

TEFF: THE TEN ESSENTIAL FACTORS IN FIREFIGHTING

Patrick Withen

Introduction

The following analysis considers wildland firefighter safety & effectiveness on the fireline as influenced by the general body of firefighting guidelines issued by the land management agencies charged with the task of fire suppression. It has been understood for some time that the number of firefighting rules and regulations imposed upon the line firefighter has become unwieldy. The South Canyon Fire and the 30 Mile Fire both shook the firefighting agencies at their base. The nature and scope of these tragedies created the general feeling that something was wrong, yet no clear solutions were forthcoming.

After the South Canyon Fire Tragedy in 1994 it was resolved by top fire management not to add any more rules. But with the seemingly inevitable fireline deaths since then, more rules and procedure have indeed been added, even if they did not come in the form of a checklist. Directives have been given. Procedures have changed. Training has been modified. Yet, the general body of firefighting guidelines to which the line firefighter is supposed to refer, have not changed.

The following analysis consolidates 59 of the present firefighting guidelines to create the Ten Essential Factors in (Wildland) Firefighting (TEFF). This paper consolidates 59 firefighting guidelines, including the 10 Standard Firefighting Orders, the 18 Watch Out Situations, the 7 Downhill Line Construction Checklist, the 4 Common Denominators of Fire Behavior on Tragedy Fires, the 7 Look Up, Down & Around Factors, the 4 LCES Components, and the 9 Wildland Urban Watch Outs, into ten essential factors in wildland firefighting. Furthermore, this analysis matches the TEFF with the risk management process, trigger points, a trends analysis, and appropriate fireline tactics, ranging from engagement, to the modification of engagement tactics, to disengagement tactics. Perhaps never before has one analysis brought together these five components: rules, risk management, a trends analysis, trigger points, and tactics. Thus the present analysis and the TEFF combine the “classic” 59 firefighting guidelines with the more recent directives, procedures, and training to create a comprehensive, non-contradictory, consolidated tool for the line wildland firefighter.

During the summer of 2003, the consolidation of the 59 firefighting guidelines into the TEFF was run as a pilot study. As discussed below, favorable comments were given, with suggestions for improvement.

Patrick Withen is an Associate Professor of Sociology and Organizational Studies and Chair of the Dept. of Social Sciences at the University of Virginia at Wise, and is a Smokejumper for the U.S. Forest Service, out of McCall, ID. pwithen@virginia.edu

In: Butler, B.W and Alexander, M.E. Eds. 2005. Eighth International Wildland Firefighter Safety Summit- Human Factors - 10 Years Later; April 26-28, 2005 Missoula, MT. The International Association of Wildland Fire, Hot Springs, SD.

Paper Organization: The next section of this paper, **3. Why the Consolidation of the Firefighting Guidelines is Needed**, provides a socio-historical analysis of the events that lead to the formulation of various sets of firefighting guidelines, discussing why a system of guidelines that developed over a period of decades should be revisited.

Following that, **4. The Construction of the Ten Essential Factors in (Wildland) Firefighting Through the Consolidation of 59 Firefighting Guidelines**, provides an overview of the methodology utilized to create the TEFF by examining, categorizing, and organizing the 59 firefighting guidelines by their function and logical groupings.

The Section entitled **5. The TEFF Card**, presents the TEFF Card itself and explains the pilot study which implemented the use of the TEFF Card during the 2003 fire season.

6. What Are the Ten Essential Factors in (Wildland) Firefighting? provides an overview and explanation of the ten essential factors in wildland firefighting.

7. Tracking Trends examines the importance of framing any firefighting guidelines, and especially the TEFF, in terms of trends rather than absolutes of go—no go, which in practice, do not exist in the field. This is a demonstration that rules must have criteria that dictate behavior while allowing for individual judgments by actors in the field.

8. Fire Suppression Tactics presents a brief discusses how, in light of the TEFF and Trends & Trigger Points, Fire Suppression Tactics should change as conditions change. Fire Suppression Tactics should be viewed in terms of trends rather than as absolutes creating a scale of full suppression, modified suppression, and disengagement.

The **Conclusion** reviews the logic of the TEFF and presents an overview of the testing and research needed for the pursuit of firefighter safety.

3. Why the Consolidation of the Firefighting Guidelines is Needed

It is sometime said in the military that “Rules are written in blood.” This adage reminds us that for the typical staid bureaucracy, change comes only under dramatic, often tragic circumstances. And indeed, many of the firefighting guidelines have there roots in one fire tragedy or another.

The Forest Service began its wildland firefighting mission as a result of the Prestigo Fire in the 1880s and the “Big Blowup” of 1910. The former killed more people than any other known in US history. The later killed many firefighters and civilians. The Mann Gulch Fire on the in the Gates of the Mountains wild area claimed the lives of 13 firefighters on August 5th, 1949. The Division of Fire Research was ordered to investigate fire behavior for firefighter and fireline safety. On the Inaja Fire on November 25, 1956, eleven firefighters lost their lives. The twin tragedies of Mann Gulch and the Inaja Fire justified the first widely known firefighting guidelines: the 10 Standard Orders and the 13 Watchouts (which today are the 18 Watchouts). In 1957, the Ten Standard Fire Orders were implemented as the primary set of fireline safety guidelines. Note that in the late 1980s the 10 Standard Orders were revised to fit the acronym FIRE ORDERS and the 13 Watchouts became the 18 Watchouts. On March 25, 2003 Joel Holtrop, the Deputy Chief State and Private Forestry issued a memo, File Code: 5100, which required all land management agencies involved in fire suppression to “immediately begin using

the 10 Standard Fire Orders in their original 1958 order and composition.” The Loop Fire on the Angeles National Forest, 1966, resulted in the death of 12 El Cariso Hotshots. Following the investigation, the Downhill Line Construction Rules and the use of hand held radios were implemented. In 1971, the Indirect Line Construction Rules were created after the Romero Fire on the Los Padres National Forest claimed four victims. After the Battlement Creek Fire of 1976 claimed four victims, fire shelters became standard PPE (Personal Protective Equipment). The Dude Fire, 1990, claimed six victims after which Paul Gleason began to promote LCES. The South Canyon Fire on Storm King Mountain, CO, 1994 killed 14 firefighters from nearly all the branches of the firefighting system. The firefighting agencies commissioned Tridata Corporation to survey all levels of the firefighting agencies. While no checklists or guidelines were created, Tridata made nearly 200 recommendations, some of which have become policy. The 30 Mile fire killed four firefighters and injured another four firefighters and two civilians. As they did after South Canyon, the firefighting agencies conducted an investigation, but were reluctant to issue more rules. Instead, various actors have issued directives ordering changes in policy, procedures, training, tactics, etc.

Indeed, it appears as if the rules of firefighting are written in blood. While each new set of rules made needed changes in firefighting operations, their formulation was reactionary and thus scattered, redundant, and in some ways, ambiguous. This analysis and the accompanying pilot study are an attempt to refine firefighting guidelines, reducing the redundancy and the ambiguity.

4. The Construction of the Ten Essential Factors in (Wildland) Firefighting Through the Consolidation of 59 Fire Guidelines

This section of the paper takes the 59 “classic” firefighting guidelines currently in place (the 10 Standard Firefighting Orders, the 18 Watchout Situations, the 7 Downhill Line Construction Checklist, the 4 Common Denominators of Fire Behavior on Tragedy Fires, the 7 Look Up, Down, & Around Factors, the 4 LCES, and the 9 Wildland Urban Watch Outs) and consolidates them into the Ten Essential Factors in Firefighting (TEFF).

In brief, the rationale for rewriting and consolidating the many firefighting guidelines falls into six categories. First, history may be an excellent teacher, but history is not a concise author. The 59 firefighting guidelines were created over approximately the last 100 years, and they have not logically focused on earlier efforts. Instead, each new set of rules was constructed as a relatively self-sufficient list. It is as if every time a new element were discovered, the discoverer also chooses to rewrite the periodic table of the elements.

Second, there are simply too many guidelines to provide clear direction. Some firefighters rely primarily on LCES; some firefighters prefer the Ten Standard Firefighting Orders, others pull out the IRPG (Incident Response Pocket Guide), the Fireline Handbook, or more recently, the Incident Organizer for guidance.

Third, it is apparent from the analysis presented below that the firefighting guidelines are redundant. The analysis below shows that some guidelines are nearly identical, and many of them clearly focus on similar issues, using different wording.

Fourth, a consolidated list of firefighting guidelines would be easier to teach, remember, and use on the fireline. 59 major firefighting guidelines, and over 80 other guidelines mean that it

takes young firefighters years to cover all of this information. Firefighters on the fireline cannot clearly implement these guidelines.

Fifth, a consolidated list of firefighting guidelines could be applied more efficiently to the fire situation.

Sixth, a consolidated list could improve the typical utilization of the Risk Management Process.

While 59 firefighting guidelines are considered here, it should be noted that there are more than 80 other rules in the form of lists, checklists, guidelines, etc. that firefighters learn including the ten Tactical Watch Outs, the five steps of the Risk Management Process, the nine guidelines for Powerline Safety, the six Safety Zone Guidelines, the 16 items on the Structure Protection Checklist, the 7 items on the Structure Assessment Checklist, the 21 Advantages & Disadvantages of Direct & Indirect Attack, Aircraft Watch Out Situations, ERC & BI Fire Indices, items in Incident Organizers, the Fire Triangle, and others. The impact of the new IRPG (Incident Response Pocket Guide) and the Directives coming out of the 30 Mile Fire are significant and add another layer of firefighting guidelines with which the firefighter must comply. (If the reader is aware of other wildland firefighting guidelines not discussed here, please contact the author with this information.) The current study focused on 59 of the “classic” firefighting guidelines because these are the guidelines most commonly used on the fireline and they are the oldest guidelines.

The purpose of this analysis is to consolidate all the firefighting guidelines into Ten Essential Factors in Firefighting. Some of the firefighting guidelines are found in more than one area. While it is recognized that even with the 59 firefighting guidelines, some critical areas have not been addressed, these gaps are not addressed here. Thus, any gaps in firefighter safety and tactics that appear in the 59 firefighting guidelines, also appear in the TEFF.

The method used to construct the TEFF was to examine all of the 59 firefighting guidelines and first combine those that were obviously redundant. Next, the remaining firefighting guidelines were combined according to common words or intent. Finally, the firefighting guidelines were logically separated into fundamental areas of concern.

The Firefighting Guidelines are represented by the following acronyms:

FO 10 Standard Fire Orders

WO 18 Watch-Out Situations

DL 7 Downhill Line Construction Checklist

CD 4 / 7 Common Denominators of fire Behavior on Tragedy Fires

LU 7 Look Up, Down & Around Factors

LC 4 LCES Factors

UW 9 Wildland Urban Watch-Out Situations

The colored font indicates that one of the firefighting guidelines is found in more than one TEFF.

Orange signifies **WO 4**: “Unfamiliar with local factors influencing fire behavior. This WO appears in the three TEFF designations of Weather, Fire Behavior, and Fuel Type.

Red signifies **WO 12**: “Cannot see main fire, not in contact w/ someone who can.” This WO appears in the three TEFF designations of Lookouts, Communications, and Fire Status.

Gray signifies **WO 17**: “Terrain & fuels make escape to safety zone difficult.” This WO appears in the three TEFF designations of Safety Zones, Terrain, and Fuel

Green signifies **DL3a**: “Crew supervisor is in direct contact w/ lookout who can see fire.” This DL appears in the two TEFF designations of Lookouts and Communication.

Purple signifies **DL3b**: “Communication is established between all crews.” This DL appears in the two TEFF designations of Communications and Escape Routes.

Turquoise signifies: **UW 1**: “Poor access and narrow one-way roads.” This UW appears in the two TEFF designations of Escape Routes and Terrain.

Brown signifies: **UW 2**: “Bridge load limits.” This UW appears in the two TEFF designations of Escape Routes and Terrain.

I. Lookouts

There are five Firefighting Guidelines that are related to Lookouts. Those Firefighting Guidelines in color are also placed in other TEFFs.

I. L Lookouts

| | |
|--------------|--|
| FO 8 | Establish lookouts in potentially hazardous situations |
| WO 12 | Cannot see main fire; not in contact w/ someone who can |
| DL 3 | LCES will be coordinated for all personnel involved |
| DL 3a | Crew supervisors is in direct contact w/ lookout who can see the fire |
| | Lookouts must be established & known to all firefighters before needed |
| LC 1 | |

By combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: **“TEFF 1: Sufficient Lookouts are in place given the Hazard Assessment.”**

II. Communications

There are nine Firefighting Guidelines that are related to Communications. Those Firefighting Guidelines in color are also placed in other TEFFs.

II

. C Communications

| | |
|------|--|
| FO 4 | Ensure Instructions are given & understood |
| | Remain in Communication w/ crew members, your supervisor, & adjoining forces |
| FO 6 | |

- WO 5 Uninformed on strategy, tactics, & hazards
- WO 6 Instructions & assignments no clear
- WO 7 No communication link w/ crew members or supervisor
- WO 12** Cannot see main fire; not in contact w/ someone who can
Crew supervisors is in direct contact w/ lookout who
can see the fire
- DL 3a** Communication is established between all crews
Communications must be established & known to all
firefighters before needed
- DL 3b** Communication is established between all crews
Communications must be established & known to all
firefighters before needed
- LC 2 firefighters before needed

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: “**TEFF 2: Communications: Sufficient Communications are in place: generally communications are needed w/ lookout(s), crews, supervisors, & adjoining forces, but there may be other critical links.**”

III. Escape Routes

There are four Firefighting Guidelines that are related to Escape Routes. Those Firefighting Guidelines in color are also placed in other TEFFs.

III

. E Escape Routes

- DL 3b** Rapid access to safety zones in case fire crosses
below crew
Escape Routes must be established & known to all
firefighters before needed
- LC 3 firefighters before needed
- UW 1** Poor access & narrow one-way roads
- UW 2** Bridge load limits

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: “**TEFF 3: Escape Routes: A suitable Escape Route is known to all.**”

IV. Safety Zones

There are four Firefighting Guidelines that are related to Safety Zones. Those Firefighting Guidelines in color are also placed in other TEFFs.

IV. S Safety zones

- FO 7 Determine safety zones & escape routes
- WO 3 Safety zones & escape routes not identified

WO

- 17 **Terrain & fuels make escape to safety zones difficult**
Safety zones must be established & known to all firefighters before needed
- LC 4

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: “**TEFF 4: Safety Zones: A suitable Safety Zone is known to all. The Safety Zone may be to exit the fire area.**”

V. Weather

There are eight Firefighting Guidelines that are related to Weather. The Firefighting Guidelines in color is also placed in another TEFF.

V**. W Weather: wind, temperature & humidity**

- FO 3 Recognize current weather conditions & obtain forecasts
- WO 4 Unfamiliar w/ weather....**
- WO
- 14 Weather becoming hotter & drier
- WO
- 15 Wind increases and/or changes direction
When there is an unexpected shift in wind direction or in
- CD 3 wind speed
- LU 5 Observe wind
- LU 6 Observe stability
- UW 8 Strong winds

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: “**TEFF 5: Weather: The Weather is doing what is expected; no RH or wind trigger points have been crossed.**”

VI. Terrain

There are ten Firefighting Guidelines that are related to Terrain. Those Firefighting Guidelines in color are also placed in other TEFFs.

VI. T Terrain

- WO 2 In country not seen in daylight
- WO 9 Building fireline downhill w/ fire below
- WO 13 On hillside where rolling material can ignite fuel below
- WO 17 Terrain & fuels make escape to safety zones difficult**

- DL 5 Fireline will not lie in or adjacent to a chute or chimney
- CE 4 When fire responds to topographic conditions & runs uphill
- LU 3 Scout terrain
- UW 1 Poor access & narrow one-way roads**
- UW 2 Bridge load limits**
Structures in chimneys, box canyons, narrow canyons, or on steep slopes
- UW 6

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: **“TEFF 6: Terrain: The Terrain is not causing unexpected fire behavior, creating a hazard for Firefighting Resources, or compromising the Escape Route.”**

VII. Fire Behavior

There are six Firefighting Guidelines that are related to Fire Behavior. Those Firefighting Guidelines in color are also placed in other TEFFs.

VII

. Fb Fire Behavior

- FO 2 Initiate all action based on current & expected fire behavior
....Unfamiliar w/ local factors influencing fire behavior
- WO 4**
- WO 16 Getting frequent spot fires across line
Bottom of the fire will be monitored; if the potential exists for the
- DL 7 fire to spread, action will be taken to secure the fire edge
- LU 7 Watch fire behavior
- UW 7 Extreme Fire Behavior

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: **“TEFF 7: Fire Behavior is understood in light of Weather, Terrain, & Fuel Type. Fire behavior is not doing anything unexpected, thus Firefighting Resources' tactics are succeeding as expected.”**

VIII. Firefighting Resources

There are seven Firefighting Guidelines that are related to Firefighting Resources.

VII]

I] Firefighting Resources

FO 1 Fight Fire Aggressively, but provide for safety first

FO 9 Retain control at all times

FO 10 Stay alert, keep calm, think clearly, act decisively

WO 18 Taking a nap near the fireline

Crew supervisors & overhead will discuss assignment prior to

DL 1 committing crews

UW 4 Inadequate water supply

UW 9 Evacuation of public (panic)

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: **“TEFF 8: While more Resources may be on order, Firefighting Resources are sufficient for Firefighters to remain safe & to successfully implement current tactics.”**

IX. Fire Status

There are ten Firefighting Guidelines that are related to Fire Status. The Firefighting Guideline in color is also placed in another TEFF.

IX Fs Fire Status

FO 5 Obtain current information on the fire status

WO 1 Fire not scouted & sized up

WO 8 Constructing line w/o safe anchor point

WO 10 Attempting frontal assault on fire

WO 11 Unburned fuel between you & fire

Cannot see main fire; not in contact w/ someone who

WO 12 can

Decision will be made after proposed fireline has been scouted

DL 2 Direct attack will be used whenever possible; if not possible, the fireline should

DL 4 be completed between anchor points before being fired out

DL 6 Starting point will be anchored for crew building fire

down from the top

On relatively small fires or deceptively quiet areas of
 CD 1 large fires

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: **“TEFF 9: Firefighters are aware of the scope of the fire, & current tactics are successful in light of amount of Firefighting Resources & to keep current Firefighters safe.”**

X. Fuel Type

There are seven Firefighting Guidelines that are related to Fuel Type. Those Firefighting Guidelines in color are also placed in other TEFFs.

X Ft Fuel Type

-Unfamiliar w/ local factors influencing fire**
- WO 4: behavior**
- WO 17 Terrain & fuels make escape to safety zones difficult**
 In relatively light fuels, such as grass, herbs, & light
- CD 2 brush
- LU 1 Assess Fuel Characteristics
- LU 2 Feel & measure fuel moisture
- UW 3 Wooden Construction & wood shake roofs
- UW 5 Natural fuels 30 ft. or closer to structures

Combining all the Firefighting Guidelines for Lookouts, the resulting TEFF is: **“TEFF 10: Fuel Type is understood, and is exhibiting expected Fire Behavior.”**

TEFF SUMMARY

A summary of all the TEFF may be found in APPENDIX A. Of the 59 firefighting guidelines, they break out into the TEFF in the following manner:

| TEFF | Number of Guidelines |
|-------------------|-----------------------------|
| 1. Lookouts | 5 Guidelines |
| 2. Communications | 9 Guidelines |
| 3, Escape Routes | 4 Guidelines |
| 4. Safety Zones | 4 Guidelines |

| | |
|-------------------|---|
| 5. Weather | 8 Guidelines |
| 6. Terrain | 10 Guidelines |
| 7. Fire Behavior | 6 Guidelines |
| 8. Fire Resources | 7 Guidelines |
| 9. Fire Status | 10 Guidelines |
| 10. Fuel Type | 7 Guidelines |
| Total | 70 (some Guidelines appear in more than one TEFF) |
| Average | 7 per TEFF |

The analysis presented above does not assume it is the penultimate formulation of the firefighting guidelines. Certainly this one attempt at a consolidation and reformulation of the “rules of engagement” of fire suppression has considerable room for improvement. In many ways, the ultimate rationale for this consolidation of the firefighting guidelines, is to demonstrate that it can be done. While it is recognized that even with the 59 firefighting guidelines, some critical areas have not been addressed (e.g., Firefighting Resources (personnel) are insufficient to safely engage the fire, etc.), these gaps are not addressed here. It is felt that while such gaps are not addressed by the 59 firefighting guidelines, that they are addressed and could be incorporated into the TEFF.

5. The TEFF Card

The TEFF were formulated in 2002 by giving firefighters each of the 59 fire guidelines and asking them to group them into logical categories, and by an analysis of keywords found in each guideline. The TEFF were then circulated to firefighters and fire managers for input. In the summer of 2003, the TEFF was operationalized on a trial basis by means of a TEFF Card which lists the TEFF and a trends analysis on side one and the Fire Suppression Tactics on the side two. This card, including a sheet of instructions** and a feedback survey were circulated among firefighters and fire overhead for use on the fireline. This analysis examines the results of the operationalization of the TEFF Card.

The TEFF Card is the tool that may be used on the fireline, which ties together all of the information contained in the consolidation of the 59 firefighting guidelines presented above.

The TEFF Card, Side One and Side Two is presented below. The TEFF Card, Side One, contains the TEFF and a matrix that runs from 1 to 9 or Good to Medium to Extreme.

Side One of the TEFF Card (Actual Size)

** The TEFF Card and the TEFF Card Instructions are included in Appendix A

| Ten Essential Factors in | | Use Risk Mgt Process: Trends Lead to Trigger Points | | | | | | | | |
|--------------------------|------------------------|---|---|---|--------|---|---|---------|---|---|
| | | Good | | | Medium | | | Extreme | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| L | Lookouts | | | | | | | | | |
| C | Communication | | | | | | | | | |
| E | Escape Routes | | | | | | | | | |
| S | Safety Zones | | | | | | | | | |
| W | Weather | | | | | | | | | |
| T | Terrain | | | | | | | | | |
| Fb | Fire Behavior | | | | | | | | | |
| Fr | Firefighting Resources | | | | | | | | | |
| Fs | Fire Status | | | | | | | | | |
| Ft | Fuel Type | | | | | | | | | |

Side Two of the TEFF Card (Actual Size)

| Fire Suppression Tactics | | |
|--|---|---|
| <p>Engage</p> <p>Anchor & Flank Direct Attack Frontal Assault on Head Indirect Backfire/Burnout</p> | <p>Modify</p> <p>Change Engagement Tactics Pull Back to better line location (indirect) Consolidate Forces Hold, Improve, Reinforce Patrol, Hold what you have</p> | <p>Send Comments on TEFF to: Patrick Withen at pwithen@virginia.edu or McCall Smokejumpers PO Box 1065 McCall, ID 83638 276-393-5268 cell</p> <p>Disengage</p> <p>Pull back closer to safety zone & break Retreat Evacuate</p> |

Side Two of the TEFF Card provides a brief overview of Fire Suppression Tactics trisecting them into Engagement, Modification, and Disengagement. The instructions given to line firefighters are contained in their entirety in APPENDIX B. The firefighters were told,

“The TEFF Card consolidates 59 standard firefighting guidelines, including the 10 Standard Firefighting Orders, the 18 Situations That Shout Watch-Out, the Downhill Line Construction List, the Common Denominators on Tragedy Fires, etc. TEFF assumes the firefighter has a strong background in the 59 firefighting guidelines.

NOTE: The TEFF Card is on a trial run. If successful it may be used to reduce paperwork, cards, etc.

On side one of the TEFF Card are the **Ten Essential Factors in Firefighting** (TEFF) and a **trends scale**. On the other side of the TEFF Card are the three levels

of Fire Suppression Tactics including Engagement, Modify, and Disengagement.

To use the TEFF Card, at the beginning of shift, mark or mentally note two boxes for each of the Ten Essential Factors. First, mark current conditions at the beginning of the shift. Second, mark the conditions you expect at the peak of burning period.

Then, throughout the day, as you use the Risk Management Process and as conditions change, update your TEFF Card to represent current conditions. You may specify specific trigger points (i.e. lost the Lookout, fire roles out on underslung line, etc.) which cause you to Modify your Fire Suppression Tactics. Second, you may watch for trends, or degradation of several of the TEFFs that might cause you to Modify your Fire Suppression Tactics.”

Then firefighters were asked for their feedback through the following survey,

“Feedback: We need your input! Mark your most appropriate response, and make comments!!

1. I found the TEFF Card to be useful.

| | | | | | |
|----------|-------|---------|---|----------|----------|
| A | B | C | D | E | |
| Strongly | Agree | Neutral | | Disagree | Strongly |
| Agree | | | | Disagree | |

2. How many shifts did you use the TEFF? _____

3. I think we are better off using the 10 & 18, and not the TEFF Card

| | | | | | |
|----------|-------|---------|---|----------|----------|
| A | B | C | D | E | |
| Strongly | Agree | Neutral | | Disagree | Strongly |
| Agree | | | | Disagree | |

4. Rank your top three preferences for fire guidelines by indicating 1, 2 & 3

| | | | |
|-------|---|-------|-----------------------------|
| _____ | 10 Standard Firefighting Orders | _____ | 7 Look Up, Down & Around |
| _____ | 18 Situations that Shout Watch-Out | _____ | 4 LCES |
| _____ | 7 Downhill Line Construction Checklist | _____ | 9 Wildland Urban Watch Outs |
| _____ | 10 TEFF | | |
| _____ | 4 Common Denominators of Fire Behavior on Tragedy Fires | | |
| _____ | Some combination of the above, such as | | |
| _____ | | | |

5. What is your highest Redcard Qual?

The TEFF Card could be improved by:

MAKE COMMENTS ON OTHER SIDE !!”

Feedback on the TEFF Card was favorable. The primary comment was that firefighters did not want another checklist! They were informed that this checklist was intended to ultimately replace existing lists and that it should be seen as a learning tool. One suggestion was that the numbering on the Trends Matrix which ran from 1 to 9 should be replaced with blank squares allowing the firefighter to insert times in the boxes. Other tactics were given which will be listed on future TEFF Cards. Weather could be replaced with Temperature, Humidity, and Wind. Fire Behavior could be subdivided into more exacting categories. Changes to the Weather and Fire Behavior Essential Factors would increase the complexity of the TEFF Card.

6. What Are the Ten Essential Factors in (Wildland) Firefighting?

The purpose of this section of the paper is to briefly explain each of the TEFFs and to give an overview of the criteria the typical firefighter would use in judging whether the situation is good, medium or extreme risk.

A Summary of TEFF

TEFF 1: Sufficient Lookouts are in place given the Hazard Assessment.

TEFF 2: Communications: Sufficient Communications are in place: generally communications are needed w/ lookout(s), crews, supervisors, & adjoining forces, but there may be other critical links.

TEFF 3: Escape Routes: A suitable Escape Route is known to all.

TEFF 4: Safety Zones: A suitable Safety Zone is known to all. The Safety Zone may be to exit the fire area.

TEFF 5: Weather: The Weather is doing what is expected; no RH or wind trigger points have been crossed.

TEFF 6: Terrain: The Terrain is not causing unexpected fire behavior, creating a hazard for Firefighting Resources, or compromising the Escape Route.

TEFF 7: Fire Behavior is understood in light of Weather, Terrain, & Fuel Type. Fire behavior is not doing anything unexpected, thus Firefighting Resources' tactics are succeeding as expected.

TEFF 8: While more Resources may be on order, Firefighting Resources are sufficient for Firefighters to remain safe & to successfully implement current tactics.

TEFF 9: Firefighters are aware of the scope of the fire, & current tactics are successful in light of amount of Firefighting Resources & to keep current Firefighters safe.

TEFF 10: Fuel Type is understood, and is exhibiting expected Fire Behavior.

Tracking Trends in the Ten Essential Factors in (Wildland) Firefighting

The following chart gives an overview of the criteria the typical firefighter would use in judging whether the situation is good, medium or extreme risk.

| LCES WT FFFF | | Good | | Medium | | Bad |
|--------------|------------------|----------------------------|---|---|---------------------|--|
| I. | L Lookouts | Good LO in place | Moving farther away from LO | LO becomes less effective because fire &/or crew moves out of sight | | No or ineffective LO |
| | | | Commo becomes so heavy it is difficult to speak to necessary forces | People move into holes where it is difficult to reach them | Weak Commo | Lost commo |
| II. | C Communications | Good Escape Route in place | Many factors enter into determining whether an Escape Route is "Short" or "Long: Terrain & Fuel dependent | Escape routes become longer, steeper, etc. as crew &/or fire change locations | "Long" Escape Route | Escape Route becomes so long as to make it ineffective |
| III. | E Escape routes | | | | | |

| | | | | | | |
|-----------------|-------------------------------|--|--|--|--|--|
| | | | | | The only safety zone may be a long Escape Route out of the area; very wind dependent | No Deployment Zone & Long Escape Route out of area |
| IV. S | Safety zones | Good Safety Zone | With Improvement, Marginal Safety Zone | Deployment Zone | | |
| V. W | Weather | "Good" Wx usually in morning, degrades as day goes on | Fire Wx in mid to late afternoon, & often into early evening | Wx also storm & front dependent | | Extreme Wx |
| VI. T | Terrain | Fire in consistent terrain | Fire approaching critical terrain | Fire just into critical terrain | Fire well into critical terrain | Fire into new critical terrain |
| VII. Fb | Fire Behavior | smoldering | creeping | running / torching | passive crowning | active crowning / major runs |
| VIII. Fr | Firefighting Resources | Fire feels over-manned | More people split off to do other jobs | Obviously not enough people | Undermanned to the extent that fire is lost | Critical functions failing: LO, Commo, etc. |
| IX. Fs | Fire Status | Fire tactics going well: good anchor, progressing on line; more line progress than fire growth | Weak anchor: roll out, spotting, bad position on fire, etc. | Tactics not working well: must chase spots, roll out, or fire is growing faster than you can line it | Fire making major advances & you are losing a lot of line | Fire is forcing w/drawl from the line/area |

| | | | | | | | |
|----------|-----------|------------------|------------------------|--|--|--|--|
| | | | | Fire approaches more volatile fuel (moisture, type, consistency) | Fire into significant pocket of more volatile fuel | Transition to volatile fuel is causing increased fire behavior | Critical Fuel: flashy, ladder fuel, preheated, pre-burned, etc., capable of initiating blow-up |
| X | Ft | Fuel Type | Consistent Fuel | | | | |

This table demonstrates that absolute criteria for the implementation of TEFF firefighting guidelines, as well as the 59 “classic” firefighting guidelines cannot realistically be developed. Rather, general criteria must be offered which allow for judgment in the field by the line firefighter on the scene.

The necessity for judgment and expertise by the line firefighter is the reason for the development of the 1 – 9 Matrix called the Trends Leading to Trigger Points. The Matrix cannot be filled out in a lock-step manner. No two firefighters will fill it out in the same manner. However, the ability to view all the criteria in one place, and to be able to see trends is an improvement over earlier training and simple checklists.

8. Fire Suppression Tactics

The purpose of this section of the paper is to state concisely all the firefighting action options, from Engagement to Modification to Disengagement, that are available to wildland firefighters when they follow the TEFF in light of the Trends Toward Trigger Points Matrix. Viewing a concise set of firefighting rules (the TEFF), combined with Trends & Trigger Points Matrix, combined with a 3 part system of Fireline Tactics combines previous firefighting knowledge in such a manner that the firefighter has a new, to-the-point guide to fireline tactics.

| Engage | Modify | Disengage |
|-------------------------|--|---|
| Anchor & Flank | Change Engagement Tactics | Pull back closer to safety zone, take a break, rethink strategy |
| Direct Attack | Consolidate Forces | Retreat |
| Frontal Assault on Head | Hold, Improve, Reinforce | Evacuate |
| Indirect Attack | Patrol, Hold what you have | Last Resort |
| Backfire/Burnout | Pull Back to better line location (indirect) | |

The tactic of Engagement is the primary tactic that is taught to firefighters. Fire suppression tactics have an almost exclusive focus on aggressively attacking a fire with little training given to understanding when engagement should be ended or modified. The tactic called Modification is so named to indicate that the firefighter is modifying “normal” engagement tactics because of safety and/or effectiveness concerns. In general, if a fire suppression tactic is not effective, it is also not safe. The tactic called Disengagement is so named because firefighters should recognize that they may not be able to engage, or directly or indirectly attack all fires. In fact, some form of “retreat” tactics needs to be clearly taught to firefighters. The Trends to Trigger Points Matrix on Side One of the TEFF Card is designed to give a visual indicator or when a firefighter might want to shift from Engagement to Modification or to Disengagement. No absolute criteria that encompass all fireline situations can be designed. However, if the firefighter is seeing many TEFF indicators degrading beyond the medium level, this should indicate it is time to modify or even disengage.

9. Conclusion

The TEFF is designed to consolidate the 59 firefighting guidelines. This tool along with the innovations of a Trends Leading to Trigger Points Matrix analysis, which replaces the absolute go—no go criteria often associated with the Ten Standard Fire Orders, LCES, and other firefighting guidelines, and the trisection of firefighting tactics into Engagement, Modification, or Disengagement provides one comprehensive, concise, and effective tool to promote safety on the fireline. Firefighters are constantly commenting that fires are becoming more complex, they have more training to complete than ever before, they are being asked to achieve more divergent goals than ever before. The TEFF Card is an effort to reverse that trend and bring firefighting back to a concern with the basics of firefighting and fireline safety.

APPENDIX : A

A Summary of the TEFF

- TEFF 1: Sufficient Lookouts are in place given the Hazard Assessment.
- TEFF 2: Communications: Sufficient Communications are in place: generally communications are needed w/ lookout(s), crews, supervisors, & adjoining forces, but there may be other critical links.
- TEFF 3: Escape Routes: A suitable Escape Route is known to all.
- TEFF 4: Safety Zones: A suitable Safety Zone is known to all. The Safety Zone may be to exit the fire area.
- TEFF 5: Weather: The Weather is doing what is expected; no RH or wind trigger points have been crossed.
- TEFF 6: Terrain: The Terrain is not causing unexpected fire behavior, creating a hazard for Firefighting Resources, or compromising the Escape Route.
- TEFF 7: Fire Behavior is understood in light of Weather, Terrain, & Fuel Type. Fire behavior is not doing anything unexpected, thus Firefighting Resources' tactics are succeeding as expected.
- TEFF 8: While more Resources may be on order, Firefighting Resources are sufficient for Firefighters to remain safe & to successfully implement current tactics.
- TEFF 9: Firefighters are aware of the scope of the fire, & current tactics are successful in light of amount of Firefighting Resources & to keep current Firefighters safe.
- TEFF 10: Fuel Type is understood, and is exhibiting expected Fire Behavior

APPENDIX : B
INSTRUCTIONS: The Ten Essential Factors in (Wildland) Firefighting (TEFF)

“Are You TEFF Enough?”

The TEFF Card consolidates 59 standard firefighting guidelines, including the 10 Standard Firefighting Orders, the 18 Situations That Shout Watch-Out, the Downhill Line Construction List, the Common Denominators on Tragedy Fires, etc. TEFF assumes the firefighter has a strong background in the 59 firefighting guidelines.

NOTE: The TEFF Card is on a trial run. If successful it may be used to reduce paperwork, cards, etc.

On side one of the TEFF Card are the **Ten Essential Factors in Firefighting (TEFF)** and a **trends scale**. On the other side of the TEFF Card are the three levels of **Fire Suppression Tactics** including **Engagement, Modify, and Disengagement**.

To use the TEFF Card, at the beginning of shift, mark or mentally note two boxes for each of the Ten Essential Factors. First, mark current conditions at the beginning of the shift. Second, mark the conditions you expect at the peak of burning period.

Then, throughout the day, as you use the Risk Management Process and as conditions change, update your TEFF Card to represent current conditions. You may specify specific trigger points (i.e. lost the Lookout, fire roles out on underslung line, etc.) which cause you to Modify your Fire Suppression Tactics. Second, you may watch for trends, or degradation of several of the TEFFs that might cause you to Modify your Fire Suppression Tactics.

Feedback: We need your input! Mark your most appropriate response, and make comments!!

1. I found the TEFF Card to be useful.

| | | | | | |
|----------|-------|---------|---|----------|----------|
| A | B | C | D | E | |
| Strongly | Agree | Neutral | | Disagree | Strongly |
| Agree | | | | Disagree | |

2. How many shifts did you use the TEFF? _____

3. I think we are better off using the 10 & 18, and not the TEFF Card

| | | | | | |
|----------|-------|---------|---|----------|----------|
| A | B | C | D | E | |
| Strongly | Agree | Neutral | | Disagree | Strongly |
| Agree | | | | Disagree | |

4. Rank your top three preferences for fire guidelines by indicating 1, 2 & 3

| | | | |
|--|------------------------------------|--|--------------------------|
| | 10 Standard Firefighting Orders | | 7 Look Up, Down & Around |
| | 18 Situations that Shout Watch-Out | | 4 LCES |

_____ 7 Downhill Line Construction Checklist _____ 9 Wildland Urban
Watch Outs

_____ 10 TEFF

_____ 4 Common Denominators of Fire Behavior on Tragedy Fires

_____ Some combination of the above, such as

5. What is your highest Redcard Qual?

The TEFF Card could be improved by: _____

MAKE COMMENTS ON OTHER SIDE !!

Patrick Withen
McCall Smokejumpers
PO Box 1065
McCall, ID 83636

-----Fold-----

-----Staple or Tape along this Fold Line-----

WRITE COMMENTS HERE, and fold to the inside. You may include your name & email address if you would like to be kept informed on the development of TEF

Contact:
Patrick Withen
McCall
Smokejumpers
PO Box 1065
McCall, ID 83638
208-634-0385 Fax
208-634-0378 Ops
276-275-1927 Cell

APPENDIX C: The TEFF Card

Side One of the TEFF Card:

| Ten Essential Factors in | | Use Risk Mgt Process: Trends Lead to Trigger Points | | | | | | | | |
|--------------------------|------------------------|---|---|---|--------|---|---|---------|---|---|
| | | Good | | | Medium | | | Extreme | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| L | Lookouts | | | | | | | | | |
| C | Communication | | | | | | | | | |
| E | Escape Routes | | | | | | | | | |
| S | Safety Zones | | | | | | | | | |
| W | Weather | | | | | | | | | |
| T | Terrain | | | | | | | | | |
| Fb | Fire Behavior | | | | | | | | | |
| Fr | Firefighting Resources | | | | | | | | | |
| Fs | Fire Status | | | | | | | | | |
| Ft | Fuel Type | | | | | | | | | |

Side Two of the TEFF Card

| Fire Suppression Tactics | | |
|--|---|---|
| <p>Engage</p> <p>Anchor & Flank Direct Attack Frontal Assault on Head Indirect Backfire/Burnout</p> | <p>Modify</p> <p>Change Engagement Tactics Pull Back to better line location (indirect) Consolidate Forces Hold, Improve, Reinforce Patrol, Hold what you have</p> | <p>Send Comments on TEFF to: Patrick Withen at pwithen@virginia.edu or McCall Smokejumpers PO Box 1065 McCall, ID 83638 276-393-5268 cell</p> <p>Disengage</p> <p>Pull back closer to safety zone & break Retreat Evacuate</p> |

APPENDIX D: A SUMMARY OF THE TEFF & THE 59 FIREFIGHTING GUIDELINES

| | | |
|-----------|-----------|--|
| 10 | FO | The 10 Standard Firefighting Orders |
| 18 | WO | The 18 Watch Out Situations |
| 7 | DL | The Downhill Line Construction Checklist |
| 4 | CD | Common Denominators of Fire Behavior on Tragedy Fires |
| 7 | LU | Look Up, Down & Around Factors |
| 4 | LC | LCES |
| 9 | UW | The Wildland Urban Watch Outs |
| 59 | | Total |

I. Lookouts

| | | |
|----|----|--|
| FO | 8 | Establish lookouts in potentially hazardous situations |
| WO | 12 | Cannot see main fire; not in contact w/ someone who can |
| DL | 3 | LCES will be coordinated for all personnel involved |
| DL | 3a | Crew supervisors is in direct contact w/ lookout who can see the fire |
| LC | 1 | Lookouts must be established & known to all firefighters before needed |

II. Communications

| | | |
|----|----|--|
| FO | 4 | Ensure Instructions are given & understood |
| FO | 6 | Remain in Communication w/ crew members, your supervisor, & adjoining forces |
| WO | 5 | Uninformed on strategy, tactics, & hazards |
| WO | 6 | Instructions & assignments not clear |
| WO | 7 | No communication link w/ crew members or supervisor |
| WO | 12 | Cannot see main fire; not in contact w/ someone who can |
| DL | 3A | Crew supervisors is in direct contact w/ lookout who can see the fire |
| DI | 3B | Communication is established between all crews |
| LC | 2 | Communications must be established & known to all firefighters before needed |

III. Escape Routes

| | | |
|----|----|---|
| DL | 3b | Rapid access to safety zones in case fire crosses below crew |
| LC | 3 | Escape Routes must be established & known to all firefighters before needed |
| UW | 1 | Poor access & narrow one-way roads |
| UW | 2 | Bridge load limits |

IV. Safety Zones

| | | |
|----|----|--|
| FO | 7 | Determine safety zones & escape routes |
| WO | 3 | Safety zones & escape routes not identified |
| WO | 17 | Terrain & fuels make escape to safety zones difficult |
| LC | 4 | Safety zones must be established & known to all firefighters before needed |

V. Weather: Wind, Temperature, & Humidity

| | | |
|----|----|--|
| FO | 3 | Recognize current weather conditions & obtain forecasts |
| WO | 4 | Unfamiliar w/ weather |
| WO | 14 | Weather becoming hotter & drier |
| WO | 15 | Wind increases and/or changes direction |
| CD | 3 | When there is an unexpected shift in wind direction or in wind speed |
| LU | 5 | Observe wind |
| LU | 6 | Observe stability |
| UW | 8 | Strong winds |

VI. Terrain

| | | |
|----|----|--|
| WO | 2 | In country not seen in daylight |
| WO | 9 | Building fireline downhill w/ fire below |
| WO | 13 | On hillside where rolling material can ignite fuel below |
| WO | 17 | Terrain & fuels make escape to safety zones difficult |

| | | |
|----|---|---|
| DL | 5 | Fireline will not lie in or adjacent to a chute or chimney |
| CE | 4 | When fire responds to topographic conditions & runs uphill |
| LU | 3 | Scout terrain |
| UW | 1 | Poor access & narrow one-way roads |
| UW | 2 | Bridge load limits |
| UW | 6 | Structures in chimneys, box canyons, narrow canyons, or on steep slopes |

VII. Fire Behavior

| | | |
|----|----|--|
| FO | 2 | Initiate all action based on current & expected fire behavior |
| WO | 4 | Unfamiliar w/ local factors influencing fire behavior |
| WO | 16 | Getting frequent spot fires across line |
| DL | 7 | Bottom of the fire will be monitored; if the potential exists for the fire to spread, action will be taken to secure the fire edge |
| LU | 7 | Watch fire behavior |
| UW | 7 | Extreme fire behavior |

VIII. Firefighting Resources

| | | |
|----|----|---|
| FO | 1 | Fight fire aggressively, but provide for safety first |
| FO | 9 | Retain control at all times |
| FO | 10 | Stay alert, keep calm, think clearly, act decisively |
| WO | 18 | Taking a nap near the fireline |
| DL | 1 | Crew supervisors & overhead will discuss assignment prior to committing crews |
| UW | 4 | Inadequate water supply |
| UW | 9 | Evacuation of public (panic) |

IX. Fire Status

| | | |
|----|---|---|
| FO | 5 | Obtain current information on the fire status |
| WO | 1 | Fire not scouted & sized up |
| WO | 8 | Constructing line w/o safe anchor point |

- WO 19 Attempting frontal assault on fire
- WO 11 Unburned fuel between you & fire
- WO 12 Cannot see main fire; not in contact w/ someone who can
- DL 2 Decision will be made after proposed fireline has been scouted
- DL 4 Direct attack will be used whenever possible; if not possible, the fireline should be completed between anchor points before being fired out
- DL 6 Starting point will be anchored for crew building fire down from the top
- CD 1 On relatively small fires or deceptively quiet areas of large fires

X. Fuel Type

- WO 4 Unfamiliar w/ local factors influencing fire behavior
- WO 17 Terrain & fuels make escape to safety zones difficult
- CD 2 In relatively light fuels, such as grass, herbs, & light brush
- LU 1 Assess fuel characteristics
- LU 2 Feel & measure fuel moisture
- UW 3 Wooden construction & wood shake roofs
- UW 5 Natural fuels 30 ft. for closer to structures

APPENDIX F : Biographical Info on the Author

The author, Patrick Withen is an Associate Professor of Sociology and Organizational Studies and Chair of the Dept. of Social Sciences at the University of Virginia at Wise, and is a Smokejumper for the U.S. Forest Service, out of McCall, ID.

SCHOOL SEASON Mid-August to Mid-May

Patrick Withen

Associate Professor of Sociology

& Chair of the Dept. of Social Sciences

University of Virginia at Wise

1 College Ave.

Wise, VA 24293

276-376-4526 office

pwithen@virginia.edu email

FIRE SEASON Mid-May to Mid-August

Patrick Withen

McCall Smokejumpers

PO Box 1065

McCall, ID 83638

276-275-1927 cell

pwithen@virginia.edu email

April 18, 2005
TEFF050414