Schultz et al. Fire Ecology (2019) 15:13
https://doi.org/10.1186/s42408-019-0028-x

Fire Ecology

FORUM Open Access

Forest Service fire management and the elusiveness of change

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Abstract

Background: There is broad recognition that fire management in the United States must fundamentally change and depart from practices that have led to an over-emphasis on suppression and limited the presence of fire in forested ecosystems. In this paper, we look at competing problem definitions in US Forest Service policy for fire management, the presence of goal ambiguity, and how these factors can explain why changes in fire management have been elusive, despite policy change. We consider US Forest Service fire policies, performance incentives, and decision-making processes for two sides of the agency: the National Forest System, which is responsible for land management on the national forests, and Fire and Aviation Management, which oversees response to wildland fire.

Findings and conclusions: We find that both sides of the agency acknowledge a complex problem definition for fire—one that recognizes fire as a natural ecological process, and also as a threat to personnel, communities, and natural resources. However, we raise the question of whether the agency is adequately addressing competing problem definitions in fire policy, particularly given its largely separated structure between land and fire management. We suggest that, in the face of goal ambiguity, factors such as performance measurement, a preference for minimizing short-term risk, and professional expertise drive decisions that perpetuate the status quo. Opportunities exist to bridge more effectively across land and fire management and reduce incentives to focus on short-term risks during fire events. These include creating a meta-frame for fire management, improving performance measurement, supporting greater integration of fire and land management planning, increasing transparency and collaboration, and arming agency personnel with the core competencies needed to effectively tackle the complex problem of fire management.

Keywords: fire policy, goal ambiguity, problem definition, risk management

Resumen

Antecedentes: Existe un amplio reconocimiento que el manejo del fuego en los Estados Unidos debe cambiar y alejarse de las prácticas que lo han llevado a sobre-enfatizar la supresión y limitar la presencia de fuego en ecosistemas forestales. En este documento, observamos el problema de las definiciones antagónicas en la política del Servicio Forestal de los EEUU para el manejo del fuego, la presencia de metas contrapuestas, y cómo estos factores pueden explicar por qué estos cambios en el manejo del fuego han sido ambiguos a pesar de los cambios en su política. Consideramos también las políticas de manejo del fuego del Servicio Forestal de los Estados Unidos, la performance de sus incentivos, y los procesos de toma de decisión en dos áreas de ese Servicio: el Servicio Forestal Nacional, quien es el responsable del manejo de tierras en los bosques nacionales, y el Servicio de Manejo del Fuego y Aviación, que supervisa la respuesta a los incendios forestales.

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Resultados y conclusiones: Encontramos que ambas áreas del Servicio Forestal reconocen el complejo problema en la definición del fuego forestal. Una que reconoce al fuego como un proceso ecológico natural, y así como una amenaza a las personas, comunidades y recursos naturales. Por otra parte, nos preguntamos si el Servicio Forestal está abordando adecuadamente el problema de las definiciones contrapuestas en su política de manejo del fuego, particularmente dada la separación que existe entre las estructuras administrativas de manejo de tierras forestales y manejo del fuego. Sugerimos que, de cara a la ambigüedad de metas, factores como la medición de la performance, la tendencia a minimizar los riesgos a corto plazo, y la experiencia profesional conducen a decisiones que perpetúan el statu quo. Existen oportunidades para combinar más efectivamente el manejo de tierras y del fuego y reducir los incentivos enfocados a los riesgos de corto plazo durante eventos de incendio. Estos incluyen el crear marcos conceptuales meta para el manejo del fuego, mejorando la medición de la performance, colaborar para una mayor integración en la planificación del manejo de tierras e incendios, incrementar la transparencia y colaboración, y capacitar al personal del Servicio Forestal con las competencias básicas necesarias para afrontar el complejo problema del manejo del fuego.

Introduction

In the United States, there is broad recognition that current wildfire management practices must fundamentally change (North et al. 2015b, Thompson et al. 2018a). Whether this is due to concerns about climate change, rising suppression costs, or the growing number of values at risk, research consistently indicates that US fire management is a wicked policy problem and one that, no matter how it is defined, is getting worse with growing negative effects to society (Moritz et al. 2014, Calkin et al. 2015, Gergel et al. 2017, Keyser and Westerling 2017, Schoennagel et al. 2017). Multiple scholars also have noted that fire governance must be viewed as a complex social-ecological system, and actors must embrace a diversity of solutions over time and in different places (Fischer et al. 2016, Steelman 2016). Although recent papers have pointed to the need for policy change, they leave it to subsequent papers to undertake a holistic investigation of policy barriers and pathways to policy change (North et al. 2015b, Stephens et al. 2016, Schoennagel et al. 2017).

Given the complexity of the fire management problem and the discussion around potential policy changes, we contend that there is a need to examine in greater detail how existing policies drive the actions of key actors, like the US Forest Service. In this paper, we consider how Forest Service policies and incentives shape the agency's fire management actions. We look at how these policies navigate conflicting problem definitions for fire (*e.g.,* fire as a threat to resources versus fire as a natural ecological process) and the extent to which federal fire policy is characterized by goal ambiguity. We then consider the consequences for decision making and potential pathways to improvement. We propose that ambiguity and conflict in defining the wildland fire management problem, along with the current mix of incentives and aspects of agency structure, have inhibited efforts over the past several decades to improve fire management outcomes, despite policy developments. Addressing these dynamics will be critical to improve management going forward.

An overview of US fire management problems and solutions

Over the last several decades, fire activity has increased in the United States, particularly the western United States (hereinafter, "the West"), with significant and increasing costs to society (Schoennagel et al. 2017). Fire responders continue to experience fatalities every year with no evidence of reductions in fatalities relative to exposure, to our knowledge (NIFC 2016). In addition, there are a number of civilian fatalities every year, although trends are unknown as there is no national database consistently tracking civilian wildfire fatalities. The expanding population base, both in and adjacent to fire-prone areas, further increases the social values at risk (Theobald and Romme 2007, Mann et al. 2014), and the challenges of fire management will only get worse as fire seasons lengthen with climate change (Jolly et al. 2015). Yet, despite increases in fire activity, many forested areas in the West face a fire deficit (Marlon et al. 2012, Parks et al. 2015), with an accumulation of areas in need of treatment and entire fire-adapted landscapes likely becoming "endangered" (Stephens et al. 2016). Recommendations boil down to the need for more ecologically beneficial fires and fewer fires with negative ecological or social impacts (*e.g.,* Collins et al. 2017, Prichard et al. 2017, Stevens et al. 2017).

In terms of federal fire management, there is broad recognition that the historical and ongoing emphasis on full suppression is problematic, leading to an unnatural accumulation of fuels, and that short-term fire suppression success creates a fire debt that eventually comes due (Reinhardt et al. 2008, Calkin et al. 2015). Many fire-adapted ecosystems would benefit from low-moderate severity fire to maintain or restore

ecological integrity (North et al. 2012). However, under current management paradigms, US fire managers are unlikely to be able to maintain, much less increase, the acreage that is treated with fire prepared for fire (Allen et al. 2002, North et al. 2015a). Roughly 98% of fires are still actively suppressed and rapidly contained (USFS 2015). Some argue that the Forest Service has poorly capitalized on opportunities to manage wildland fires for resource benefit, instead perpetuating a model of fire exclusion, which can lead to ever worsening feedbacks (North et al. 2015b, Ingalsbee 2017). In addition, the amount of money spent on fighting wildfire on national forests, both in absolute terms and as a proportion of the US Forest Service's budget, has increased dramatically since 2000 (USFS 2015). As of 2017, wildfire management accounted for about 60% of annual appropriations for the agency, leaving less money for everything else—perhaps most notably the restoration work that is designed to support more resilient and fire-adapted landscapes that would reduce the need for fire suppression in the future (USFS 2015). The Consolidated Appropriations Act of 2018 included a "fire funding fix," scheduled to go into effect in 2020, which would increase the available funds for wildfire management and thereby decrease the percentage of the agency's budget that goes to wildfire management. Nonetheless, if the status-quo of suppressing almost all wildfires is maintained, management practices may do little to alleviate, and may exacerbate, fire problems.

The extent of the problem in the United States is not lost on communities, land and fire managers, policy makers, or scientists. The scientific literature articulates the need to adapt to living with more fire, reduce exposure of responders and civilians, manage costs more effectively, increase restoration activities, and improve the ability to use fire as a management tool (Reinhardt et al. 2008, North et al. 2012, Ryan et al. 2013, Calkin et al. 2014, O'Connor et al. 2016, Schoennagel et al. 2017). The research also indicates that communities in the West increasingly understand the importance of fire in the landscapes where they reside (McCaffrey et al. 2013). Land managers in surveys also reflect an understanding of and commitment to these interrelated objectives (Cleaves et al. 2000, Reiners 2012, Calkin et al. 2013). And over time, as we discuss in subsequent sections of the paper, the US government has articulated the need for fire-adapted human communities, forest restoration, and improved approaches to suppression as exemplified through acts of Congress and numerous agency policies and actions (WFEC 2014).

In summary, there is broad agreement that current fire management practices are leading to undesirable outcomes and are unsustainable in the long run (Olson et al. 2015). It has become starkly apparent that recognizing that there is a problem is one thing, while solving it is entirely another. Reforming current fire management approaches will require work across social, economic, ecological, and organizational variables. Significant efforts need to occur on the social and economic pieces of the puzzle so that communities can become more fire adapted, and so that more forest restoration activities can take place where they are deemed appropriate. More work is also needed so that fire responders can enhance the safety and effectiveness of fire management actions, including through capitalizing on opportunities to expand the footprint of fires to achieve long-term land and resource objectives (Dunn et al. 2017). We recognize that the situation is not static and that different efforts are underway to address many of these issues (*e.g.,* the Risk Management Assistance Teams pilot program, see https://wfmrda.nwcg.gov/RMAT.html).

Our goal in this paper is to look more closely at one key piece of the puzzle—the US Forest Service as a primary actor in this system and how agency policies and other structural institutions (*e.g.,* agency-wide incentives) may contribute to or inhibit progress towards desired outcomes. Other scholars have noted that the Forest Service continues to prioritize short-term risks in its actions and have suggested potential areas of policy change (Stephens et al. 2016). In this paper, we undertake an examination of existing policy and do not suggest changes to statutes or agency mission. Instead, we focus on gaps in implementing current policy and how internal structures, policies, and guidance may be a force in that dynamic.

Problem definition and goal ambiguity in policy

Multiple authors have worked to describe the complexity of the wildfire problem, often characterizing fire management as a wicked problem, and one that is situated in dynamic and complex social-ecological systems (Carroll et al. 2007, Chapin et al. 2008, Gill et al. 2013, Steelman 2016). We examine this issue more narrowly, specifically in terms of how the primary wildland fire organization in the United States, the US Forest Service, defines the fire problem and how this may perpetuate current fire management approaches despite policy changes.

Problem definition plays an important role in both structuring decisions and framing solutions. In the decision sciences, problem definition (or problem structuring) is viewed as an essential first stage in a broader, multi-stage decision process, and one that can be particularly difficult for natural resource management problems (Gregory et al. 2012). The aim is to consider the multiple problems at hand and evaluate among them to direct resources to priorities. Ideally, actors work to ensure that priority problems are being addressed, the

necessary people are involved, and the appropriate level and type of resources are brought to bear. A well-framed problem statement and associated evaluation criteria ideally provide clarity that results in decisions that are more transparent, defensible, durable, and aligned with strategic objectives (Marcot et al. 2012). In the political science literature, problem definition (or issue framing) is often examined as a discursive strategy for advancing policy objectives in the policy process (Pralle 2006). It involves multiple facets, including: how a problem is characterized (*e.g.,* whether fire is an ecological process or a looming catastrophe), the solutions identified, and the allocation of responsibility for solving the problem (Rochefort and Cobb 1993).

Competing or ambiguous definitions of a problem in policy result in goal ambiguity, which is something that characterizes almost all public agency mandates (Pandey and Wright 2006, Rainey and Jung 2014). Goal ambiguity comes in many forms, including ambiguity about how to translate broad mission statements into objectives and actions, prioritize among competing goals in policies, or measure progress towards stated goals (Rainey and Jung 2014). The more politically salient an agency's activities are, drawing in the interests of multiple constituencies and their representatives in Congress, the more ambiguous an agency's goals will be (Biber 2009, Lee et al. 2009). For a governance challenge like fire, which is complex and involves many groups of constituents, eliminating goal ambiguity is not realistic, nor is it entirely desirable as ambiguous policies draw in broad constituencies and their political support (Jarzabkowski et al. 2010).

Nonetheless, an important question for our purposes is what the consequences might be of goal ambiguity and how these may perpetuate the status quo in fire management within the US Forest Service. When faced with multiple, competing objectives, agencies will tend to focus on measurable accomplishments, particularly those that are relevant to leadership and political overseers like Congress on one- to two-year timelines (Biber 2009). In addition, individual actors typically will operate within a bounded rationality, based on their professional training and how they and their colleagues understand problems (Busenberg 2004, Cairney et al. 2016). Agencies also are apt to take on problems that can be handled by the organizational leadership, structure, and culture that already exists within an organization, often reverting to a status quo, even when policies may direct agencies to embrace change (Allison 1971).

The extent to which these dynamics will affect how policies are implemented depends on a wide array of factors, including the broader political context, local unit-level dynamics, and agency-wide variables (Steelman 2010). In this paper, we consider the influence of agency-wide structural variables, including policy direction, performance measures, and decision-making requirements, on how Forest Service fire policy is implemented on the ground. Policies we consider include: law written by Congress; regulations, which interpret the laws; and agency-specific policies in manuals or guidance. Performance measures, another type of agency-wide variable, are created by the agency, often in cooperation and negotiation with the President's Office of Management and Budget, and Congress. They serve multiple purposes, including incentivizing particular activities in the field and communicating agency accomplishments to stakeholders and Congress (Radin 2006). Meeting targeted accomplishments for certain performance measures is important for positive personnel evaluations and maintenance or augmentation of budgets. Performance measures can contribute to goal ambiguity when they emphasize competing objectives, are not clearly linked to stated goals, or when it is unclear how to prioritize among measures. Although it is beyond the scope of this paper, it is worth noting that many other factors affect how policies are implemented, including a variety of unit-level variables, like local capacity, leadership, and stakeholders (Steelman 2010). Additionally, informal norms (sometimes referred to broadly as agency culture) and communication from agency leadership at multiple levels can affect the likelihood that staff will adopt and support desired behaviors as policy changes (Fernandez and Rainey 2005).

Examining Forest Service institutions for fire and forest management

The Forest Service is made up of five primary branches, two of which are directly involved in fire management: the National Forest System (NFS) and State and Private Forestry. The NFS manages the national forests and is responsible for resource distribution for land management, land and resource management planning (*i.e.,* forest planning), project-level planning, and project implementation to meet forest plan goals. State and Private Forestry, in addition to engaging in landowner and state-level partnerships and assistance programs, houses the Fire and Aviation Management (FAM) program, which oversees fire prevention, pre-suppression preparedness, and suppression activities within the agency. Although many fire staff members are NFS employees, their funding, fire training, planning, and response operations typically follow FAM guidance and requirements. Historically, FAM and NFS have shared responsibility for prioritizing investments in vegetation treatments to restore forest conditions and reduce hazardous fuel loads, although budget controls for these activities shifted primarily to NFS in fiscal year (FY) 2018.

In the following sections, we examine how the fire problem is defined within the NFS and FAM. Because we seek to understand system-wide trends and not unit-level differences in policy implementation, we focus on structural variables in our analysis, including: congressional and agency policies, incentives in the form of performance measures, and agency-wide processes for decision making that are outlined in policy documents.

The National Forest System

The primary statute guiding the Forest Service is the National Forest Management Act of 1976 (NFMA; 16 US Code 1600 *et seq.;* see Table 1 for a summary of policies discussed herein). The NFMA maintained the agency's multiple-use mandate from the 1960s and established resource protection and land management planning requirements for all national forests and grasslands. The NFMA regulations (also known as "the planning rule" and at 36 CFR 219 *et seq.*) provide details about the requirements for land and resource management planning (*i.e.,* forest planning) and the goals of forest management, which evolve over time within the space for discretion afforded by the agency's broad mandate under the NFMA.

The most recent NFMA regulations, promulgated in 2012 (77 FR 21162), explain how fire management is to be approached in forest plans. The concept of ecological integrity, which incorporates aspects of resilience, natural range of variation, and biodiversity conservation, is the overarching framework of the planning rule (Wurtzebach and Schultz 2016). Plans must include components to maintain and restore ecological integrity, taking into account, "System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change" (36 CFR 219.8 [iv]). Fire is thus described as both a driver (*i.e.,* a natural and critical ecological process) and a stressor, particularly when it is catastrophic or degrades ecological integrity (see 36 CFR 219.9). Fire is presented in the 2012 planning rule primarily as an opportunity to restore ecological integrity but also as a potential risk to the same ecological integrity, at times threatening soil, water, and biodiversity conditions, as well as other valued resources and uses on national forests. In addition, while plans are required to focus on ecological integrity, they are also supposed to contribute to social and economic sustainability. However, the planning rule does not indicate how these are to be prioritized if there are conflicts (*e.g.,* between aspen regeneration and the maintenance of long-standing grazing privileges, or between the

Table 1 A summary of primary fire-related policies in the US Forest Service, 1976 to present

Policy	General relevance to problem framing and wildland fire response	Primary USFS branch affected
National Forest Management Act, passed by Congress in 1976 (NFMA); see also NFMA regulations, also known as "the planning rule," written by the agency to interpret the NFMA and most recently revised in 2012	Establishes requirements and provides guidance for land and resource planning documents	NFS
Healthy Forests Restoration Act, passed by Congress in 2003 (HFRA)	Prioritizes hazardous fuel reduction projects; encourages Community Wildfire Protection Plans	NFS
Collaborative Forest Landscape Restoration Program (CFLRP), established by Congress under Title IV of the Omnibus Public Land Management Act of 2009	Funds priority hazardous fuel reduction and forest restoration projects that are collaboratively designed and implemented	NFS
National Cohesive Wildland Fire Management Strategy, written by the US Departments of Agriculture and Interior and required under the Federal Land Assistance, Management and Enhancement Act, passed by Congress in 2009	Sets broad fire management goals for the Departments of Agriculture and Interior	NFS and FAM
Land and resource management plans (*i.e.,* "forest plans")	Establish desired resource conditions; govern development and implementation of local projects; must be written to comply with the NFMA and planning rule	NFS
Spatial Fire Planning and Fire Management Reference System	Establishes fire management objectives and requirements for incident response consistent with forest plan guidance and objectives	FAM
Federal Wildland Fire Management Policy (1995, 2001) and Guidance for Implementation (2009)	Establishes priorities and protocols for fire response, and circumscribes allowable response objectives	FAM
National Fire Plan (2000)	Prioritizes fuels reduction and directs additional resources towards suppression efforts	FAM
Forest Service Manual (FSM), Chapter 5130	Outlines general roles, responsibilities, and principles for agency fire response	FAM
Interagency Standards for Fire and Aviation Operations (Red Book)	Provides guidance for implementation of response operations	FAM

presence of fire and silvicultural practices to support timber harvest; 36 CFR 219.8).

In recent decades, several other statutes have been passed that provide guidance on fire management. Title I of the Healthy Forests Restoration Act of 2003 (HFRA; 16 USC 6501 *et seq.*) focuses on fire as a hazard, with its emphasis on fuel reduction on federal lands, and fire as a threat to communities, water supplies and source streams, human lives and homes, and threatened and endangered species. The Act encourages the prioritization and implementation of fuels reduction treatments in areas at risk. The Act also focuses on community-level fire planning, something we discuss more below, specifically fuels reduction to remove proximate fire hazard. Several years later, Congress passed Title IV of the Omnibus Public Land Management Act of 2009 (16 USC 7301 *et seq.*), which established the Collaborative Forest Landscape Restoration Program, or CFLRP (see Schultz et al. 2012 for more detail on CFLRP). Its purpose is "to encourage the collaborative, science-based ecosystem restoration of priority forest landscapes" and "facilitate the reduction of wildfire management costs, including through reestablishing natural fire regimes and reducing the risk of uncharacteristic wildfire" (16 USC 7301). In contrast to HFRA, which focused primarily on fuels reduction, CFLRP characterizes fire as both a risk to be managed and a natural process to be restored, with a focus on a larger-scale approach to addressing this problem.

Broader policy around the intersection of fire and land management also came with the passage of the 2009 Federal Land Assistance, Management and Enhancement Act, or FLAME Act, which, among other measures, mandated that the US Departments of Interior and Agriculture develop a cohesive wildfire management strategy (43 USC 1701 *et seq.*). The resulting National Cohesive Wildland Fire Strategy guides fire management for the Forest Service and other partners, including local, state, and federal land management agencies, and outlines three primary goals for fire management: (1) restoring and maintaining landscapes through the use of fire (prescribed and wildfire for resource objectives) and non-fire "treatments" such as mechanical thinning; (2) promoting fire-adapted communities; and (3) fostering safer and more effective response to wildfires (WFEC 2014).

The sum total of these policies is a complex problem definition—one that requires fire be understood as a key ecological process to be restored, as well as a threat to natural resources, infrastructure, and communities that must be responded to. Some policies, like HFRA, emphasize fire primarily as a hazard, while more recent policies also identify fire as a natural ecological process.

Historically, the agency has used a handful of performance measures with hard targets for land management, including watersheds moved to an improved condition class, miles of road decommissioned, miles of stream habitat restored, volume of timber sold, and different types of acres treated, including wildland–urban interface (WUI) and non-WUI acres of fuels reduction. In FY 2018, the agency began focusing on two flagship targets, including fuels-acres treated and timber-volume sold. Fuels-acres treated can include acres treated with prescribed fire, natural ignitions managed for resource benefit, and mechanical thinning (although whether acres treated as a result of wildfire can be counted depends on planning documents and varies at different levels of the agency). The timber-volume-sold target can be compatible with fuels-acres treated, but it is often the hardest target to meet, incentivizing the agency to focus activities in places that will yield timber volume, even though these may not be priority areas for treatment for fire management (Schultz et al. 2015). Thus, performance measures emphasize both fuels reduction and timber production, two activities that may or may not be compatible, sending some mixed messages about priorities.

The Forest Service has sole land management decision-making authority on national forests. All decisions must be compliant with forest plans, which are developed through an interdisciplinary process and accompanied by environmental impact statements (EIS), completed in accordance with requirements of the National Environmental Policy Act of 1969 (NEPA; 42 USC 4321 *et seq.*). Any management actions to be implemented also go through project-level planning and additional NEPA processes, which can take years to complete. While decision making for federal land management agencies formally rests with the agency, the planning rule, HFRA, and CFLRP all emphasize the role of collaboration with diverse stakeholders in designing both forest plans and projects. Both CFLRP and HFRA also emphasize the importance of prioritizing landscapes for treatment. HFRA encourages creation of Community Wildfire Protection Plans, which at-risk communities (at a minimum, the local fire department, local government, and state forestry agency) develop in consultation with federal agencies, and which must include identification and prioritization of hazardous fuels reduction projects. Under CFLRP, funding is allocated to a limited number of projects through a competitive process, and collaboration is required through all stages of project development, implementation, and monitoring (Schultz et al. 2012). Given these requirements, major, planned land management actions take place after multiple years of deliberation, usually with input from organized stakeholder groups and broader public involvement, and time to conduct environmental impact analyses. The exception is during wildland fire events, when decision

making proceeds according to different norms, which we discuss more below.

Fire and Aviation Management

Although the evolution of federal fire policy over time is an interesting story in its own right, here we limit our discussion to a timeline that is relatively recent and that roughly corresponds to that articulated in the previous section. In 1995, in response to concern over the growing complexity and risks of managing wildland fire, the Secretaries of Agriculture and Interior chartered a Federal Wildland Fire Management Policy and Program Review to ensure consistency, cohesion, and cooperation across federal fire management agencies (USDA and USDI 1995). Three of the areas emphasized in the document are: (1) the need to integrate wildland fire as an ecological process into land management planning; (2) the need to reintroduce fire into ecosystems and empower employees to do so; and (3) the need for agency administrators to have flexibility when making suppression response decisions. Although structural fire protection in the WUI was explicitly stated to be outside of federal responsibility, and instead left to tribal, state, and local governments, the 1995 policy also emphasized the protection of human life and safety as the primary objective during wildland fire events, relative to property and resource values. Under this policy, managing a wildland fire for resource benefits required a formal prescription consistent with existing plans.

Five years later, in response to a challenging wildfire season, the Clinton Administration released a report titled Managing the Impact of Wildfires on Communities and the Environment (often referred to as the National Fire Plan; Babbitt and Glickman 2000). In contrast to the broad strategic direction provided by the 1995 policy, the National Fire Plan was described as "more narrowly focused and tactical" (NWCG 2001). In the National Fire Plan, there is limited recognition of fire as an ecological process and instead a clear focus on fire risk reduction with key recommendations for increasing firefighting resources (*e.g.,* crews, engines, bulldozers) to augment the efficiency of suppression efforts to protect life and property.

A 2001 review and update of the 1995 policy found that, although it was generally sound and appropriate, in practice, implementation of that policy had been lacking. The update acknowledged that the fire hazard in fire-adapted ecosystems and in the WUI was worse than previously understood and had continued to worsen due to fire exclusion practices (NWCG 2001). Key themes included: (1) recognizing fire not only as a critical natural process but also as a tool to sustain healthy ecosystems; (2) improving the quality and relevance of fire management plans; (3) stressing that response to fire should be based not on the ignition source or location of the fire, but rather on the guidance and requirements outlined in fire management plans; and (4) establishing effective mechanisms to oversee and evaluate implementation of fire policy.

Concerns over insufficient implementation of policy remained, such that in 2009, a document titled Guidance for Implementation of Federal Wildland Fire Management Policy was issued (Fire Executive Council 2009). It again acknowledged that the issue of the WUI is more complex and extensive than previously considered, and closer coordination and engagement across federal, state, local, and tribal managers is needed. One of the biggest shifts associated with the 2009 policy update is the clarification that a fire may be concurrently managed for one or more objectives, and that the full range of strategic and tactical options are available for response to every fire (*i.e.,* tactics for one portion of the fire could focus on suppression, while those on another could focus on managing for resource objectives). Previously, if any portion of a fire required suppression tactics, the entire fire needed to be managed with those tactics, and vice versa for a resource-benefit fire. In a shift from the language in the 2001 update that response should not be based on ignition source, the new guidance explicitly states that human-caused fires are to be suppressed in all instances without consideration of resource-benefit objectives. The 2009 policy update thus somewhat expanded the decision space for fire managers by allowing the ability to manage the same naturally ignited fire for multiple objectives, along with the ability to change objectives over time as conditions evolve.

In summary, Federal Wildland Fire Management Policy has evolved over the last 30 years in recognition of the increasing complexity of the wildland fire environment and the changing needs of the interagency fire management community. Two prominent challenges—increasing number of values at risk in fire-prone areas and growing need to reintroduce fire into fire-adapted ecosystems—influenced policy updates and reflect management problems that the US Forest Service continues to face. Policy statements for decades have embraced a complex definition of the fire problem and provided direction to protect resources at risk and expand the presence of fire to meet resource objectives when possible.

Internal guidance documents build upon federal policy and collectively articulate fire program organizational policies, objectives, and principles, outline workforce roles and responsibilities, and define performance measures. Of particular interest are the Forest Service Manual (FSM) and the Interagency Standards for Fire and Aviation Operations (also known as Red Book). The FSM "contains legal authorities, objectives, policies, responsibilities, instructions, and guidance needed on a

continuing basis by Forest Service line officers and primary staff in more than one unit to plan and execute assigned programs and activities" (USFS 2017a). Of specific interest is Chapter 5130, Wildfire Response, which calls for use of a risk management process to "minimize the exposure and effects of the inherent hazards in wildfire response while maximizing the opportunities to achieve management objectives." The FSM articulates wildfire doctrine as a set of principles intended to guide organizational actions, with specific principles listed for leadership, operations, risk management, and wildland fire response. This doctrine stresses aspects such as accountability, the need for clearly defined and attainable objectives, and integration of fire as a critical natural process. The FSM thus describes the intent of wildfire response to be to achieve natural resource objectives in addition to protection objectives. Other sections of the FSM require local managers to assess and report area burned by wildfire that meets desired conditions as described in forest plans. This provides a mechanism that accounts for the ecological role of fire in achieving beneficial outcomes, and allows managers to claim accomplishments from unplanned natural ignitions.

Whereas the FSM is specific to the Forest Service, the Red Book is an interagency document produced by the Interagency Standards for Fire and Fire Aviation Operations Group of the National Interagency Fire Center. The document, in part, provides "guidance for implementing safe and effective fire and aviation management operations based on policy in Forest Service Manual 5100 and 5700" (USFS 2018). Chapter 5, USDA Forest Service Wildland Fire and Aviation Program Organization and Responsibilities, states that it is intended to be a "program reference guide that documents the standards for operational procedures and practices for the USDA Forest Service Fire and Aviation Management program" (USFS 2018). Like the FSM, the Red Book stresses the above-referenced doctrine, risk management, and the role of fire management to maintain and restore ecological health, while at the same time emphasizing pre-season preparedness work, calling for the predetermination of a "range of acceptable response strategies for protecting identified values at risk while balancing firefighter and public exposure."

Also relevant to our discussion are planning documents that help translate federal policy, agency guidance documents, and forest plans into action. Perhaps the most basic policy requirement is that every burnable acre of federally managed land needs to tie back to a fire management plan (note that while this was long referred to as a Fire Management Plan [FMP], in 2014, the agency began transitioning away from the Interagency Fire Management Plan [FMP] template towards Spatial Fire Planning [SFP]). These plans must be consistent with guidance from existing forest plans and are intended to inform and assist line officers (NFS personnel with decision-making authority; *i.e.,* regional foresters, forest supervisors, and district rangers) when making strategic and tactical fire response decisions. Outdated, inconsistent, or inflexible forest plans may constrain options (Steelman and McCaffrey 2011).

Current and proposed performance measures include the initial attack success rate, a landscape risk index, the percent of large fires that exceed a suppression cost threshold, and the percent of acres burned by unplanned natural ignitions with resource benefits (USFS 2017b). This last measure in concept incentivizes ecologically beneficial fire and, as described earlier, is premised on an assessment of whether burned areas moved towards desired conditions. Two caveats are worth noting. First, there may be ambiguity or incompatibility between this measure and initial attack targets, as increasing the initial attack success rate may foreclose opportunities to allow fire to resume its natural role in ecosystems. Second, it does not appear that current reporting standards have any direct connection to fire response decisions and actions, such that, in theory, a manager could claim accomplishments even after deciding to aggressively suppress a fire to keep it as small as possible. In addition, the FSM characterizes success this way: "Safely achieving reasonable objectives with the least firefighter exposure necessary while enhancing stakeholder support for our management efforts" (FSM 5131.4.4). However, three essential elements of success by this definition—reasonable objectives, firefighter exposure, and enhanced stakeholder support—do not appear in performance measures. Forest Service researchers have demonstrated how exposure-related performance measures could be developed, but there remains a need for better monitoring of suppression decisions and operations (Stonesifer et al. 2014, Stonesifer et al. 2016, Thompson et al. 2018b). In addition, evaluating stakeholder support for management efforts would require more of an investment in social science research.

The response to a wildfire unfolds within the National Incident Management System (NIMS), which provides a consistent organizational framework to facilitate collaboration and coordination of wildfire response across agencies. FAM promulgates guidelines that outline roles and responsibilities within NIMS (USFS 2017a). A key role is that of the Agency Administrator (AA), who is the assigned line officer with statutory responsibility for managing the incident (for National Forest lands, this can range from District Ranger to Regional Forester, depending on the fire size and complexity). The AA is responsible for assigning and delegating responsibility for fire management operations to an incident commander (IC) for every fire. The AA also provides "leader's intent" to the IC that specifically outlines the

strategic objectives for the wildfire response. The assigned IC (and accompanying Incident Management Team, or IMT) is then accountable to the AA for achieving the desired strategic objectives through tactical and operational decisions, and handling all wildfire response activities, such as mobilizing and deploying suppression resources. In many instances, the IC will be a local Forest Service employee with fire qualifications. As the complexity of the incident grows, however, external ICs and IMTs may be brought in. In these cases, the objectives and guidance provided by the local AA to the IMT—made up of individuals who may be unfamiliar with local social and ecological conditions—are particularly important.

Discussion

Complexity and conflict in how the fire problem is characterized

Here we return to the question of how the fire problem is defined and to what extent goal ambiguity exists when looking at the combination of policy, incentives, and decision-making structures within the US Forest Service. Both FAM and NFS policy acknowledge that fire is both a beneficial process and a threat to resources, life, and property. However, there is limited recognition of how and when these two goals may conflict and how to handle the resultant tradeoffs. Examining the language in the different documents reveals two distinct problem definitions that use different wording. Viewing fire as an ecological process, while acknowledging that fire can have undesired effects, often relies on words like "restoration" and takes a long-term view of fire as a natural process to be leveraged, while viewing fire as risk focuses largely on negative and short-term consequences, "catastrophic fire," and the need to "protect" and "control" fire (Table 2). These represent significantly different problem framings in terms of how the problem and solutions are characterized. In addition, performance measures track different and sometimes competing objectives without clear priorities for accomplishments. Our observation is that, rather than utilizing a complex definition of the fire problem, current agency policy effectively includes two competing definitions of the fire problem. Thus, the problem as structured within the US Forest Service involves goal ambiguity in multiple ways, including how to reconcile these two conceptualizations of fire, prioritize among the risks associated with decision making in various aspects of fire management, and how to evaluate success, given that performance measures often track competing outcomes.

In addition, although both NFS and FAM embrace broad fire management objectives, when one digs a little deeper, significant differences between these two sides of the agency become more apparent. The performance measures for FAM emphasize more the fire-as-risk frame, with safety-related definitions of success and initial-attack measures, while those of NFS emphasize more the ecological process frame, with fuels-acres-treated targets. Decision-making dynamics also are distinct when considered side by side (Table 3). On the NFS side, decisions take place through a synoptic and deliberative process, are guided by line officers in consultation with their staff, align with forest plans that ensure consistency with the NFMA's requirements, and proceed only after going through the requirements of environmental impact assessment, alternatives analysis, and public involvement under NEPA. While the NEPA process does not ensure full disclosure of tradeoffs or guarantee quality analysis, it is a much more time intensive and deliberative process than the incident management system used by FAM to respond to fire, by which decisions are focused on operational response and resource needs, made in a matter of hours or days, and sometimes with little public involvement during or after decisions. The two also operate under essentially separate management systems, including: largely separate budgets and relationships with budgetary limits (*i.e.,* the law authorizes FAM to spend beyond appropriated dollars and be reimbursed by Congress after the fact [see Busenberg 2004]); different leadership, roles, and responsibilities; different knowledge, training, skills, and abilities; and often different personnel, with their attendant professional norms and culture. In the following section, we consider some possible consequences of these differences between NFS and FAM.

The consequences of goal ambiguity for Forest Service fire management

Given the complexities and potential conflicts in how the fire management problem is defined within the Forest Service, it is critical to examine the factors that may

Table 2 Different language, goals, actions, and timeframes associated with framing fire as an ecological process versus risk to values

Dynamic	Fire as ecological process	Fire as risk to life, property, and resources
Consequences	Both desirable and undesirable effects	Negative effects; damages
Language	Fire is a natural process	Catastrophic fire
Goal	Restore	Protect
Decisions and actions	Capitalize, leverage fire	Exclude, control, minimize fire
Time horizon	Long-term (years, decades, centuries)	Near-term (hours, days, weeks)

Table 3 Planning focus and decision processes as they compare between the National Forest System (NFS) and Fire and Aviation Management Program (FAM)

Dynamic	Land management (NFS)	Fire response (FAM)
Focus of planning	Consistent with land management plan (*i.e.,* forest plan) goals and requirements	Through spatial fire planning and consistent with forest plan direction to provide information to assist operational response strategies and tactics
Generation and evaluation of alternatives	Required by the NEPA and includes assessment of proposed alternatives compared to 'no action'	No reporting requirement, although the Red Book calls for units to "pre-determine" a range of response strategies
Decision timing	Decision processes unfold over years, except in cases of emergency response	Decision processes unfold over hours to days
Decision authority	Local manager responsible for decisions	Local manager responsible for expressing strategic direction through delegation of authority; however, incident commanders who may be external to the unit often responsible for tactical and operational decisions
Basis of decisions	Line officer priorities, based on staff input, budget allocations, stakeholder preferences, targets, and other factors, and often refined through a multi-year NEPA process	Expert judgment, based on perceived risk and value tradeoffs, suppression resource availability, and other factors

drive prioritization among goals and perpetuate the status quo. We suggest that treating the characterization of the fire management problem and attendant solutions as if it reflects a unified problem definition, without explicit recognition of the existing goal ambiguity and inherent conflicts in fire management within the agency, may be one reason improving fire outcomes has been elusive.

In situations with goal ambiguity, agencies typically favor conducting work that is measurable on short timeframes and that they know how to do, based on their expertise (Allison 1971, Radin 2006, Biber 2009). In addition, without targeted interventions, decision makers also tend to prioritize managing for short-term risk over long-term risk (Underdal 2010). With fire, these tendencies can be exacerbated by temporal mismatches between the long-term dynamics of fuel accumulation, with short-term risks associated with fire events. This dynamic is further enforced by short-term (*i.e.,* 1 to 5 yr) evaluation and promotion cycles for decision makers, and annual reporting and appropriations cycles for the agency and Congress. Individual decision makers likely will minimize short-term risks to their personal careers and liability, which increase as more fire is allowed onto the landscape, compared to risks to broader ecological conditions, which increase with fire suppression but are more likely to become apparent in the future, after the tenure of current decision makers. Biases towards management for short-term risks also are likely to dominate during wildland fire events, which are often viewed as emergency situations requiring rapid decision making, with immediate risks readily apparent (Stephens et al. 2016, Thompson et al. 2018a). Because agency administrators are the face of the NFS to their local publics and to political overseers, they also may face considerable pressure to put out a fire depending on the perceived risk to communities and potential smoke impacts. For these reasons, without clear incentives or processes to do otherwise, we can assume that managers are likely to consistently prioritize managing for short-term risks over long-term risks, resulting in a consistent emphasis on fire suppression, even though policy articulates a broader set of goals (Donovan and Brown 2005, Wilson et al. 2011).

In light of the complexity of policy goals, another important question is whether decision makers and planners are armed with the appropriate training and experience to manage the complex risk management and strategic planning tasks that are required in planning for and responding to fire. Although risk management is increasingly acknowledged as a desired core competency for both NFS and FAM personnel, there remains an absence of guidance in policies for how managers ought to balance often competing objectives, or how managers ought to be assessing and discussing complex tradeoffs. For instance, the planning rule does not provide explicit guidance for how to balance or prioritize risks and the word "tradeoff" does not appear in either the FSM or the Red Book, despite the growing emphasis on risk management. The one piece of policy that indirectly addresses tradeoffs simply gives incident commanders the authority to supersede natural, environmental, and cultural resource objectives when potentially life-threatening situations exist, in effect weighting the decision focus toward emergency response (USFS 2017a). This further increases the likelihood that incident commanders will pursue courses of action that minimize perceived short-term risks, while failing to achieve resource objectives and potentially exacerbating long-term risks to landscapes, communities, and future responders. If the fire problem must be understood as a complex one that requires situational risk management, then personnel and processes must be primed to

accomplish this task with attendant guidance, training, and experience.

The agency structures that differ within NFS and FAM are also relevant. Although goal ambiguity is an inherent part of an organization with a multiple-use mandate, as is the need for different internal staffs specialized in various tasks, the degree of difference and division between FAM and NFS increases the challenge of navigating goal ambiguity across the entire agency in a deliberative and coherent fashion. As we have noted, FAM policies, decision-making processes, and performance measures emphasize suppression to a greater extent than NFS processes. Both decision-making processes and performance measures prime FAM to emphasize short-term risk management to a greater extent than NFS, which has numerous processes in place to engage in long-term planning. Personnel within FAM are much more likely to have a background in fire suppression than other agency staffs; conversely, as fire training requirements have increased, the number of NFS personnel with fire experience has decreased. These dynamics limit the ability of personnel in the different branches to recognize and understand the tradeoffs among different goals. Without intentional work to better share perspectives, experience, and knowledge across these two sides of the agency, there is a likelihood that, despite policy changes, suppression will continue to be emphasized, particularly by FAM, and that the two staffs within the Forest Service may work towards divergent goals and talk past each other.

In summary, the current system likely will continue to lead to prioritization of management for short-term risks during wildland fire events. The agency for most of its history has focused on fire suppression and acquiring the human and capital resources necessary to fight fire, making it likely that, as an organization, the Forest Service still is better primed for suppression than management of natural fire (Busenberg 2004). Divisions between NFS and FAM branches within the agency may exacerbate this dynamic during wildland fire events, even if NFS continues to emphasize long-term planning goals for ecological restoration in its planning documents. Without adequate training and strong incentives to counter natural biases in both branches, personnel are likely to revert to default behaviors, focusing on what they know how to do best, minimizing short-term risks, and maximizing measurable accomplishments over politically and professionally relevant timelines.

Supporting a more integrated approach

The complexity of today's public management challenges requires greater coordination within and across organizations (Kettl 2006). While some specialization within the Forest Service of its wildland fire and land management branches may be necessary, better connections and communication between the two sides of the agency could improve the ability to more effectively navigate goal ambiguity. In addition, improved integration of planning exercises and more clarity on how to prioritize among goals may be in order. In this section, we offer our suggestions for paths forward, constraining our recommendations to actions that could be undertaken within the current legal framework and organizational structure of the Forest Service.

As noted earlier, eliminating goal ambiguity is not desirable or feasible for Forest Service land and fire management. However, in the face of goal ambiguity and competing problem definitions, it can be useful to develop a "meta-frame," which is a framing of a problem that incorporates multiple problem definitions. A shared meta-frame could involve different constituencies and actors in "constructing a shared narrative that recognizes multiple voices, teases out the implications of these value preferences, and seeks to resolve conflicts" (Head and Alford 2013: 723). This presents an area of opportunity for improved internal dialogue with the agency, as a starting point, perhaps towards defining fire management as a complex risk management problem. In addition, developing a meta-frame requires dialogue among multiple constituencies. For fire management, this kind of stakeholder dialogue is important because of the emphasis on collaboration in policy, the role of local partners and stakeholders in preparing and responding to fire, and because local collaborative contexts will have a significant impact on implementation of ambiguous policy goals (Matland 1995). Working with stakeholders (*e.g.,* community representatives, partner agencies, non-governmental organizations that bring capacity, etc.) to develop a meta-frame could facilitate effective response to complex problems by allowing for improved understanding of the nature of the problem from multiple perspectives and identification of a wider range of possible solutions, along with support for their implementation (Head and Alford 2013). External partners also can offer a degree of accountability to long-term goals and bring support for those goals to fire events, potentially alleviating some of the political pressure and natural decision biases that lead to a relatively greater emphasis on managing for short-term risks in the face of goal ambiguity. Long-term collaboration and larger-scale planning under approaches like CFLRP and other Forest Service restoration approaches likely support meta-framing and a possible a path forward (Schultz et al. 2018); internal agency and stakeholder collaboration during forest plan revisions, which could embrace a greater emphasis on fire as a natural process critical for long-term sustainability, also may present an opportunity.

Another step the agency could take to support the long-term goals of reintroducing more fire into forested ecosystems and minimize the risks associated with not doing so, would be to decrease barriers to engaging in strategic and transparent fire management planning, which would allow for more upfront consideration of various tradeoffs. In particular, long-term versus short-term considerations can be undertaken deliberatively and over time, outside the context of emergency management. We support current agency efforts in this direction, including creation of operationally relevant fire plans that consider factors related to fire control opportunities and firefighter safety (O'Connor et al. 2016, O'Connor et al. 2017). We also support the notion of developing plans that are spatially and temporally scalable, and that are designed to be flexible and adaptive (Meyer et al. 2015). A related opportunity lies in better integrating fire management planning into forest and project-level planning so that tradeoffs can be evaluated at the plan stage and built into project-level planning more effectively. During the planning process, identification could be made of areas where fire might be managed on the land to meet different management objectives, where it would likely need to be suppressed, and where to prioritize fuels treatment (see Thompson et al. 2016 for potential strategies). Some of this has happened in the past but often outside of the NEPA process, limiting opportunities for transparency, deliberation, and stakeholder involvement.

In essence, we suggest that incorporating conversations about fire management more regularly into formal decision-making processes could lay valuable groundwork for both forest and project planning, while engaging all participants in creating necessary meta-frames for fire management. Ideally, pre-season discussions about potential strategies and tradeoffs with different resource personnel or other agency partners could expand the decision space during fire events. Such activities could be used as a means of setting expectations for response for both an IMT as well as the community, with the goal of ensuring that effective plans for fire management are in place that can support more burning and have stakeholder support. Over time, this may create more pressure to justify suppression decisions when they compromise long-term management goals. Importantly, these activities require that the agency has adequate capacity, so that personnel trained in both fire management and fire ecology can participate in planning processes and have the time and skills to effectively engage in collaboration with partners and stakeholders.

Another opportunity to improve decision making is to build greater accountability into the incident command process, which has been a historically difficult area for the public to gain any oversight or involvement. Accountability is central to successful public administration and can augment understanding of where current practices are contributing to the status quo (Kettl 2006). Organizations with activities subject to direct observation also are better at evaluating progress towards goals (Lee et al. 2009). Although there already are multiple avenues for public involvement and oversight within the NFS's planning processes, the incident response side of the equation may be an area in which greater accountability could improve outcomes. One core area would be evaluating the quality of line officer and incident commander decisions on large fire incidents (Thompson et al. 2018b). We recognize that line officers and incident commanders may see greater accountability measures as potentially taking time away from more important activities or second-guessing their expertise in what are high-pressure situations. However, the time is ripe to explore opportunities to introduce greater accountability procedures formally, particularly given the current emphasis from Congress on cost accountability. For example, tracking variation in suppression resource use and identifying high-use IMTs could support greater accountability around cost containment and firefighter exposure (Hand et al. 2015). An important aspect of this would be to evaluate patterns of behavior over time, as opposed to confining evaluation to isolated fire assignments or even fire seasons. To what extent and by what avenues the agency might welcome greater external review of its practices is beyond the scope of this paper, but it is a critical question for discussion.

Finally, we segue from accountability to the related problem of performance measurement and how this may be influencing decision making in the face of goal ambiguity. Ongoing evaluation of performance measures is always essential to ensure that they are incentivizing the desired mix of activities and meeting communication needs (Radin 2006). Steelman and Burke (2007) acknowledged a challenge in performance measurement for fire risk reduction a decade ago, writing, "Current performance indicators such as acres treated may not be the best proxy for assessing whether long-term risk is mitigated" (Steelman and Burke 2007: 70); they pointed to this as a factor for why fire suppression continues to be emphasized over management of natural fire, despite policy change. One area for which better measures may be needed is in tracking the ecological outcomes associated with restoration activities, including the reintroduction of fire. In the face of goal ambiguity, because decision makers will favor measurable outcomes, it is important to consider how to better measure ecological outcomes, both to create strong incentives to manage fire for long-term ecological benefits and to effectively communicate success to policy makers. One opportunity may be to keep acres-treated targets, but to also develop

one-, five-, and ten-year goals for priority watersheds, communities, or ecosystems at risk. Short-term measures could be aggregated into more complex multi-year measures to communicate success over time.

Another possibility for enhanced performance measurement would be to move away from strictly outcome-based reporting of beneficial burned acres (*i.e.,* fire effects judged to have been favorable in achieving forest plan objectives independent of the response strategy), to a system that more strongly couples response decisions with reporting accomplishments. The goal would be to provide clearer incentives during incidents to manage natural fires for something other than suppression, in areas where forest plans or project decisions allow for fire. We are not advocating against ecological monitoring to determine post-fire conditions in relation to desired conditions but, rather, suggesting that claiming such acres as "accomplishments" might require a stronger demonstration of alignment between pre-fire plans, fire response objectives, and fire outcomes. Such a shift could require, for instance, the agency to more clearly articulate how much effort put into preventing an acre from burning is tolerable for that same acre, if it does ultimately burn, to be claimed as an accomplishment. In the ideal, such systemic changes could better align objectives, strategy, and performance by evaluating outcomes in relation to how management decisions and actions influenced attainment of land management objectives (Thompson et al. 2018a, b). A final issue, particularly for FAM, is to provide more dialogue about the import of different performance measures and how to prioritize among them. At present, priorities are unclear and different measures provide conflicting incentives. Further, some aspects of success, as defined by the agency, have no clear, associated measures, making it likely that these activities are under-incentivized, and also making it likely that the agency might miss opportunities for organizational learning and improvement.

Conclusions

Ambiguity and complexity in Forest Service fire policy, which recognizes fire as both an ecological process and a risk to human values, cannot be entirely eliminated, nor would that necessarily be appropriate. However, it is important to overtly recognize different problem definitions, the extent of current goal ambiguity, and the resultant potential conflicts that exist within and between NFS and FAM. This is a necessary step to begin to identify approaches that could improve upon a status quo that continues to prioritize fire suppression, despite multiple policy changes intended to decrease that emphasis. Creating a meta-frame of the fire management problem that is developed by diverse stakeholders and across parts of the agency could more explicitly recognize the conflict between fire as risk and fire as ecological process and enable more nuanced questions to be asked, such as how to best support more fire on the landscape. Collaborative partners are critical to supporting increased application of fire and could ease some of the pressure on fire managers during wildland and prescribed fire events. Partners can help to communicate the importance of the long-term risks of fire exclusion and hold managers accountable to locally agreed upon strategies to manage for more fire. Integrating fire management more directly into the forest management planning process also could serve to decrease the distance between the long-term time horizon of forest planning and the near-term time horizon of fire response. Improving the design of performance measures, with some that communicate multi-year successes, and embracing more comprehensive training in complex decision making around tradeoffs also may offer some paths forward. We offer these suggestions as possible steps to be taken within the current policy structure, under which suppression responses still dominate, despite changes over several decades to emphasize the management of fire for resource benefit.

Acknowledgements

Thank you to G. Ricco, Research Assistant at Colorado State University, for her assistance on this paper.

Funding

Funding for C. Schultz for this work was conducted under a Research Joint Venture Agreement with the USDA Forest Service Rocky Mountain Research Station (#14-JV-11221636-029).

Availability of data and materials

Not applicable.

Authors' contributions

CAS, MPT, and SMC co-wrote this manuscript. All authors read and approved the final manuscript.

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Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Publisher's Note

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Received: 22 March 2018 Accepted: 25 January 2019
Published online: 29 April 2019

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