Examining changes in public resource governance in the United States through three analytical lenses

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Abstract

Analyses of public natural resource governance in the United States have traditionally been viewed as a principal-agent problem: the behavior of administrative bureaucracies to secure power and resources, and the structures, processes, and strategies to control and limit discretion of the administrative state by civil society. Over the past 20 years, the roles of non-governmental actors in US public resource governance, especially at the subnational level, have increased and evolved to the point where many lines that historically separated public, private, and civic sectors have blurred. The purpose of this paper is to examine this governance change through three analytical lenses: Collaborative Public Management, Adaptive Governance, and New Institutionalism. Each lens offers a framework of understanding and explaining certain aspects of public resource governance; collectively, the lenses provide analytical power beyond what any single lens could provide. The Collaborative Public Management (CPM) draws on a family of inquiry encompassing network governance, collaborative management, hybrid arrangements, and strands of New Public Management to address public goods management and delivery problems that cannot easily be solved by any single entity. CPM focuses attention on: structures of interdependence; strategies for pooling resources, monitoring, and accountability; and capacity to attain desired outcomes. Adaptive Governance draws attention to the integration of science, policy and decision making at a constitutive level to facilitate adaptive management at the operational level. Structures that facilitate social learning, successive modifications and continued improvement across different scales are of particular interest. New institutionalism suggests that the intuitions of governance resist change, so that even new ideas—such as adaptive governance and collaborative public management—may fail to become institutionalized, even when widely supported. If they do beceome institutionalized, it may be in a context in which older institutions continue to co-exist, creating a complex and sometimes contradictory management context.

We apply these lenses on the problem of wildfire risk mitigation and prevention as an emblematic public resource governance issue. Historically, wildfire mitigation was the sole province of federal land management agencies, especially the U.S. Forest Service, in cooperation with state authorities. In the past

decade, the architecture of wildfire governance has expanded to include a host of state and non-state actors. This examination aims to contribute to theoretical and analytical frameworks for understanding and explaining changes in environmental governance in which the roles, relationships, and boundaries between the state, private enterprise, and civil society are shifting.

Introduction

Rising sea levels, escalating severity of wildfires, expanding species invasions, and growing incidence of prolonged drought are but a few environmental changes increasing the vulnerability of ecosystems and livelihoods (Reid et al. 2005). In turn, these environmental changes are spurring changes – or at least proposals for changes – in governance structures, processes, and institutional arrangements (Durant, Fiorino, and O'Leary 2004; Jordan, Wurzel, and Zito 2003). Most notable are multi-stakeholder collaborative partnerships across social organizational scales, blurring of lines between government, business, and civic sectors (Glasbergen, Biermann, and Mol 2007). From international initiatives on biodiversity and sustainable development stemming from the 1992 Rio Earth Summit (Hemmati 2002), to local processes addressing forest, wildlife, or watershed stewardship in concert with sustaining local livelihoods (Wondolleck and Yaffee 2000), collaborative governance is taking shape.

Observers cast collaborative governance in part as a response to the inadequacies of top-down, command-and-control environmental governance systems, which tend to simplify social-ecological systems, rely on efficiency and predictive control, lack monitoring and learning feedback loops, and result in declining resilience of natural and social capitals (Holling and Meffe 1996; Pretty 2000). Implicated are hierarchical, bureaucratic public and private organizations whose primary criterion is efficiency (Hayes 1999) and whose rigid norms, fragmented organizational structures, and standard operating procedures stand in the way of collaboration, learning, and adaptation in the face of complex, uncertain system changes (Yaffee 1997).

By transference, governance approaches intentionally designed to foster adaptation and resilience of socio-ecological systems are preferable to command-and-control (Folke et al. 2005; Lebel et al. 2006; Walker et al. 2006). Drawing on seminal works in adaptive management (Holling 1978; Lee 1993), scholars have devoted attention to crafting design principles for governance arrangements address the complexities and uncertainties associated with environmental change. A primary principle is the importance of collaborative networks and bridging organizations (Berkes 2009; Daniels and Walker 2001; Folke et al. 2005; Keen, Brown, and Dyball 2005) organized at different scales or levels of social organization (Armitage, Marschke, and Plummer 2008; Berkes 2009; Bouwen and Taillieu 2004; Folke et al. 2007)that, to some degree, have redundant purposes and activities and are arranged to be "polycentric" relative to the social-ecological system (Ostrom 1998; Tabara and Pahl-Wostl 2007).

Furthermore, to function in coordination with one another, network members must take a systems orientation in order to understand how various components of the social-ecological system are interrelated (Dyball, Beavis, and Kaufman 2005; Maarleveld and Dabgbegnon 1999; Wilson and Morren 1990), and to actively engage in social learning – specifically moving beyond single-loop towards double- and triple-loop learning (Armitage, Marschke, and Plummer 2008; Blackmore 2007; Bouwen and Taillieu 2004; Pahl-Wostl 2006, 2009; Tabara and Pahl-Wostl 2007). Single loop learning refers to the process of answering the question, "Did the intervention work?" Most environmental management agencies tend to emphasize single-loop learning in their monitoring programs. Double-loop learning probes the assumptions underlying the intervention; is reducing catastrophic wildfire behavior really the right strategy? Triple-loop learning calls into question the governing values and structures associated with the assumptions underlying intervention. Are the existing scientific and technical premises and institutional arrangements governing wildfire management appropriate in the face of an uncertain future? Few governance arrangements invest in double- or triple-loop learning processes, undoubtedly because they can surface questions about organizations' core missions and identities (Pahl-Wostl 2009).

Over the past decade, much scholarship has converged on the twin themes of collaboration and social learning as being foundational to developing governance institutions that foster adaptive capacity and resilience of social-ecological systems. This has the possibility of injecting a fresh set of concepts into analyses of public land and resource governance in the US, which have traditionally focused on the principal-agent problem associated with public resource agencies, such as the behavior of administrative bureaucracies to secure power and resources (Baden and Stroup 1981; Clarke and McCool 1996; O'Toole 1988; Stroup and Baden 1983; Twight 1983), and the structures, processes, and strategies to control and limit discretion of the administrative state by civil society (Nie 2004; Yaffee 1994).

As an empirical matter, however, several questions persist: What are the pathways towards these changes? Where are the contact points that link together horizontal, collaborative networks with vertical, hierarchical bureaucracies to ensure durable governance change (Agranoff 2006; Peters 1998)? Similarly, what are the barriers to these linkages? Do these changes proceed incrementally or through sudden sweeping reforms? What factors explain differences across efforts to foster collaborative, learning-based governance arrangements? The environmental governance scholarship thus far has yet to fully address these questions, generally remaining at the conceptual level (Paavola 2007).

In this paper, we examine the pathways and factors associated with the rise of more collaborative, learning-based governance approaches with respect to wildland fire management in the US. Wildfire is a prominent public resource governance concern, especially in the face of climate change, with some studies predicting increasing number and severity of wildfires, especially in the Western US (Westerling et al. 2006). Although there are studies that caution over-generalizing wildfire risk associated with

climate change (Flannigan et al. 1998; Schoennagel, Veblen, and Romme 2004), the uncertainty over interactions between climate change and wildfires has spurred greater attention towards the need to develop wildfire management governance institutions that foster adaptive, resilient social-ecological systems at risk of catastrophic wildfires.

Wildfire management serves as an illustrative example due to the significant changes in wildfire policy at the federal level in the past decade. Such changes have spurred the growth of collaborative, network-based governance approaches from the local to national levels (Steelman and Burke 2007). These multi-scalar changes lend themselves to analysis using Kiser and Ostrom's (1982) "three worlds of action" framework for analyzing governance institutions, which specifies three levels of governance rules: operational, collective-choice, and constitutional-choice. *Operational* rules articulate decisions about how to appropriate and manage resources, provide information, monitor actions, and enforce rules. *Collective-choice* rules enable or constrain operational-level governance by defining the parameters in which operational decisions are made. *Constitutional-choice* governance refers to the assignment of rights and duties of participants authorized to define collective-choice and operational rules, and the designation of rules affecting the interaction among those participants. Hence, constitutional-choice decisions affect and constrain collective-choice; in turn, collective-choice affects operational governance. This framework provides a means by which to examine at what governance level changes are occurring, what factors enable or constrain changes at each level, why these factors arise and persist, and the prospects for durable change given conditions at across the three governance levels. This follows the work of Imperial (2005), who examines the performance of collaborative watershed management across the three governance levels.

To further the critical nature of the examination and add depth to answering the "why" question, we apply three interpretive lenses to our wildfire management governance cases, with each lens coming from different starting points relative to governance: collaborative public management, adaptive governance, and historic institutionalism. Collaborative public management (CPM) draws on a family of inquiry encompassing network governance, collaborative management, hybrid arrangements, and strands of New Public Management to address public goods management and delivery problems that cannot easily be solved by any single entity (Bingham and O'Leary 2006). CPM is grounded in public administration research and application, and focuses attention on: structures of interdependence; strategies for pooling resources, monitoring, and accountability; and capacity to attain desired outcomes (Bingham and O'Leary 2008).

Adaptive governance draws attention to the integration of science, policy and decision making at a constitutive level to facilitate adaptive management at the operational level (Brunner and Steelman 2005; Folke et al. 2005). Structures that facilitate social learning, successive modifications and continued

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improvement across different scales are of particular interest (Cash et al. 2006; Folke et al. 2007; Ostrom 1998). Historic institutionalism suggests that the institutions of governance resist change, so that even new ideas—such as adaptive governance and collaborative public management—may fail to become institutionalized, even when widely supported (Ansell and Gash ; Peters 2005; Skocpol 2002). If they do become institutionalized, it may be in a context in which older institutions continue to co-exist, creating a complex and sometimes contradictory management context (Greenwood and Hinings 1996). The path-dependence of existing institutions determines in large part the pathways and direction for changes in governance structures and processes (Pierson and Skocpol 2002).

When brought together, the lenses shed a critical light on how and why pathways and mechanisms manifest the way they do at each governance level, and how changes – are lack of change – at the operational, collective-choice, and constitutional-choice levels interact. Further, applying the three lenses collectively can target barriers to specific pathways and mechanisms to more durable governance change, and inform more systematic, intentional transformations in wildfire governance structures and processes.

Status of Wildfire Governance

Until the early-2000s, US wildland fire management was the sole province of federal land management agencies, such as the US Department of Agriculture's Forest Service (USFS) and US Department of the Interior bureaus and services (Bureau of Indian Affairs, Bureau of Land Management, and National Park Service), working in concert with state forestry agencies (Busenberg 2004; Pyne 1997). Suppression of wildfire was the primary policy goal, with the aforementioned institutions investing resources and technologies towards putting out wildfires no matter where they occurred.

The wildfire seasons of 2000 and 2002 had a several uncharacteristically large and severe wildfires. Many of these fires destroyed large numbers of homes and structures, displaced people, and led to detrimental impacts to domestic watersheds and other high-value resources (Steelman and Burke 2007). It became widely acknowledged that, in many parts of the US, historic logging and grazing practices, a century of aggressive wildfire suppression, and encroaching residential development into fire-prone ecosystems that expanded the wildland-urban interface combined to increase the complexities and uncertainties associated with wildfire management, and outpaced the capacity of traditional governance institutions to adequately to address (Busenberg 2004).

In response, federal and state policy-makers enacted a series of policy initiatives to transform wildfire governance: the National Fire Plan (NFP), the Western Governors Association's Ten-Year Implementation Strategy (TYIS), the Wildland Fire Leadership Council (WFLC), and the Healthy Forest

Restoration Act (HFRA) enacted by the US Congress in 2003 (Table 1). NFP was created under the

Clinton Administration and defined four national goals: fire suppression, post-fire rehabilitation,

Table 1. Recent US wildfire management policies

Policy	Governance Level	Description
National Fire Plan	Collective-Action	Directs the Departments of Agriculture and Interior to take steps to achieve goals of increased firefighting capacity, post-fire rehabilitation, hazardous fuel reduction, and assistance to communities to reduce catastrophic wildfire risk
Ten-Year Implementation Strategy	Collective-Action	Establishes a collaborative, performance-based framework across federal, Tribal, state, and local governments to achieve goals of improving fire prevention and suppression, reducing hazardous fuel reduction, restoring fire-adapted ecosystems, and promoting assistance to communities to reduce catastrophic wildfire risk. The collaborative framework spans three organizational levels: local, state/regional and Tribal, and national.
Wildland Fire Leadership Council	Constitutional	Establishes duties and responsibilities for an intergovernmental committee of federal, state, Tribal, county, and municipal governments to work in concert to address large-scale policy, programmatic resource allocation, prioritization, and budget issues.
Healthy Forest Restoration Act of 2003	Constitutional, collective-action, and operational	Directs the Secretaries of Agriculture and the Interior to conduct hazardous fuels reduction projects on National Forest System lands and Bureau of Land Management lands aimed at protecting communities, watersheds, and certain other at-risk lands from catastrophic wildfire, and to enhance efforts to protect watersheds and address threats to forest and rangeland health, including catastrophic wildfire, across the landscape. Authorizes the role of communities to work collaboratively with federal, state, and local governments to develop Community Wildfire Protection Plans to complement plans and priorities of federal agencies to reduce wildfire risk to communities.

For more details on each policy, see further: http://www.forestsandrangelands.gov/index.shtml

restoration of fire-adapted ecosystems, and assistance to communities. As such, NFP is a set of collective-

choice governance rules that defines the parameters for wildfire management by directing federal

agencies to invest technical, financial, and organizational resources to support wildfire management

across jurisdictions and land ownerships. Similarly, the TYIS is a collective-choice mechanism that

specifies a framework for intergovernmental, interagency, and government-non-governmental organizational collaboration, and a system of performance-based measures.

The WFLC was created by the Secretaries of Agriculture and Interior as a constitutional-choice level arrangement to oversee wildfire policy. WFLC is an intergovernmental committee of federal, state, tribal, county and municipal government officials that provide oversight and coordination of the National Fire Plan and Federal Wildland Fire Management Policy. HFRA authorized a multitude of activities to meet the primary goals of reducing catastrophic wildfire risk to communities and high-value resources, and protect and restore forest and rangeland ecosystems. Each policy initiative explicitly emphasized the need for greater coordination and collaboration between federal, state, and local governments, and between government agencies and non-governmental and community organizations and stakeholders. And, for the first time, wildfire policy acknowledged the need for greater local, community-based collaborative governance structures for wildfire management. As a constitutive policy, HFRA authorized communities to work with government agencies to collaboratively create Community Wildfire Protection Plans (CWPPs) that specify priority areas for hazardous fuel reduction, recommended treatment prescriptions for those priorities, and measures to reduce "structural ignitability" – the hazards near and on homes that are flammable during a wildfire event.

What has been the progress of these governance changes? At the constitutive level, the WFLC has carried out its duties to meet on a regular basis to discuss policy, resource allocation, prioritization, and budgeting[1]. However, WFLC recommendations have not translated to changes at the collective-action governance level. The General Accounting Office[2] (GAO) has consistently discovered that agencies have failed to develop and implement a comprehensive, cohesive wildland management strategy as specified by the NFP, TYIS, and HFRA (GAO 2006, 2007, 2008, 2009). With regard to the TYIS' framework for collaboration across governments and non-governmental entities to develop a coordinated system of accounting and performance measures, GAO and others have found that federal agencies have fallen short in developing information systems to prioritize and measure effectiveness of treatments, and budgeting tools to allocate funds to achieve national wildfire management goals (GAO 2007, 2009).

A common theme throughout these critical assessments is the problem of containing costs associated with fire suppression. The cost of fire suppression has increased from an annual average of US$1 billion in the 1990s to over $US3 billion annually since 2000 (GAO 2009). For reference, the average annual budget of the USFS since 2000 has been approximately US$5 billion, with fire suppression surpassing 50% of the total budget. During active wildfire seasons, federal agencies have

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[1] Information on WFLC meetings can be accessed at URL:
http://www.forestsandrangelands.gov/leadership/meetings/index.shtml
[2] The General Accounting Office is an independent, non-partisan agency that serves the US Congress in assessing how the federal government spends US taxpayers' money.

spent down their fire suppression budgets, resulting in a phenomenon called "fire borrowing" where non-wildfire program budgets – including programs relating to restoration of fire-adapted ecosystems – are redirected to suppression. Although 80% of those funds have been returned, the fire borrowing has resulted in project delays or cancellations, strained relationships, and management disruptions for all other federal agency programs (GAO 2004). Regarding reform efforts to control wildfire suppression costs, analysts have found that institutional incentives run counter to cost-control objectives:

> "Performance measures are being adopted by the Forest Service partly to help control suppression expenditures. However, as these performance measures encourage aggressive wildfire suppression, they may contribute to increased suppression costs in the long term. Furthermore, because progress toward desired outcomes is difficult to quantify, the performance measures often focus instead on intermediate outputs that may not adequately represent the desired outcomes" (Donovan, Brown, and Dale 2008)

Additionally, the US Department of Agriculture's Office of Inspector General found that, "Without both adequate performance measures and an effective system to track its accomplishments, [the Forest Service] cannot demonstrate to Congress that the funds it receives for wildland fire suppression are spend in a cost-effective manner and that the benefits of firefighting outweigh its costs" (USDA-OIG 2006, p. 22).

Clearly, a barrier to governance change in wildfire management is the century-long institutional investment in fire suppression as the primary goal in wildfire management (Busenberg 2004; Steelman and Burke 2007). The enactment by Congress of the Federal Land Assistance, Management, and Enhancement Act (FLAME) in October 2009 seeks to relieve the fire-borrowing issue by creating a separate fund for fire suppression during active wildfire seasons. It remains to be seen whether this will spur the realization of collective-choice governance changes that has thus far been found lacking in numerous critiques.

Information and research on local CWPP development and implementation suggests that the expansion the roles and duties of communities has made halting progress. CWPPs are altering operational-level rules for how communities, non-governmental stakeholders, and federal, state, Tribal, and local governments interact to address wildfire management goals and priorities. A recent update reported that over 4,600 CWPPs have been developed (USDI and USDA 2009). Academic research is emerging on factors affecting collaboration between government agencies and non-government and community stakeholders. In a comparative case study of 13 CWPP processes across eight states indicate variable types and levels of collaboration in CWPPs (Jakes et al. 2007). One key finding is that the collaborative process to develop CWPPs does result in social benefits beyond hazardous fuels reduction, such as enhanced social networks within the community and between community members and

government entities, the development of learning communities, and the development of community capacity to self-organize to address wildfire risks and hazards beyond the CWPP process (Jakes et al. 2007).

Given that HFRA is vague on how the wildland-urban interface (WUI) is to be defined, CWPP processes vary greatly in defining the WUI for purposes of prioritizing hazardous fuels treatments (Grayzeck-Souter et al. 2009). An assessment of CWPP processes in Colorado sponsored by a consortium of conservation organizations, the Southern Rockies Conservation Alliance, found this variation WUI definition to be a detriment (Chapman 2009). Further, the assessment found that many CWPPs lacked specific fuels reduction recommendations, had inconsistent involvement of government agencies, and lacked clear planning objectives to continue updating and revising CWPPs in the face of new information.

In looking forward, the Quadrennial Fire Review 2009 final report (WFLC Fire Executive Council and NASF 2009) defines a "strategy calling for reaffirming fire governance, essentially building a new national intergovernmental wildfire policy framework" (p. v) to clarify and realign roles, responsibilities, and authorities of the various agencies tasked with wildfire management around three strategic elements: 1) achieving fire-adapted communities; 2) establishing an integrated fuels management portfolio that moves away from project-by-project outputs to a larger investment in support of broader land management priorities and multi-jurisdictional goals; and 3) creating new information sharing and public education and outreach mediums. The report further outlines needed capacities to achieve these strategic elements, including workforce capacity and capital assets. As the authoritative report on defining future needs in wildfire governance, the Quadrennial Fire Review makes it clear that much work remains to be completed.

Analysis and Interpretation

Recent wildfire policies and initiatives signal a transformation in wildfire governance structures and processes towards collaborative, performance-based, adaptive management. Significant reforms at the constitutional-choice, collective-choice, and operational levels set the stage for governance changes to occur. Yet, as indicated by numerous assessments and research on outcomes, such change has generally fallen well short of expectations. In this section, we apply three interpretive lenses to analyze where and why change has progressed or stalled out: collaborative public management, adaptive governance and management, and historical institutionalism. Each lens surfaces different attributes of the wildfire governance system, such as administrative behaviors in the context of collaboration, the role of science and information feedback loops, and the importance of the historical path-dependence of institutions. By

applying three distinct lenses to each governance level, we hope to draw out where the critical pathways and mechanisms exist, and what barriers stand in the way of a clear path to governance change.

Collaborative Public Management

Collaboration has been a subject of much research in public resource management emphasizing key collaboration attributes, structures, and processes for maximizing inclusion and transparency (Moote, McClaran, and Chickering 1997; Schuett, Selin, and Carr 2001; Wondolleck and Ryan 1999), methods for fostering productive dialogue and social learning (Blumenthal and Jannink 2000; Daniels and Walker 1996; Richard and Burns 1998; Schusler, Decker, and Pfeffer 2003), frameworks and techniques for managing conflict (Daniels and Walker 2001; Selin, Schuett, and Carr 1997), and approaches to building zones of agreement and shared ownership for decisions (Lachappelle, McCool, and Patterson 2003; Paulson 1998). The CPM literature is distinct from scholarship in public natural resource collaboration in that the primary focus is on the organizational aspects of collaboration (Bryson, Crosby, and Stone 2006): organizational features of collaboratives, relationship between the collaborative process and internal dynamics of participating organizations, and relationship between the collaborative process and the broader organizational landscape (organizations not participating in the collaborative, but are affected or interested in the collaborative's outcomes). However, both public natural resource collaboration and CPM research ask questions regarding process legitimacy and effectiveness, stakeholder behaviors and interactions, and outcome effectiveness.

CPM brings together various types of collaborative approaches to achieving the delivery of public goods and services in the context of public administration. With its origins in interorganizational conflict and collaboration (Gray 1985; Gray 1989), CPM addresses the practical challenges public organizations face in addressing complex public problems that any one organization cannot solve alone. The primary analytical questions in the CPM literature are the structures that advance interdependent goals among diverse organizations and the processes, conditions and capacities for attaining desired outcomes. An overlay on these questions is how public organizations behave in, and adapt as a result of, collaborative processes.

By definition, collaboration involves multiple actors and organizations spurred to work together to achieve goals that no one entity has sufficient resources to achieve alone (Agranoff 2006; Gray 1989; O'Leary, Gerard, and Bingham 2006). In addressing public problems, collaboration has blurred the boundaries between state and non-state actors (Pahl-Wostl 2009), spurred by increased public participation mandates and the dispersion of authority and resources away from the state to non-state actors (Kettl 2000; Salamon 1994). Structurally, CPM can be categorized into five types (Agranoff 2006; Hooghe and Marks 2003; McGuire 2006): 1) intermittent coordination across two or more organizations

to achieve a particular objective, 2) temporary task force to define strategic direction for a specific, limited purpose, 3) permanent organizational structure through formal arrangements, 4) an ad hoc coalition to address a specific issue, and 5) a loose network around a broad set of tasks, such as information exchange, capacity building, and outreach to target populations and constituents.

Although much research has been conducted in how collaborations are established, an ongoing challenge is how to merge "horizontal" collaborative network outputs with "vertical" hierarchically organized bureaucracies (Bryson, Crosby, and Stone 2006; Jones, Hesterly, and Borgatti 1997). Bureaucratic agencies such as the USFS have dominated wildfire governance for nearly a century while horizontal, collaborative arrangements are relative newcomers. New rules and practices developed by collaborative arrangements need to interface with existing routines, roles, norms, and values, as well as to create new ones that advance the goals of the collaboration (Bryson, Crosby, and Stone 2006; McGuire 2006). This interface is often obstructed by unwilling leadership, inflexible budget structures, unwieldy organizational decision-making procedures, and resistant organizational cultures. As such, collaborative networks may only marginally alter the boundaries and activities of bureaucracies (Agranoff 2006), and may not significantly affect collective-choice and constitutional-choice governance levels unless the overcome these obstructions.

The most distinctive collaborative activity is knowledge management – bringing together multiple, diverse forms of knowledge to bear on a problem situation (Agranoff 2006; Daniels and Walker 2001). In doing so, collaboration can give rise to potential solutions that would otherwise not be considered within the boundaries of one organization; it expands the possibility set for the resolution of a particular problem. Coupled with knowledge management is the enhancement of social learning among diverse interests and organizations compared to hierarchical organizations (Pahl-Wostl 2009). The most distinctive outcome of collaborative public management is that it builds collective capacity for subsequent collaborative solutions across many other settings over time (Agranoff 2006). This has interesting implications for how to measure the relative "success" of CPM: success is only realized over a period of years and problems, not whether or not the immediate collaboration concluded in a decision that solved the problem for all time.

When applying the CPM lens to the three levels of wildfire governance, the analytical challenge is to examine the pathways and mechanisms through which new collaborative arrangements are interfacing and transforming existing wildfire management institutions, and creating enduring governance changes. At the operational level, while national accounting reports identify over 4600 CWPPs in existence (USDI and USDA 2009), research by Jakes et al. (2007) suggest that collaboration among government, non-government, and community organizations is inconsistent. Some cases had intensive collaborative engagement throughout phases of CWPP development, while others relied solely on

government agencies or private contractors to develop CWPPs. Drawing upon Agranoff's (2006) synthesis of lessons learned from empirical research on interorganizational collaboration, public agency wildfire managers still address the new challenge of community-based wildfire management through existing hierarchical processes.

An over-riding consideration for agency managers is that HFRA stipulates that 50% of funds for hazardous fuels reduction must be completed in the WUI, providing an incentive to identify sufficient geographic areas in which to apply those funds. In the competition for scarce funds, agency managers are motivated to develop as many CWPPs as quickly as possible. Since collaboration takes time, agency managers are confronted with the choice to either position themselves to garner funding or embark on what might be an onerous collaborative process, thereby jeopardize losing funding. In this view, the structure incentives of bureaucratic budgets prevent widespread changes in operational level governance.

In the case of the WFLC, there is evidence of more cooperation among agencies, levels of government, and between government and nongovernmental organizations. However, WFLC has no authority to forceably alter the operational rules of any one organization or collection of organizations. Its recommendations are merely suggestive, but wildfire management organizations' internal budget controls and operating procedures for wildfire management hold sway. Fire suppression still commands a large proportion of federal government agency budgets, while state and local government, non-governmental, and community organizations have insufficient funds to carry out non-suppression wildfire management activities.

At the collective-choice level, while HFRA expanded the roles and duties of entities in wildfire management, specifically communities, HFRA was vague or silent on who is supposed to be in charge and who has authority and responsibility for carrying out CWPPs. Empirical research and anecdotal evidence suggests that collaborative governance in CWPPs has been highly variable, possibly due in part to the lack of specified authority and responsibility. For example, in one of the Colorado cases in Jakes et al. (2007), even though several communities within a Colorado county had developed CWPPs and identified priority areas for treatment, the USFS did not fully integrate these priorities with their own internal work plans. A key barrier identified by interviewed subjects was the set of performance targets for the USFS specified in their budget allocations. The USFS is held to achieving annual targets for treating acres, not number of CWPPs collaboratively developed and implemented. A widely distributed guidebook developed by a consortium of government and non-governmental organizations helped define the rules of the game (Communities Committee 2004), but no accountable standards for what constitutes "collaboration" under HFRA. When facing a choice between achieving acres treated targets and entering into numerous small-scale CWPP processes, USFS managers may be forced to forego the collective-choice rules spelled out in HFRA and other collaboration mandates. This is not a weakness of HFRA,

NFP, and other collective-choice governance changes, but a function of how agency effectiveness is rated according to performance targets that operate independently from new collaborative governance arrangements.

At the constitutional-choice level, TYIS and HFRA clearly set out new expectations for roles and responsibilities over wildfire management, but, in the end, federal and state fire managers are held politically and legally liable and accountable for wildfires and suppression, regardless of any collaborative efforts to mitigate catastrophic wildfire risk and hazards. The combination of the biophysical realities of wildfire and political liability are barriers to constitutional-choice governance changes. Mitigating catastrophic wildfires does not necessarily result in no fires; in many cases, it simply means that wildfire risks have been reduced. The uncertainties associated with catastrophic wildfire behavior in extreme conditions means that even mitigation efforts are no guarantee that homes will burn. Existing political and legal liability rules and accountability expectations expose government agency managers, even if those managers are part of a collaborative arrangement. As such, government managers – especially federal wildfire managers – are highly exposed to negative consequences while their partners may not be. Collaborative governance inherently requires shared risks; however, the existing set of liability rules do not yet redistribute those risks beyond government managers. Despite constitutional-choice changes in wildfire governance, the fundamental distribution of rights and duties remains unchanged; the burden of risks still falls on federal agencies. Fundamental societal and political value shifts are required before rights, risks, and duties are genuinely shared across government and non-governmental entities with sufficient political accountability and legal backing.

Adaptive Governance/Management

Adaptive governance emerged to deal with the institutional barriers, fragmentation and rigidities that were perceived to obstruct the practice of adaptive management. Adaptive governance scholars realized that reforms are needed at a constitutive or governance level to facilitate the implementation of adaptive management at the operational level. *Adaptive management* refers to the day-to-day or operational implementation of adaptive principles that guide responses. The focus has been predominantly on how science is used in the process (Holling 1978; Walters 1986). At the operational level, adaptive management is an approach that includes scientific methodologies in the design, implementation and evaluation of management strategies. As such, the process of adaptive management comprises phases in which actors operate: specify objectives and model existing knowledge; identify goals relating to objectives; model alternate management options; identify decision structures; implement management actions; and monitor and evaluate those actions against expected objectives (Sabine et al. 2004).

Some authors place emphasis on the importance of social learning within the adaptive management framework. Social learning emphasizes social interactions among stakeholders, as well as individual and group reflection on what is being learned in an iterative process. By incorporating social learning as part of intended goals, adaptive management thus emphasizes the importance of seeing environmental problem solving as a cyclical process, as well as stressing the inclusion and involvement of stakeholders (Stringer et al. 2006). In spite of the attention to these more social and collaborative aspect within the adaptive management model, challenges persist. An overreliance on rational comprehensive planning models, a tendency to discount nonscientific forms of knowledge, and an inattention to policy processes that promote the development of shared understandings among diverse stakeholders have been identified as long standing problems (McLain and Lee 1996).

Implicit in the literature on adaptive management is that governance structures need to support these operational management actions. Dietz et al. (2003) use the term *adaptive governance* to expand the focus from adaptive management to address the broader social context that enables adaptive management. Folke et al. (2005) additionally discuss adaptive governance as the collaborative, co-management structures that facilitate decision making. In this sense, governance refers to higher-ordered decision making that creates conditions for social coordination and collective action at lower levels within a hierarchy (Ostrom 1990).

The lack of space for experimentation, inclusive decision making and social learning has been attributed to the culture of scientific management (Brunner and Steelman 2005). Scientific management is typified by beliefs that science determines policy that is then implemented through hierarchical bureaucratic structures with experts or elites as the primary participants. These beliefs permeate the mindset of individuals and institutions in which many natural resources problems are situated. According to Brunner and Steelman (2005), adaptive governance re-imagines the relationships among science, policy and decision making to recognize that multiple participants with diverse interests need to establish a policy that serves the common interest. A flexible decision making structure needs to accommodate these diverse interests, while also providing the opportunity for science, as well as other types of knowledge, to inform the problem definition and alternatives for dealing with the problem. Ideally, an adaptive governance structure should facilitate the integration of different types of knowledge. Including local knowledge that is transferrable not across time, space, and specific social settings, as well as professional based scientific knowledge that not change depending on the context and that is transferrable across time, space, and specific social settings (Adler and Birkhoff n.d.).

The dynamics between management and governance are often discussed in the adaptive literature as jurisdictional cross-level issues (Cash et al. 2006). Harmonizing actions across scales is important for overall policy effectiveness. Cross-level interactions occur when there is vertical interplay between or

among entities located at higher and lower levels on the jurisdictional scale (Dolsak and Ostrom 2002; Young 2002). Experience shows that recognition and successful exploitation of cross-scale opportunities has been important for improving adaptive responses in natural resource management, especially when bureaucratic agencies more consciously address scale issues and the dynamic linkages across levels (Cash et al. 2006). For hierarchical management institutions such as the USFS these cross-scale interactions may be important for fostering more adaptive responses.

Given the interconnected nature of the nested system of rules and the crucial role that constitutive and collective rules play in influencing the operational level, it is constructive to treat adaptive management and adaptive governance as nested and interactive components. If we accept the nested and interactive qualities associated with adaptive management and adaptive governance two hypotheses emerge (Steelman In Press). First, establishing rules at one level without putting into place complementary rules at the other levels produces an incomplete system (Ostrom 1990). Expecting adaptive management to take place at the operational level may be unrealistic in the long run if adaptive governance structures are not present at the collective or constitutive levels to support such operational level action. Second, rules at each successive level of the hierarchy are increasingly costly to change (Goodin 1996). Change is difficult, particularly at the collective and constitutive levels, because significant commitments in terms of infrastructure, staff and budgets are made based on the expectation that rules at the collective and constitutive levels are more permanent than at the operational level. Additionally, efforts to change rules at the collective and then the constitutive levels require greater levels of consensus among actors (Goodin 1996). These hypotheses, if supported, contribute to two contradictory insights that pose challenges for the long term implementation of adaptive management. First, it is easier to undertake adaptive management at the operational level and more difficult to create adaptive governance structures at the collective and constitutive levels to support these operational activities. Second, without adaptive governance structures or support at the collective and constitutive levels, adaptive management at the operational level will stand little chance of longer term success. Recognizing the interdependent complexities among the nested levels of governance help us better understand why it has been so difficult to overcome some of the barriers to move to a world of more adaptive management.

The adaptive governance lens exposes deficiencies in the nestedness and cross-scale linkages between the three governance levels. There is little evidence that adaptive management or adaptive governance is happening in wildfire policy. Collaboration may be taking place, but adaptive management and governance is not. Although we have seen changes in operational, collective and constitutive rule making, there is little cross scale interaction or learning taking place that could be characterized as adaptive management or adaptive governance. The challenge is to knit together the threads that currently

exist within the broader governance structure to create effective and authoritative feedback mechanisms that can facilitate a learning system.

The adaptive governance literature suggests that we would want to see CWPPs guided by integrated decision-making structures that would recognize the diverse interests at stake and incorporate relevant science and other knowledge to define context specific problems and the alternatives to address them. However, evidence suggests that the process of CWPPs has been one more of scientific management—achieving the target of a completed plan without necessarily creating a sustainable governance structure that can see through implementation, evaluation and adaptive change (Chapman 2009). Collaboration has taken place in some locales, while in others contractors took on the task of organizing the plans. In most situations, collaboration was purely symbolic not substantive.

Cross scale support has not been a constraint in the case of CWPPs, but interaction has been. Literature suggests that harmonizing actions across scales is important for policy effectiveness (Cash et al. 2006). In the case of CWPPs, constitutive level rules are in place to support operational level action. HFRA provides the foundation for CWPPs. However, feedback mechanisms to the collective and the constitutional levels are missing. It is not clear there is horizontal interplay or vertical interplay in terms of learning. Although there are more than 4,000 CWPPs currently completed, it is not clear whether social learning is taking place among those who have completed CWPPs (horizontal diffusion) or among those at higher levels within the governance hierarchy (vertical diffusion). There is, in effect, no collective level mechanism between the constitutive rule that is HFRA and the operational action that are CWPPs other than an estimation of the total number of CWPPs that have been completed (USDI and USDA 2009). When CWPPs fail to live up to their potential, there is no feedback into the collective level to facilitate double loop learning or back to the constitutive level to foster triple loop learning. What we learn is that at the operational level, in many places CWPPs have become symbolic of meeting a target without fulfilling their intended purpose or fostering feedback and learning at the collective and constitutive levels.

At the operational level, the question we would like to be able to answer is: have CWPPs made a difference in the way we manage fire? From an adaptive management perspective, ideally, we'd want some empirically based evidence that could demonstrate how direction in CWPPs (prioritizing fuel reduction projects, identifying important values at risk and specifying forest and fire management direction) made a difference in how fires were managed. However, we do not know the answer to this because we do not have a system in place that can learn the answer or take corrective action based on what that answer might be.

At the collective and constitutive levels, we have legislation and actors that operate in an ad hoc manner. WFLC oversee the implementation of NFP through the TYIS, but it is not clear that the

feedback mechanisms work. At the collective level, the TYIS does not have a clear authority signature with the decision makers that matter at the operational level. The disjuncture between the collective and constitutive levels is troubling because great effort has been expended to effect change at these levels. It is increasingly hard to effect change as you move up in the hierarchy and so it is frustrating not to realize these benefits (Goodin 1996).

We do not see evidence of adaptive management at the operational level, nor do we see evidence of structures in place at the collective or constitutive level that could promote the integration of knowledge and social learning that would typify adaptive governance. We do have governance structure in place that are mutually supportive (e.g. HFRA supports CWPPs), but there are no feedbacks at any level within the system to promote learning. To transition to a more adaptive management/governance regime would require linking the information derived from the operational processes to decision makers at the operational, collective and constitutive levels and then taking action based on what was learned.

Historical Institutionalism

Ideas about the ways in which we should govern natural resources and the environment have changed considerably over the past two decades. We have come to believe that multi-stakeholder collaboration and adaptive management are needed to manage complex biophysical and socioeconomic systems. Yet, these ideas and the people who support them have to exert and maintain considerable pressure to incorporate these ideas into existing natural resource institutions and decision-making processes, even in small ways. By no means are these ideas institutionalized in the everyday action of natural resource agencies, even after 15 years of constant political dialogue and growing consensus that these ideas offer a way forward in natural resource management. Instead, natural resource agencies seem to be entangled in an increasingly complex array of conflicting mandates, reorganizations, and declining morale.

Historical Intuitionalism (HI) is a school of political science focused on understanding how institutions—rules, habits, cultures, and history—structures political action (Steinmo, Thelen, and Longstreth 1992; Thelen 1999). In particular, HI scholars are concerned with the role that history plays in structuring current political and administrative activity (Orren and Skowronek 2004). In their view, ideas institutionalized in earlier periods of political development continue to influence current politics even after ideas have changed about how we should govern (Skocpol 2002). In the area of natural resource governance, the Progressive ideas of government-led, expert-led management continued to dominate along with the Environmentalist era notions of rational comprehensive planning, land use zoning, and regulation (Dana and Fairfax 1980).

Without destroying old intuitions or building institutions that are congruent at multiple governance levels, creating new policies and governance arrangements creates complexity, confusion, and conflicting mandates (Pierson 2000). In this context, most new governance arrangements will have to find niches between, align with, or constantly struggle against long-standing existing institutions. This last scenario faces a high risk of failure. Generally, new ideas are likely to struggle to become institutionalized; other, more powerful intuitions may well continue to trump new ideas.

Predicting how and when this sort of change will or can occur is a matter of considerable debate among historical institutionalists (Pierson and Skocpol 2002). Some see punctuated equilibrium as the key dynamic, believing that most big change occurs during a few key periods in history, spanned by long periods of relative stability as institutions settle into their routines and niches. Some focus these change around critical elections, which they think create opportunities for political innovation (Sundquist 1983). Other believe that there are periods of more active policy making, but observe the moment where great change appears to be occurring quickly fade or is reversed by later politics and the changes never become institutionalized (Mayhew 1991, 2002). This attention to periods of large change, and moments of institution building have tended to focus the historical institutionalists on major periods in policy development, such as the Progressive Era and the New Deal. Kingdon (1984) focuses the importance of political windows of opportunity for creating change and seeks opportunities for change in more than the large moments in political history.

Historical intuitionalism tells us that change is difficult, suggesting caution and strategies for making change. First, historical institutionalism draws attention to the importance of changing institutions, not simply putting forth new ideas in policies. Carpenter (2001), for example points out that the Progressive and others building the USFS and other natural resource agencies set out on a task of building institutional structures and processes that would endure through election cycles and regime changes. They sought to get "the system" in place to achieve their mission. Rather than settle for enacting solely substantive, goal-oriented policies, elected officials and their allied organized interests sought to institutionalize bureaucratic structures – missions, values, norms, budgets, and decisional procedures and criteria – that would be biased towards those goals (Moe 1980, 1989). These relatively stable institutional structures create path dependency of norms, practices, and modes of thinking (David 1994; Mahoney 2000); although the original socio-political context and motivations underlying the creation of these structures may no longer be relevant decades later, the pathways for governance and decision-making endure through new eras of governance ideas. The realities of path dependency and the importance of history suggests that effective change in governance institutions will likely need to build on what comes before rather than attempting to create new policies from whole cloth. Even in moments of revolution, there are really no blank slates.

The HI lens allows us to examine and raise questions about how the historic contexts that have shaped – and continue to shape – the origins and development of traditional wildfire governance institutions shape the pathways, mechanisms, and barriers to changing wildfire institutions at all three levels of governance currently and into the future. At the operational level, Jakes et al.'s (2007) research demonstrates the importance of context in shaping collaborative participation and processes in CWPP development. The authors refer to past cooperative efforts to address wildfire or other natural resource-related issues, the density of social networks within the community and between the community and wildfire management agencies, and the history of conflict over natural resource issues. Collective, these contextual attributes point to the path-dependence of social relationships in determining the success of collaborative arrangements (Greenhalgh and Chapman 1995; Wells et al. 2007). Even if collaborative agreements are made to take action in high priority areas, CWPPs do not carry any authority or enforceable rules due in part to long-standing constitutive and collective-choice rules that grant sole authority to federal agencies to address wildfire management.

Furthermore, few CWPPs specify monitoring, learning, and adaptive management process. Until recently, federal and state wildfire agencies did not maintain any sort of monitoring database for wildfire management activities. While the NFP and TYIS emphasized performance-based measures to gauge progress towards broad policy goals, the main mechanism, National Fire Plan Operating and Reporting System (NFPORS) has been criticized for not being sufficient to gauge whether fuel reduction treatments are achieving desired objectives (Cochrane et al. 2006; Stephens and Ruth 2005). The historic pattern of federal land management agencies to not invest in response monitoring has limited the development of adaptive collaborative arrangements at the operation level of CWPPs.

At the level of WFLC, collaboration among participants appears to have increased information sharing, shared knowledge building, and coordinating recommendations for action across participating organizations. The mandate for quarterly meetings ensures regular interaction among WFLC participants, thereby overcoming any historic institutional inertia that would prevent interaction. However, similar to CWPPs, WFLC carries no authority or enforcement ability in its constitutive origins. Recommendations are suggestive rather than mandatory.

The limitations to collaboration and adaptive learning at the operational level have their source in part at the collective-choice level. The participation of federal agencies, the USFS in particular, seems to be more of a function of individual characteristics rather than an institutional imperative. Federal land management agencies were originally set up to be insulated from public and political pressure, populated by scientifically-trained technical experts (Kaufmann 1960; Pinchot 1998). The insular nature of these agencies eroded with the passage of the Administrative Procedures Act of 1946 and the National Environmental Policy Act of 1960, requiring agencies to be more transparent, systematic, and inclusive in

their decision-making processes. Along with the Federal Advisory Committees Act of 1972, APA and NEPA established new constitutive rules that defined roles, duties, expectations, and expectations for how, when, and why federal agencies engages with public stakeholders. Agency resistance to these changes, coupled with growing public distrust and displeasure over federal land management resulted in a divisive, "us vs. them" posture (Wondolleck 1988). Although public involvement in administrative environmental planning has existed for 40 years and collaborative natural resource management processes have expanded over the past 15 years, these institutional attitudes and relationships persist, demonstrating the power of history in affecting pathways to institutional change. As the Advocacy Coalition Framework suggests (Sabatier 1988), analysis of change requires a span of a decade or more.

At the constitutional-choice level, the expectations and rules of interaction that have developed around wildfire management between the public, elected officials in Congress, and federal land management agencies can be traced back to the "Big Blow-Up" in 1910, when a network of large, catastrophic fires in Idaho and Montana killed dozens of people, destroyed entire towns, and burned over 3 million acres of forest land (Pyne 1997). This event set the stage for public expectations and policy regarding wildfire governance and management for nearly a century (Salka 2004; Sedjo 2000). With wildfires being nearly universally demonized following the Big Blow-Up, the USFS rallied around the central mission of protecting people and resources from wildfire. It developed a militaristic organizational structure given near autonomy and authority to garner resources and implement action with little need to collaborate outside the wildfire institutional structure (Busenberg 2004; Pyne 1997). New governance structures, monitoring of performance measures, accountability, and collaboration run orthogonally to these long-standing wildfire management institutional structures.

Clearly, suppression as the primary fire management strategy is deeply institutionalized into the USFS at the constitutive, collective, and operational levels. Suppression-oriented wildfire management began to become institutionalized into the federal land management agencies in the 1910s and was institutionalized by the 1930s (Carle 2002, Pyne 1981). Yet, fire suppression has become increasingly troublesome ecologically and financially for the agencies. But, HI suggests that one something is deeply institutionalized, it is not easily changed.

How can change occur? Historical institutionalists have long pointed to crises as critical junctures that create the opportunity for major policy change and the development of new political institutions (Kingdon 1984; Skowronek 1982). This has certainly been the case with wildfire management. Years with massive fires have led to institutional development in wildfire management.   Over the past century, every major policy change had lead to increasing the suppression capacity of the federal land management agencies. At these critical junctures, there had been significant incorporation of new and

bureaucratic/operational developments (such as the 10 am policy adopted in the 1930s) and new technologies (e.g. air tankers after world war II) (Pyne 1997).

As crisis events, these large fire years and subsequent political developments have served to reinforce the pre-existing institutions by focusing attention on preventing the frightening event from happening again.   Now with suppression institutions firmly in place, even though suppression is now considered part of the problem, suppression has continued to be at the center of wildfire management. Despite the fact the National Fire Plan sought to reduce costs, reduce wildfire risk, restore fire adapted ecosystems, and reintroduce wildfire as natural process, much of what has actually happened both at the collective-chose and operational levels has been to re-enforced and further strengthen the suppression institutions.   For example, at the collective action levels, there have been new systems of interagency coordination, information sharing and the like which has made national wildfire planning and event management possible. At the operational level, there have been countless innovations including the incorporation of new computer technologies such as fire behavior models, Internet communications, and new contracting and dispatch procedures that have made it easier to quickly deploy massive amounts of human, equipment, and technical resources to manage active fires. Rather than reducing the costs and engagement in fire suppression, the institutional momentum of the fire management combined with the political crisis of the large wildfires of the late 1990s and early 2000s served to reinforce and strengthen old institutions rather than dramatically changing them.

HI perspective also sheds light on the reality that new policies may come into conflict with long standing, institutionalized policies at any level.   This has also been the case in wildfire management. Beyond the reinforcement of suppression institutions, another second major institutional dynamic has been in play in the area of hazardous fuels reduction, creating outcomes different that was intended when wildfire policies were set at the constitutive level. Under the National Fire Plan framework, hazardous fuels reduction was designed to restore fire-adapted ecosystems, increase community safety, and reduce suppression costs.   Also at the constitutive level, the Healthy Forest Restoration Act requires that half acres treated were to be treated in the wildland urban interface. Yet, the Forest Service has treated most of the conducted most of its hazardous fuels reduction in the Southern region (Region 8 of the USFS National Forest System structure), where there is limited concern over community and relatively low fire suppression costs.   Forest Service had a long history of using relatively simple targets (volume harvested, acres treated) as accountability.   The combination of pressure from Office of management and budget to lower costs plus and culture of measuring success of led the Forest Service focus its hazardous fuels reduction efforts to maximize the number of acres treated. This focused the agency's attention on places where hazardous fuels reduction was least expensive on a per acre basis rather than on places in places where it would do the most to reduce community risks or lower suppression costs in the medium term.

Discussion

Changes in wildfire governance mirror changes in natural resource and environmental governance in general, with its emphasis on multi-stakeholder collaboration, reforming long-held management goals and practices, and creating adaptive, social learning-based approaches to making decisions through monitoring of performance measures. Using Kiser and Ostrom's (1982) three levels of institutional action framework, wildfire policy reforms have occurred at all three levels. At the operational level, policies emphasize greater community-based, interagency, and intergovernmental collaboration to address broad wildfire goals. At the collective-choice level, policies have expanded wildfire management to include not only suppression but restoration and community protection. CWPPs are supposed to direct some proportion of agency wildland fire budgets towards fuels reduction projects in the wildland-urban interface. At the constitutional-choice level, policies have expanded the roles and duties for wildfire management beyond the traditional federal agencies to include state and local governments, non-governmental organizations, and community organizations, landowners, and activists. Policies have also constituted new governance structures like WFLC and CWPPs intended to ensure the accomplishment of broader wildfire management goals than solely fire suppression..

Despite these new initiatives, change has been slow to occur as articulated in the many academic and government critiques of federal wildfire management. These critiques make clear that there is no "single devil" that stands in the way of change, but that change requires a systemic change with contributions from many institutions. As such, explaining pathways, mechanisms, and barriers to change across the three governance levels in such a complex arena as wildfire management suggests the need for multiple lenses to understand, analyze, and interpret. The three lenses we have chosen to apply – Collaborative Public Management, Adaptive Governance, and Historical Institutionalism – allow us to interpret what is happening in efforts to transform wildfire governance. We acknowledge limitations of this analysis by selecting these three lenses, which necessarily excludes other lenses that explain change, such as individual behavior, institutional incentives, and political risk-taking. Additionally, we rely primarily on secondary sources of information to draw conclusions about change in wildfire governance. Extensive, further analysis requires empirical investigations into behavior, motivations, and institutional structures and arrangements that enable or impede governance change. Our analysis may also be limited by the time-span since policy reforms were enacted. Sabatier (1988) suggest that policy change can only be examined over a period of a decade or more.

Nonetheless, we believe our analysis raises critical issues relating to changing governance in wildfire management in particular, and public natural resources in general. The CPM lens emphasizes the linkages between new 'horizontal' collaborative arrangements with existing 'vertical' bureaucratic

organizations. While collaboration achieves the pooling of knowledge and resources and building capacity of organizations to address complex problems, meshing of norms, values, and practices faces barriers of existing organizational standard operating procedures, budgetary controls, and desire for autonomy – resistant leadership and organizational cultures. In the context of wildfire governance, CPM helps explain how existing organizational practices and budget structures prevent fully implementing collaborative, adaptive wildfire management. At the operational level, collaboration is only inconsistently occurring among stakeholders, with government agencies pushing through CWPPs in order to get as many completed as possible to garner financial resources. Even in cases where robust, multi-stakeholder collaboration is occurring, the emerging empirical research suggests that implementation of collectively agreed-upon priorities is lacking as funding is being directed to conducting treatments across a large an area as possible in order to reach "acres treated" agency targets. Additionally, collaborative groups – either at the CWPP or the national WFLC level – lack any enforcement authority to assure that agreements and recommendations are, in fact, carried out. As a result, the USFS and other government agencies can act fairly autonomously of any collaborative effort and seek to achieve their own goals and objectives.

This lack of enforcement stems in part from collective-action and constitutional-choice rules that are unclear about who has authority and is accountable for carrying out priorities defined in CWPPs or by the WFLC. National wildfire policies appear to be merely suggestive in how government agencies engage in and respond to these new collaborative governance arrangements. At the same time, federal agencies are held accountable to achieve acres-treated targets associated with their budget allocations. When facing a choice between achieving acres treated targets and entering into numerous small-scale CWPP processes, USFS managers may be forced to forego the collective-choice rules spelled out in HFRA and other collaboration mandates. This is not a weakness of HFRA, NFP, and other collective-choice governance changes, but a function of how agency effectiveness is rated according to performance targets that operate independently from new collaborative governance arrangements.

The AG lens draws from a normative framework for nesting operational, collective-choice, and constitutional-choice governance levels through flexible institutional designs that integrate science, decision-making, and policy in a more coherent fashion. Of special interest is on how institutions foster social learning so as to integrate diverse forms of knowledge and information into designing, monitoring, and evaluating action. Harmonizing actions across scales is important for overall policy effectiveness; cross-level interactions occur when there is vertical interplay between or among entities located at higher and lower levels on the jurisdictional scale (Dolsak and Ostrom 2002; Young 2002). Governance rule change needs to occur at all three governance levels and across jurisdictional levels (i.e., national to local levels). Given these postulates, there is little evidence that adaptive management or adaptive governance

is happening in wildfire governance. Although we have seen changes in operational, collective and constitutive rule making, there is little cross scale interaction or learning taking place that could be characterized as adaptive management or adaptive governance. The challenge is to knit together the threads that currently exist within the broader governance structure to create effective and authoritative feedback mechanisms that can facilitate a learning system.

At the operational level, there is a lack of evidence of adaptive management, nor do we see evidence of structures in place at the collective or constitutive level that could promote the integration of knowledge and social learning that would typify adaptive governance. There are multi-level governance structures in place that are mutually supportive (e.g. HFRA supports CWPPs), but there are no formal feedbacks at any level within the system to promote learning. Transitioning to a more adaptive governance regime would require linking the information derived from the operational processes to decision makers at the operational, collective and constitutive levels and then taking action based on what was learned.

The HI lens sheds light on the role of historical context and motivations in creating stable institutional structures that are designed to endure through changing ideas about governance. HI suggests that change occurs incrementally, as new governance arrangements must be dovetailed with existing governance institutions and practices. The supremacy of fire suppression as de facto policy and practice for the USFS and other responsible agencies represents a daunting institutional issue for new wildfire governance strategies. The recent changes at the constitutional- and collective-choice policy levels to increase interagency coordination and community collaboration have actually strengthened fire suppression institutional structures. Policies intended to increase hazardous fuels treatments to restore fire-adapted ecosystems, increase community safety, and reduce suppression costs have not been realized as a result. Instead, due to internal agency incentives to maximize the geographic area treated while minimizing cost-per unit of treatment, hazardous fuels treatments are being conducted in places with low per-unit costs rather than places where where it would do the most to reduce community risks or lower suppression costs.

When combining these lenses, three primary barriers to collaborative, adaptive wildfire governance come into focus. The first are organizational operational and budget structures, and long-standing values, attitudes and behaviors rooted in history. Looking specifically at the USFS, wildfire management has long been associated with fire suppression as the primary goal. The newer goals of restoring fire-adapted ecosystems and community protection do not yet have an organizational infrastructure developed around them. Restoration through vegetation management is the operational responsibility of functional programs outside of wildfire management. Interagency and community collaborative arrangements, these functional program areas are infrequently represented; instead, fire

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management officers are typically participants in these arrangements. Budgets for wildfire management have and continue to be primarily directed to suppression; frequently, funds for restoration are drawn from non-wildfire programs which are historically much lower than fire suppression budgets. Furthermore, the historic organizational norms associated with wildfire management stem from a highly militaristic, hierarchical structure unaccustomed to collaboration. In many ways, wildfire management institutions are the epitome of command-and-control resource management focused on a single target, maladapted to the complexities and uncertainties associated with multi-objective policies.

Second, there is a lack of institutional structures and performance measures that foster feedback and learning across governance and jurisdictional levels. While NFP and the TYIS in particular mandate performance-based measures to facilitate adaptive management, the measures themselves lack adequate feedback relative to the inter-linked goals of fire suppression, post-fire rehabilitation, restoration of fire-adapted ecosystems and community protection. The latter two goals in particular lack performance measures that, when monitored, would indicate movement towards goal accomplishment. In the event that such measures are being monitored, there is a paucity of mechanisms by which to aggregate and integrate these measures across governance and jurisdictional levels. For example, monitoring to gauge the effectiveness of treatments to restore fire-adapted ecosystems at the operational level may provide feedback to those participants engaged at that level, but there is no database available in which to input these measures. Without the ability to aggregate treatment effectiveness measures at higher levels, it is not possible to know where to continue to invest scarce resources or to adapt management practices.

Lastly, as demonstrated by the "acres treated" agency targets and the institutional pressure to minimize per-unit treatment costs, the current institutional incentives do not align with new wildfire policy goals. Performance targets are an historical artifact for public natural resource agencies, whether they relate to timber outputs, livestock grazing production, water yields, or wildlife target populations. Such single objective targets are ill-suited to the integrated goals of new wildfire policies. By focusing on the number of acres treated at the lowest possible cost, government agencies are motivated to achieve those targets, often at the expense of the recommended priorities of collaborative arrangements. This was pointed out in one controversial study (Schoennagel et al. 2009) which showed that only 11% of fuels treatments under the NFP were being conducted in the WUI – far below the expectation of 50%. Without incentives and rewards associated with performance measures that show progress towards multiple wildfire management goals, agency managers are motivated – and accountable – to achieve single-objective targets.

Conclusion

Scholars, policy-makers, and practitioners generally agree that changing governance of public natural resources is necessary to keep pace with the pace and scale of environmental change. Our analysis suggests that the desire for rapid change should be tempered by multi-faceted examination into the pathways and mechanisms for change at operational, collective-choice, and constitutional-choice governance levels. In the case of wildfire governance reform, changes appear to be informed by trial-and-error and incremental changes in process. Our analysis suggests a more critical, holistic look at how new institutional structures and processes are designed, and how those designs integrate with existing institutional structures and processes to figure out where contact points and pathways exist for reform. Crafting more adaptive, collaborative governance arrangements to address the complexities and uncertainties associated with environmental change appears to be the normative trajectory of governance change, but the time has come to face the pragmatic realities of how this change proceeds.

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