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Adaptive Governance in Fire-Prone Landscapes

Emily Platt[a], Susan Charnley[b], John D. Bailey[a], and Lori A. Cramer[c]

[a]Forest Engineering, Resources and Management, Oregon State University, Corvallis, OR, USA; [b]Pacific Northwest Research Station, U.S. Forest Service, Portland, OR, USA; [c]School of Public Policy, Oregon State University, Corvallis, OR, USA

ABSTRACT

Wildfire is an influential driver of social and ecological change that calls for adaptive governance on federal lands. We identify supporting and limiting elements of adaptive governance in the context of wildfire management on the Deschutes National Forest (DNF). We use key findings to propose actions and leverage points to increase the US Forest Service's ability to engage in adaptive governance. Our research suggests that key supporting elements of adaptive governance within the Forest Service are generally found at the local scale. These supportive elements can be tapped to shed national-scale rigidity traps that lock the Forest Service into actions that have had problematic outcomes. The governance framework we used could be helpful in other research that aims to explore supporting and limiting elements of adaptive governance and identify high leverage points for change.

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Introduction

Wildfire has become a major driver of ecological change across the western United States (e.g., Halofsky, Peterson, and Harvey 2020). In recent years, large wildfires have burned across millions of acres—taking lives, threatening homes, and polluting communities. As the primary wildland fire organization in the United States (Schultz, Thompson, and McCaffrey 2019), the U.S. Forest Service (Forest Service) plays a central role in wildfire management. Roughly 32.4 million hectares of National Forest System land and 70,000 communities are at risk from uncharacteristically severe wildfires (USDA 2019). The agency's ability to adapt to rapidly shifting social and ecological conditions is critical to effective management of national forestlands (Spies et al. 2010; Stern et al. 2014), necessitating further examination of its adaptive governance capacity.

The importance of adapting governance systems to changing ecological conditions has been long recognized by ecologists (Chapin et al. 2008; Holling 1973), and research has found governance structures are a key obstacle to adaptive, ecologically-oriented management (Chaffin, Gosnell, and Cosens 2014; Reiners 2012). Climate research (Magness et al. 2011), socio-ecological research (Brown 2003; Liu et al. 2007), and social

CONTACT Emily Platt Emily.Platt@usda.gov Forest Engineering, Resources and Management, Oregon State University, Corvallis, OR, USA.

science (Steelman and Burke 2007) all highlight the importance of flexible and adaptive governance.

Adaptive governance could help the Forest Service effectively manage the rapid change it faces in the West associated with large and intense wildfires. There is a widely recognized need for restoring greater disturbance resistance to fire-adapted landscapes in the West (Bailey and Covington 2002; Calkin, Thompson, and Finney 2015; North et al. 2015) and for more low- and mixed-severity fire on the landscape under moderate weather conditions (Dunn et al. 2020a). Drought conditions and warmer summer temperatures will continue to increase risks associated with wildfire into the future (Hessburg et al. 2020), underscoring the need for adaptation. Yet past research suggests resistance to change in Forest Service management and organizational systems (Calkin, Thompson, and Finney 2015; Cramer et al. 2010; Steelman and McCaffrey 2011). Such resistance today could directly impact the ecological trajectory of national forestlands and economic and social opportunities for many communities.

Using the Deschutes National Forest (DNF) in central Oregon as a case study, we assess the responsiveness of Forest Service governance to changing ecological and social conditions by focusing on how the DNF manages for wildfire. Our research questions were: (1) what factors limit or support the DNF's ability to manage for wildfire; and (2) what adaptive governance approaches could be utilized to address identified rigidity traps?[1]

Background

Adaptive Governance

Adaptive governance emerged as a strategy to mitigate rigid organizational systems that fail to adequately shift to emergent and turbulent ecological situations (Folke et al. 2005). The concept of adaptive governance recognizes that decisions are influenced by multi-scalar governmental and non-governmental processes and interests, as well as both formal and informal institutions (e.g., policies, rules, social norms, etc.) (Abrams et al. 2021). Adaptive governance includes the implementation of policy decisions in ways that are adapted for diverse interests and in response to local social-ecological context and experience on the ground, incorporating both science and politics (Brunner and Steelman 2005; Moseley and Charnley 2014). Drawing on Chaffin, Gosnell, and Cosens (2014), we define adaptive governance in the context of this research as the institutional arrangements that enable the Forest Service to adapt its management activities to changing ecological and social conditions. These institutional arrangements are often complex, multi-scalar, and include networks of diverse actors and organizations that work in concert to identify and achieve agreed upon management outcomes in specific landscapes (Abrams et al. 2021).

The literature on adaptive governance indicates keys to success include inclusivity and open participatory dialogue among actors (Dietz, Ostrom, and Stern 2003; Olsson et al. 2006; Sharma-Wallace, Velarde, and Wreford 2018) that supports development of a shared understanding of the problem and shared vision for moving forward (Abrams et al. 2021; Brunner and Steelman 2005). Sharma-Wallace, Velarde, and Wreford (2018) further highlight the need for community empowerment and deep engagement through

actions like early involvement in goal setting and design stages, legitimizing community knowledge, and engaging diverse actors in different ways. Inclusive and collaborative communications and arrangements support the development of trust between actor groups, another foundational element of adaptive governance (Folke et al. 2005; Sharma-Wallace, Velarde, and Wreford 2018).

Another key to adaptive governance is functioning social networks that connect actors in multiple ways (Folke et al. 2005) and foster bridging and effective coordination between scales and multiple interests (Cheng et al. 2015; Sharma-Wallace, Velarde, and Wreford 2018; Wurtzebach et al. 2019). Wurtzebach et al. (2019) suggest a need for specific people to fill roles as knowledge-sharing bridges. Cheng et al. (2015) suggest that objects (e.g., knowledge syntheses, monitoring protocols) can also serve as bridges.

Also needed are organizational capacity and support (Sharma-Wallace, Velarde, and Wreford 2018) and institutional structures that encourage experimentation and adaptation of policies and management structures based on learning (Folke et al. 2005; Olsson et al. 2006; Wurtzebach et al. 2019). Organizational flexibility enables actors to take advantage of windows of opportunity for transitions toward adaptive governance (Olsson et al. 2006). Because many see the scope and intensity of wildfire in the West as a crisis, wildfire has the potential to serve as a catalyst for further transformation of Forest Service management toward adaptive governance.

Organizational Rigidity and Change

Organizational research suggests flexible and adaptive governance systems are more readily achieved when organizations move away from traditional, centralized hierarchical structures toward structures that encourage engagement of lower organizational levels to promote consultation and information and advice sharing (Shafritz, Ott, and Jang 2005). Hierarchical governance tends to divide work into functional tasks, generating a focus on technical improvements or organizational procedures resulting in rigid policies, instructions to field staff, and responses to events (Burns and Stalker 2004). The Forest Service functions as a traditional hierarchical organization with a penchant for developing extensive and sometimes conflicting internal policies, procedures, and instructions (Abrams 2019) which creates inherent rigidity. Increased organizational effectiveness, flexibility and responsiveness are associated with eliminating layers of hierarchy, procedures, and middle managers (Adler and Borys 1996; Alam, Kabir, and Chaudhri 2014; Ouchi 1981; Shafritz, Ott, and Jang 2005).

Governance systems need to be able to integrate learning and adapt in the face of change to avoid rigidity traps that could increase the likelihood of catastrophic events and dramatic change (Butler and Goldstein 2010). Influences and constraints on governance change at multiple scales need to be considered (Abrams et al. 2021), and researchers recognize that the status quo may be maintained even when managers realize improvements could be made with new approaches (Repetto and Allen 2006).

Examples of rigidity within the Forest Service are well documented in the literature. For example, the Forest Service has been slow to change fire management actions despite an evolving policy framework and broad agreement that current management is leading to undesirable outcomes (Schultz, Thompson, and McCaffrey 2019; Steelman

and McCaffrey 2011). Steelman and Burke (2007) and Butler and Goldstein (2010) found that the organizational incentives, budget priorities and structure, and professional practices of agency land managers were unchanged despite new Congressional policies directing the agency to focus on ecologically-sound fire management. Kennedy and Quigley (1998) note that attempting to achieve and reward ecosystem management goals with traditional systems and organizational structures is likely destined for frustration and failure, presumably because these systems were developed to support historical agency emphases. Maguire and Albright's (2005) research shows that forest managers in the Northwest reported few incentives to take adaptive approaches. Wildfire management could therefore be caught in a rigidity trap (Butler and Goldstein 2010)—a management space maintained by plans, policies, and professional practices that leave little room for flexibility. Despite broad scientific consensus that more fire is needed on the landscape (ideally under moderate weather conditions), the Forest Service still aggressively suppresses the vast majority of all wildfires (Calkin, Thompson, and Finney 2015; Dunn et al. 2020b; Schultz, Thompson, and McCaffrey 2019). While there is increasingly common communication at all levels of the Forest Service about getting more fire back on the landscape under more tenable conditions, translating these ideas into new approaches on the ground has not yet happened on a large scale.

Methods

Study Area

We chose the DNF for this study because of its active historical and current fire history, its national recognition for successful partnerships and collaborative work (Scruggs 2017), and its reputation as a forest that works well and gets things done (Platt, unpublished data). The DNF encompasses 650,000 hectares and consists of three ranger districts, the smallest administrative unit comprising a national forest: Sisters (128,600 ha), Bend-Fork Rock (395,000 ha), and Crescent (124,700 ha) (Figure 1). Management is hierarchical with a district ranger responsible for all activities on a district. District rangers report to a forest supervisor who is responsible for all activities and decisions on the DNF.

Located in central Oregon, the DNF is bounded on the west by the crest of the Cascade Range and on the east by juniper woodlands and shrub-steppe. The varied climate and topography support a wide range of forest types from mountain hemlock plant associations (*Tsuga mertensiana*) to grand fir-white fir (*Abies grandis-Abies concolor*), ponderosa pine (*Pinus ponderosa*), and lodgepole pine (*Pinus contorta*) associations (Figure 1). The natural fire history of the area varies with landscape context and includes infrequent mixed- and high-severity fires in the west at higher elevations, and frequent low-severity fires at lower elevations in drier areas to the east. As with many areas of the West, conditions conducive to larger, more severe wildfires have increased on the DNF and high fire-hazard forests now dominate the landscape in a way inconsistent with historical conditions (Hessburg, Agee, and Franklin 2005). Forests are denser and contain more trees with lower resistance to fire than were present historically (i.e. altered size distribution and species composition) and have higher surface fuel

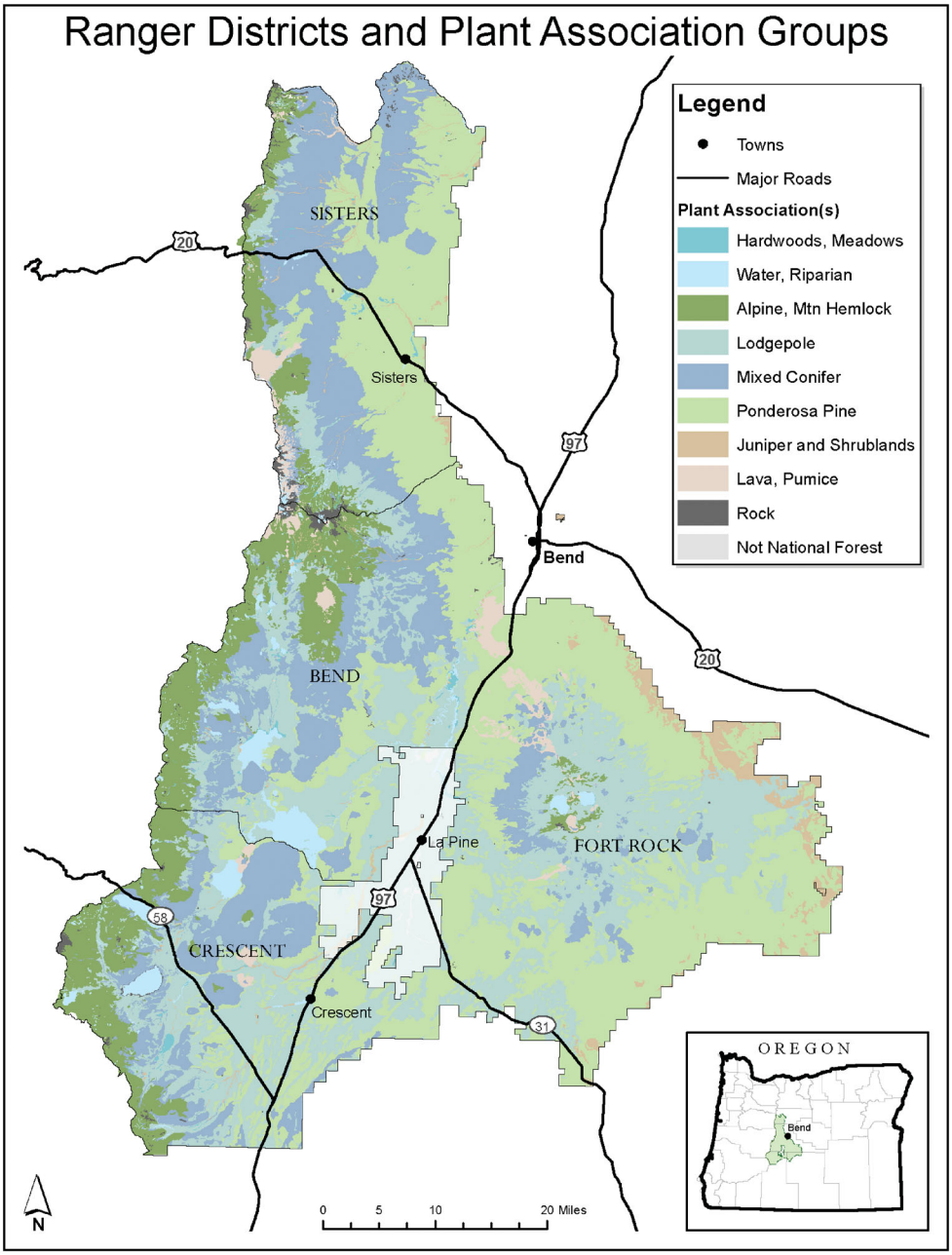

Figure 1. Three ranger districts (Sisters, Bend-Fort Rock, and Crescent) comprise the Deschutes National Forest. A range of diverse plant associations are found within the study area.

loads (Hagmann, Franklin, and Johnson 2013; Hessburg et al. 2020; Merschel et al. 2018).

The DNF spans Oregon's Jefferson, Deschutes and Klamath Counties. The portion of these counties in federal land ranges from 27.6% to 75.4% (Table 1). Both Deschutes and Jefferson Counties have experienced significant population growth since 1990.

Table 1. County statistics for study area.

County	Jefferson (%)	Deschutes (%)	Klamath (%)
Portion of county that is federal lands	27.6	75.4	57.3
Population increase since 1990	78	96.5	17.8
Portion of housing built since 1990	45	60	30
Portion of wildland-urban interface developed	10.2	41.8	4.3

In populated areas, Jefferson County has a 95% greater risk to homes from wildfire than other counties in the nation, and Deschutes and Klamath Counties have 85% and 75% greater risk, respectively. This risk increases with development, which is most notable in Deschutes County: nearly 60% of Deschutes County housing has been built since 1990, and 41.8% of the WUI has been developed.

Data Collection and Analysis

We used a mixed-methods approach to investigate our research questions. We used an overarching inductive approach to further develop an existing conceptual model and develop hypotheses or propositions about management actions that could support the Forest Service's ability to engage in adaptive governance. We reviewed Forest Service strategic planning and budget documents, the DNF land management plan, and other existing documents to obtain information about management priorities and implementation of activities. Forest Service activity databases, GIS analysis, and national and local budget planning documents and data provided additional information about DNF management and potential constraints. County-level social and economic data from the Headwaters Economics Economic Profile System and collaborative reports and materials provided information about social context for DNF management.

We conducted key informant interviews with 32 DNF staff and 9 Forest Service staff at the regional and national offices. Interviews took place in 2012–2013 using a semi-structured interview guide (Bernard 1988). We note in the results and discussion where important changes relating to interview findings have taken place. To gain insight into factors limiting or supporting the DNF's ability to manage for wildfire, the interview guide contained questions pertaining to forest management objectives, current fuel conditions and how fuels are managed, the history of wildfire and how it was addressed (e.g., suppression, managed wildfire), and factors influencing the DNF's ability to effectively reduce wildfire hazard and restore fire-resilient forest conditions. To investigate adaptive governance approaches that could be utilized to address identified rigidity traps, the guide contained questions about social networks, collaborative decision making processes, which management activities, if any, might increase forest resistance and resilience to disturbances, and what the challenges were to implementing such activities.

We used qualitative content analysis (Richards 2005) to identify patterns in the interview data and test findings and questions. Following Richards (2005), we developed a unique hierarchical coding scheme to analyze interview transcripts and notes and identify prevalent themes, assess relationships between themes, and develop explanations for patterns found in the data (Krippendorff 1980; Richards 2005). Interviews were coded manually by the lead author using an interactive-hermeneutic approach in which more selective categories for analysis were created during the process of reading the interview

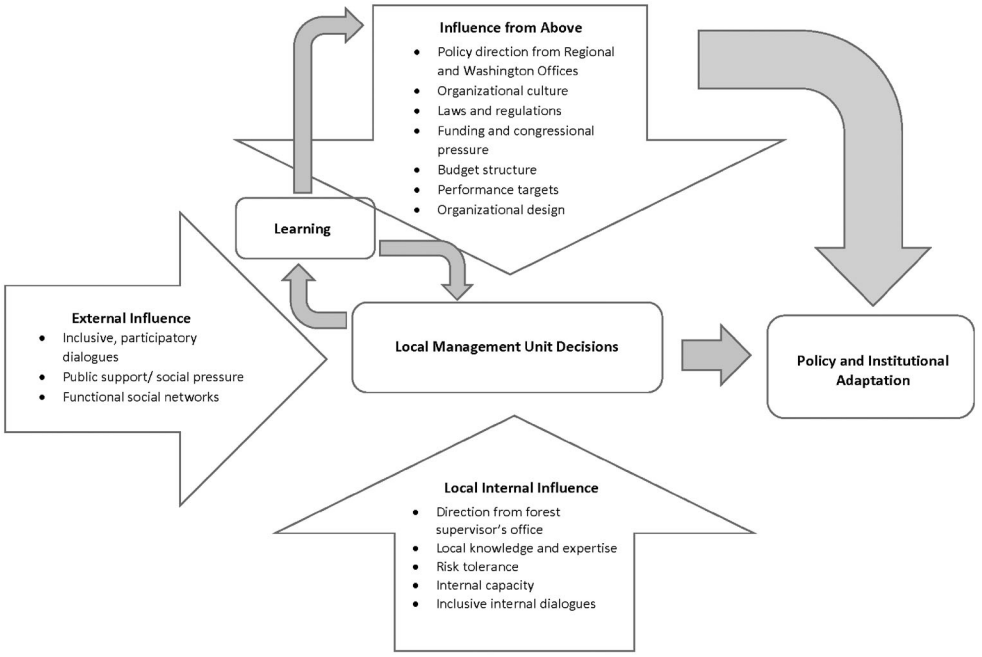

Figure 2. Adaptive governance framework shows influences on U.S. Forest Service local management decisions.

transcripts, and the analysis was then increasingly directed by a growing understanding of the transcripts (Krippendorff 1980). Two additional social scientists conducted peer checks of nearly ¼ of the interviews to support the reliability and validity of analysis (Kirk and Miller 1986). The reliability assessment resulted in additional clarifications and adjustments to coding categories where different uses of codes had occurred and achieved an agreement between coders of 89.3%. Variations in the data were used to deepen our understanding of flexibility and rigidity within the Forest Service.

We analyzed Forest Service budget and performance data (e.g., acres and location of hazardous fuel treatments), policies, and laws and regulations to increase our understanding of the extent and effectiveness of management activities and the policy challenges mentioned by respondents in interviews. The organizational and adaptive governance literature was consulted to develop propositions that addressed the rigidities mentioned most often in the interview data.

Framework for Reporting Results

Our research focus on Forest Service decision making lends itself to use of the framework advanced by Moseley and Charnley (2014) and Charnley et al. (2015) to present our results. We explicitly modified it to incorporate adaptive governance and organizational rigidity and change concepts introduced in the Background section above. We do not empirically examine the framework but rather use it to assess elements of adaptive governance and identify patterns and linkages in the data (Figure 2). Local management unit decisions are at the center of the framework. Factors outside the local level such as laws,

Table 2. Performance targets for key line items from forest service FY20 budget justification.

Line item	Performance target
Forest products	3.7 billion board feet
Hazardous fuels	Mitigate wildfire risk on 3.4 million acres of hazardous fuels in high priority and high risk areas
Preparedness	[No substantial target]
Suppression	[No substantial target]
Vegetation and watershed management	Maintain 52% of watersheds in functioning condition and contribute to sustaining and restoring watershed function and resilience on more than 2,000,000 acres
Wildlife and fisheries habitat management	[No substantial target]
Forest health management—cooperative lands	Acres of native and non-native insects and pests treated on nonfederal lands
Recreation, heritage and wilderness	[No substantial target]
Facilities	[no substantial target]

regulations and policy influence those decisions, as do factors internal to the local unit. Collaborative groups and other external factors play a key role as well. Learning can directly influence local management decisions and can also affect influences that come from above. Policy and institutional adaptation are mediated through influences at the national scale (influences from above).

Results

Research Question: What Factors Limit or Support the DNF's Ability to Manage for Wildfire?

Respondents generally agreed that fuel reduction treatments have been effective at reducing fire hazard at site-specific scales. While effective for a specific piece of ground, they concurred that treatments need to occur at a larger scale. Relevant research on historical disturbance supports respondent comments (e.g., Haugo et al. 2015; Hessburg et al. 2020).

Influence from Above

Limiting Factor: Budget Structure and Performance Targets. Challenges related to the budget structure were the most often-mentioned obstacle to achieving land management goals related to wildfire. This can also be seen as pressure from Congress because Congress controls the Forest Service budget. The Forest Service budget is divided into "programmatic" line items, with separate line items for vegetation management, fuels reduction, wildlife and fisheries, recreation, etc. The Forest Service budget for fiscal year 2019 contained 59 line items, a decrease from 72 in 2014. Key line items are linked to a measure, or performance target, that tracks accomplishments for each line item (Table 2). Performance targets are measured as outcomes or outputs and are determined by each program area (USDA 2014). For instance, "timber volume sold" is one target associated with the forest products line item. Congress determines how much funding goes into each line item during its annual appropriations process.

Respondents referred to problems with the "color" of money, or the line item associated with the provided dollars and regularly alluded to the disconnect between annual line item appropriations and land management goals. An important aspect of this issue

is the target associated with some line items. The need to achieve one program area target may inhibit or alter other management activities. The timber target (mmbf sold/year) was often cited as a constraint to meeting fuel reduction objectives despite the hazardous fuel line item being well-funded. On the DNF, timber and hazardous fuel dollars are often combined to achieve timber and fuels targets simultaneously and make the funding stretch farther. The need to combine funding often leads to a focus on areas that can produce commercial timber. These areas may not necessarily be high priority areas for fuel reduction (see also Schultz, Thompson, and McCaffrey 2019). One line officer's comment was echoed by many others, "It makes me think of our stewardship[2] projects in particular. There's a lot of acres with a little bit of volume. However, treatments in those acres are no less important than they are in places that are high volume. It's just a different goal, different objective." Likewise, fire specialists explained that it can be difficult to conduct critical maintenance treatments where fuel reduction work has already taken place because timber volume is not generally produced in areas that only need maintenance.

While the timber target was often cited as a constraint, respondents were not opposed to producing timber. On the contrary, many noted that local timber-processing infrastructure was needed to accomplish restoration goals. Respondents generally wanted timber production to be a secondary restoration outcome rather than a hard target. Line officers and specialists reported a preference for measuring outcomes such as landscapes and watersheds restored. Targets were seen as more of a constraint by field staff (staff at the ranger districts) than by staff at the regional and national levels.

Limiting Factor: Organizational Design. The Forest Service is a traditional hierarchical organization with line officers responsible for making decisions at each level of the organization. These include over 600 district rangers at the ground level, forest supervisors on each of the nation's 154 national forests, regional foresters at each of the agency's nine regions, and the chief of the Forest Service in the Washington Office. Specialists serve within distinct program areas (e.g., wildlife, fire, silviculture), and these program divisions are found at each level of the organization. Field staff at the district level plan and implement project work, and with every step up through the hierarchy, staff functions generally shift toward oversight and giving direction to lower levels of the organization. This organizational design results in tens of thousands of pages[3] of Forest Service handbooks and manuals, which create agency-wide procedures and policies layered on top of laws and agency regulations. Lack of cross-program integration was raised as an obstacle to achieving management goals related to wildfire by interview respondents at all levels of the agency (see inclusive internal dialogues section for more detail).

Limiting Factor: Wildfire Policy and Culture. Respondents viewed the Forest Service culture of quickly suppressing all fire starts as an obstacle to restoring fire-adapted ecosystems and forest resilience. Central Oregon had an average of 185 annual fire starts from 2011 to 2020 (57% caused by humans, 43% caused by lightning) and effectively suppressed 98–99% of wildfires during initial attack (Central Oregon Fire Management Service, personal communication). The high fire suppression rate limits natural fires

that might otherwise reduce fuels and restore desired forest structure and composition. Consistent with the literature (e.g., Dunn et al. 2020b; North et al. 2015), one program manager described this suppression strategy as "transferring risk into the future." A fire specialist explained, "The more you are successful at [suppressing] small fires, the worse the problem gets – eventually you'll get one under conditions that are untenable." Deciding to not immediately suppress a wildfire is difficult. A decision maker commented, "You gotta be able to accept the risk and that is just tough." Increased development in the WUI can exacerbate this risk, as do increasing temperatures, drier conditions, and longer fire seasons. While Forest Service decision makers have more latitude to use wildland fire to achieve land management objectives than they did in the past, the suppression rate remains at 98–99% in central Oregon, consistent with national statistics (USDA 2015).

External Influence

Generally Supporting Factor: Public Support and Social Pressure. Most respondents at the district level and a few respondents at the regional and national levels talked about the role of public support and social pressure in achieving forest management goals related to wildfire. District respondents talked about both the supportive role of public engagement and how public pressure can block action. Respondents also described how, as social values and preferences have changed, priorities and management work on the forest have changed as well. Districts have thus naturally begun to focus on restoration and fuels reduction as communities have become interested in this work. Respondents talked about how public support helped get more work implemented on the ground and the value of local collaboratives and partnerships in generating that support. A district respondent shared, "The relationships that were developed and built … turned the tide on us being able to get work done." Respondents noted that wildfires like Awbrey Hall, which burned people's homes in Bend in 1990, created public support for hazardous fuel reduction. Public support in turn enabled local managers to expand the type of work they implement on the ground, such as thinning in old forests and applying prescribed fire in highly visible locations.

Conversely, lack of social support can be an obstacle to achieving management goals. Respondents highlighted smoke from prescribed fires, visible signs of management (blackened stumps, slash, skid trails), different ideas of what is "natural," and litigation as inhibiting the DNF's ability to achieve management goals. For example, a decision maker might avoid prescribed fire because of smoke impacts or avoid controversial activities such as treatments in fire-prone landscapes set aside as "reserves" for older forests.

While both limiting and supporting aspects of public support and social pressure were discussed, it was clear that increasing levels of public support and understanding have made possible a new range of activities for the Forest Service. The fact that areas remain where the Forest Service does not have social support highlights that public engagement is a continuous process of learning and information exchange.

Supporting Factor: Inclusive, Participatory Dialogue. Strong and interactive partnerships on the DNF have been growing over the last twenty years. While early projects aimed

to educate visitors about restoration strategies, later projects focused on developing agreement between diverse external stakeholders. The Deschutes Collaborative Forest (DCF) project was among the first ten projects in the nation to be selected for the Collaborative Forest Landscape Restoration Program (CFLRP) when it was initiated in 2009.[4] Selection of CFLRP projects reflects the importance of the ecological work to be completed, as well as the strength of the collaborative process used and the ability to reduce wildfire management costs in the long term. Recent projects and collaborative work rely on participatory, inclusive external engagement to build a common vision and influence project work on the DNF.

Local Internal Influence

Limiting Factor: Direction from Forest Supervisor's Office. Each national forest is required to have a forest management plan that guides management and outlines which activities are allowed where. Although forest plans should be updated every 10–15 years, this rarely happens owing to constraints associated with funding, capacity, and social and political controversy. Consequently, the DNF management plan, published in 1990, is based on social and biophysical science over 30 years old. The forest management plan was raised as an obstacle to meeting management objectives by many respondents at the forest and district levels. A typical respondent shared, "It is unfortunate that … our existing planning, doesn't really do an awful lot except to provide us constraints … A lot of the concepts at the time, which we thought were great, have changed." A specialist explained, "There are a few pieces [of the plan] where … we just kind of throw up our hands and just go okay well we are going to have to write off a certain number of acres … we are really being asked to manage stands in an unsustainable way." Respondents also referenced the Supervisor's Office focus on producing timber target and competing for budget resources at the forest level as a challenge to achieving management goals related to wildfire.

Generally Limiting Factor: Inclusive Internal Dialogues. Respondents at all levels discussed the lack of integration within teams or between resource areas (e.g., timber, fire, wildlife) as a key obstacle to achieving management goals on each district because objectives may not align or may be at cross purposes. The degree to which integration was a constraint varied strongly by district. One specialist commented, "But when you want us to help you achieve your specific resource objectives and they're completely competing across the board, that's never gonna happen. So what I would like is before we even go into an area, to have a common vision." Some project teams have found ways to address these inherent program divisions. A fire specialist noted, "I think everybody's goals and where they're trying to head is starting to mesh a little bit more … we really try to get out on the ground … which definitely makes a difference." Recent research (Nowell and Steelman 2019) and organizational theory (e.g., Burns and Stalker 2004) suggest that integration is likely an issue throughout the agency.

Other Local Factors. Local knowledge and expertise were clearly supporting factors on the DNF. Respondents demonstrated high levels of knowledge of their specialties (e.g., fire, wildlife, silviculture), and the Forest Service invests in the presence of a wide array

of specialists at all levels of the agency. Partners brought additional scientific data, expertise, and local knowledge to the table.

Nevertheless, respondents highlighted the ongoing lack of staff and funding capacity to achieve management objectives as a limiting factor and tended to accept this as the normal course of business. The Forest Service has worked nationally and regionally in recent years to increase capacity for accomplishing restoration work through partnerships with States, Tribes, and others. In 2013, Oregon's legislature began funding collaborative capacity and projects related to restoration on federal lands. The Forest Service and State of Oregon signed an agreement outlining cooperative management activities through the Good Neighbor Authority in 2016. The State also passed a wildfire bill in 2021 that includes further support for partnering with the federal government. Additionally, the DNF has benefited from CFLRP funding, though these funds were limited to a relatively small geographic area. The Federal Administration's FY22 budget proposal for the Forest Service requests a significant increase in funding for wildfire-related activities.

Discussion

Research Question: What Adaptive Governance Approaches Could Be Utilized to Address Identified Rigidity Traps?

In this section, we use adaptive governance and organizational theory to develop propositions for increasing the Forest Service's ability to engage in adaptive governance. Specifically, we suggest that the generalized key findings from this research apply more broadly across the Forest Service and can be used to develop propositions for increasing adaptive governance.

The first key finding from the DNF is that the primary factors inhibiting the agency's ability to adapt and achieve land management goals related to wildfire are from above (generally national-scale elements, see Figure 2). This finding is consistent with findings from other studies (e.g., Abrams et al. 2021; Charnley et al. 2015; Steelman and Burke 2007), suggesting it applies more broadly across the Forest Service. We identified Forest Service budget structure and associated performance targets, organizational design, and institutional structures and inertia that support wildfire suppression as constraints in this context.

Secondly, local level governance elements tend to support the Forest Service's ability to adapt and achieve goals related to wildfire. These include inclusive internal dialogues and local knowledge and expertise. While the importance of inclusive internal dialogue for adaptive governance is largely recognized in the organizational literature using different terminology (e.g., Burns and Stalker 2004; Shafritz, Ott, and Jang 2005), with this research we also recognize the value of local knowledge and expertise within the Forest Service and local communities and the need for upward communication across scales.

The third key finding is that external influences including public support, partnerships, and participatory inclusive dialogues with partners tend to be generally supportive of the Forest Service's ability to adapt and achieve wildfire goals when stakeholders are engaged deeply over time, consistent with the literature (e.g., Sharma-Wallace, Velarde, and Wreford 2018). While the value of collaboration and local partnerships is largely

recognized in the literature (e.g., Butler and Goldstein 2010; Chaffin, Gosnell, and Cosens 2014), we further suggest that collaboration and partnerships are a potentially powerful fulcrum that could be used to support adaptive governance by increasing opportunities for experimentation and flexibility at the local district scale and to cut across bureaucratic layers and scale.

Given these findings, if the ability exists at the local level to solve a problem related to wildfire, this is likely the most effective approach (e.g., forest plan amendments rather than forest plan revision that requires Washington Office approval). Moreover, the Forest Service could use supporting factors to gain traction on limiting factors. Here we use several examples from our case study to develop specific propositions to help the Forest Service overcome rigidity traps associated with wildfire.

Limiting Factor: Budget Structure and Performance Targets

Issues with the Forest Service budget structure and performance targets are generally well-known (e.g., Charnley et al. 2015; Schultz, Thompson, and McCaffrey 2019; Thompson et al. 2018). We propose the Forest Service could increase adaptive governance to better achieve management goals related to wildfire if it focuses on an outcome-based target for vegetation management, for example a metric focused on resistance of forests to disturbances (Platt 2014). Similarly, Thompson et al. (2018) suggest developing performance targets related to suppression decisions such as the number of days where suppression resources were not engaged due to extreme weather or the length of perimeter where direct attack was not pursued. Likewise, the Forest Service could measure the number of incidents where the response was not full, immediate suppression. Such changes would further shift the Forest Service focus to outcomes rather than outputs and align with recent changes including a budget with fewer line items and former Forest Service Chief Christiansen's proposal to change the hazardous fuels program performance target from acres treated to number of high priority acres where wildfire risk is mitigated (testimony to Senate Energy and Natural Resource Committee 6-17-2021).

Based on our key findings and the governance framework (Figure 2), we further propose the Forest Service will be most successful in changing performance targets by leveraging supporting elements, including tapping into local internal expertise and using deeply invested external partners to bridge gaps between the local and national scales. For example, national decision makers might ask district rangers or forest supervisors for feedback on appropriate outcome targets, and a suite of potential new targets could be shared with deeply invested partners to begin a dialogue and build support for this change.

Limiting Factor: Wildfire Policy and Culture

Quickly and aggressively suppressing wildfire is still deeply embedded within Forest Service culture (Butler and Goldstein 2010; Calkin, Thompson, and Finney 2015) and has been highlighted by researchers as an obstacle to reducing wildfire hazard and managing for fire-resilient forests (Calkin, Thompson, and Finney 2015; Steelman and Burke 2007; Thompson et al. 2018). Changing a core general purpose of an organization is one of the most difficult organizational changes to make (Hannan and Freeman 1984),

and aggressively suppressing wildfire has been a core agency goal since the early 1900s. We again propose that the Forest Service is likely to be most successful if it uses an approach informed by local knowledge and expertise and creates opportunities for continued engagement of deeply invested partners. For example, ranger districts or national forests might engage local staff and deeply invested partners outside of fire season to create understanding, and agreement where possible, about where wildfire ignitions could be given more space to burn before they are suppressed (e.g., potential operational delineations [PODs] work). We also propose that Forest Service engagement of field-level Forest Service experts and partners in developing a common vision for wildfire management at the regional or national scales is an important focus area due to the lack of common vision both within the Forest Service and between external partners (Schultz, Thompson, and McCaffrey 2019; Steelman and Nowell 2019; Thompson et al. 2018) and because of its potential as a fulcrum for needed change.

Limiting Factor: Organizational Design

Because of its deep connection to our key findings and its direct relevance to addressing the limiting and supporting factors identified in our research, we propose focusing on organizational design could prove a powerful force for movement toward adaptive governance within the Forest Service. The Forest Service could more readily tap into local innovation and expertise and adapt policy at the national scale by flattening its hierarchy and increasing two-way vertical communication. Regardless of the scope of this work, the Forest Service has an opportunity to tap into local knowledge and share it more directly upward within the Forest Service. Currently, there is little to no direct pathway for communication from the field level (districts) to the Washington Office. Information flow is mediated by supervisors' offices, regional offices, and program managers and decision makers at each level, which tends to halt innovation and new ideas (Osborne and Gaebler 1992). Improved vertical information exchange might help address the difference in responses we noted at the district, regional, and national scales about the obstacles to achieving desired outcomes for wildfire. Our research complements Nowell and Steelman's (2019) findings that suggest a move away from command and control hierarchical governance is needed for managing disasters like wildfires. We propose the need extends to the preventive and proactive side of wildfire management as well. Innumerable options for moving in this direction could be advanced from simple, easy-to-implement actions to more complex actions that would cut deeper into ingrained patterns and processes. For example, program managers and decision makers in the Washington Office might create small groups of district ranger and forest supervisor advisors to ensure programs and decisions are informed by changing local conditions and innovative ideas. Or, the Forest Service could reduce the number of staff at regional and national offices or re-purpose these resources to focus on implementing high priority work or projects instead of oversight. Regardless of the chosen path, an investment in participatory, inclusive and multi-directional information flow could produce helpful movement toward adaptive governance for wildfire.

A more nimble and adaptable approach to wildfire management could also be achieved with more two-way horizontal communication, or integration (Abrams et al. 2021; Ouchi 1981). This proposition is consistent with literature demonstrating a lack

of integration across program areas in the Forest Service (Schultz, Thompson, and McCaffrey 2019; Stern et al. 2014) and that cross departmental projects help break down turf walls and foster collaboration (Burns and Stalker 2004; Osborne and Gaebler 1992). A similar divide has been found between external partners engaged in wildfire issues with the Forest Service (Fischer et al. 2016). To support horizontal integration, the Forest Service might chose to re-focus regional and national resources on time-limited, project-specific, ad hoc teams, which could also help shift focus away from process and toward achieving broad agency priorities (Burns and Stalker 2004; Osborne and Gaebler 1992). The Forest Service might consider engaging deeply invested external partners in these teams as well.

Conclusion

Our research suggests that key supporting elements of adaptive governance within the Forest Service are generally found at the local scale. These supportive elements can be tapped to shed national-scale rigidity traps that lock the Forest Service into actions that have had problematic outcomes. The modified governance framework we used could be helpful in other research that aims to explore supporting and limiting elements of adaptive governance and identify high leverage points for change.

With wildfire season lengthening and the size of fires increasing, springing the Forest Service wildfire rigidity trap requires more than incremental change. While it can be daunting to consider national-scale rigidities that create obstacles to adaptive governance, our research identified specific and discrete organizational changes that could improve the Forest Service's ability to engage in adaptive wildfire governance.

Notes

1. An inability to apply novelty and innovation in the midst of crisis (Butler and Goldstein 2010).
2. Stewardship projects use congressionally approved contracting authorities to achieve land-management goals that improve, maintain, or restore forest or rangeland health, water quality, fish and wildlife habitat, native plant species, and reduce hazardous fuels that pose risks to communities and ecosystem values through an open, collaborative process.
3. 4,398 separate documents comprise the mountain of *national* directives to the field.
4. The purpose of the CFLRP is to encourage collaborative, science-based ecosystem restoration of priority forest landscapes and to reduce wildfire management costs, including through reducing the risk of uncharacteristic wildfire.

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ORCID

Emily Platt http://orcid.org/0000-0003-2609-8803

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