



Using Escaped Prescribed Fire Reviews to Improve Organizational Learning (JFSP project 10-1-05-1)

Final Report
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Principal Investigator:

Dr. Anne. E. Black, Social Science Analyst, Human Factors and Risk Management RD&A,
USDA Forest Service, Rocky Mountain Research Station, 800 E. Beckwith Ave, Missoula,
MT 59801; Phone: 406.329.2126; e-mail: [aebblack\[at\]fs.fed.us](mailto:aebblack[at]fs.fed.us).

Co- Principal Investigators:

Dr. James Saveland, Program Manager, Human Factors and Risk Management RD&A, USDA
Forest Service, Rocky Mountain Research Station, 240 Prospect Ave, Fort Collins, CO
80525; Phone: 970.218.4781; e-mail: [jsaveland\[at\]fs.fed.us](mailto:jsaveland[at]fs.fed.us).

Dave Thomas, Renoveling, 2334 N 500W, Ogden, UT 84414 Phone: 801.782.2912
email: [renoveling\[at\]msn.com](mailto:renoveling[at]msn.com).

Dr. Jennifer Ziegler, Associate Teaching Professor of Management, Mendoza College of
Business, University of Notre Dame, Notre Dame, IN. Phone: 574.631.4133; email:
[Jennifer.A.Ziegler.16\[at\]nd.edu](mailto:Jennifer.A.Ziegler.16[at]nd.edu). [Note: Dr. Ziegler was Associate Professor of
Communication, Valparaiso University, Valparaiso, IN during field phase of this project.]

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to www.firescience.gov



Abstract

The US wildland fire community has been interested in cultivating organizational learning to improve safety and overall performance for a number of years. A key focus has been on understanding the difference between culpability (to be guilty) and accountability (to explain) and on re-orienting review processes towards building a collective account of (as opposed to finding individual blame for) unwanted outcomes. A variety of innovative methodologies have been developed, yet until this project, there has been no systematic reflection to determine whether or how any of the existing review processes might be assisting organizational learning.

Through a series of five workshops with members of the US interagency prescribed fire community, we sought to assess how the various review processes, products, and the atmosphere within which these are conducted may be contributing to or inhibiting achievement of organizational learning.

This final report briefly describes the project activities and methods, presents key findings and management implications, and provides links and references to more in-depth description of project findings.

I. Background and Purpose

Since at least the tragedy on Storm King Mountain in 1994, the US wildland fire community has been interested in cultivating ‘organizational learning’ to improve safety and overall performance (Keller 2004, 2006; Larson et al. 2007, Wright 2010, Zimmerman and Sexton, 2010). Federal agencies have established and continue to support the Wildland Fire Lessons Learned Center, have sponsored several national conferences, and are continuously innovating and revising formal and informal policies and learning processes. By interagency policy (*Interagency Prescribed Fire Planning and Implementation Guide*), an official review must be conducted after an escape. “*The goal of the declared wildfire review process is to guide future program actions by minimizing future resource damage and/or preventing future escapes from occurring by gathering knowledge and insight for incorporation into future resource management and prescribed fire planning*” (NWCG 2008: 29).

Current academic paradigms guiding reviews have evolved over the past decade and now encourage a focus on organizational learning as opposed to individual accountability even for all but the most serious accidents (eg., Argyris and Schon 1978; Reason 1997; Dekker 2006; Snook 2000). As demonstrated by the initiation of the US Forest Service’s ‘Safety Journey’ and commitment to and interest in associated development of a ‘Human Performance’ curricula, federal fire agencies are also recognizing that conditions necessary for organizational learning are often repressed by cause → effect approaches, and sometimes by epidemiological approaches and that they are most often nurtured through systems and resilience engineering approaches (Lundberg et al. 2009)

Recently, interagency fire review processes have begun to emphasize using a systems approach to understanding how unwanted outcomes occur. A variety of innovative methodologies have been developed – including Facilitated Learning Analysis, After Action Reviews, multi-incident

syntheses and comparisons (Dether 2005; Dether and Black 2006; Nasiatka et al. 2008) and reviews based on High Reliability (Weick and Sutcliffe 2007) and Resiliency (Dekker 2006). In these, more attention is placed on understanding human sense- and decision-making.

Whatever review style or context, reviewing agencies appear to make the assumption that learning has or will occur once a review has been prepared and approved; yet as David Garvin (2000) notes, a lesson is not truly learned until behaviors and practices change. To date, there has been no systematic effort to determine whether or how learning is occurring in the prescribed fire community during or after review.

This project was designed to address a series of questions posed by the interagency Joint Fire Science Program, which was interested in understanding barriers to learning and how best to structure reviews, providing guidance to review teams, identifying necessary skills for review teams, and identifying possible changes to better respond to review recommendations. In light of this broad interest, we sought to assess how the various review processes, products, and the atmosphere within which these are conducted may be contributing to or inhibiting achievement of their goal: organizational learning.

II. Study description and location

The basic questions posed in this study focus less on building the theoretical foundation of organizational learning and more on understanding how these concepts appear in the prescribed fire community. The sociological and organizational psychology literature is replete with scientific studies concerning the worthiness of organizational learning for error prevention (e.g., Senge 1990; Garvin 2000; Kegan and Lahey 2000; Weick and Sutcliffe 2007), and, there are numerous theories about how organizations learn and change (e.g., Schein 1996; Shivastrava 1983; Scharmer 2007), and the conditions and activities necessary to facilitate this (e.g., Isaacs et al. 2006; Edmondson 1999).

We sought to understand how members of this community recognize and internalize new insights and adjust behavior as a consequence of participating in a review or using review products, as well as what they believe assists and interferes with learning, and what they believe will promote learning. We sought this information directly from members of the prescribed fire community. Our goal was to build a rich – and hopefully comprehensive - understanding of the learning space within the context of formal agency reviews. We reflect on these results through multiple theoretical lenses to deepen our understanding of system dynamics and to improve effectiveness of resulting recommendations.

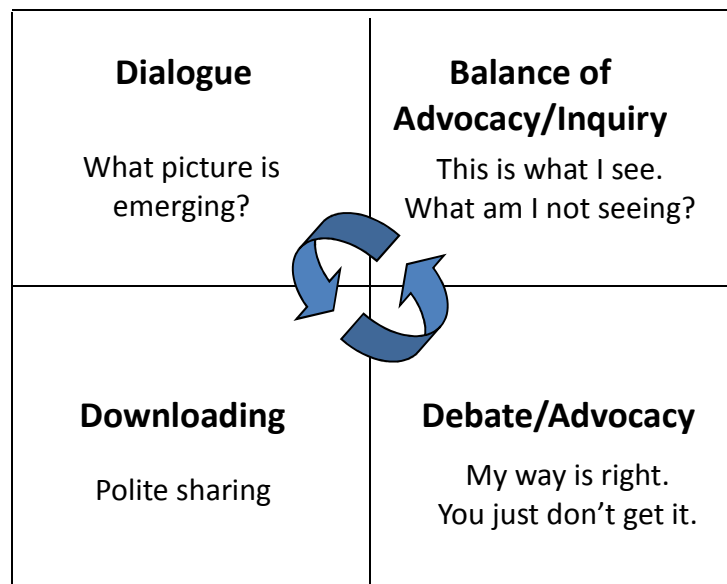
Methods

We focused on the practitioners and managers who have been reviewed, those who have served on review teams, those who request reviews, and those who use the products and results of reviews. We were interested in developing a shared understanding of the review and utility of subsequent products (both social processes). Thus, we selected semi-structured group dialogue as opposed to individual interviews as our primary method of inquiry. We proposed to hold dialogue sessions in several major regional cities of the U.S. and to pay close attention to the accumulation and replication of themes.

Dialogue

Dialogue has been described as a discipline of collective thinking and inquiry (Bohm 1996; Isaacs 1999; Isaacs et al. 2006). Ordinary phases of conversation are primarily focused on informing another about, or convincing another to adopt, one's own perspective (Figure 1, lower boxes). Dialogue differs by emphasizing as its goal the generation of new understanding and insight (Figure 1, upper boxes). This occurs through sharing of individual experience, acknowledgement of multiple – even conflicting - perspectives, and inquiry into the underlying structures (mental models, identities, goals) for these perspectives. Dialogue has been shown to be an effective technique to solve and to understand knotty sometimes intractable organizational problems especially if those problems are rooted in the culture of the organization; dialogue has been used successfully by such companies as Monsanto, U. S. Steel and Shell Oil.

Figure 1: Phases of Conversation. (Adapted from Isaacs et al. 2006; Scharmer 2007)



Workshop participants

We proposed four dialogue sessions around the United States (Northwest, Interior West, Central, Southeast), with each session attended by 12-15 participants who have experienced some aspect of an escaped prescribed burns and/or review. In each, we sought representation from all wildland fire agencies – primarily from the federal agencies, the Department of Interior's Bureau of Land Management, Bureau of Indian Affairs, National Park Service, Fish and Wildlife Service, and the Department of Agriculture's Forest Service – but were open to participation by other interagency partners as well – state, local, and non-profit organizations. We also sought a range of hierarchical and operational positions likely to be involved in a prescribed fire review, from ground line officers to the national level, review team participants to prescribed fire planning and operational staff (burn plan developers, firing, holding bosses, etc.) and ancillary support (fire weather meteorologists, dispatch, etc.).

To identify participants, we sent a formal letter signed by the principal investigators to the regional fuels managers in each federal agency with the request that it be distributed both

through the formal organizational hierarchy, and through informal social networks. This letter introduced the project purpose and draft agenda, and invited fire community personnel to one of the four scheduled workshops (dates and places included). Included in the letter was the offer to pay for travel expenses. Selection was based on a first-come, first-served basis.

Workshop structure

We designed each dialogue as a two day workshop, guided by inquiry into participants' personal moments of insight and the transfer of those insights into practice across several dimensions organizational learning.

Defining Learning: At the outset of each workshop we defined 'learning' as having three axes (Figure 2). First (top row of Figure 2), we acknowledged that many insights are gained during the burn and escape itself. We parsed review process, product, and transfer in order to acknowledge, and hopefully discuss, the potentially distinct actions and practices of each. The second axis (left vertical bar in Figure 2) is one of scale, because there are multiple levels of organization: individual, the burn team and local unit, review team, peers and peer units, and the organization as a whole. Finally, we separated insight from subsequent behavioral and/or structural change, following Garvin (2000). This explicitly recognizes how intention precedes action and allows us to delve into factors that promote or inhibit moving insight into action. In this context, 'organizational learning' is observed to be the lessons that have been incorporated into a work unit's processes and/or behavior.

After each dialogue session, Thomas conducted short video interviews with volunteers to provide background and content for our podcast series. Thomas lead the podcast team. Podcasts are designed to facilitate transfer of results (see Deliverables for more information).

Figure 2. Qualitative depiction of the level and the timing of learning that occurs currently (larger marks indicate more reported instances).

	Event	Review Process	Review Product	Transfer Activities
Individual				
Burn Team				
Review Team				
Peers/Units				
Organization				

Data Analysis

During each workshop two of the PI team served as lead facilitators (Thomas and Black), one team member took extensive notes (Ziegler), and one team member observed (Saveland).

During the first workshop, Saveland recognized an emerging structure, and developed this into an initial model of ‘human performance in the circuit of action and learning’. He presented and led a discussion on this in each workshop which served to further refine this model (see subsequent discussion, Key Findings).

On the second afternoon of each workshop, Ziegler presented a synthesis of the themes that came up during the two days. These were read back to the participants at the end of the second day. The purpose was to generate a quick summary of topics discussed, to demonstrate the productivity of the dialogue approach by allowing the participants to see the breadth and depth of the conversations they had just created, and to catch major errors. These summaries were used to develop initial project results [9474]. The final step of the workshop asked participants to summarize their discussions onto flip charts using a World Café approach. These were collated and synthesized as a preliminary finding, then sent out to all workshop participants for verification and commentary [9475].

Transcripts of each workshop were prepared to mask identities (identifiers are agency, position, workshop attended) and reviewed by the PI for accuracy. Black and Ziegler used Nvivo 9 (QSR 2011) for in-depth qualitative analysis. We initially coded the data into major workshop category (participants and affiliations, workshop, and workshop phase) for easier handling. In this cut of the data, we coded for *a priori* categories: event, review process, review product, transfer. We then split the data and each coded a section inductively using a grounded theory approach (Strauss and Corbin 1998). We periodically compared our emerging coding structure, discussed and resolved differences to agree upon a common codebook. Then, we each coded the remainder of the data, continuing to compare coding periodically. For analysis, we each pursued specific themes in greater detail based on our individual interests and perspective (communications, high performance/organizational learning).

Results

Between January and July 2011, we held five two-day workshops with members of the US interagency fire community concerning existing and potential learning in the context of escaped prescribed fire reviews¹ (Figure 3).

Each workshop drew an interagency audience with representation from all facets of fire management, from ground personnel to local line officers, regional, and national positions (see Figures 4-5, Table 1). Half of the 67 total participants have worked for more than one wildland fire agency. Eighty-percent had some experience with reviews, either as a burn team or review team member, and one third had experience on both sides.

Over the course of these 10 days of discussion (generating 30+ hours of transcripts), we developed a rich, deep dataset out of which we developed two conceptual models of the learning cycle in prescribed fire.

¹ Note: We accommodated one of two requests to hold an additional workshop in the Southwest. Although we briefed the Southern State fire group, we did not specifically target, nor did we get any state or local wildland fire organization representation.

Figure 3: Geographic location of five project workshops – Portland, OR; Denver, CO; Salt Lake City, UT; Tucson, AZ; Tallahassee, FL.



Figure 4: Proportion of workshop participants by organizational level (n = 67).

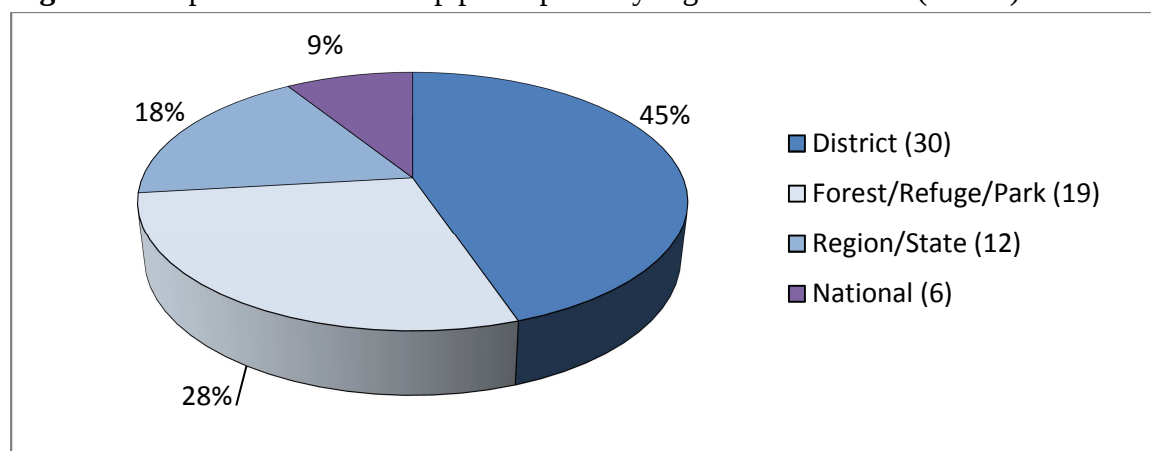
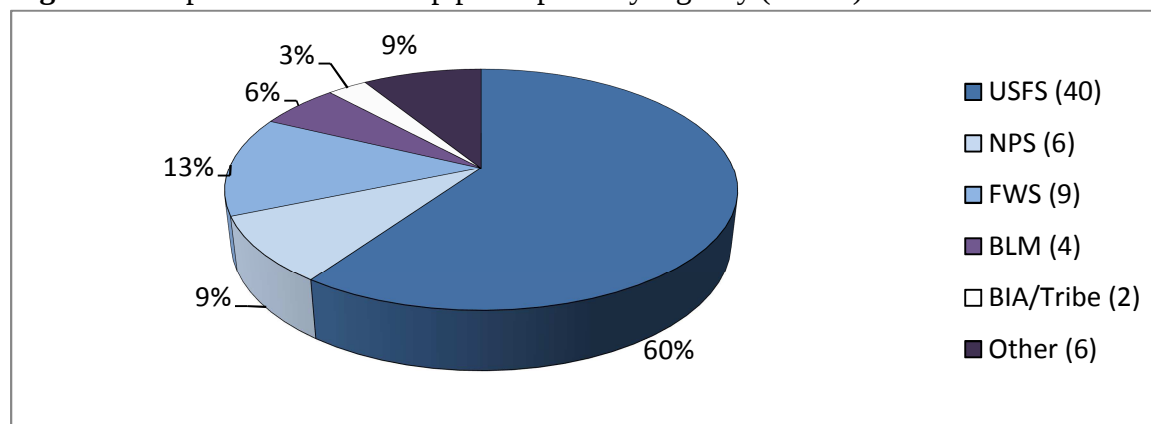


Figure 5. Proportion of workshop participants by Agency (n = 67).



USFS – USDA Forest Service, NPS – National Park Service, FWS – Fish and Wildlife Service, BLM – Bureau of Land Management, BIA – Bureau of Indian Affairs.

Table 1: Workshop participants by position, with total number in each category in parentheses.

District	Forest/Park/Refuge	Region/State	National
District/Zone AFMO* (5)	FMO (10)	Deputy FMO (3)	Fire Use Training Academy (FUTA -1)
District/Zone FMO ⁺ (8)	Fuels Specialist (5)	Fuels (6)	
District Fuels Specialist (4)	Fuels Planner (1)	Fire Ecologist (1)	Prescribed Fire Training Academy (PFTC -1)
Zone Fuels Specialist (2)	Fire Staff Officer (1)	Safety (1)	
Zone Fire Staff Officer (1)	Burn Boss (1)	Asst Dir F&AM (1)	Wildland Fire Lessons Learned Center (1)
Engine Captain (2)	Retired (1)		The Nature Conservancy (1)
Seasonal (1)			
Smokejumper (1)			
Wildland Fire Module (2)			
Assist. Hotshot Sup. (1)			
District Ranger (2)			
District/Zone AFMO (5)			

*AFMO – Assistant Fire Management Officer

⁺FMO – Fire Management Officer

IV. Key Findings

Our pragmatic approach – based on the interaction of theory and practice – provides a clear, comprehensive assessment of the existing climate and structure of escaped prescribed fire reviews as they influence organizational learning, and leads to concrete suggestions for improving individual, group and organizational learning. Many of these suggestions are grounded in current, albeit scattered, practice. Focused attention to these should dramatically enhance learning and organizational performance. The remainder of this section highlights specific findings and provides links to additional material.

Two notes:

- 1) Participants reported they greatly appreciated the open format and the ability to share, listen, and learn from each other. Providing more opportunities for these types of activities would greatly assist the development and transfer of the knowledge and wisdom necessary for optimal organizational performance.
- 2) We are continuing to analyze this tremendous dataset and expect to produce additional findings in the months to come.

Assessment of Organizational Learning from Reviews

This section synthesizes perspectives shared by participants regarding the extent to which they believe learning is occurring from escaped prescribed fire reviews (the data), as well as emergent patterns from the data that have been considered in light of organizational learning theory (the analysis). More extensive treatment of these may be found in deliverables: key concepts, tips and recommendations are presented in the podcasts [9904-9910], presentations [9407, 9833, 9834], and poster [9835], as well as in forthcoming peer-reviewed publications.

- ***Considerable learning seems to occur during a prescribed burn. However, different audiences seek different information during different phases of the learning cycle, and the current review process seems to serve top-level administrators almost exclusively.***

“We do escaped prescribed fire reviews with the intent of identifying deficiencies so we can modify the planning process. That’s basically what it says. There’s nothing about the learning piece. There’s nothing about it.”
(BLM, National Fire Operations)

Event - Most learning at the individual and burn team levels occurs during or immediately after an event by those directly and immediately affected, and generally prior to the formal review process. Insights and changes in behavior seem intimately intertwined at this level, generally stemming from the emotional valence surrounding personal involvement. This emotional valence appears to be critical for replicating for effective transfer of insights to others.

Process – We heard little evidence of true “organizational” learning from escaped prescribed fire reviews (Figure 2). That said, a well run review, particularly using inquiry-based approaches such as some of the Forest Service’s Facilitated Learning Analyses (FLA) as opposed to investigatory approaches, have assisted individuals, burn teams and local units in completing their internal learning.

Review team members report the most gains from their involvement in the review process. Participation on review teams appears to be an effective development opportunity. For instance, several review team members noted that their experiences altered their perspectives on burn plans and that they immediately began thinking about and writing burn plans differently.

We heard evidence that regional levels often feel ‘caught’ between upward reporting requirements (to address the seven required elements²) and national expectations for how the resulting report will look, and processes that may yield richer and more effective local unit learning. It is unclear what is done with the data collected at the national level as they are not being relayed back to the field.

Evidence of organizational learning at the national level manifests itself in larger-scale changes in policy and guidance, generally following infrequent, high profile events.

Product - Many participants commented that they are often unaware of the availability or existence of reports – even those who were personally involved with a review. Most obtain

² Current Interagency guidance requires each review to include “at a minimum, these seven elements:

- “1. An analysis of seasonal severity, weather events, and on-site conditions leading up to the wildfire declaration.
2. An analysis of the actions taken leading up to the wildfire declaration for consistency with the Prescribed Fire Plan.
3. An analysis of the Prescribed Fire Plan for consistency with policy.
4. An analysis of the prescribed fire prescription and associated environmental parameters.
5. A review of the approving line officer’s qualifications, experience, and involvement.
6. A review of the qualifications and experience of key personnel involved.
7. A summary of causal agents contributing to the wildfire declaration.” (NWCG 2008:29)

them through their social network or from the Wildland Fire Lessons Learned Center (LLC) website as opposed to through official channels. Fire Management Officers and those developing refresher and other training report using and gaining more from review products than others in the fire community. These are used largely to develop training modules. Most participants indicated they do not have time to read reports, particularly lengthy ones.

A note on FLAs: Those who have experienced the Forest Service's Facilitated Learning Analysis process report that by and large these produce better local learning than other reviews (however, this sentiment is not universal. We heard consistent reports that FLA reports do not meet the needs of other levels of the organization). The key to success is in attitude, tone and focus: A focus on local sense-making and learning, and an attitude and tone of respectful inquiry seem to lead to a positive social learning environment.

We also heard the desire for better transfer of local lessons gained through an FLA to a wider peer audience. Additionally, we heard a frustration with how some FLAs have been written up. Reports need to have sufficient context and specificity to enable others to understand the lessons and facilitate transfer to their own situations.

Transfer – Currently, peers and those on adjacent units learn most through personal connections to the event – either from those they know, or from a presentation by a peer involved in the event. The most effective transfer mechanisms are those that put someone ‘in the shoes’ of the burn team and help replicate the emotional valence of the experience (see below as well).

- ***The focus on organizational learning largely dissolves once a review is complete, resulting in haphazard and inconsistent learning, and lost opportunities for true organization-wide learning.*** There is little indication that sufficient attention or energy is put towards transfer of results. This has dimensions of both appropriate format and dissemination. There is a widespread perception that lessons ought to be transferred to other structurally equivalent units, but that this often does not happen. Some reasons include that others may not know about an event, they may not have access to it, they may not know what lessons are relevant to them, or they may dismiss the review and report as lacking in credibility (see next point about spaces of action).

There is a need to develop appropriately formatted products. The typical report format appears to have little utility for many participants, particularly those on the ground or supervising ground forces. Those who do read reports are generally in managerial positions (e.g., FMO, Regional Office) and those who develop training materials.

Almost without exception, the most effective learning format perceived for the ground and their supervisors is one that is interactive and creates an emotional valence within which the participants experience the event ‘first hand’. Sand table exercises, simulations, and Google Earth ‘virtual staff rides’ are some of the formats widely discussed as effective.

Generally speaking the skills to produce these products are not sought or obtained on a review team. Options include deliberately staffing a review team with members capable of producing such a result, or developing a new team to take the review results and to develop a field-friendly product.

Who is responsible for dissemination? While the Wildland Fire Lessons Learned Center (LLC) serves as a repository for reviews, it is often unclear just who is responsible for sending the completed review to the LLC. Moreover, there appears to be no general or consistent process to notify either interested or affected parties of the availability of a report. Using the Davis report as an example, we heard several people from a different Forest Service region indicate a desire to read it and the resultant management action items as they thought it applicable to their units, but they had no idea if and where the report was available.

How is implementation and monitoring of recommendations occurring? After reviews are disseminated, it is important to monitor whether the information contained in the report has been used (incorporated into practice) and is achieving desired results. We received anecdotal reports of local programmatic changes that have resulted from specific reviews, but not all reviews identify recommendations, and even those that do may not lead to implementation of corrective action and monitoring. Often, recommendations are not associated with the review document and generally speaking, corrective actions are only shared locally. Participants expressed the desire to learn of, and from, corrective actions.

Participants noted they see little evidence that recommendations and lessons learned developed during a review are tracked to ensure implementation and/or to assess impact to determine if actions taken meet intent. This is apparently true for the unit receiving the review as well as for others who may wish to incorporate relevant suggestions into their own units and/or organizational practices.

Release of a report is necessary for the local unit as well as third-parties. If a final review is not released back to the field, the critical step of achieving closure and rebuilding cannot be completed, or in some cases, cannot even begin. Opportunities for transferring lessons to other units are also stymied. While participants understand there are political realities that may be at play at regional and national levels, that does not seem to change their need to have a report in hand.

Certain large scale events are perceived to have had a significant impact on learning, with some having identifiable changes in operational and safety practices (e.g., Cerro Grande, Dutch Creek), and with others having conveyed lessons that were more about organizational responses to negative outcomes (e.g., Thirtymile, Cramer). Given that organizational learning is perceived only from some events (and that sometimes they are not the lessons that were intended), many opportunities for organizational learning are apparently slipping through the cracks.

Tracking and trending, if conducted, is not widely known, available or communicated. In addition to effective learning cycles at each of the distributed (local) units, successful organizational learning also requires a collective perspective. The task is to build and maintain collective awareness of common features, practices, behaviors and outcomes of local functioning across the organization or community. The purpose is to distinguish what is common from what is idiosyncratic. Commonalities derive from shared attributes –whether they be environmental, structural (e.g., organizational policy, procedures), cultural (informal procedures, attitudes, norms, behaviors), or genetic (e.g., of the human condition). Commonalities can be actively engaged by managers. Idiosyncracies cannot.

At an *individual* level, the mantra ‘every fire is different’ may be a useful mantra to guard against complacency. At an *organizational* level, guarding against complacency can be facilitated by understanding how common features and behaviors combine to create unwanted outcomes.

People at all levels – ground, FMO, regional, national – expressed the desire for tracking and trending. However, the most common qualifiers were ‘but that’s not part of my job description’, or ‘I wish I had time to do that’.

Two aspects of the current system frustrate tracking and trending: availability and awareness of reports, adequate time to conduct. An emerging issue is the consistency of information from the FLA process in particular.

- ***People pay attention to how management responds to prescribed fire escapes, especially the use of the review process and its consequences.*** There is a desire to “open up” what has been “shut down,” but real consternation about whether and how to do so. Spillover from unfortunate outcomes in wildland fire has damaged trust for many ground level people at the burn boss level and below. A consistent theme in our data is that there is widespread mistrust of managerial motives for reviews, particularly from younger firefighters. We identified an important dichotomous metaphor related to “open” and “shut.” People use “shut down” to describe not only burn programs (i.e., burn programs have been “shut down” as a consequence of fires escaping), but they also use “shut down” to describe what has happened to individuals and crews (i.e., individuals and crews “shut down” during a review if they perceive it to be a witch-hunt). Simultaneously we noted a genuine desire in the data for people to be able to “open up” for the sake of learning (and wanting others to do so), but there is perplexity about whether and how to get younger people in particular to “open up” during reviews).
- ***There is a false dichotomy between “ground” and “management” that appears to be hampering system level organizational learning.*** The data provide rich evidence of how people orient to what they take to be very real – but very different – organizational spaces of action in which they operate (e.g., “ground” vs. “management”). Consequently they identify and insist upon different learning needs from an escaped prescribed fire review. For example, some insist that the purpose of a review should be for the learning by the affected local unit, while others say that the purpose of a review should be for management to identify areas for corrective action or policy change. The top leaders seem to be primarily concerned with learning about the organizational structures that potentially require changing (a cognitive process), while those on the ground seem to be focused on gaining insight and expertise to improve their performance (a social process). Yet another segment – those in mid-level regional positions - are caught in the middle, trying to meet their organizational responsibilities while also promoting effective social learning on the ground.

Pursuit of the learning needs of those in one space of action tends to negate pursuit of the learning needs of those in another space of action. For instance, participants report that reviews that focus almost exclusively on meeting the needs of the central organization lead to reviews with significantly diminished learning at the local level, and often diminished transferability. The result is an impasse or a persistent dissatisfaction by one group or the

other, or both. Although the review process is a social process, at present, most organizational attention and expectation for learning is placed on the cognitive aspects - the outcome of a review. In reality, both are needed.

This false dichotomy also manifests in proposed solutions, for example, in the suggestion that agencies hold two different reviews: one “just for” the ground and one “just for” management. The organizational learning challenge is how to set these different spheres of action in productive relation to one another (from “either/or” to “both/and”), and to identify relevant learning objectives and products that meet the needs of an entire system which includes these valid but different spaces of action.

- ***The roots of this disconnect lie at least in part in a lack of a common sense of identity; that is, each level largely considers its needs in isolation to those of other levels.*** Results and theory suggest that a powerful advance would be through development of a common framing and understanding that is inclusive of all purposes and needs. In the absence of that, developing separate processes to address each need may lead to some improved learning.

Social learning – or collective learning - is necessary when the task being considered requires multiple actors, at least some of whom take different actions to achieve the end result. In other words, there are different perspectives for any outcome. This is true of prescribed fire. Social learning requires more than simply the sharing of those different perspectives. It requires the group to integrate these to create a shared understanding. This can emerge only once a group has created a common language (jargon) and a common framing of the situation (mental model) (e.g., Jacobs and Cohgan 2005; Gherardi and Nicolini 2002).

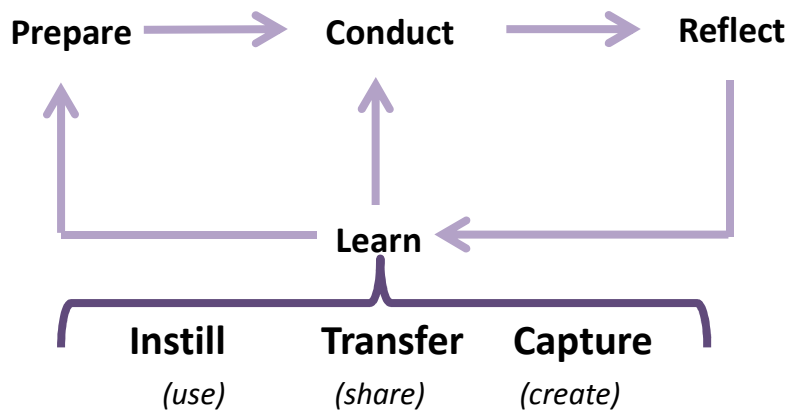
Seen through this lens, current review processes are hit by a double-whammy: social learning requires a collective sense of identity *and* multiple perspectives; yet the current culture seems to discourage both of these. Integration implies more than the adoption of one perspective by all; it implies the co-creation of an understanding bigger and broader than any single perspective alone. This can only happen if the group feels or is able to create a sense of community with the attendant sense of mutual accountability and belonging. For the majority of reviews discussed during our workshops, in the absence of this mutuality and belonging, reviews resulted in very little local learning. They may have met the needs of some levels of the organization (e.g., learning about structures), but they did not result in local learning.

- ***Results suggest that a key area for improvement is in the social/behavioral context, in particular learning how to establish and maintain an effective social learning environment.*** Current review processes lack ‘psychological safety’ (Edmondson 1999), which leads those involved in the escape to be disinclined to share the sorts of insights that are necessary to build an accurate and common understanding of events. Thus, while many current reviews may meet the stated needs of the national offices, recommendations are based on very partial data – leading to potentially inaccurate interpretation of events. This finding has implications for both leaders and review teams. For leaders, this includes setting an appropriate tone (climate) for learning, clearly articulating the expected outcome, communicating these, and ensuring that they occur. More explicit articulation and communication of intended audiences and outcome from a review are needed. For review

teams, this includes social intelligence skills to enable them to help create and maintain a healthy social learning environment.

- ***The dialogues allowed us to refine a classic model of learning. This refinement reveals a number of concrete steps necessary for improving learning from prescribed fire events [9835].***

Figure 6. A refined model of Dewey's (1922) Action and Learning circuit.



Considerable organizational focus to date has been on the ‘Prepare’ and ‘Conduct’ steps, with relatively little on the ‘Reflect’ step and virtually none on the ‘Learn’ step (Figure 6). While our focus was on learning from escaped prescribed fire reviews, we were quickly informed that ‘learning’ occurs throughout the full cycle from Preparing a burn plan, to Conducting the burn, to the post-incident Reflection processes and back to pre-season preparation. John Dewey described this learning cycle in 1922 as designing, carrying out, reflecting upon, and modifying actions (Edmondson 1999). This study expanded our understanding of the ‘Reflect’ and ‘Learn’ steps. In particular it has raised awareness of how much organizational focus to date has been on the ‘Prepare’ and ‘Conduct’ steps, with relatively little on the ‘Reflect’ step and virtually none on the ‘Learn’ step and its sub-phases; meanwhile there is considerable individual energy and interest in the Reflect, Capture and Transfer steps. [See poster – 9835]

Participants in the workshops articulated a number of specific activities and competencies that enact and support each step of the circuit. For instance, participants identified visualization techniques, controlled experiments and pre-mortem techniques to improve planning.

Techniques to improve performance while conducting action include honing skills in perceiving and interpreting situational awareness through whole body knowledge and in emotional regulation.

Techniques to improve reflection include working to build emotional and social intelligence skill and understanding.

Completing the learning stage actually requires a number of different, but interdependent actions. Whereas the preceding stages are pretty universally accepted and enacted to a greater or lesser degree, the phases of this stage are not. For instance, the skills, actors and

organizational support necessary to complete this stage likely differ from those necessary to Prepare and Conduct, even to some degree to Reflect successfully. These distinctions and the general lack of acknowledgement and provision for these offer good reasons why performance in this phase is so often sub-optimal or an abysmal failure. We characterize these (new) stages as: Capture, Transfer, Instill.

Successful accomplishment of the Capture stage requires active listening skills, curiosity, and compassion to fully capture and help integrate the data. Access to an expert in the format/venue of the product is also required.

Successful transfer requires commitment of all levels of the organization and the support and expertise to create and accomplish successfully moving insights gained by one unit to others – across time and geography.

Successfully instilling lessons is based all levels of the organization remaining focused, providing support and attention to creating/changing appropriate structures, creating/changing mental models, practice and interactions. Success is also based on follow-up to determine whether actions are taken, and if so, whether they achieve their goal, and if any adaptations are required.

Through this model, we were able to identify gaps where learning is occurring piecemeal and unevenly and where there are opportunities to “close the loop.” Fortunately, the system contains many existing practices that mitigate these weaknesses. These good practices that can be leveraged and mined to create a true system for organizational learning. See below and Management Implications for additional detail.

Elements of Process that Best Facilitate Organizational Learning

The findings below synthesize best practices in escaped prescribed fire reviews as expressed by workshop participants.

- **Local Leadership.** The local leader sets the tone for a creating a learning environment in the unit. The local leader does not need to wait for a review to occur to start building a learning culture.

When an escape does occur, involving the local fire leadership in a discussion about the purpose and process of a review can dramatically improve the local learning environment. In collaboration with fire staff and the review team, the leader clarifies the objectives for the review in terms of learning expectations for the local units and programs, including how those objectives match the scale and scope of event objectives. Widely communicating this to the entire unit can help ensure that the crews feel supported and respected.

Carefully selecting review team members to gain the desired technical and social skills to conduct a learning review and to produce products capable of reaching target audiences is essential, even if it means delaying a review until desired team members are available. The leader assembles and cultivates a review team that is independent from – but sufficiently structurally equivalent to – the unit being reviewed, including the use of operational level peers.

The leader develops a Delegation of Authority that includes this information as well as are a description of the deliverables to be produced and the audiences for those products.

Leaders can monitor the review process and review product development to maintain awareness of how well the process is meeting expectations and to initiate a course

correction. One way to do this is to assign a liaison officer who can ensure the team is following intent, but who can also act as a buffer for the team to work independently.

Finally, leaders can help ensure that relevant and appropriate information is released. In the absence of this, it is difficult for the local unit to gain closure and begin to rebuild – internally and with partners – let alone provide information necessary for others to enrich their own practice through the lessons and recommendations contained in the report.

“Clarify the Delegation of Authority – ensure it covers who the audience is, what the purpose is, how it is to be conducted, what the products are. Work to include/align the various desires, such as from RO, Forest Sup, District Ranger.” (*Workshop Summary bullet*)

“I think as a Line Officer I would want to develop an accurate Letter of Delegation and have somebody as a liaison to keep the team in line with that Letter of Delegation. And if there were things that came up that were outside the letter of delegation, maybe readjust it, but there should be some dialogue between the Forest or the Unit and the team to do that adjustment. They shouldn’t just run with what they think it should or where they think it should go.” (*NFS, District Ranger*)

- **Review Team.** Review team members act as witnesses and facilitators to first help the local unit make sense of what they experienced. They do this by providing for psychological safety and by emphasizing listening without judgment. The local unit is open and receptive to learning which makes for a richer story. Significant learning occurs by review team members who gain a new perspective on the space of action within which they also work. Review team members act as mentors to the team being reviewed while they also take lessons back to their own home units. The review team also assembles a narrative and contextual information in order to help others who have a need to understand what happened and why. However, it is clear to all that the review team’s narrative is “a” perspective about what happened that is written for a specific audience. But other opportunities for the local unit to continue to tell (and to experience) the story exist, such as during refreshers, burn boss road shows, sand tables, staff rides, podcasts, and through popular literature.

“I keep going back to team makeup and how a team runs a review and making sure that there’s clear objectives for the review that are agreed upon and then basically go in with the attitude of, hey, we want to be able to figure out what happened, learn from it, and if there’s corrective actions that need to take place, do those. Make sure those corrective actions happen, and let all this political stuff, drop it out of the equation and try and get people .. engaged with us.” (*BIA, Regional Fuels*)

- **Boundary Management.** Boundaries for information that should be shared and not shared, and with whom, are continually identified and respected. This can be a very complex task for a review team and unit leader, who must cooperatively a) create a safe container in which the local unit can make sense together of what occurred without fear of retribution, but also b) ensure that the report is released to the local program to help them reach closure with cooperators and partners, while c) simultaneously protecting the organization from inappropriate scrutiny from outsiders.
- **Transfer.** More so than just adapting to different “learning styles” for convenience, the learning modalities need to simulate the spaces of action in which people actually work. For

example, experiential modalities like sand tables and staff rides can provide a vicarious experience for operational crews who need to experience the contextual factors in all their uncertainty to think through options and decisions. This helps ensure that the story and lessons are captured and transferred on a peer-to-peer level, and in a format that helps the audience place themselves in the shoes of their burn team peers. These activities help to hone skills in situational awareness and decision-making.

Gripping stories can also provide a vicarious experience for leaders whose primary sphere of work is realized through face to face, written, and electronic communications.

Locally, units can create a continuous transfer environment by identifying appropriate roll-up lessons and targeting these to a specific audience. One way is to pick up someone else's review and use it to benchmark your organization. Another is to incorporate sharing into daily, weekly, annual meetings and refreshers. Yet another is to review prior recommendations and incorporate lessons – into burn plans, actions, processes.

“there really isn't that defined mechanism for getting the lessons learned on escaped prescribed fires out or even the review reports.” (*NFS, Forest FMO*)

“Often when we are on these review teams, I think my job is done when the product is written or whatever is done; it's in a pretty package, put a bow on it, and we're done. But that's often the first stage to sharing the information.” (*Workshop summary*)

“You can do a report, but face to face buys you a lot.” (*NPS, Lead Wildland Fire Module*)

“The most powerful communicator in sharing lessons learned are those people, a Burn Boss or somebody directly involved in the event and going on the circuit to share their story with others.” (*NFS, Forest Fuels Planner*)

“If I can create a personal connection to it, it has a lot more relevance, and I'm likely to learn those lessons, rather than if it's another report or even a video interview or something that I can't make a connection to.” (*NFS, Forest FMO*)

- **Follow Through.** Just as a burn plan needs to account for mop-up and monitoring, so does the review of an escaped prescribed fire need to provide for follow through to promote learning.

A learning environment does not conclude with the departure of the review team. A learning environment is one that promotes the incorporation of lessons learned into practice, such as by engaging in refresher activities, cultivating a 'telling' culture such as by promoting opportunities for members to share their lessons, sending team members on the 'burn boss lecture circuit', and/or swapping lessons with adjacent unit staff, randomly selecting a burn plan and conducting a pre-mortem to test for weaknesses, and ensuring that recommendations and lessons learned from previous events are remembered and incorporated into practice. Such practices build confidence and resiliency within a unit.

For more detailed information about the elements that set up a review for success, see GTR *Improving Learning from Escaped Prescribed Fire Reviews*.

V. Management Implications

Implications for Safety Climate/Culture

We believe this project has identified key lessons for improved safety and performance. Safe performance is driven by adequate and effective reflection on past performance and integration of lessons learned. People are naturally disinclined to speak up when disciplinary actions are possible or in an atmosphere of fear (name, shame and blame). Yet safe future performance is based on surfacing and discussing openly small mishaps in current operations. Disciplinary action is a necessary management tool, though one that is best used extremely rarely. Thus, management is faced with a delicate and fragile balance. Our research results highlight the significant need for building a more constructive learning environment – in wildland fire and beyond. The following are a few of the key management implications recognized thus far in our data collection and analysis.

- ***Pay attention to how the organization responds to incidents. Begin by revising the stated purpose of reviews and products to cultivate a “both/and” approach to system wide organizational learning.*** Participants say that learning occurs during prescribed fire escapes even without the help of a review team, in part due to the flood of emotions that can include mystification, self-recrimination, shame, and fear. Too often, the arrival of a review team signals a level of scrutiny that exacerbates those emotions. Furthermore, people pay attention to how management responds to an escape. The 2008 Interagency Prescribed Fire Operations Guide states that the “The goal of the declared wildfire review process is to guide future program actions by minimizing future resource damage and/or preventing future escapes from occurring *by gathering knowledge and insight for incorporation into* future resource management and prescribed fire planning” (italics added) (p. 29). Management should consider how the phrase “gathering knowledge an insight for” reflects a paradigm where some members of the organization “extract” information for use by others, which can feel intrusive, raise defenses, and feel like an interrogation to those being reviewed. An alternate paradigm might regard learning as a shared responsibility. Management should consider revisions to empower local units to cultivate a learning culture and to identify learning that connects with the larger system. This may help to overcome the ground-management dichotomy that we identified as hampering organizational learning. Managers may also help their unit become familiar and more comfortable with the process of critical reflection by practicing on all outcomes.
- ***Consider how the current paradigm of focusing on reviews of single incidents may be facilitating single loop rather than double loop learning.*** Single loop learning refers to acute learning from a single instance which can often improve technical expertise, but which may also miss more fundamental dynamics. Reliance upon, or acceptance of, single-loop learning alone sets up organizations to repeat and relearn mistakes. Double loop learning refers to engaging in a learning process that leads to fundamental changes in the paradigm. Potential examples of double loop learning appeared in our data, although they were attributed to single events that severely shocked the system and produced change, such as the South Canyon Fire (i.e.; right to refuse an assignment or disengage), the Thirtymile Fire (i.e.; emphasizing leadership development), and The Dutch Creek Incident (i.e.; medical

evacuation as a consideration before engaging). The good news is that people pay attention to the things that management is paying attention to. The bad news is that severe shocks to the system cause trauma and unintended consequences. Analyzing trends and feeding that information back to the field is a less traumatic way to identify weak signals of system problems, which can lead to paradigm change before the costs become too high.

- ***Build a system to track and trend escaped prescribed fires, convey middle management that this as an important management function, and provide resources for support of this function.*** Trend analysis--that is, analyzing similarities and differences across multiple events and consistently sharing the resulting information--is a critical component of learning from prescribed fire events that is either missing entirely or under-developed. Trending has both a social and a technology component. The technology component includes collecting data on escaped prescribed fires and reviews. Responsibility for trending appears to reside at the national level at this time. Current interagency policy requiring each review to address the seven elements is an instantiation of the impulse to track and trend. However, these data need to be stored and analyzed in a system for trending to support organizational learning. Benchmark other organizations like UPS, Con Edison, URS, Los Alamos National Laboratory, etc., who track, trend, distribute and use information on error rates at all organizational levels. On the social side, workshop discussions were inconclusive with respect to who should have primary responsibility for tracking and trending. For instance, encouraging middle managers to build and communicate a “bird’s eye view” of the program and organization would help field units orient themselves and their program within the broader organization and program, such as what occurs today within UPS and other organizations. However, this implies giving middle managers the time and resources to conduct managerial level analysis and trending. The Lessons Learned Center was also discussed as potentially carrying out this task. Currently it is primarily seen as an accessible repository for information (although LLC recognizes the need for synthesis and comparison as evidenced by the recent creation of an analyst position). Yet, it may be that agency managers are best positioned to recognize which lessons are most relevant to their own fire operations.
- ***Provide guidance to prescribed fire specialists and review teams about information boundaries: Specify what should and should not be communicated to whom, when, and why.*** Provide an appropriate safety container for local unit to engage in their own learning reflection. In this case, certain information would only be shared among the team members and no further, and possibly not written down. Release the report because this provides an important sense of closure for program managers and to be able to share with their cooperators and partners. In this case, certain information would be released publicly and not withheld. Protect the organization from undue outside scrutiny by specifying what information to not release during a review. In this case, certain information would not be released publicly, etc.
- ***Invest in experiential learning not just for reasons of “learning style” or preference, but because experiential learning modalities best simulate the space of action experienced in certain kinds of work.*** From low complexity (e.g., podcasts and sand tables) to high complexity (e.g., staff rides and simulators), experiential learning modalities better simulate

the space of action that represents the work reality for ground operations. They can experience the same uncertainty and equivocality that creates new perspectives and high impact learning but with low risk.

- ***Support Line Officers as important member of the fire team.*** Management has identified needs and invested in fire leadership training and other safety initiatives, but these are often siloed for the fire staff in particular. Cultivate Line Officers to ensure they can comfortably set the tone for learning in their units. Train them in facilitative and emotional intelligence skills that help them to help others to identify and cultivate learning opportunities within their own sphere of influence.
- ***Cultivate, train, and mobilize review team members as an important development opportunity.*** Somewhat unexpectedly, we discovered that review teams members often learn the most during prescribed fire reviews. This means that being a member of a review team represents an important development opportunity, especially for ground personnel who act as ‘peers’. Therefore, one implication of our findings is that management should cultivate, train, and mobilize review team members as an important professional development opportunity.
- ***Specifically train review team members in the soft skills necessary to create a learning environment.*** By all accounts, learning can be facilitated by review team members who have, or can quickly cultivate, the skills to create an effective social learning environment. This could take the form of additional training modules in social and emotional intelligence.
- ***Gauge prevailing practice in your agency along the Burn plan specificity continuum and identify its likely impact.*** One topic that surprised us was how divergent participants’ views were regarding prescribed fire burn plans. We noted significant variability within and across agencies on the purpose and specificity of the burn plan, and its relation to field operations. Managers may want to consider that burners on the ground react to how management responds to escapes, and those reactions have effects on how subsequent burn plans are put together and used. Consider burn plan practice as being on a continuum: at the one end there is the bare bones burn plan where not all blocks are filled in; those that are filled in contain extremely wide parameters that make it nearly impossible to be out of prescription but that also border on being meaningless as an operational document. At the other end of the continuum there is the very detailed burn plan where all blocks are filled in and parameters tightly constrained; yet that very precision makes it difficult to stay in prescription, even though conditions may not present a hazard to natural resources or safety.

VI. Relationship to Other Recent Findings and Ongoing Work on this Topic

To our knowledge, while there is a large literature on organizational learning, organizational communication, and high performance, there are no other empirical research projects investigating this specific arena. We know of several US researchers pursuing advanced degrees in safety, resiliency/human performance and organizational learning (e.g., Jahn³, Lewis,

³ Supported in all or part by JFSP

Pupulidy, Christenson, Wright¹) focused on wildland fire, and there is considerable applied research in Australia concerning safety, incident management, and incorporating lessons from ‘Black Sunday’ and other Australian events to improve future performance. Zimmerman and Sexton (2010) summarized the evolution of wildland fire policy and guidance, specifically how organizational learning has influenced managing for fire use.

There is much more activity in the knowledge management arena, though few are set up in an adaptive management or action-research framework. Such innovative efforts as the ‘Learning from the Experts’ video series (55 podcasts to date), jointly funded by the Aldo Leopold Wilderness Research Institute, the National Park Service, and hosted by the Wildland Fire Lessons Learned Center represents one effort to capture fire management expertise and then to transfer the knowledge via podcasts (Thomas 2006-2008). The only efforts available that compare prescribed fire escapes over the past decade are three sponsored or supported by the LLC (Dether 2005; Dether and Black 2006; Nasiatka et al. 2008; Schwope et al. 2006). These resulted in three grey literature reports and a publication in the Forest Service’s *Fire Management Today*, which is edited, but not formally peer reviewed. More has been done, both in management and research on wildland fire injuries, fatalities and entrapments. There is also an impressive array of innovative and experimental efforts to capture lessons from mishaps. A quick grab-sample of review titles from the LLC is illustrative (Figure 7) of efforts to learn from undesired outcomes. National Forest Systems is increasingly requesting Human Factors analysis for both fire and non-fire mishaps.

Figure 7: Grab-sample of review titles from Lessons Learned Center.



Others are experimenting with learning from exceptional to every-day events. For instance, in 2010, incident managers for the Sheep Complex fire burning on both the Sequoia National Forest and Sequoia-Kings Canyon National Park ordered a Technical Specialist to help them capture

their insights and lessons regarding managing a long-duration wildland fire with a local Type 3 organization (Black 2010).

Some of the essentials of organizational learning are being built into existing courses (e.g., SLAM - Senior Leader in Aviation Management); and an entirely new curriculum is being developed as well (e.g., Human Performance lead by the Forest Service's Human Performance Specialist and the Human Factors and Risk Management RD&A). The Forest Service's Safety Journey is itself a learning journey, and also seeks to promote a learning environment by sensitizing individuals to the distinctions between compliance-based and learning-based systems and encouraging a 'telling' culture. These support the development of a positive learning environment by introducing individuals to new paradigms for understanding and assessing performance variability.

This work contributes at both the instrumental and mechanistic levels. Instrumentally, this project has revealed numerous tips, techniques and insights which can be immediately adopted by the wildfire community at individual, group and organizational levels. Mechanistically, this project has identified some of the underlying drivers for current behavior, and offers some insights that may help the community close gaps by identifying underutilized strengths and features of the existing system that can be built upon to close and improve learning.

VII. Future Work Needed

This project was nicely timed because it aligned with an interagency effort to update the *Interagency Prescribed Fire Guide*, continuing efforts by the US Forest Service to further develop the Facilitated Learning Analysis concept for learning from unwanted events, and the US Forest Service's National Safety Journey. There are a number of practical, applied directions for future work: assessing how well recommendations are working in more recent reviews, putting effort into transferring these results in fire and more broadly into supporting continuous improvement in individual and organizational performance (details follow).

Assess Effect of Draft Recommendations to Close the Learning Loop

Several reviews subsequent to our workshops explicitly incorporated suggestions and ideas emerging from this project. To complete learning, there is a need to follow-up with participants of these reviews to determine whether and how these insights improved review outcomes.

Proposal: Interview leaders, burn team/unit members, and review team to capture insights into what worked, what didn't and thoughts on further changes and experimentation. Transfer those lessons back to the field.

Transfer Results to Fire Training Specialists and Leaders

The majority of our findings fall into the realm of cultural practices and behaviors rather than policy. That is, while participants almost universally said the 'seven elements' of the existing review process do not promote learning, their rationale and explanations point to issues of leadership, communications, leader, and review team perspective on error, review process, tone, and on the lack of follow-up and incorporation of lessons into practice. As such, in addition to

informing guidance and policy, it is critical to move insights from this study into the hands of those who can influence cultural practices and behaviors, most particularly, training programs and leaders. While our six podcasts will hopefully get considerable attention, unless these are incorporated widely into refreshers, trainings, and other outreach venues, the impact will likely be minimal. Moreover, they cover only six aspects of a very rich set of results.

We believe project results to be valuable for inclusion in the Leadership curricula, in Line Officer trainings, in Prescribed Fire trainings courses, and in annual refresher courses.

Proposal: Several more podcasts could be developed, and additional transfer materials would undoubtedly assist in reaching the diverse audience. For instance, line officers have tremendous opportunity to influence the effectiveness of a review for organizational learning. Podcast #6 (focuses on line officers) could easily be complemented by several others; or supplemented with a short ‘desk guide’ of tips and advice for line officers responsible for convening a review.

Determine Factors Leading to Non-release of Reports

Despite credibility problems that can emerge for reports issued from reviews, the actual release of a report is an important step to allow people to move on from an event with external partners and cooperators and even to reach emotional closure internally within the organization.

Proposal: Identify reviews where the report was not released, “pulled”, or changed significantly after an initial release, and interview people confidentially at the appropriate level (e.g., forest, regional, or national) to identify the information that was not able to be shared that caused the report to be withheld. The goal will be to develop knowledge to assist review teams in appropriately managing boundaries for information during a review by identifying what needs to be kept private but also what needs to be made public for the sake of organizational recovery and continuity.

Explore the Temporal Dimensions of Learning

Some participants noted that the emotional impact of an escaped prescribed fire can lead to initial defensiveness that might soften with the passage of time and that might allow people to consider other perspectives when away from the immediate stress and scrutiny of an event.

Proposal: Identify reviews that were particularly contentious or controversial at the time they were conducted, and interview parties involved to determine their perspectives on the event and the review today, including what new insights have emerged over time and in talking with others. The goal will be to help review teams to understand the limitations that might exist for learning *immediately* after an event and to identify organizational learning opportunities that might exist *over time* for the fire community.

Better Characterize Ecological and Landscape Fire Effects

Participants raised concerns about another temporal challenge of the current review process: if prescribed fire escapes are defined as those that have burned outside prescription within the burn boundary or those that have burned across a jurisdictional boundary, reviews that are done

immediately after an escape are unable to determine the ultimate effect of the burn on the landscape.

Proposal: Identify reviews that were deemed outside prescription or outside of jurisdictional boundary where the same area subsequently burned again (e.g., burn treatments that had been identified as escapes that were later visited by the Rodeo Chediski fire). Interview the parties involved to determine the impact on the landscape. The goal will be to help review teams to consider the landscape scale of time and to inform overall organizational response to escaped prescribed fires.

Clarify and Specify What is Meant by ‘Organization’ in Organizational Learning

In this project we use ‘organization’ in a number of different contexts and sub-meanings.

Proposal (Specific analysis and manuscript development): It would be quite valuable to ask WHAT organization we are talking about when we say “organizational learning.” Or at least problematize how an interagency enterprise complicates what organizational looks like when you don’t have ONE organization with an identifiable boundary and a neat set of constituencies. This could make a valuable contribution to the organizational learning literature.

Explore and Test Ways to Close the Gap between Espoused and Actual Practice

In this research project, we revealed a gap between espoused theory of practice (do we learn from escaped fire reviews?) and actual practice (we might learn from prescribed fire reviews but, then again, we might not be learning as well as we could). We know of no other research projects that have exposed the gap in quite this way.

There is a sizable amount of research that could be conducted to close this gap. What are some of the ways to close the gaps that occur between each of the phases in the Learning portion of the circuit - from creating knowledge to transferring it and then actually using it. The following potential follow-up projects are framed with this gap in mind, and in a small way, might help fill the space between espoused action and reality.

Proposal (Booklets): Prepare attractive booklets to be used as study guides to accompany the six podcasts developed from the research material. These study guides could make use of professional articles on the learning organization from such prestigious journals as *Harvard Business Review* or *Academic Management Quarterly*. **Value to Audience:** Booklets would allow our research information to be displayed in a different format creating another learning style fire managers could use.

Proposal (Develop additional audio products): Since each dialogue session was audio-recorded, explore using the voices of the dialogue participants as a platform for deep learning from the research results. One product could be an addition to the Human Factors/ Risk Management webpage in which audio recordings are used to tell stories. [Note: any potential release would require obtaining permission from the individual.] **Value to Audience:** Learning is always is more acute when it comes from a peer’s mouth.

Proposal (Further develop the project web-page): We have only begun to develop webpages that enhance adult learning. The goal of this effort would be to work with professional webpage

designers and videographers to develop a “state of the art” webpage that would experimentally test how best to portray (share) information gathered during this research effort. **Value to Audience:** Potential value is huge, especially to younger generation employees who are accustomed to sharing and using information using computer enhanced processes.

Proposal (Further analyze transcripts): In a number of academic studies, wildland firefighter behaviors and thought processes have been analyzed for characteristics of high reliability mindfulness (HRO-mindfulness). The data set of interviews created through this project could be used for similar analyses but would be specifically directed at prescribed fire operations. We would hook the results of this analysis to the Human Factors webpage. **Value to Audience:** Wildland firefighters are always asking what HRO-mindfulness looks like in action. This would give them another template of real time behaviors to test their own performance against.

Proposal (Enhance utility of existing video material and podcasts): Previous work completed for a “deep smarts” project funded by Aldo Leopold Wilderness Research Institute, the National Park Service and WFLCC would be linked to the six podcasts developed as part of this JFSP work. This linkage would create a larger more synergic learning platform. **Value to audience:** Enhancement of learning opportunities to becoming better prescribed fire managers.

Proposal: We heard time after time the need to use prescribed burning successes (after all there are more successful burns than escapes!) as platforms for organizational learning. We do not disagree with this recommendation, but we do believe constructing training programs based solely on success, whether they be sand table exercises, staff rides or stories, is more complex than people realize. What is success? How do we know we didn’t luck out? An important next step for research would be to develop a protocol for designing successful training using “a successful prescribed operation.” **Value to Audience:** The prescribed fire practitioner would be learning from both “failure and success.” But more importantly, we’d be meeting a need the audience is demanding to do.

VIII. The Deliverables Crosswalk Table

Proposed	Actual
A professional paper on how prescribed fire escape reviews are actually prepared and then used by field units.	Four publications are under development, with more under consideration. At least three will target disciplinary journals, and one the management community through a Station General Technical Report. See Deliverables in preparation, below.
Development of a simple protocol for improving EFPRs.	The initial summary of recommendations and tips emerging from the five interagency workshops. This document was released to the field in August, 2011 and verified and refined through subsequent qualitative analysis. [see deliverables 9474, 9475]

Complete six podcasts to be posted on the Wildland Fire Lessons Learned website that describe how to improve EFPR processes so that organizational learning is enhanced.	Seven podcasts are in the final editing phase and will be accessed through a new webpage hosted on the Human Factors and Risk Management RD&A's website and cross-linked to the Wildland Fire Lessons Learned Center. In addition to the podcasts, the page will provide access to additional information on the project and associated materials and additional resources. See Podcasts, below.
The development of a reframed escape fire review process based on the information gathered from the dialogue sessions.	This was delivered in the form of 2-3 hour power point-assisted discussion to: the NWCG's Fire Use sub-committee; the NWCG Fuels Management Committee; the USFWS and USFS National Fuels groups; and in an international webinar hosted by the Wildland Fire Lessons Learned Center. Project results were incorporated into the NWCG's re-draft of the Interagency Prescribed Fire Guidelines. [see deliverables 9704, 9712, 9713, 9714, 9832]
A testing of the new process in the field where escapes have occurred.	Our ideas were used directly in three escaped prescribed fire reviews that we are aware of: USFS –Coal Canyon FLA, Black Hills NF; Box Fire, Fish Lake NF; State of Colorado – Lower North Fork.
Researchers speak at various fire symposia, conferences and workshops on what they have learned.	Management: Made 5 invited presentations to national level agency and interagency groups on results. Presentations included in-person workshops (NWCG, NFS) VTC (for FWS meeting in Atlanta, GA), and recorded international webinar (LLC). This latter has been requested by the NFS WO and Regional FAM for Burn Boss refresher trainings. [See citations database, below and at JFSP website.] Professional: Gave 5 presentations at international wildland fire conference. An additional presentation has been submitted. [see citations database, below and at JFSP website – 9407, 9833, 9834, 9835, 9836]
Additional Outreach	• Preliminary workshop demographics and results of workshop survey on utility of review products and transfer mechanisms. [9406] • This project was included in both the USFS and JFSP annual research 'highlights' documents which are widely circulated to interested internal and external entities. • Keller, P. 2012. Prescribed Fire Escapes: are we learning anything? <i>Two More Chains</i> 1(4):10-5. <i>Two More Chains</i> is a quarterly on-line publication of the Wildland Fire Lessons Learned Center targeting wildland fire staff. [9715]

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X. Additional Reporting

Deliverables Citation Database (items entered into the JFSP Citation Database through July 30, 2012)

Note: Numbers in parentheses at the end of citations refer to the JFSP reference number available at www.firescience.gov.

Final Report

Black, A.E.; Ziegler, J.A.; Thomas, D.; Saveland, J. 2012. Using Escaped Prescribed Fire Reviews to Improve Organizational Learning. Final Project Report (JFSP Project Number: 10-1-05-1). July 30, 2012.

Knowledge Transfer Workshops and Advisory Meetings

Black, A.E. 2011. NWCG Fire Use Subcommittee: Black, A.E. Dec 14, 2011. Invited extended presentation and briefing of NWCG's Fire Use Subcommittee. Lakewood, CO.[9712]

Black, A.E. 2012. USFWS National Fuels Meeting. January 25, 2012. Learning from Escaped Prescribed Fire. . Invited session conducted via VTC – Missoula-Atlanta) [9713]

Black, A.E. 2012. NWCG Fuels Management Committee. Invited extended presentation and briefing of NWCG's Fuels Management Committee. February 2, 2012. Boise, ID. [9704]

Black, A.E. 2012. LLC Webinar: "Learning from Escaped Prescribed Fire Reviews". February 21, 2012. [9714]

Black, A.E. 2012. USFS National Fuels Group. Invited extended presentation and briefing March 29, 2012. Lakewood, CO. [9832]

Professional Conference Presentations

Black, A.; Thomas, D.; Saveland, J.; Ziegler, J.. 2011. Learning from Escaped prescribed fire reviews. 11th International Wildland Fire Safety Summit; 4-8 April 2011; Missoula, MT. Missoula, MT: International Association of Wildland Fire [9407].

Black, A.E.; Ziegler, J.; Saveland, J.; Thomas, D. 2012. Learning as a Shared Responsibility: insights from a series of dialogic workshops with practitioners, leaders, and researchers. 3rd Human Dimensions in Wildland Fire Conference, International Association of Wildland Fire, Seattle, WA April 17-19, 2012 [9833]

Ziegler, J.; Black, A.E. 2012. Pleasing some of the people some of the time: how authors, subjects, and readers assess the complex landscape of audience in wildland fire incident reviews. 3rd Human Dimensions in Wildland Fire Conference, International Association of Wildland Fire, Seattle, WA April 17-19, 2012 [9834]

Black, A.E. 2012. Tips, Techniques, and Suggestions for Improving Learning from Escaped Prescribed Fire Reviews. (poster) 3rd Human Dimensions in Wildland Fire Conference, International Association of Wildland Fire, Seattle, WA April 17-19, 2012. [9835]

Ziegler, J.; Black, A.E. (Submitted). Audience Assessments and perceived credibility of accident investigation reports. National Communication Association. Scheduled November, 2012. Orlando, FL. [9836]

Thomas, D. 2012 Being wrong. Half day workshop, Yosemite National Park, May 2012.

Thomas, D. 2012. Stories and Organizational Learning: Facilitated Learning Analysis Workshop, NAFRI, Tucson, AZ, March 2012.

Other Technology Transfer Products

Black, A.; Thomas, D.; Saveland, J.; Ziegler, J. Sept. 2011 Workshop Summary. Sent to every workshop participant and sent as pre-reading for management presentations. [9974].

Black, A.; Thomas, D.; Saveland, J.; Ziegler, J. Sept. 2011. Workshop Flip Chart Summary. Sept. 2011. Sent to every workshop participant and sent as pre-reading for management presentations. [9975]

Deliverables in Preparation

Peer-reviewed and Research Station publications:

Ziegler, J.A., & Black, A.E. (201x). *“Shutting down” and “opening up” in escaped prescribed fire reviews: Metaphors for communication in the desire for cultural healing in wildland fire.* To be submitted to a managerial communication journal such as *Management Communication Quarterly*.

Ziegler, J.A., & Black, A.E. (201x). *The official story vs. my/their story: Perceived spaces of action and report credibility in investigative reviews of escaped prescribed fires.* To be submitted to a qualitative management journal such as *Human Relations*.

Ziegler, J.A. (201x). *Dialogue as data: Observations on created conversations in action research.* To be submitted to a qualitative methods journal such as *Qualitative Inquiry*.

Black, A.; Thomas, D.; Saveland, J.; Ziegler, J. 2013. *Improving Organizational Learning from Prescribed Fire Reviews.* JFSP ‘Black’ series General Technical Report-RMRS.

Black, A.E. (201x). *Organizational Learning through Prescribed Fire Reviews.* To be submitted to an organizational learning or management journal.

Podcasts

Thomas, D. and Black, AE. 2012. *Overview: Learning from Escaped Prescribed Fire Reviews.* Podcast. [9904]

Thomas, D. and Black, AE. 2012. *Part 1: Building a Prescribed Fire Learning Organization at the Local Unit Level.* Podcast. [9905]

Thomas, D. and Black, AE. 2012. *Part 2: Establishing a Robust Learning Culture.* Podcast. [9906]

Thomas, D. and Black, AE. 2012. *Part 3: Creating, Sharing, and Using Prescribed Fire Insights Locally.* Podcast. [9907]

Thomas, D. and Black, AE. 2012. *Part 4: Using Dialogue to Improve Learning from Prescribed Fire Operations.* Podcast. [9908]

Thomas, D. and Black, AE. 2012. *Part 5: Tips and Techniques to Deepend Prescribed Fire Organizational Learning*. Podcast. [9909]

Thomas, D. and Black, AE. 2012. *Part 6: Leading Organizational Learning in Prescribed Fire Operations*. Podcast. [9910]

Web page

Project webpage hosting the podcasts and additional resources to be linked to new Human Factors and Risk Management RD&A webpage. The RD&A website is being built in August, 2012 on the Rocky Mountain Research Station's website. Podcasts will be linked to Wildland Fire Lessons Learned Center, and likely co-hosted on YouTube. [9911]