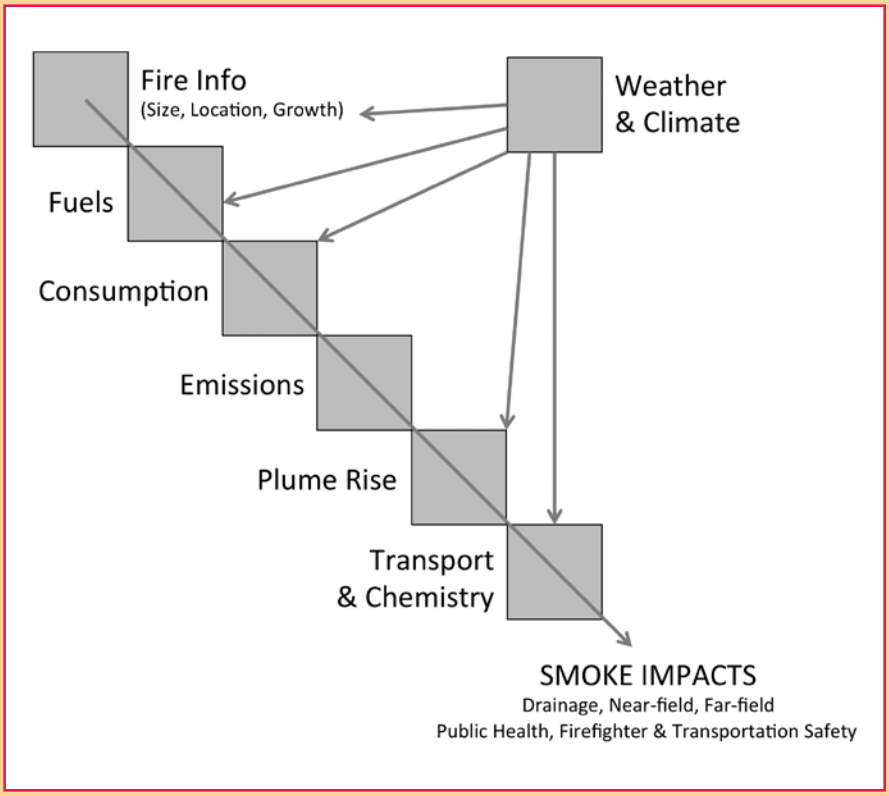


Figure 1.—*Steps involved in modeling smoke. While fire information—such as the size, location, and growth of the fire, including backburn operations and other operational information—is the critical starting point, numerous additional factors must be added to get to smoke impacts on public health, firefighters, and transportation. Figure courtesy S. Larkin, Forest Service*

weather synopsis served as a prelude to the air quality report, which then identified smoke transport from the fire to areas downwind that may have been of concern.

The air quality discussion during briefings was tight and focused, with no time allotted for a detailed analysis. A mantra that best described these briefings came from Mike Baca, Phoenix National Incident Management Organization planning section chief, "Be bright, be brief, be gone."

Preparation for a briefing included polling and assessing ambient air quality monitors near the fire and downwind, running the Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model, and assessing the Google Earth KMZ smoke dispersion files developed from custom model runs conducted by the Pacific Northwest Research Station (PNW) AirFire Team (figure 2).

A frequent challenge in compiling the monitoring data faced by ARAs is that monitoring can be conducted in many ways and is not typically available in one location. For the ID AC effort, air quality monitoring was conducted by the Idaho Department of Environmental Quality (ID DEQ) and the Forest Service, with monitoring data posted at the Western Regional Climate Center (WRCC), the AIRSIS Web page, the ID DEQ Web site, and EPA's AirNOW site. Four different types of monitors were recording particulate matter (PM) data (Beta Attenuation Monitor (BAM®), E-BAM®, E-sampler®, and Tapered Element Oscillating Microbalance (TEOM®)), and units captured $PM^{2.5}$ or PM^{10} raw unverified data (table 1). The report-out focused on monitors with anticipated public health impacts, such as in Salmon and Boise, ID. Fire personnel exposure was also assessed at base camps for the Trinity Ridge, Halstead, and Mustang Fires. Monitors at the Halstead Incident Command Post recorded high values of PM for short periods; Trinity Ridge and Mustang recorded high values for prolonged periods; these values were pointed out at briefings.

The ID AC used the common operating picture (COP) approach; smoke dispersion and air quality impact information also was included. The COP used Google Earth to display modeling results as well as other fire and smoke products. This visual representation of smoke impacts (figures. 1 and 2) showed the relative smoke levels from multiple fires, including regional transport beyond the fires assigned to the ID AC; it also

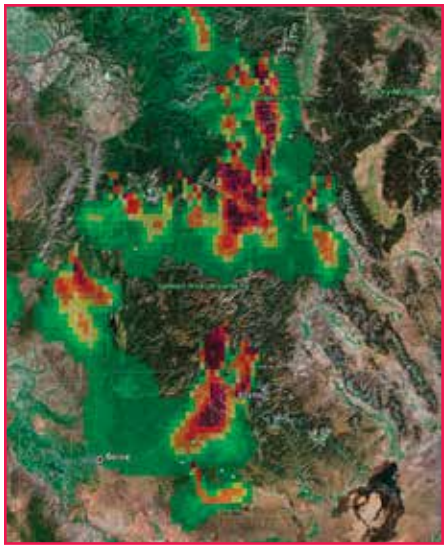


Figure 2.— *Smoke impacts predicted through custom regional smoke model runs done by the Forest Service, Pacific Northwest Research Station AirFire Team in consultation with air resource advisors assigned to incidents and area command. Output shown is from a 4-kilometer grid model run showing September 24, 2012.*

Figure 3.— *A common task for air resource advisors is to assess air quality impacts from other fires on the incident or area of concern, in this case the Southwest Idaho Area Command, where an air resource advisor was assigned. The satellite image on September 20, 2012, shows smoke from adjacent States into southwest Idaho. The impacts on Boise resulted in exceedances of both PM^{10} and $PM^{2.5}$ national ambient air quality standards. Output from the NASA Goddard Space Center, AERNET image from the TERRA satellite at 1 kilometer resolution.*

allowed assessment for planning and communicating the extent of impact local and regional fires.

A fundamental task for an ARA at the incident or area level is to coordinate and communicate with agencies that have an interest in understanding the air quality impacts of the fire(s). Working at ID AC allowed the ARA to gather intelligence from all the fires under their purview, which allowed for much improved modeling prediction of smoke impacts on air quality. An ARA deployed on an incident generally is focused on that incident alone, but a large part of coordinating with agencies is establishing a common message on smoke impacts and potential public impacts, and coordinating the dissemination of the message. Some of the personnel involved in the southwest Idaho fires included those assigned to the ID AC on site, as well as remote support and local and State partners such as personnel from ID DEQ. The ID AC effort built upon efforts of the ARA assigned to the Halstead Fire, who had established daily interagency conference calls with county health officials, EPA, ID DEQ, and NWS. The ID AC allowed the ARA to focus beyond the information from just the Halsted Fire and to collect critical information from other fires from California whose smoke was also affecting southern Idaho.

Table 1—*Southwest Idaho Area Command Smoke Monitoring PM2.5 Report (8-24-2012).*

Location/monitor	1- hour peak ug/m^3 (hour[1])	8-hour peak ug/m^3 (hour[1])	24-hour peak ug/m^3 (hour[1])	Air quality index[2]
Idaho				
Soda Springs (PM2.5 NEPH)				Good
Franklin (PM2.5 BAM)				Good
Garden Valley (PM2.5)		28 (0100)	19 (0800)	Moderate
Grangeville (PM2.5 Teom)				Good[5]
Idaho City (PM2.5)	49 (1100)	24 (1400)	20 (0800)	Moderate
Ketchum (PM 2.5 TEOM)	229 (1700)	140 (2100)	93 (1700)	Unhealthy[5]
Nampa (PM2.5 TEOM)	42 (1700)			Moderate
Paul Elem (PM2.5 Neph)			18 (2000)	Moderate
Penford—Idaho Falls (PM2.5 Neph)	60 (1200)	31 (1400)	22 (0800)	
Pocatello (PM2.5 TEOM)		23 (0800)	21 (0800)	Moderate
Rexburg (PM2.5 NEPH)	70 (1300)	46 (1700)	28 (0800)	Moderate
Salmon (PM 2.5 BAM)	75 (0200)	61 (0800)	43 (0800)	
St. Luke-Meridian (PM2.5 TEOM)				Good
Twin Falls (PM2.5)			19 (0900)	Moderate
Weiser H.S. (PM2.5 NEPH)				Good
Forest Service				
North Fork (PM 2.5 ES)	113 (1300)	78 (1400)	66 (0800)	Unhealthy
Fairfield (PM2.5)	239 (0800)	140 (0900)	100 (1100)	Unhealthy
Challis, ID (PM 2.5 EBAM)	255 (1700)	143 (2200)	97 (2100)	Unhealthy
Stanley, ID (PM2.5 EBAM)	136 (1200)	82 (1300)	55 (1300)	Unhealthy[5]
Nez Perce Tribe				
Orofino, ID (PM 2.5)				Good
Nez Perce, ID (PM 2.5)				Good

After the overall ID AC assignment ended, at the request of ID DEQ, the Great Basin Multi-Agency Coordinating Group kept the ARA effort in place temporarily because there were still serious smoke impacts in Idaho. Eventually that effort ended and ID DEQ reverted to using INCIWEB for fire information and estimates of smoke impacts.

At the end of the fire season, ID DEQ conducted an after-action review and stated that the State of Idaho and the affected public had benefited greatly from the efforts to address air quality impacts of wildfire in 2012. They noted that after the area ARA effort had ended, there was a significant challenge in creating informed and joint communications to be given to the public about smoke impacts and important health warnings, because there was no longer a formal process in place to work directly with the incidents or area command.

Interagency and partner support for the efforts to address the air quality impacts from wildfires is growing at local to national levels.

The conclusions of that after-action review further supports future use of the ARA position on incidents and areas that have serious and prolonged-duration smoke impacts. Interagency and partner support for the efforts to address the air quality impacts from wildfires is growing at local to national levels. Efforts are underway to develop more technical specialists to meet this emerging need and be prepared for the upcoming 2013 Western United States wildfire season. ■

Source: Southwest Idaho Area Command.

[a] A daily monitoring assessment is routinely produced by ARAs, which allows for planning, assessment, and coordination among agencies on severity of smoke impacts on air quality. This kind of table also allows the public to verify impacts experienced in the Air Quality Index, a scale they can understand and respond to as needed.

Success Stories Wanted!

We'd like to know how your work has been going! Provide us with your success stories within the state fire program or from your individual fire department. Let us know how the State Fire Assistance (SFA), Volunteer Fire Assistance (VFA), the Federal Excess Personal Property (FEPP) program, or the Firefighter Property (FFP) program has benefited your community. Feature articles should be up to about 2,000 words in length; short items of up to 200 words.

Submit articles and photographs as electronic files by email or through traditional or express mail to:

Fire Management Today
USDA Forest Service
Fire and Aviation Management
1400 Independence Ave., SW
Mailstop 1107
Washington, DC 20250

E-mail: firemanagementtoday@fs.fed.us

If you have any questions about your submission, you can contact one of the FMT staff at the email address above or by calling 202-205-1090.

Developing Standardized Strategic Response Categories for Fire Management Units

Matthew P. Thompson, Crystal S. Stonesifer, Robert C. Seli, and Marlena Hovorka

Introduction: Fire Management Units, Strategic Objectives, and Response Categories

Federal wildland fire policy requires that publicly owned lands with burnable vegetation have a fire management plan (FMP); this applies to the five primary Federal fire agencies (Bureau of Indian Affairs, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and Forest Service). FMPs are based on land and resource management plans and are intended to provide guidance for managers responding to wildland fire incidents. FMPs summarize information on the basis of fire management units (FMUs), which divide landscapes into smaller geographic areas according to biophysical and socioeconomic characteristics. FMU-level guidance for incident response is tailored according to these characteristics <http://wfdss.usgs.gov/wfdss/pdfs/Geospatial_data_stnd.pdf>.

Matthew Thompson is a research forester and Crystal Stonesifer is a biological scientist at the Forest Service, Rocky Mountain Research Station, Missoula, MT. Robert Seli and Marlena Hovorka are fire technology transfer specialists with the Forest Service at the Wildland Fire Management Research, Development, and Application program in Missoula, MT, and Albuquerque, NM, respectively. *All of the authors' work is supported by the National Fire Decision Support Center.*

We undertook an exploration of these data to better understand how fire management objectives and corresponding planned incident responses vary across landscapes and ownerships.

FMUs are thus fundamentally premised on spatial information. Variation in FMU management guidance reflects underlying spatial variation in factors influencing fire occurrence and behavior; in jurisdictional boundaries; and in the pattern, density, and extent of fire-susceptible resources and assets and their respective degrees of susceptibility to fire (considering both beneficial and negative impacts).

Management guidance for FMUs describes FMU-specific objectives, desired conditions, and approved wildland fire management strategies. Agency administrators rely on this information to navigate complex decision processes for managing active wildland fire incidents, specifically setting overarching incident strategies consistent with strategic objectives and management requirements of land and resource management plans and FMPs. This guidance, coupled with the spatial decision support tools and decision documentation functionality within the Wildland Fire Decision Support System (WFDSS), helps agency administrators develop risk-informed responses to incidents.

The same five Federal fire agencies are required to use the WFDSS for incident response. Increasingly, the WFDSS is also being used to house data relating to FMUs, including geospatial polygon boundaries and FMU strategic objectives. Though neither exhaustive nor required, the coverage of uploaded FMUs is quite extensive (thousands of FMUs), and we anticipate continued uploading and refinement of data from the field. Spatial data on FMUs are uploaded four times a year, and written objectives are uploaded by individual units as appropriate. The spatial size of the FMUs that were uploaded into WFDSS varies greatly—from less than an acre to more than 8 million acres. The median size is approximately 29,000 acres. For more information on FMU geospatial data, see the WFDSS Web site at <http://wfdss.usgs.gov/wfdss/WFDSS_FMU_Downloads.shtml>.

We undertook an exploration of these data to better understand how fire management objectives and corresponding planned incident responses vary across landscapes and ownerships throughout the United States. By capturing com-

mon themes across FMUs, we were able to establish a broad set of four standard response categories for purposes of classification. In this paper, we describe our methods for assigning FMUs to each of these categories, and we present results for the FMUs for which we have data.

Our results reflect a work in progress, but we believe it is important to review lessons learned to date, including the importance of clarity and completeness in the definition of objectives and the distinction between "fundamental" and "means" objectives (see box, Defining Objectives). Further, we illustrate how this information can be used to evaluate the consistency of incident decisions with FMP and FMU objectives, and we highlight how a stronger integration of FMU information within WFDSS could facilitate development of spatial FMPs. Because FMPs and FMUs evolve over time as new information becomes available and as conditions change, and because field staff best know their landscapes and their management objectives, it will ultimately be more desirable for field units to self-assign FMU-specific response categories.

Assigning Response Categories

The first step in our analysis was to download data for all FMUs with polygons uploaded into WFDSS. This dataset included fields for a unit name, unit description, agency, and, critically, text with strategic objectives. We then comprehensively reviewed these objectives in order to identify and define a standard set of incident response categories. While the *fundamental* objectives (for example, protect homes and infrastructure, protect critical habitat, and restore and maintain fire-adapted ecosystems) across FMUs will vary greatly owing to heterogeneity in biophysical and socioeconomic characteristics, we can come up with a standard set of *means* objectives that describe how incident responses will achieve the fundamental objectives.

We arrived at four broad incident-response categories, with sub-categories defined to further capture nuance. Categories at the extreme ends have little decision space, mandating either a full suppression response (category 1) or effectively the opposite (category 4). Categories 2 and 3 have greater decision flexibility, considering a balance of objectives between suppression costs, values at risk, and ecological benefits from fire (firefighter safety is an omnipresent concern).

We focused only on natural ignitions, where there generally is more flexibility for incident response. For methodological consistency, we categorized FMUs based solely on the strategic objective text. Our response category classification scheme is defined below:

1. Suppress all fires at smallest size, and cost is not a consideration;
2. Suppress all fires, considering tradeoffs:
   A. Consider costs, and
   B. Consider values at risk;
3. Make a real-time agency administrator decision for resource benefits (formerly the fire use go/no go decision):

Defining Objectives

It is not a simple task to articulate objectives: ends can be confused with means, objectives can be confused with management requirements or other constraints, and relationships between objectives may not be immediately obvious. Here, we distinguish between *fundamental* and *means* objectives.

Fundamental objectives relate to aspirations and desired outcomes for the fire management unit's (FMU) geographic area; these can include ecological, economic, social, and cultural dimensions. It is imperative that these objectives are clear, concise, measurable, and consistent with guidance in fire management plans and land and resource management plans.

Means objectives, by contrast, are methods to achieve fundamental objectives. For example, in an FMU that contains or is proximal to an area with a high density of resources and assets that are susceptible to fire-related loss, full suppression might be the means objective to achieve the fundamental objective of resource and asset protection.

Our response categories directly relate to means objectives; that is, they categorize the decision space for how fires will be managed, not the underlying rationale for why they will be managed that way. Our premise is that the most useful information contained within FMU strategic objectives would articulate fundamental objectives as well as means objectives.

A. Resource benefit optional—recognizing ability to manage fire for resource benefits, and
B. Resource benefit promoted—promotes management of fire for resource benefits; and

4. Preplanned agency administrator decisions are used to monitor all fires, and fire is managed as necessary to achieve protection or restoration objectives.

We further identified two additional categories, indicating whether no strategic response was provided (that is, strategic objectives were not uploaded into WFDSS with the polygon boundaries) or where strategic responses were unclear. There were multiple reasons why we identified responses as unclear. In some cases, there exists broader guidance (for example, "fire for resource benefit is authorized park-wide") uploaded into WFDSS, but a lack of FMU-specific text. In other cases, FMUs might have a suggestive descriptor value (for example, "full suppression"), but the actual text itself did not specifically provide information on objectives and response to fire. Some objectives were simply too vague (for example, "make appropriate suppression response to all wildfires"). Lastly, strategic objectives in a small number of cases seemed contradictory (for example, "unplanned ignitions are used to restore and maintain historic fire regimes… unplanned ignitions are generally suppressed to minimize the acreage burned").

Results

These preliminary findings are limited to FMUs within the contiguous United States. (CONUS) and are current as of September 6, 2012. Of a total of 3,165 FMUs with uploaded polygon boundaries, 1,448 FMUs provided strategic response information. Of these, we identified 273 FMUs as "strategic response unclear," leading to a total of 1,175 FMUs with assigned strategic response categories. The total areal extent of FMUs with uploaded polygon boundaries was 455.47 million acres, 58.71 million of which were associated with unclear responses.

Figure 1 displays a color-coded map of strategic response categories for the 3,165 FMUs. The

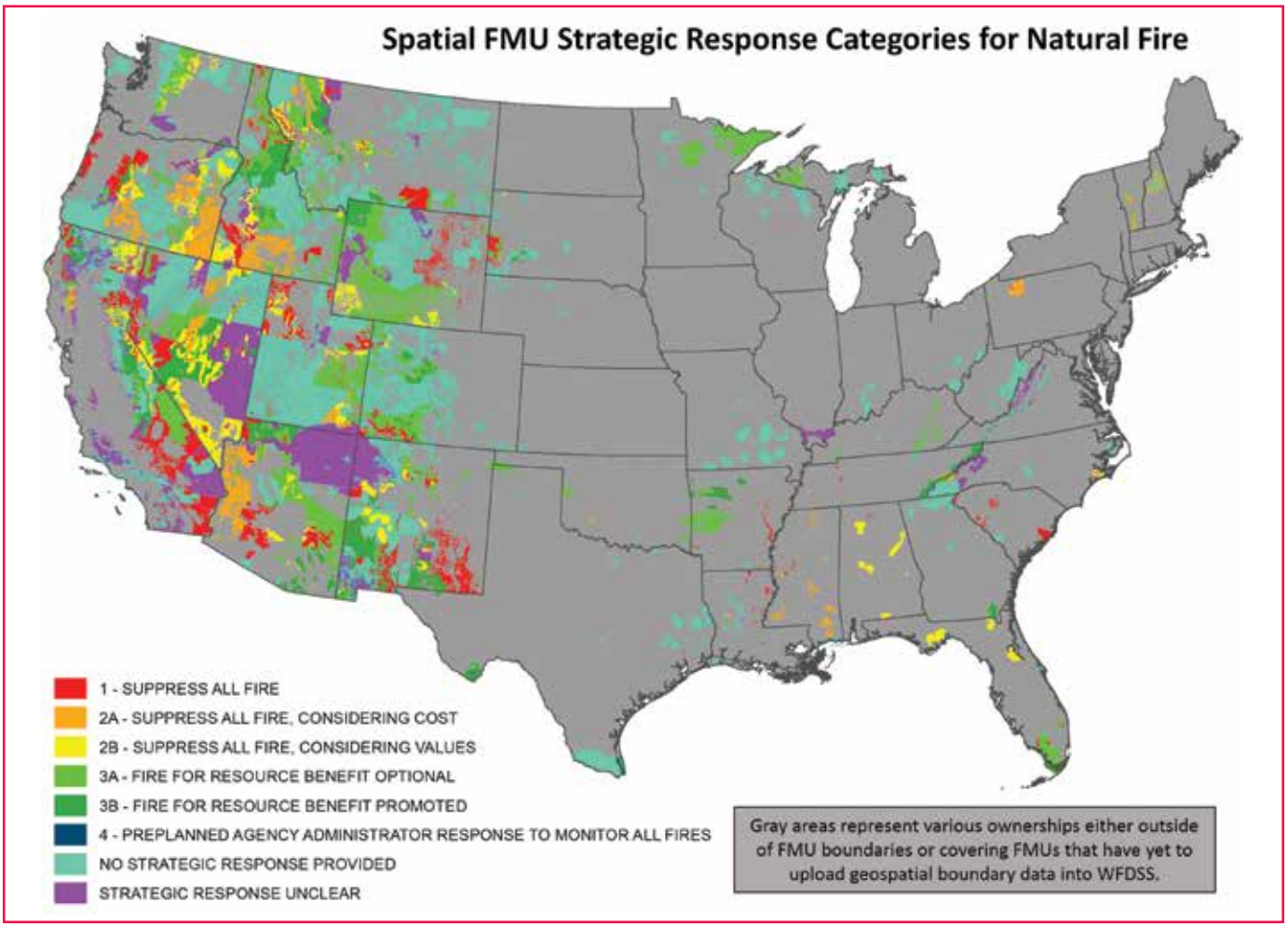


Figure 1. —*Spatial fire management units strategic response categories for natural fires.*

map exhibits spatial heterogeneity throughout the country, with many Western States encompassing the range of strategic responses. Whereas FMUs with categories 1 and 2 appear slightly more spread out, there are large contiguous areas of category 3, especially in the West. This result is influenced by vast tracts of Federal land such as the Frank Church River of No Return Wilderness or the Greater Yellowstone area. Only one FMU, in the Southwest, was assigned to category 4; however, it is expected that adding FMUs from Alaska would increase the extent of category 4 assignments. Figure 2 summarizes the areal percentages of all FMUs in each response category. There exist large areas for which strategic responses either were not provided (37.8 percent) or were unclear (12.9 percent). Category 1 accounted for 9.4 percent, category 2 accounted for 13.7 percent, and category 3 accounted for 26.2 percent of the total FMU area. Exclusive of FMUs that did not provide a strategic response, category 1 accounts for 15.1 percent, category 2 for 22.1 percent, and category 3 for 42.2 percent of FMU area.

Table 1 summarizes the breakdown of FMU strategic response categories according to geographic coordinating areas (GCAs; fig. 3), by areal percentages. Most GCAs have roughly the same areal percentage with either none or unclear strategic responses—about half of the total FMU area within each GCA—but the relative breakdown varies significantly. In the Eastern Area (EAA), East Basin (EBA), Northern Rockies (NRA), Northwest (NWA), Rocky Mountain (RMA), and Southern (SAA) Coordination Centers, the dominant issue preventing assignment of response categories is that information on strategic responses was not provided. In the Northern California (ONA), Southern California (OSA), Southwest Area (SWA), and West Basin (WBA) coordinating areas, unclear responses are as much or more of an issue preventing assignment of response categories.

The OSA has by far the highest areal percentage of category 1 (24.63 percent) followed by the ONA (15.68 percent) and the SWA (13.01 percent). We might expect an even greater degree of category 1 in some locations due to high population densities proximal to flammable landscapes, if and when more data are uploaded and/or clarified. NWA (30.72 percent) had the largest overall areal percentage in category 2 followed by the WBA (22.11 percent). The NRA (38.62 percent), RMA (34.82 percent), EAA (31.03 percent), and SWA (30.37 percent) had the highest areal percentage in category 3.

Table 2 similarly summarizes the breakdown of FMU areal percentage by strategic response category, but according to land management agency. The Forest Service and Bureau of Land Management (BLM) constitute the largest share of uploaded FMU area. By contrast the U.S. Fish and Wildlife Service (UWFWS) and State agencies (STATE) constitute very little area indeed, and of this area most FMUs provided no strategic responses. The Bureau of Indian Affairs (BIA) had the largest degree of unclear responses.

The BLM has the greatest share of category 1 at 14.86 percent, followed by USFWS at 13.34 percent (but this represents a relatively small amount of land, see column 2 in table 2), followed by the BIA at 11.89 percent. BLM has the greatest share of category 2 (16.93 percent) followed by the Forest Service (15.63 percent). The National Park Service has the greatest share of acreage in category 3 (45.48 percent), and a minimal amount in categories 1 and 2.

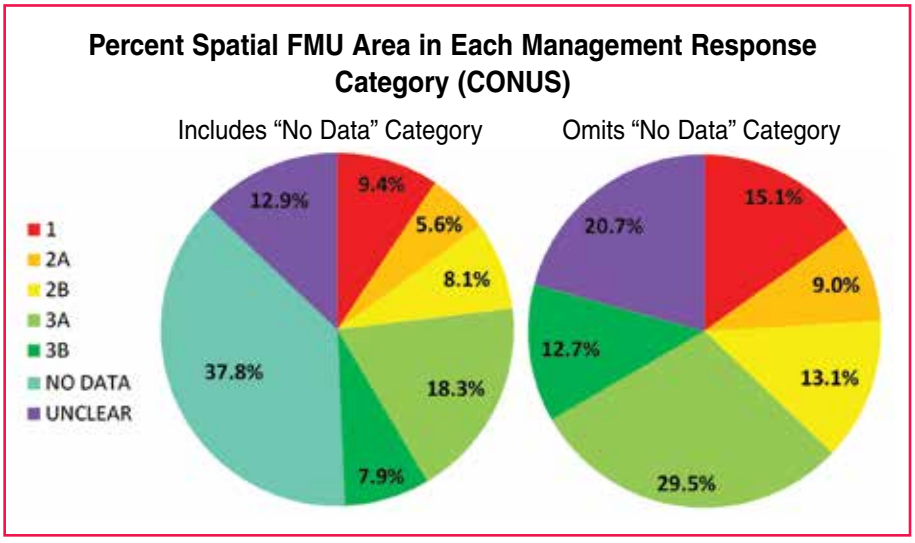


Figure 2.—*Percentage of spatial fire management units area in each management response category (CONUS).*

Table 1.—*Fire management units area percentages in each strategic response category, by geographic coordinating area (CONUS only).*

GCA	TOTAL spatial FMU area	Strategic response category							
		1	2A	2B	3A	3B	4	No data	Unclear
		Areal Percentages							
EAA	**21.02**	0.00	6.43	0.14	31.03	0.00	0.00	57.50	4.90
EBA	**72.62**	8.16	6.15	9.61	17.21	6.21	0.00	47.34	5.31
NRA	**47.83**	7.93	2.15	6.02	24.65	13.97	0.00	41.84	3.43
NWA	**46.09**	6.83	18.55	12.17	11.71	2.45	0.00	42.13	6.16
ONA	**18.70**	15.68	3.91	12.31	6.42	5.62	0.00	34.94	21.13
OSA	**30.69**	24.63	0.00	2.18	14.50	6.91	0.00	26.33	25.45
RMA	**54.65**	7.48	0.07	4.13	31.50	3.31	0.00	51.57	1.92
SAA	**31.06**	6.15	4.80	9.37	21.42	8.95	0.00	41.80	7.50
SWA	**79.08**	13.01	7.01	4.77	16.89	11.73	0.16	21.11	25.32
WBA	**53.75**	5.69	4.22	17.88	8.32	12.08	0.00	25.49	26.31
CONUS	**455.47**	9.38	5.59	8.13	18.34	7.87	0.03	37.78	12.89

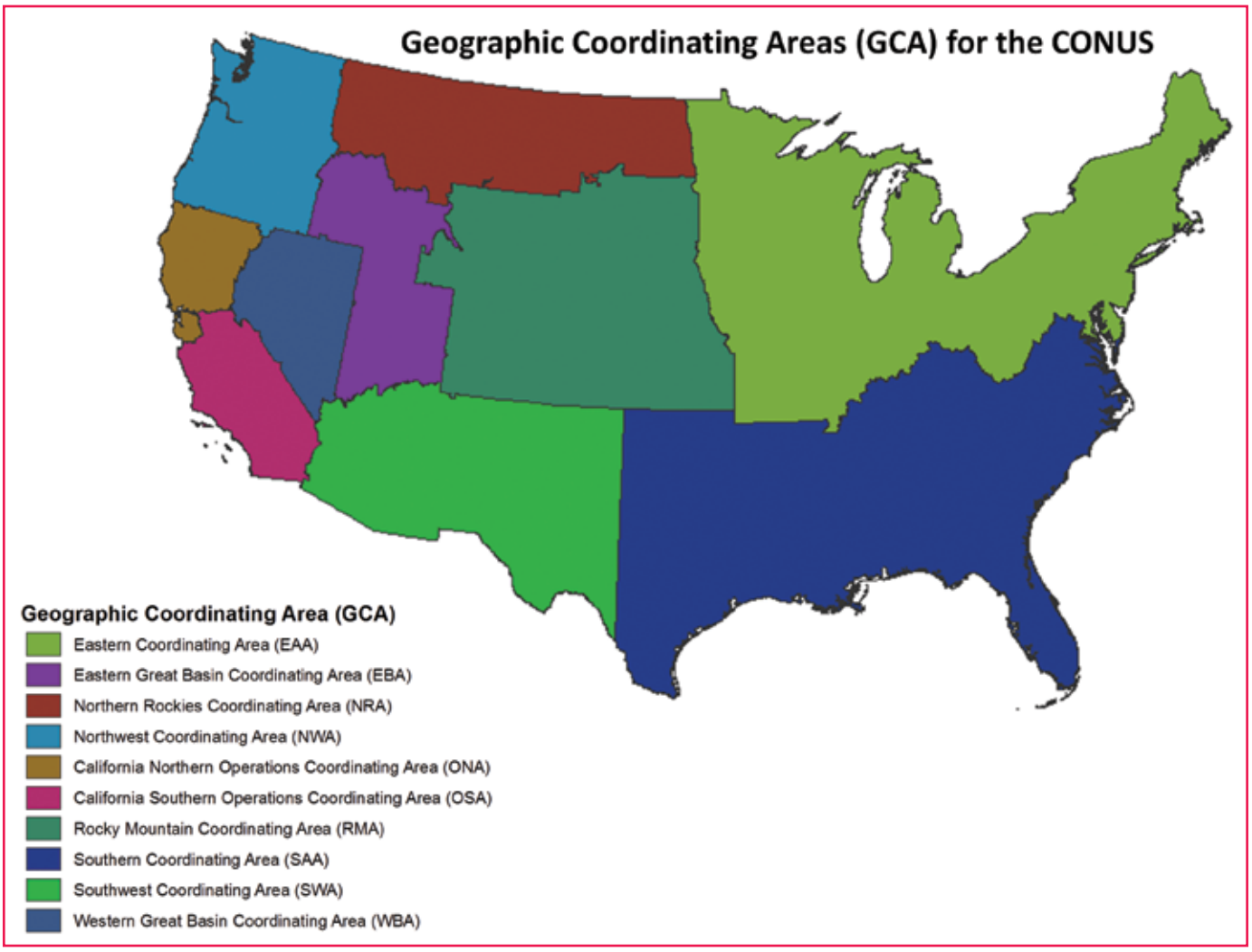


Figure 3.—*Geographic coordinating areas (GCA) for the CONUS.*

Table 2.—*Fire management units area percentages in each strategic response category, by land management agency (CONUS only).*

Land management agency	Total spatial FMU area	Strategic response category							
		1	2A	2B	3A	3B	4	No data	Unclear
		Areal Percentages							
BIA	**46.00**	11.89	1.63	3.41	10.13	0.17	0.00	27.07	45.68
BLM	**170.51**	14.86	9.44	7.48	14.36	5.70	0.00	35.49	12.67
National Park Service	**25.23**	2.26	0.59	0.36	29.50	15.98	0.04	45.84	5.43
State	**9.58**	1.98	0.00	2.71	10.11	1.04	0.00	83.63	0.52
Forest Service	**196.74**	5.16	4.29	11.35	23.28	10.93	0.00	37.58	7.42
USFWS	**7.41**	13.36	0.81	0.27	3.10	5.67	0.00	75.98	0.94
CONUS	**455.47**	9.38	5.59	8.13	18.35	7.87	0.03	37.79	12.89

Some Examples of Clear Strategic Responses

1 Full suppression; fire is not recognized as a natural process. This ecosystem is not suitable for fire; rapid suppression techniques will be emphasized.

1 Because of human development, fire can no longer be tolerated without significant risk or economic loss. All wildland fires, regardless of ignition source, will be a high priority and will receive prompt suppression actions to minimize fire size.

2A Fire suppression strategies will continue to call for suppression of all fires. However, as a cost-saving measure, fires in high-elevation areas with sparse vegetation may be contained or confined; low-risk fires may not always be extinguished as quickly as in the past.

2A All wildland fires will be suppressed using the full range of strategic and tactical operations…. Wildland fires are suppressed at minimum cost….

2B Respond to wildland fires by taking suppression actions commensurate with human and natural resource values at risk.

2B Fire management responses can be direct aggressive control strategies through less intense control actions commensurate with specific incident needs and objectives. These responses should be based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to be protected.

3A …Wildland fire may be managed through a full range of strategies from prompt and full suppression to management of both human-caused and natural fires for resource benefits.

3A Aggressive suppression action, consistent with firefighter safety, will be taken for wildfires in proximity to private property, highways, or known endangered species locations. Natural fires in remote areas will be allowed to follow a natural course as long as there are no values threatened.

3B Use wildland fire to the extent possible to return fire as a natural ecological process.

3B Use planned fire use and surrogate fire treatments to restore and maintain primary natural resources and their processes where applicable.

4 All fires are to be managed with resource benefit objectives. There are no fire exclusion areas.

Discussion and Conclusions

Several key lessons learned in this study lead to a number of logical future developments in the realm of spatial fire management planning and spatial decision support. First, however, we should address some limitations. In this work, we present only a snapshot of a dynamic management environment. The ultimate aim is not a static color-coded map but rather an evolving system in which clear and complete fire management objectives and planned responses are spatially referenced, updated as necessary, and most importantly, help inform incident management.

Our results are, of course, not binding and are assuredly not correct in all circumstances. Fundamental objectives may have been well-written, but we did not take the step of making inferences if means objectives (that is, incident responses) were omitted. We may have misinterpreted language, and what was unclear to us may be quite clear to the person who uploaded the information. Further, some FMUs might be too heterogeneous for a single response category to be appropriate, thus arguing for further spatial delineation on the basis of areas with consistent response.

Spatial fire management plans (SFMPs) are currently being developed by several U.S. Department of the Interior agencies. In this effort, several units are using fire management zones (FMZs) in lieu of FMUs. The zones represent areas of consistent response categories on the landscape. In future SFMP efforts, the results of the FMU analysis could provide a standard "pick list" of response categories. The pick list would expedite the crosswalk of land and resource management plans to SFMP strategic objectives or FMZ spatial data layers. Greater spatial delineation could provide increased consistency of response categories: unclear or variable FMU responses might become much clearer when further separating the FMU into a wildland-urban interface FMZ and a roadless area FMZ, for instance.

It appears that many fire management units could benefit from a more clear articulation of strategic objectives and corresponding response categories.

Beyond development and refinement of SFMPs, there are a number of other potential uses of this information. One interesting avenue of research would be to examine published incident decisions within WFDSS, apply the same response categorization scheme to decisions, and then examine the alignment of actual decisions with pre-fire incident objectives. Of FMUs with assigned response categories, more than half had response categories that recognized and/or promoted fires for resource benefit. Superficially, it seems unlikely that more than half of natural ignitions in these areas were managed for resource benefits. However, any such analysis would need to consider ignition locations with respect to adjacent FMUs, jurisdictional boundaries, and values-at-risk, and would especially need to consider fire weather; under more extreme weather conditions, agency administrators may be more averse to allowing fires to burn, and fire behavior may be so extreme as to not provide any resource benefits.

It appears many FMUs could benefit from a more clear articulation of strategic objectives and corresponding response categories. It is not our intent to point out the bad apples, so to speak, but we did find many instances where so-called strategic objectives had little to no connection to landscape objectives or to what would be done in response to fire. Some of the least informative examples offered little more than a description of the FMU. This prompted our emphasis on explaining what objectives are and how to define them, as well as providing some examples that we found to be clear and comprehensible.

That field units are uploading into WFDSS geospatial polygons with FMU information and objectives is a great step forward for risk-informed incident response planning. With continued refinement and expansion of FMU-level geospatial data within WFDSS, the fire management community may be able to make progress towards clarity, accountability, and transparency in wildfire incident response. Development of specific SFMP/FMU/FMZ guidance provides clarity for agency administrators in uncertain, complex, and stressful decision environments and could improve communication with the public when smoke is in the air.

Further, these changes may help the fire management community better realize the full potential of the 2009 Federal wildland fire policy reinterpretation and could strengthen ties between planning and investments across the wildfire management spectrum. Ultimately, spatial risk assessments that consider the likelihood and magnitude of potential fire impacts to highly valued resources and assets could be brought to bear to help assign strategic objectives and response categories at the FMU or possibly the FMZ level. ■

Intentional Retention: Roadmapping Your Fire Career

Ken Frederick

Introduction

Jesse Guettermann's experience as a wildland firefighter illustrates the challenge of retaining skilled young employees in fire management. Guettermann had just graduated from Boise State University with a health sciences degree when he landed a job on the Idaho City (Boise National Forest) hand crew in 2011. Guettermann proved to be an outstanding employee: he was a hard-working firefighter, and he learned the job quickly and thoroughly. The Idaho City Ranger District offered him additional fire training courses in the off-season and rehired him as a seasonal employee in 2012. Halfway through the 2012 fire season, Guettermann was offered a vacant position on the Idaho City Hotshot crew for the remainder of the fire season. Guettermann's two initial fire seasons were busy, with lots of travel and rewarding fire assignments.

In spite of his training, fire experience, and genuine affection for firefighting, however, Guettermann had to make some difficult decisions about pursuing fire management as a career. For a recent college graduate who is serious in establishing himself in a career, the prospect of working seasonally for many years creates a significant barrier. Guettermann began exploring the military as a career option because it seemed more stable, more career-oriented, and more of a challenge; there he found a path that could enable him to better meet his fire management career aspirations. In early 2013, he enlisted as a part-time member of the Idaho Air National Guard, which will enhance his job skills and education while allowing him to continue as a wildland firefighter. For Guettermann, it seems to be a great fit.

Ken Frederick is a public affairs specialist with the Bureau of Land Management at the National Interagency Fire Center.

> For many younger seasonal temporary employees, fighting fire amounts to a cool job but not a career.

For many younger seasonal temporary employees, fighting fire amounts to a cool job but not a career. It is regrettable that a relatively small number of capable young firefighters grasp a vision for making fire management their profession these days. After getting several years of training and experience, many younger firefighters lose interest in the field or become frustrated with barriers to their career development and leave.

Today's young adults are entering the workforce with some attitudes and assumptions about life and work that are sharply different than those held by their counterparts a generation ago, which can create challenges for organizations wanting to retain younger employees. According to research published by organizational behavior experts Dr. Georgia Chao and Dr. Phil Gardner (Chao and Gardner 2008), young adults today define a "good job" differently than did their counterparts of 15 to 20 years ago. Instead of being motivated by traditional incentives such as high income and working for a prestigious company, today's fledgling workers are primarily looking for interesting work, good benefits, job security, and chances for promotion. They also are less apt to stay with a job just because they have one.

Chao and Gardner surveyed 700 managers who employ this age cohort and found that "[a]lmost two-thirds of the managers agreed or strongly agreed that retaining young adults has become more difficult" (Chao and Gardner 2008, p.7). Whether you call this generation twixters, Generation Y, or Millennials, today's entry-level firefighters bring different ways of thinking to the job.

Such new ways of thinking make it more challenging than ever to retain and develop valuable seasonal employees, which is a key objective for every fire program leader and line officer. Successful recruitment may launch a fire management program workforce, but unless high-performing seasonal employees are *retained* and given opportunities to develop and advance into permanent positions, even the best recruitment strategy comes up empty in the long run.

Planning a Fire-Career Workshop

In 2011, I began working on an idea to improve employee retention. If younger employees had some indication of how a career in the Federal wildland fire service works and how to achieve progress in their careers, they could see beyond their day-to-day jobs and at least consider the option of a career in fire and aviation. What promising younger employees in fire need, I reasoned, is a frame of reference—a "roadmap"—that demystifies the process of developing a career in fire management. My concept centered on a short workshop that would present practical advice for pursuing a career in fire management, given by people who have traveled the same path younger employees are just beginning.

Early in the process of formulating and refining the concept of a career-building workshop, I asked former colleague Mike Benefield to partner with me in developing this idea. Benefield and I shared many of the same concerns related to mentoring the next generation in fire. Like many in our generation of firefighters (who started their careers in the late 1970s or early 1980s), our experience with career guidance was similar to gold prospecting: what you were looking for was out there, but it took some serious searching and digging to find it.

Benefield and I crystallized four objectives for the workshop:

1. Articulate why fire management is an attractive and rewarding profession. We wanted to share what we thought makes a career in wildland fire distinct from other occupations. We also wanted participants to perceive firefighting more in terms of a profession and a worthwhile calling, rather than a seasonal job.
2. Expose younger employees to the bigger and broader world of fire. We wanted to convey the idea that a career in fire and aviation can encompass different kinds of jobs and roles; it can take one to different parts of the country; and it can involve different agencies, crews, and kinds of firefighting.
3. Show younger employees how they can move beyond a *job* in fire management to a *career* in the field. We wanted to present a set of strategies and insights for developing and managing one's own career. We would suggest the kind of insider information about a career that the panelists had learned through dint of experience.
4. Communicate effectively with employees who are younger and often coming from different cultural contexts.

Building a capable and professional workforce in a fire management program starts with recruiting intelligent, skilled, and diverse job candidates. But retaining and developing good seasonal employees in the workforce must be equally intentional.

As we discussed and worked on the content of the workshop, we gradually narrowed it down to three key elements:

1. Vision-Casting. In this section, the presenters would share why a career in fire captivated them and why fire management is a distinctive and significant career choice. We felt that an inspiring *vision* of what the future could be like was important.
2. Career Nuts and Bolts. This would be the meat-and-potatoes portion of the workshop, including eight practical suggestions that constitute the building blocks of career development. For example, this section would cover how to perceive and take advantage of career development opportunities, become a student of fire, find mentors, and develop leadership skills. This section would also discuss the importance of being a reliable and skilled employee, developing communication skills to complement your fire skills, realizing that a fire career can be amazingly diversified, and understanding that there's more to this career than just earning money.
3. Job Acquisition Skills. We felt that the great majority of younger fire employees are not adept at the mechanics of finding new jobs in the Federal system. Also, we concluded that many do not understand the art and science of marketing their skills and abilities using resumes and other job application tools. This section would provide instruction in how to acquire a job in fire management.

We planned for time at the end of the workshop for questions and

answers. The workshop would be wrapped up with the facilitator summarizing several important themes or take-away points that surfaced during the session.

As planning progressed, we paid particular attention to how the panel would operate. Three or four panelists would present the workshop by essentially team-teaching the content sections. We thought the panel should have a strong connection to the audience because we wanted to convey the idea that a career in fire was not an illusory goal that was out of reach for the typical seasonal temporary employee. In other words, we wanted to say, "We started our careers right here—just like you. If we did it, you can do it."

We also wanted the panelists to have strong operational backgrounds in fire suppression. We felt this attribute would lend credibility to the session.

Finally, we wanted the panel to exemplify the idea that a fire career can take a person in many directions—both geographically and vocationally.

Bringing the Concept to Life

Our next step was to find a unit to host the workshop. We contacted Kyle Cannon, Columbia River Division fire management officer (FMO) on the Okanogan-Wenatchee National Forest, and shared our ideas with him. Cannon supervises a large and diverse fire program, which includes a Hotshot crew, two large initial attack crews, two engine modules, and a managerial organization comprising seven field-level specialists and supervisors. In total, the Columbia River Division includes 66 permanent, permanent-seasonal, and temporary seasonal fire employees—a group large enough to serve as a test audience. Further, this was familiar ground to Benefield and me, as we had spent significant parts of our early careers on the Wenatchee National Forest.

> Today's entry-level firefighters bring different ways of thinking to the job.

Cannon grasped the vision and value of the session and offered to host the pilot presentation of the workshop, which we had titled Roadmapping Your Fire Career. By spring 2012, we felt the content of the workshop was ready to present. We set a date of June 7 as the maiden voyage of the workshop. Though we would be putting on the workshop in a real setting, we were treating the initial offering of the workshop almost as a test flight, to see if the concept was feasible and capable of having a positive effect on participants' thinking and decisionmaking.

Initially, Benefield and I were on the panel. As the district FMO, Cannon both moderated the workshop and participated on the panel. We recruited a fourth panelist, Troy Corn, from the local area. Prior to his retirement, Corn had been a local area FMO. Later in his career, Corn had taken on several special assignments for the Pacific Northwest Region and the Okanogan-Wenatchee National Forest; he clearly met the criteria for a panelist and was well known as an excellent speaker and leader.

More than 40 Columbia River Division fire employees attended the workshop. Most of the participants were in their 20s and were seasonal temporary fire employees of the Columbia River Division. Most worked on the division's type 2 hand crew or on an engine. Some worked in fuels or prevention. Most of the participants had worked in fire for fewer than 5 years and had varying levels of interest in making a career in wildland fire management.

We had planned for the event to take 2 hours; the session ended up taking closer to 3 hours to cover the material and answer participants' questions. After the session, the panel felt positive about the event and felt we had accomplished our objectives.

What We Learned

Two weeks after the workshop was held, Cannon distributed an evaluation and feedback form to as many of the participants who were available. We intentionally delayed the evaluation in order to test the participants' retention of key points presented in the workshop. We eventually received 29 completed evaluations back from workshop attendees. Although they included a plethora of suggestions, the evaluations clearly substantiated the idea of an informal career development workshop for newer fire employees.

The evaluation asked participants to rate the usefulness of the session on a scale of 1 to 10. The mean rating was just over 7, and the median rating was 7.5, meaning most respondents found the workshop useful and worth their time. Significantly, fully 25 percent of the

temporary employees who gave us feedback stated that they were *more likely* to make wildland fire management their career as a result of the workshop.

Because the initial offering of the workshop was something of a test run, we were not surprised to receive a lot of suggestions to improve the workshop. Some of the 48 suggestions candidly pointed out things we could have done better, but many were complimentary. All of the suggestions were helpful.

We organized suggestions into three areas: (a) improving the structure of the workshop, (b) making the information more relevant and specific to the audience, and (c) streamlining the presentation of the workshop. Some of the suggestions reflected personal tastes; for example, two participants suggested the planners limit the workshop to 2 hours, while two other participants recommended the session be lengthened.

Two themes, however, floated to the top in terms of ways to improve the workshop. First, the workshop's content needed to include more information about the practicalities of a fire career. Topics including pay, benefits, career options in fire, and the future outlook of the field should be covered in future offerings of the Roadmapping workshop. Second, the workshop needed to talk in concrete terms about what a career path actually looks like. When we presented that kind of information, we tended to discuss it more abstractly than the audience wanted.

We were pleased to discover that almost half of the respondents offered unsolicited gratitude and support for the workshop. One person wrote, "I think the presentation had a fantastic effect on folks who feel stagnant and don't know what next steps to take. It's very beneficial to take the time to get everyone thinking about these things now." Another wrote this at the bottom of the evaluation: "Please continue [to do this] especially for the new/younger generation. All the help we can [get] is very useful. Thank you."

> Fully 25 percent of the temporary employees who gave us feedback stated that they were *more likely* to make wildland fire management their career as a result of the workshop.

These expressions of gratitude for Roadmapping Your Fire Career illuminate a valuable take-away point for fire program managers and leaders. Younger employees care about their jobs, and many of them are interested in future careers in fire. Leaders who are genuinely concerned with the lives and careers of younger employees—and who demonstrate that concern—will have a strong influence on those employees' decisionmaking.

Finally, we concluded that it is not actually *retention* that leaders in fire should be focusing on. It's *development*. Retention means simply keeping something for your use. If the message we give is, "We like your work and want to keep you here," fire programs are going to lose valuable employees. The message we really need to send is, "You are a fantastic employee, and we want to do everything we can to give you opportunities to grow and develop your career."

Conclusion

Building a capable and professional workforce in a fire management program starts with recruiting intelligent, skilled, and diverse job candidates. But retaining and developing good seasonal employees in the workforce must be equally intentional. This process starts with robust efforts to create growth and development opportunities—especially for newer employees who have proven their capabilities for future development. This process, however, must include leaders who talk to, listen to, and mentor younger employees. It doesn't happen accidentally.

References

Chao, G.; Gardner, P. 2008. Young adults at work. MonsterTrak. White Paper. 13 p. <http://ceri.msu.edu/publications/pdf/yadultswk3-26-09.pdf>. (23 May 2013). ■

For units interested in using and adapting this concept, Roadmapping Your Fire Career™ is available in the PDF format, along with a supporting document describing strategies and methods to present the workshop. For more information, contact Ken Frederick, National Interagency Fire Center, at kfrederi@blm.gov.

Prevention and Education Teams—A Valuable Resource

Jim Funk

Wildland fire prevention and education teams were developed to respond to specific wildland fire conditions or threats that might result in increased fire occurrence and losses of resources, property, and life. Since the first one was used in the Southwest in 1996, such teams have proven to be beneficial in all geographic areas of the country, and they are becoming more widely recognized over time. Yet agencies are still not clear on their use and function.

I have had the pleasure of serving on several teams and find each one to be unique and challenging. In the past 10 years, I have seen an evolution in teams and how agencies use them.

A successful prevention and education team reflects a joint effort in which the team listens to the agency, develops an agreed upon strategy, and implements the plan. In my opinion, prevention and education teams are effective and efficient, and they accomplish stated objectives for the host agency. However, there is still a learning curve for teams and agencies to make the accomplishments even better.

In the past, a Federal or State agency would ask an incoming team, "We called you in because we have a very serious situation. What can you do for us?" Teams helped the agency do a quick assessment of prevention needs and developed a strategy to raise awareness and get the word out. Now, an agency usually has a plan in mind before calling in a team, although often that plan is not specific. It is still the team's function to help assess the situation and advise a strategy to reach the objectives.

Having a prevention and education team is a joint effort where the team listens to the agency, develops an agreed upon strategy, and implements the plan.

Prevention and education teams bolster an agency's capacity to reduce the number of fire starts. Honestly, I find that these teams often get to focus on what the host agency has always wanted to do, but doesn't have the time. It is amazing what a team can do when allowed to spend 2 entire weeks on a specific mission without the interruptions of the normal daily workload.

What Can a Prevention and Education Team Do for You?

Although raising awareness is always part of the incident management teams (IMT) mission to protect life/property/resources and suppress the fire, other broad-based issues typically need attention. There is a growing interest in fire information and "what is the immediate threat to me?" If there are IMTs assigned to a larger fire, their information officers handle the fire status and community threat near the fire. Prevention and education teams can assist the effort by keeping surrounding communities informed and by coordinating the IMT prevention message and concerns into the team messaging. This helps reduce additional fire starts in the area that would complicate the IMT's main objectives. The prevention and education team is usually separate from the IMT and must not conflict with the IMT's mission.

Beyond awareness and immediate threat, I find the public wants to understand the wildfire issues. For example, a community might ask, "What does 'dry fuels' really mean?" "What is causing all the fires?" "What do the restrictions mean?" The team's mission is to work with the host agency to make the issues and answers clear with simple and understandable messaging.

Two recent examples of messaging were in Utah (2012) and Texas (2011). The goal in Utah was to simplify the fire restrictions of Federal and State agencies into a simple message. Symbols of the

Jim Funk, Association of Consulting Foresters, is a consulting forester in Virginia and an experienced national fire prevention and education team leader. He retired from a 33-year career with the Kentucky Division of Forestry and remains active in wildland fire prevention activities.

main fire restrictions were formatted on a single page with green circles for acceptable and red circles with a slash (internationally recognized) for unacceptable. Agency personnel, as well as the public, found the messaging direct and understandable. In Texas, a product was developed to provide simple guidance on personal actions for the "Ready, Set, Go!" program in the State. Several other related products conveyed the central themes of the State's prevention program. Products on ember awareness, landscaping, and construction can be viewed at the Texas Forest Service Web site <http://texasforestservice.tamu.edu/main/article.aspx?id=8516>.

Prevention and education teams bolster an agency's capacity to reduce the number of fire starts.

In both cases, the agencies realized a need to refresh and simplify the prevention messages so they could inform and involve the public in an effort to garner support in the overall effort. In general, people want to do the right thing; they want to know what to do for themselves and the community. Getting individuals to take action is the answer, rather than an agency telling the public how to behave. As simple as this concept is, agencies often violate the principle.

Prevention and education teams are also asked to interface with local governments and community groups. I believe community engagement is going to be a growing task with these teams. Working with concerned individuals and groups, the team involves local people by listening to their concerns and proposed solutions, providing information, and filling in gaps of communication with open discussions.

Recent examples of community engagement are from Kentucky, Louisiana, and Georgia. Working directly with communities has reduced arson problems in the Redbird District of the Daniel Boone National Forest in Kentucky and the Marlow area in Louisiana. In both instances, the community was made more aware of the situation, felt empowered, and the incidence of arson was reduced. In Georgia, teams met with island communities, where self-protection was the issue; the team listened to the issues and helped the community forge plans to protect themselves by using the Firewise Communities program and available mitigation resources. Building broad partnerships was especially beneficial in this assignment.

Other tasks for prevention and education teams are to develop prevention campaigns, professional informational materials, a long-term prevention strategy, Web site and social media messaging, and prevention implementation plans. These types of tasks may not be completed in a 2-week assignment, but one value of a prevention and education team is to get the conversation started and leave the host agency with suggestions to guide future efforts.

Getting the Best From Prevention and Education Teams

To make the most of your prevention and education team, the first thing to decide is your prevention *needs*. What one action will best help your prevention effort? You may need to raise awareness, build partnerships, develop a prevention campaign, or create useful publications. If you are unsure, you may

The prevention and education team is usually separate from the IMT and must not conflict with the IMT's mission.

Wildland Fire Prevention and Education Teams (WFPET)

What criteria are used for ordering a WFPET?

- Current and predicted weather indexes, such as red flag warnings, Keetch-Byram Drought Index, rainfall amounts, drought indexes, etc.;
- Fuel conditions and loading; and
- Fire occurrence.

What is the process for ordering a WFPET?

- Through the Resource Ordering and Status System (ROSS), as done with other resources.

What positions are normally on a WFPET?

- Team leader;
- Fire prevention specialist team member;
- Public affairs or public information officer team member; and
- Other team members as required such as administrative support, finance, logistics, law enforcement, agency liaison, etc.

What are the typical activities of a WFPET and what type of products can a WFPET produce?

- Typical activities: generating prevention contacts, developing prevention and materials, organizing and appearing at prevention events, attending community meetings, distributing prevention materials, meeting with local officials, etc.;
- Possible products: a communications plan, fire prevention and education brochures, posters and bumper stickers, an ongoing fire prevention plan, media releases, fact sheets, and typically a final team report.

What are some possible benefits of using a WFPET?

- Reduction in fire occurrence,
- New fire prevention and education products,
- Updated fire prevention assessment,
- New fire prevention plan,
- Updated or new communications plan,
- Improved community relations and fire department relations, and
- Heightened public awareness and education.

What types of funding are available for WFPET?

- For Federal agencies, the use of severity funds;
- Certain types of grant funds; and
- Possibly, fire preparedness or fire mitigation funds.

wish to talk to other agencies or individuals to see what is working for them. Talking to prevention team leaders or members may also be useful.

Community engagement is going to be a growing task with these teams.

When the time is right for requesting a team, you now have a general direction, which makes a difference in team composition. If the assignment is media-heavy and will deal with a lot of public contact, your team will need at least two experienced public information officer (PIO) positions. If the assignment is product-heavy, consider the inclusion of a graphic artist for design and a PIO skilled in writing and editing. A law enforcement officer (LEO) may be part of the team if the direction is to address a specific fire cause such as arson; the LEO can add great insight to the approach of the prevention strategy.

When a team is assigned, talk to the leader before arrival. This gives the team a better idea what to expect, allows time for research, and may adjust the team composition. The leader may ask for access to data or other information to get a head start on the objectives.

On arrival, spend enough time at the "in-briefing" to make sure the situation is understood and the assignment is clear. The team will work to make sure the objectives

are obtainable and reasonable within the allotted timeframe. Be available to the team to make decisions, approve products, and monitor the progress. Be willing to quickly adjust the approach and tasks. My experience is that the accomplishments are usually larger than originally planned.

Each of these steps is important, leads to better team utilization, and accomplishes more for the agency. The team should be an extension of the agency prevention program and move the long-term direction of the agency forward. The team is there for 2 weeks; the agency is there for the long haul.

Final Thoughts

Prevention and education teams can be valuable to an agency or interagency group at all levels. State and regional teams are forming in many places and doing great work. As these teams gain experience in their own areas, they become more valuable for national teams. I think it is crucial to involve new members and leaders on each assignment in order to increase national capacity and ensure that trained members are available for local teams. For incoming national teams, trained and experienced local members assist a team by providing local knowledge of the situation, access to community players, and insight on historical prevention efforts.

To make the most of your prevention team, the first thing to decide is your prevention *needs*.

In our most recent assignment, the team developed signage for the local interagency group. By removing the interagency logo and specific Web site information, the products can be used regionally and by other States. The work of prevention and education teams thus can have significant impact beyond the host, in part, because simple messaging transcends the boundaries of a national forest or agency. The overall cost of a prevention and education team is easily justified when there is broad application for the work and when adaptable products become available for others to share and use.

Especially with product work, developing materials that can be used by other States or agencies in general prevention messaging is cost-effective and helps other teams get a faster start to get the public informed and engaged. Teams have been doing this for years. Although I, as a prevention team member, may be highly biased, I feel prevention and education teams provide instrumental assistance needed by agencies to address dangerous situations and reduce the incidence of wildfire from human causes. ■

Firefighter Property Program Deemed a Success in Texas

April Saginor

Adequate firefighting equipment is always a critical need for fire response organizations—the scars of last season's mega-wildfires are still fresh, and firefighting organizations are working diligently to rebuild their wildfire response capabilities.

The Firefighter Property (FPP) program was launched in 2005 through an agreement between the Forest Service and the U.S. Department of Defense. It provides equipment to fire departments and State program cooperators. Texas began participation in 2006, becoming the third State to sign an agreement to join the program.

An impressive aspect of the program is the level of cooperation between local fire departments, the Federal Government, and State governments. The U.S. Department of Defense identifies surplus equipment available for acquisition. State agencies, such as the Texas A&M Forest Service (TFS), acquire the equipment and pass it along to the recipient, who must paint the item, purchase insurance, and use it for firefighting for 1 year before the title is turned over.

Primarily focused on building the capacity of local fire departments, TFS has used the program to acquire and deliver more than 200 vehicles, mostly the 5- or 2½-ton cargo trucks, to fire departments across Texas. The military vehicles are in high demand statewide and are particularly suited for wildfire suppression operations in the brush and grasslands of central and west Texas. Fire department requests are rated based on factors such as response area size, population protected, and distance to the nearest fire department, placing the highest priority on volunteer fire departments serving rural and less developed communities.

Recently, the State agency itself has benefited from the program by acquiring several large dozers, trailers, and transport trucks to supplement the State wildfire response fleet. In total, the agency has acquired eight D7-size dozers, trailers, and transports that are being placed in service with TFS fire response crews.

One of the units (a Caterpillar D7G dozer, transport trailer, and haul truck) recently completed refurbishment, with a minimum investment of $6,000 for the dozer and $8,000 for the trailer, to bring the equipment up to standard for fireline service. This unit now has a combined value of $170,000 and is being deployed in east Texas to support local, regional, and statewide wildfire response (figure 1).

Providing the needed resources is one way government agencies can work together

Figure 1. —*DC 7 Dozer in service by the Texas A&M Forest Service.*

April Saginor is a communications specialist for Texas A&M Forest Service, Forest Resource Protection.

Wes Moorehead, east Texas operations department head for the TFS, said the program offers an opportunity to build capacity in the State's fire service.

Providing the needed resources is one way government agencies can work together, said Mark Stanford, fire chief for the TFS.

An impressive aspect of the program is the level of cooperation between local fire departments, the Federal Government, and State governments.

"Texas A&M Forest Service is proud to partner with the DoD and the Forest Service in coordination of the State's Firefighter Property program," Stanford said. "We expect this program will continue to contribute greatly in the protection of life and property not only in Texas but across the country." ■

Table 1. —*Some recent Texas A&M Forest Service truck assigned to various fire departments.*

Year	Make	Series	Value	Item	Region	County	Notes	Delivered
1988	Oshkosh	R-11	$94,124.96	Truck, Tank	Livingston	Tyler	Colmesneil	04/17/11
1999	AM General	M920	$74,288.00	Truck, Tractor	Abilene	Brown	Zephyr	10/11/11
1984	AM General	M923	$70,613.00	Truck, Cargo 5 Ton	Canyon	Parmer	Lazbuddie	02/02/12
1985	AM General	M923	$70,613.00	Truck, Cargo 5 Ton	San Angelo	Tom Green	Quail Valley	12/13/11
1986	Chevy	M1008	$15,751.00	Truck, Cargo 1.25 Ton	Livingston	Angelina	Rivercrest/ Redland	02/09/11
1985	AM General	M923	$70,613.00	Truck, Cargo 5 Ton	Childress	Collingsworth	Samnorwood	04/09/12
1984	AM General	M923	$70,613.00	Truck, Cargo 5 Ton	La Grange	Burnet	Hoover Valley	06/08/12
1991	Oshkosh	A/S32 R-11	$94,124.96	Truck, Tank	Fort Hood	San Saba	Richland Springs	06/13/12
1985	AM General	M925	$75,278.00	Truck, Cargo 5 Ton	Lubbock	Lubbock	Shallowater	06/27/12
1985	AM General	M923	$70,613.00	Truck, Cargo 5 Ton	Beeville	Brooks	Falfurrias	06/11/12

Colmesnell

Samnorwood

Zephyr

Hoover Valley

Lazbuddle

Richland Springs

Quail Valley

Shallow Water

Rivercrest

Falfurrias

Fire Shirts for Safety, Not Fashion: Proper Use of PPE To Prevent Thermal Heat Burn Injuries

Fred J. Schoeffler

Burns are one of the most painful, disabling, disfiguring, and costly injuries anyone can experience, requiring more medical care than all other traumas (Tutterow 2012). There is a recognized growing problem in the wildland firefighting culture whereby firefighters are exposing themselves to burn injuries by not properly wearing personal protective equipment (PPE), primarily fire shirts. Unfortunately, supervisors are allowing this unsafe practice.

Fire shirts are being improperly worn while on the firelines—for example, sleeves are rolled up or in poor condition (threadbare, torn, worn out, or soaked in gas and oil)—subjecting the wearer to potential burn injuries. A common firefighter's response is, "it's my favorite fire shirt." Sociologist Diane Vaughan calls this "normalizing deviance" (Vaughn 1996).

This has been a troubling practice of several years now. The practice started with our most elite firefighters setting the trend, so leadership *should* be well aware of this safety weakness.[1] Elite firefighters exert a very strong influence on the attitudes and behaviors of the wildland fire culture, including this attitude toward PPE (Kapsali 2009).

Obviously, no one plans on getting burned. The experience of a burn injury, or merely a conversation with anyone who's had one, or reading investigative reports or lessons-learned accounts *should* motivate firefighters to wear good, sound PPE. After all, we are trained to "plan for the worst," so wearing sturdy PPE should just make sense, right? It *should* be a simple and obvious choice to replace your "favorite fire shirt" with a well-maintained, structurally sound PPE and wear it properly with sleeves rolled down while on the active firelines to avoid thermal burn injuries.

Burn Injury Research

The Stoll Curve

Researchers Alice Stoll and Maria Chianta conducted thermal burn studies on humans and animals in the 1950s and 1960s for the Naval Air Development Center, Aerospace Medical Research Department. In a laboratory, they applied various heat fluxes to their subjects to determine the heat energy level required to create a second-degree burn, defined as the point when a blister forms and the outer layer of skin (epidermis) is destroyed. This research (Stoll and Chianta 1968, Neal 2005) resulted in the now internationally recognized "Stoll curve," which measures burn injuries by quantifying the heat level and duration required both to feel pain and to acquire a second-degree burn in a wide range of exposure conditions (Furtak and Silecky 2012, Lawson 1996, Sipe 2004, Neal 2005).

The key point on the Stoll Curve is where the time to second-degree burn and the heat flux intersect at about *one second,* generating what

Wildland firefighter on the active fireline with sleeves rolled up. Photo by Kari Greer, 17 August 2012

Wildland firefighter with properly worn personal protective equipment. Photo by Kari Greer, 17 August 2012

[1] There are numerous media photos depicting firefighters with their sleeves rolled up on the firelines.

Fred J. Schoeffler works for the Coconino National Forest as a call-when-needed fireline supervisor. Retired from the Forest Service in 2007 after 34 years, he also spent 26 years (1981–2007) as the Payson Interagency Hot Shot Crew superintendent.

is known as the thermal protective performance (TPP) number. Wildland PPE is rated by the radiant protective performance (RPP) rating. For all practical purposes, they are the same rating. The TPP test evaluates the garment material's thermal insulation in the presence of both direct flame and radiant heat. The purpose of the TPP is to measure the length of time that the person wearing the garment can be exposed to a heat source before incurring a second degree, or skin blistering, burn (Ackerman 2010, Tutterow 2012, Neal 2005).

Human Tissue Tolerance to Second-Degree Burns

The human skin is the largest organ in the body, with an approximately 5.5 sq. ft. (1.7 m^2) surface area, representing about 15 percent of an adult's total weight. The skin performs numerous vital tasks, such as protecting underlying tissues from physical or thermal trauma, thermally regulating the body by sweating and heat conduction, providing impermeability to tissue fluids, and supplying the sensory perception of touch (Ackerman 2010, Society for Fire Protection Engineers 2000).

There are several uncertainties associated with predicting thermal injury to skin for a given heat flux exposure. They deal mostly with the fact that a person's skin is not uniform in thickness over the body and is a series of separate layers where the cell structure varies with depth, such as forearms compared to the soles of one's feet (Ackerman 2010).

Burn injury progression is largely related to the amount of time the skin is above 111° F (44° C) at any given depth; the rate at which damage occurs is roughly tripled for each degree the cells are above the threshold temperature (Ackerman 2010). Even small skin temperature changes result in serious burns (Lawson 1996).

The fireline is not a fashion show.

Radiant heat is transmitted through the air like light, without heating the air, so any object (PPE or exposed skin) used to absorb the heat will modify it. Conversely, convective heat, in most cases, can be sufficiently intense to burn airways and is mostly fatal (Butler 2013). It also is possible that firefighters could receive serious burn injuries with no evidence of thermal damage to the clothing, or they could even be unaware that they've been burned, especially during periods of heavy sweating (Lawson 1996, Lessons Learned Center).

According to researcher K.J. Gaston, "The best way to treat a burn is not to have one" (McLean 2001). This definitely states the obvious and somewhat begs the question; however, avoiding burns may be neither quite so obvious nor so easily accomplished.

The distance at which human beings will suffer serious skin burn injury differs depending on the heat flux level. The degree of burn injury depends on the total dose of energy received by the skin and the rate at which the energy is received. The threshold energy for a second-degree burn injury is a variable, not a constant. The time to pain is completely dependent on the heat flux, and the minimum needed to feel any pain is 5.5 sq. ft. (1.7 W/m^2))(Furtak and Silecky 2012.

What Is PPE and What Does It Provide?

The PPE Standards

Wildland fire PPE is covered under National Fire Protection Association (NFPA) 1977, which requires a RPP test. The RPP rating, virtually identical to the TPP discussed earlier, also reflects the time to get a second degree burn. The stated standard requires wildland PPE to have a RPP of 7, meaning it should withstand 0.5 calories of heat for 14 seconds (in a laboratory) before an individual wearing it would receive a second-degree burn (Miller 2008).

According to NFPA (1977), "The goal of this [PPE] standard [is] to provide thermal protection for the wildland firefighter against external heat sources with flame-resistant clothing and equipment while not inducing an extraordinary internal heat stress load" (Mangan 1999).

According to the Code of Federal Regulations (29 CFR 1910.132), employers must provide "protective equipment for eyes, face, head, and extremities." It "shall be … used and maintained in a … reliable condition," and "defective or damaged personal protective equipment shall not be used" (1910.132(e)) and must be replaced.

Research on the subject reveals that the CFRs dealing with PPE are inadequate and provide an unsafe basis for specifying firefighter protective clothing performance (29 CFR 1910.132(a), Stull and Stull 2011). However, this is no excuse for improperly worn (sleeves rolled up) or substandard (threadbare, gas-and-oil-soaked) PPE. The *Red Book* 2013 directs us to wear and use PPE (Nomex®, Kevlar®, or other fire-retardant materials) that

is in good condition and worn properly. The Red Book states that PPE "will be replaced when the fabric is so worn as to reduce the protection capability of the garment or is so faded as to significantly reduce the desired visibility qualities and to be cleaned or replaced especially when soiled by petroleum products" (Red Book 2013).

The Nomex® shirts and trousers currently used by wildland firefighters have fabric weights of 5.7 and 8.5 oz/yd^2 (190 and 280 g/m^2), respectively. The PPE is tested based on a single criterion of human exposure, namely, 5 kW/m^2 heat flux level. The fabric rating improves as its thickness or weight increases, yet many firefighters are using fire shirts well beyond their effective lifespan when no matter its original rating, the fabric thickness, or weight tends to decrease. Like it or not, PPE has a finite life (Tutterow 2012).

The Balance

There is a considerable amount of literature on "garment comfort and the psychological and physiological functionality" related to garment wear. Some of it relates to wildland garments, but it mostly pertains to structural firefighters, law enforcement officers, skateboarders, and, of course, the fashion world (Kapsali 2009; Cassel et al. 2005, Black et al. 2005). A researcher investigating law enforcement PPE identified several cases where individuals working in hazardous environments rejected their PPE because the look and design were deemed unsuitable (Black et al. 2005).

Personal protective clothing should strike a balance between worker protection and worker comfort (Sharkey 1999); that does not mean that it's okay to wear your favorite fire shirt beyond its effective lifespan just because you think it's comfortable. Many firefighters have stated that they are totally opposed to wearing a new fire shirt because it's so bright or that their favorite fire shirt is much more comfortable than a new one.

Clearly, the fireline is not a fashion show, but an increasing number of firefighters seem to see their fire shirts as a fashion statement. Worn-out or threadbare favorite fire shirts have a greatly reduced or virtually nil RPP rating; while they will afford some protection, these worn-out shirts just will not provide the protection needed in a "worst-case scenario."

With respect to working in the wildland-urban interface (WUI) around fully engulfed structures, 1960s studies suggest that our wildland PPE is sadly inadequate for these radiated heat intensities. A fully involved single-family home produces radiant heat exceeding 32.25W/in^2 (5 W/cm^2) up to 40 feet (12 m) from the burning structure (Law 1963, McGuire 1965).

Replace your "favorite fire shirt" with a well-maintained, structurally sound PPE and wear it properly with sleeves rolled down to avoid thermal burn injuries.

The Paradox

So, what's the answer here? Do you wear double layers of Nomex in these situations or do you practice good situational awareness and avoidance? PPE can most likely survive under high temperatures with little or no damage; the human body cannot. Double-layer PPE has grown popular because of the notion that "more layering is more protection" and has proven effective in reducing some severe wildland fire burn injuries. Others correctly argue that double-layer PPE may actually accelerate the potential for heat injuries because the firefighter stays in place too long (Miller 2008, Mangan 1999).

There is, thus, a paradox to PPE use. While there are advantages to protecting the face, neck, and ears with PPE such as a shroud, one must exercise extra caution because the extra protection can allow a firefighter to enter an area that is dangerously hot and remain there for too long. By the time one feels pain, it is often too late to avoid a burn (Sipe 2004, Stull and Stull 2011). This is also evidenced by the Wagon Box, Poe Cabin, and New York Peak Fires discussed below, even though shrouds would have clearly prevented or at least reduced some of the burn injuries (Lessons Learned Center).

Normalization of Deviance: Problems Lying in Wait

A strongly held subjective preference for one's favorite fire shirt is not based on logic and certainly not based on objective safety standards. In some cases, it is purely based on superstition. These attitudes fall into the "Human Factor Barriers to Situation Awareness" listed in the Incident Response Pocket Guide as

dangerous, especially the hazardous attitudes and social influences. The prevailing view seems to be that one's favorite fire shirt has been adequate all these years and nothing harmful has happened, therefore, it must be okay. Attitudes have a powerful influence on behavior, and this attitude regarding PPE is clearly very dangerous.

Negative and slow incremental changes are dangerous because they are subtle and normalizing, explained sociologist Diane Vaughan. As a result of studying the 1996 Challenger Space Shuttle crash and fatalities, her research indicates that troubles come about from both individual and organizational failures. The common thread is that ignoring early warning signs and noncompliance with safety standards allows one to accept more and more risk. A "normalization of deviance" is established by continuing to accept more and more risk after the first anomaly is accepted. It's the classic case of bad decisions with good outcomes, reinforcing bad behavior: nothing happened last time, so why not do it again this time (Vaughn 1996). I believe this is what is occurring with the increasingly common unsafe attitude toward PPE.

Case Studies

Reviewing just three wildland fires will put fire intensity and heat flux, proper PPE, and worst-case scenarios into perspective. Go to the Lessons Learned Web site <http://www.wildfirelessons.net/Home.aspx>; Incident Reviews; FLA Guide to review the following fires: (1) Wagon Box Fire near Elko, NV, on July 22, 1999; (2) Poe Cabin Fire in Idaho of August 7, 2007; and (3) New York Peak Fire of July 25, 2006, near Winnemucca, NV. In every case, the firefighters received first-, second-, and third-degree burns on exposed flesh because they had their sleeves rolled up or were not wearing gloves. In two of the fires, firefighters received second- and third-degree burns *through their Nomex* where they had only one layer of protection underneath. All three of these incidents were clearly sudden and short-lived worst-case scenarios where good, sturdy PPE, *for the most part*, worked properly. All three fires occurred in Nevada in sagebrush fuel type, a particularly volatile fuel. Please note that these fires were not exceptionally intense and did not really exhibit any remarkable fire behavior and should, therefore, be considered as fairly common occurrences.

> The best way to treat a burn is not to have one.

Leadership Solution

In many cases, supervisors, including safety officers, are acquiescing to this pattern of inadequate or improper PPE by not correcting the obvious problem. This "problem lying in wait" must be dealt with. It is a leadership issue that can be easily corrected with a fairly simple solution: a good supervisor will set the example, speak up, and take appropriate action when necessary to correct matters. We need supervisors to consistently and fairly implement the required safety system and to enforce the safety policies. Rules without enforcement are just words, so don't just choose the ones you like. Remember to watch out when "deviations" become the norm. Be part of the solution; fix the problem!

References

Ackerman, M.Y. 2010. Burn injuries and their relation to wild land fire fighting. Alberta, British Columbia; Univ. of Alberta, Department of Mechanical Engineering. 20 p.

Black, S.; Kapsali, S.; Bourgourd, V.; Geesin, J. 2005. Fashion and function: factors affecting the design and use of protective clothing. In: Scott, R. A.,ed., Textiles for protection. Cambridge, UK: Woodhead Publishing Limited: 60–89.

Butler, B.; Forthofer, J.; Shannon, K.; Jimenez, D.; Frankman, D. 2010. The effect of terrain slope on firefighter safety zone effectiveness. Proceedings of 3rd Fire Behavior and Fuels Conference, October 25-29, 2010, Spokane, Washington. Birmingham, AL: International Association of Wildland Fire. 6 p.

Butler, B.; Forthofer, J. 2002. Get into the zone. Missoula, MT: International Association of Wildland Fire. Wildfire Magazine: September/October, 2002. 16–22.

Butler, B. 2013. Personal communication. Mechanical engineer, Forest Service, Rocky Mountain Research Station, 240 West Prospect RD, Fort Collins, CO 80526.

Cassel, E.; Clapperton, A.; Aroni, R.; Ashby, K.; Sawyer, S. 2005. Gear up—motivation and barriers to the wearing of PPE by youth in council skateparks, final report to DHS Public Health Research Grants Scheme. Caulfield East Victoria, Australia: Monash University, Monash Research Center. 45 p.

Furtak, M.; Silecky, L. 2012. Evaluation of onset to second-degree burn energy in Arc-flash hazard analysis. Richardson, TX: International Association of Electrical Inspectors. IAFI News No. 65. 8 p.

Harris, W. 2013. Personal communications. El Dorado Interagency Hot Shot Crew superintendent, acting superintendent while engaged on the NY Peak Fire on July 25, 2006. Forest Service, El Dorado National Forest, 100 Forni RD, Placerville, CA, 95667.

Hess, B.W. 2012. Improving safety and health of wildland firefighters through personal protective clothing. Western Association of Agricultural Experiment Station Directors. <http://nimss.umd.edu/homepages/home.cfm?trackID=14598>. (24 May 2013).

Kapsali, V. 2009. Metropolitan comfort: biomimetic interpretation of hygroscopic botanical mechanisms into a smart textile for the management of physiological discomfort during urban travel. Bath, UK: University of Bath, Dept. of Mechanical Engineering. 179 p. Doctor of Philosophy thesis.

Law, M. 1963. Heat radiation from fires and building separation. Boreham Wood, UK: Department of Scientific and Industrial Research and Fire Offices' Committee: Fire Research Station. Technical Paper No. 5. 31 p.

Lawson, J.R. 1996. Firefighter's protective clothing and thermal environments of structural fire fighting. Springfield, VA: National Technical Information Service, Technology Administration: U.S. Department of Commerce. NISTIR 5804. 26 p.

Lessons Learned Center. 2013. Incident reviews. Wildland Fire Lessons Learned Center linkage. <http://iirdb.wildfire-lessons.net/main/Reviews.aspx>. (27 February 2013).

Mangan R. 1999. Wildland fire fatalities in the United States 1990–1998. 9951-2808-MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Program. 17 p.

McGuire, J.H. 1965. Fire and the spatial separation of buildings. Ottawa, Ontario, Canada: National Research Council, Division of Building Research. Fire Technology. 1: 278–287.

McLean, A.D. 2001. Burns and military clothing. Pub Med. Bethesda, MD: J.R. Army Medical Corps, National Center for Biotechnology Information. 147 (1): 97–106.

Miller, V. 2008. The challenges of speccing PPE for WUI firefighting. Tulsa, OK: Firefighter Nation. FireRescue Magazine. July 2008. 6 p.

National Fire Protection Association. 2011. Standard on protective clothing and equipment for wildland fire fighting. Quincy, MA. 67 p.

Neal, Tom, DR. 2005. Understanding the Stoll curve. New Bedford, MA: Oberon Innovative Safety Products. White Paper. 4 p.

Red Book, Standards for Fire and Fire Aviation Operations Task Group. 2013. National Fire Equipment System Catalog. Boise, ID. 379 p.

Sharkey, B., ed. 1999. Wildland firefighter health and safety: recommendations of the consensus conference, April 1999. Tech. Rep. 9981-2841. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology Development Center. 74 p.

Sipe, Joel Edwards. 2004. Development of an instrumented dynamic mannequin test to rate the thermal protection provided by protective clothing. Worcester, MA: Worcester Polytechnic Institute. Master's thesis. 109 p.

Society for Fire Protection Engineers. 2000. Engineering guide for predicting 1st and 2nd degree skin burns from thermal radiation. Bethesda, MD: Society for Fire Protection Engineers. Engineering Guide. 32 p.

Stoll A.M.; Chianta, M.A. 1968. Burn production and prevention in convective and radiant heat transfer. Dayton, OH: Aerospace Medicine. 39: 1232–1238.

Stull, Jeffrey O.; Stull, Grace, G. 2011. Firefighter PPE: understanding limitations of government regulations. http://www.firerescue1.com/fire-products/gloves/articles/1210329-Firefighter-PPE-Understanding-limitations-of-government-regulations/. (24 May 2013).

Tutterow, Robert. 2012. Understanding the thermal protective performance of your PPE. Firefighter Nation. FireRescue Magazine. June 2012. 8 p.

Vaughn, Diane. 1996. The challenger launch decision; risky technology, culture, and deviance at NASA. University of Chicago Press. 592 p. ■

Contributors Wanted!

Fire Management Today is a source of information on all aspects of fire behavior and management at Federal, State, tribal, county, and local levels. Has there been a change in the way you work? New equipment or tools? New partnerships or programs? To keep up the communication, we need your fire-related articles and photographs! Feature articles should be up to about 2,000 words in length. We also need short items of up to 200 words. Subjects of articles published in *Fire Management Today* may include:

Aviation
Communication
Cooperation
Ecosystem management
Equipment/Technology
Fire behavior
Fire ecology
Fire effects
Fire history
Fire science
Fire use (including prescribed fire)
Fuels management
Firefighting experiences
Incident management
Information management (including systems)
Personnel
Planning (including budgeting)
Preparedness
Prevention/Education
Safety
Suppression
Training
Weather
Wildland-urban interface

2013 Smokey Bear Award Winners

Gwen Beavans

The annual Smokey Bear Awards are sponsored by the National Association of State Foresters, the Forest Service, and the Advertising Council, Inc., who together constitute the Cooperative Forest Fire Prevention (CFFP) Committee. These awards represent the highest national honor one can receive for outstanding work and significant program impact in wildfire prevention.

These awards represent the highest national honor one can receive for outstanding work and significant program impact in wildfire prevention.

The first Gold Smokey Bear Awards were given out by President Dwight D. Eisenhower. To date, only three people have received all three Gold, Silver, and Bronze Smokey Bear Awards. A full list of winners can be found at http://www.SmokeyBear.com/awards.

For the 2013 nomination year, one silver winner and six bronze winners were announced; there were no Gold Smokey Bear Award winners this year.

- **Angel Crespo**, fire chief for the Puerto Rico Fire Department in San Juan, received a Silver Smokey Bear Award for his efforts to reduce human-caused wildfires, primarily started from debris burning, in Puerto Rico and the U.S. Virgin Islands. Fire-prevention messages incorporated into his original rap songs and hard rock music, "Fuego Forestal" (or "Forest Fire"), enabled him to get the attention of his audience in an effective and innovative way. Clips of his performances have been shown on CCN and other regional and local U.S. news outlets. A short video biography is found at the following link: <http://www.bing.com/videos/search?q=el+bombero+rapero&mid=FD1B974B83F860BE3D43FD1B974B83F860BE3D43&view=detail&FORM=VIRE3>.

As Marilyn Chakroff of the U.S. Virgin Islands Department of Agriculture put it, "Music is a way of life in our islands. Reaching people through music is a great way to teach wildfire prevention because people remember the message reiterated in the choruses of various songs. Repeating the chorus leads to remembering the message. Mr. Crespo is a good example of the important work that can be done in fire prevention when an imaginative mind has the freedom to create a program that appeals to children, teens and their parents, and teachers alike." Crespo has partnered with the Puerto Rico Department of Natural Resources and the New York City Fire Department Hispanic Society to further spread fire-prevention messages.

- **Paul Reier**, forest technician with the Virginia Department of Forestry and volunteer with his local fire and rescue squad, received a Bronze Smokey Bear Award for his many hours (on and off the job) of working to ensure Smokey is at numerous fairs, special events, baseball games, and schools. He partners with everyone from local nursing homes to the local county fire and rescue organizations and county fire departments. Reier found new ways to get Smokey Bear and wildfire prevention involved in community events, including the Ladies Professional

The three levels of awards are gold, silver, and bronze. All three award categories are the highest level of recognition possible, the only difference being the geographical sphere of the nominated work:

- Gold is given for nationwide impact,
- Silver is given for multi-State impact, and
- Bronze is given for impact within a State.

In the 57 years since the CFFP committee has selected winners, only 80 Gold Smokey Bear Awards have been given (one or two each year).

Gwen Beavans has worked with the Forest Service since 1986. Her career has included positions as forester, silviculturist, National Environmental Policy Act coordinator, interpretive and education specialist, information officer, fire prevention education team leader, and regional fire prevention coordinator.

Golf Association. He also developed a cross-generational fire-prevention message delivery process where elderly populations provide information to grandchildren and great grandchildren. Reier states, "I sincerely appreciate the recognition from colleagues for my efforts in trying to get Smokey's message out to the public in different venues. This is something I really enjoy and will continue to promote Smokey's message of "Only You Can Prevent Wildfires" (figure 1).

Paul Reier, Virginia Department of Forestry, was surprised with the bronze Smokey award.

- **Eric Mosley**, wildfire mitigation specialist with the Georgia Forestry Commission, received a Bronze Smokey Bear Award. Mosley's leadership efforts engaged multiagency partners, including the Forest Service, National Park Service, U.S. Fish and Wildlife Service, and many volunteer fire departments to develop and use fire-prevention education teams in Florida and Georgia. With Mosley spearheading the efforts, local prevention programs and messages were unified, allowing one consistent message to be heard by the public. He helped form subcommittees and task force teams to deliver fire-prevention and education information, hold town-hall information sessions, and conduct home assessments. Home and business assessments, as well as maps, were put into notebooks and given to local fire departments to assist with fire prevention, wildfire assessment, and evacuation needs. In addition, Mosley secured funding for training seasonal employees and local fire department personnel to become qualified and carded Fire Prevention Education Team members.

> To date, only three people have received all three Gold, Silver, and Bronze Smokey Bear Awards.

- **The Texas A&M Forest Service East Texas Operations team** was selected as a Bronze Smokey Bear Award winner for innovative approaches to reach audiences with fire-prevention messages. The "Are You Smarter Than a 5th Grader?" fire-prevention school program was a huge hit, as were the programs delivered at Boy Scout events, the "passport" used at the Fire Museum of Texas' fire prevention camp, and "Show and Tell" and puppet programs. More than 300 programs reached more than 18,000 people over a 2-year period. The team worked cooperatively with school districts and volunteer fire departments to leverage knowledge, skills, and resources. As a result, the number of preventable human-caused wildfires was reduced in their 54-county area. These effective fire-prevention programs and products are being replicated for use throughout Texas.

- Pennsylvania's Fire Prevention Action Team developed the **Pennsylvania Wardens Helping in Prevention (WHIP) program** in 1988. This year, these "wardens" received a Bronze Smokey Bear Award. Under this program, numerous volunteers work with volunteer fire departments, the Pennsylvania Department of Conservation and Natural Resources, schools, and diverse State agencies to educate people about being fire safe. They have presented more than 150 programs at fairs, schools, minor league hockey and baseball games, Penn State football games, and many more venues. Although it is always difficult to tell how much of an impact a specific program has on fire starts, the average acreage burned per year has been reduced from more than 10,000 acres to 6,500 acres since the program began.

- **Glenn Liepe,** of the New Jersey Forest Fire Service, received a Bronze Smokey Bear Award for researching, developing, and marketing a K-9 prevention "Tracks" program. Starting in 2004, Liepe lobbied for a pilot Wildland Fire Investigation and Prevention initiative that would use a bloodhound to determine wildfire origin and cause to successfully track fire-setters. He volunteered to house and care for the dog at his own expense,

Smokey Bear Awards: A History

After World War II, public use of national and State forests increased dramatically, quickly surpassing previous visitor records by 1950. Fire prevention was a real concern because during the period 1946 to 1950, 9 out of 10 wildfires were human-caused. Compared to 1941, however, the total number of national wildfires declined annually during that same period. The drop was widely attributed to public cooperation with Federal and State fire prevention efforts.

President Eisenhower presents Golden Smokey Bear to Judy Bell during the Golden Smokey Bear award presentation at the White House on May 8, 1958.

The main fire-prevention effort in the late 1940s was the Smokey Bear Cooperative Forest Fire Prevention Campaign, cosponsored by the National Association of State Foresters, the Advertising Council, Inc., and the Forest Service. Although the fire-prevention compaign originated as part of the war effort, it evolved into an enduring legacy when a 1944 poster bear painted by Albert Staehle became personified by a real bear cub found in a New Mexico fire in 1950. Rudy Wendelin, a Forest Service artist, helped re-design the poster bear from Staehle's original 1944 cartoonish image into the more robust version popular today.

During the mid-1950s, scrolls were given out as awards for fire prevention activities. Wendelin was assigned the task of developing a statuette to be awarded to outstanding organizations (and later to individuals as well) for their help in fire prevention on a national level. Rudy Wendelin modeled in clay a statuette that was similar in design to the Hollywood "Oscar;" it was a simple design that symbolized the shape of Smokey Bear. In 1957, the scrolls were officially replaced by the gilded statuette.

By working connections with White House Chief of Staff Sherman Adams, President Dwight D. Eisenhower gave out the first Gold Smokey Bear Awards in 1958 to mark the fine fire record achieved in 1957. Judy Bell, daughter of Ruth and Ray Bell who had nursed the bear cub back to health after his rescue from the 1950 Lincoln National Forest fire, received the first golden Smokey Bear statuette from President Eisenhower on behalf of the "fine cooperation the children of America have given forest fire prevention." The Gold Smokey Bear Award continues to be presented to individuals or organizations for their proven record of service in wildfire prevention on a national scale.

Silver Smokey Bear statuettes were later developed and first awarded in 1967 to recognize regional organizations or persons for a proven record of service in regional (multi-State) areas. Beginning in 1962, a Bronze Smokey Bear Award (previously called the Smokey Bear Plaque), is also awarded yearly as well, for outstanding contributions to statewide wildfire prevention efforts.

Nominations are accepted each fall. Representatives from the National Association of State Foresters, the Forest Service, and the Advertising Council, Inc., jointly select the annual Smokey Bear Award winners from the pool of nominated candidates.

For more information visit the Smokey Bear Web site at http://www.SmokeyBear.com/awards.

took several months of training with the dog, and developed a template for the "Tracks" Program. This program provided an innovative way to reduce human-caused wildfires in the Pine Barrens region of New Jersey. Liepe made it a point to deliver programs to every school in Hamilton Township, reaching more than 2,900 students. Since 2004, "Tracks" has participated in more than 750 programs across the State with more than 10,000 fire prevention contacts.

- **Robin D. Nelson**, geographic information specialist from the Bureau of Land Management High Plains District Office in Wyoming, has spent many years volunteering her time to educate children in the Casper, WY, area about wildfire prevention and protection of homes and property against wildfire. Nelson has been a guest with Smokey on local television and radio stations numerous times in her career, and, in 2012, she was featured prominently on Facebook throughout the month of October with each school she visited. Nelson also attends special events with Smokey, including the annual Wyoming Hunting and Fishing Expo sponsored by the Wyoming Game and Fish Department. More than 2,000 school children from all over Wyoming visit the Expo, and Smokey Bear makes numerous appearances during the event. In 2010, the Casper Field Office won the 2010 Outstanding Indoor Exhibit from the Wyoming Game and Fish Department for Nelson's and Smokey's participation. Nelson partnered with numerous companies and organizations to spread Smokey's wildfire-prevention message, including at the Home Depot Fire Education Day, Boys and Girls Club Education Day, and the local YMCA youth summer camp. Owing in no small part to Nelson's outreach efforts, Smokey has also made special appearances at parades and at a Casper Ghosts Baseball game. Nelson is a leader in creating local community partnerships, which increases the capacity to share consistent fire-prevention messages. Nelson has touched the lives of more than 20,000 kids through her prevention efforts.

Think about those *you* know who have made an impact on reducing human-caused wildfires—and nominate them to be recognized through the Smokey Bear Awards program.

Bureau of Land Management, Wyoming State director, Don Simpson presenting Robin Nelson with her award.

As we approach Smokey Bear's 70th birthday (2014) as a wildfire prevention icon, think about those *you* know who have made an impact on reducing human-caused wildfires and nominate them to be recognized for their efforts through the national Smokey Bear Awards program (figure 2)

For more information on the history of Smokey Bear and how to nominate someone for a Smokey Bear Award, see the accompanying Smokey Awards History box, and visit http://www.SmokeyBear.com/awards or http://www.fs.fed.us/fire/prev_ed/smokeybearawards/index.html.

Remember…Only You Can Prevent Wildfires! ■

THERE'S A LITTLE SMOKEY IN ALL OF US.

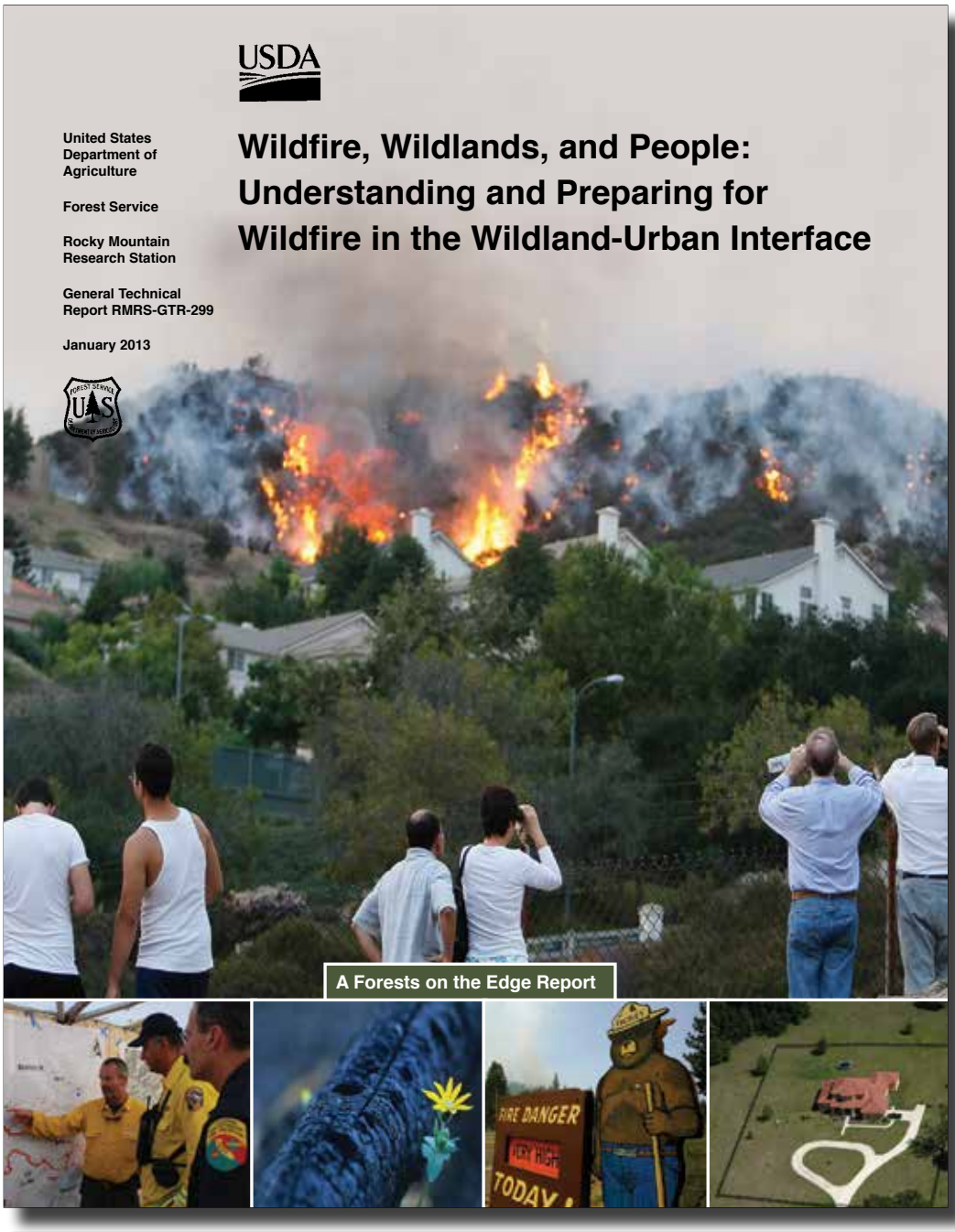
9 out of 10 wildfires are caused by humans. Which means 9 out of 10 wildfires can be prevented. So if you see someone acting irresponsibly, step in and make a difference.

ONLY YOU CAN PREVENT WILDFIRE.

SmokeyBear.com

Ad Council

photo Jill Greenberg
©USDA Forest Service



Stein, S.M.; Menakis, J.; Carr, M.A.; Comas, S.J.; Stewart, S.I.; Cleveland, H.; Bramwell, L.; Radeloff, V.C. 2013. **Wildfire, wildlands, and people: understanding and preparing for wildfire in the wildland-urban interface—a Forests on the Edge report.** Gen. Tech. Rep. RMRS-GTR-299. Fort Collins, CO. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 36 p.

Abstract

Fire has historically played a fundamental ecological role in many of America's wildland areas. However, the rising number of homes in the wildland-urban interface (WUI), associated impacts on lives and property from wildfire, and escalating costs of wildfire management have led to an urgent need for communities to become "fire-adapted." We present maps of the conterminous United States that illustrate historical natural fire regimes, the wildland-urban interface, and the number and location of structures burned since 1999. We outline a sampler of actions, programs, and community planning and development options to help decrease the risks of and damages from wildfire.

Key Words: wildfire, community planning, fire-adapted, wildland-urban interface, defensible space

To Order a Copy:

Fill in this form (which will be used as the mailing label) and return it to: Publications Distribution, Rocky Mountain Research Station, USDA Forest Service, 240 W. Prospect Rd., Fort Collins, CO 80526. Or visit our web site at http://www.fs.fed.us/rm/publications. This publication is currently available on our web site; printed copies will be available in April 2013.

❑ **Yes!** Please send me a copy of **Wildfire, wildlands, and people: understanding and preparing for wildfire in the wildland-urban interface—a Forests on the Edge report** by S.M. Stein, J. Menakis, M.A. Carr, S.J. Comas, S.I. Stewart, H. Cleveland, L. Bramwell, and V.C. Radeloff.

Name: _____

Organization: _____

Street Address: _____

City, State and Zip Code, or Country: _____

Fire Management today

2013 Photo Contest

Deadline for submission is 6 p.m. eastern time, Friday, December 6, 2013

Fire Management Today (FMT) invites you to submit your best fire-related images to be judged in our photo competition. Entries must be received by close of business at 6 p.m. eastern time on Friday, December 6, 2013.

Awards

Winning images will appear in a future issue of *FMT* and may be publicly displayed at the Forest Service's national office in Washington, DC.

Winners in each category will receive the following awards:

- 1st place: One 20- by 24-inch framed copy of your image.
- 2nd place: One 16- by 20-inch framed copy of your image.
- 3rd place: One 11- by 14-inch framed copy of your image.
- Honorable mention: One 8- by 10- inch framed copy of your image.

Categories

- Wildland fire
- Aerial resources
- Wildland-urban interface fire
- Prescribed fire
- Ground resources
- Miscellaneous (fire effects, fire weather, fire-dependent communities or species, etc.)

Rules

- The contest is open to everyone. You may submit an unlimited number of entries taken at any time, but you must submit each image with a separate release/application form. You may not enter images that were judged in previous *FMT* contests.
- You must have the authority to grant the Forest Service unlimited use of the image, and you must agree that the image will become public domain. Moreover, the image must not have been previously published in any publication.
- *FMT* accepts only digital images at the highest resolution using a setting with at least 3.2 mega pixels. Digital image files should be TIFFs or highest quality JPGs. Note: *FMT* will eliminate date-stamped images. Submitted images will not be returned to the contestant.
- You must indicate only one category per image. To ensure fair evaluation, *FMT* reserves the right to change the competition category for your image.
- You must provide a detailed caption for each image. For example: *A Sikorsky S-64 Skycrane delivers retardant on the 1996 Clark Peak Fire, Coronado National Forest, AZ.*
- You must submit with each digital image a completed and signed Release Statement and Photo Contest Application granting the Forest Service rights to use your image. See http://www.fs.fed.us/fire/fmt/release.pdf.

Disclaimer

- A panel of judges with photography and publishing experience will determine the winners. Their decision is final.
- Images depicting safety violations, as determined by the panel of judges, will be disqualified.
- Life or property cannot be jeopardized to obtain images.
- The Forest Service does not encourage or support deviation from firefighting responsibilities to capture images.
- Images will be eliminated from the competition if they are obtained by illegal or unauthorized access to restricted areas, show unsafe firefighting practices (unless that is their expressed purpose), or are of low technical quality (for example, have soft focus or camera movement).

To help ensure that all files are kept together, e-mail your completed release form/contest application and digital image file at the same time.

E-mail entries to: firemanagementtoday@fs.fed.us

Postmark Deadline is 6 p.m., Friday, December 6, 2013

Superintendent of Documents **Subscription** Order Form

Order Processing Code:
*

S3

Charge your order. It's easy!

To fax your orders: 202-512-2104

To phone your orders: 202-512-1800 or 1-866-512-1800

For subscription cost and to Order on Line: http://bookstore.gpo.gov

☐ **YES,** enter my subscription(s) as follows:

The total cost of my order is $_____. Price includes regular shipping and handling and is subject to change. International customers please add 25%.

Company or personal name (Please type or print)

Additional address/attention line

Street address

City, State, Zip code

Daytime phone including area code

Purchase order number (optional)

For privacy protection, check the box below:

❑ Do not make my name available to other mailers

Check method of payment:

❑ Check payable to Superintendent of Documents

❑ GPO Deposit Account ☐☐☐☐☐☐☐ – ☐

❑ VISA ❑ MasterCard

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

☐☐☐☐ (expiration date)

Thank you for your order!

Authorizing signature

Mail To: U.S. Government Printing Office - New Orders
P.O. Box 979050
St. Louis, MO 63197-9000