Institutional Effects on Decision Making on Public Lands: An Interagency Examination of Wildfire Management

A significant increase in catastrophic wildfires in the interior West of the United States has left public land agencies scrambling to reduce dangerous fuel loads and manage forests according to an ecological understanding of fire and forest health. However, this has not translated into standardized on-the-ground fire and fuel management in public land agencies. Different on-the-ground management practices raise questions about the extent to which ecosystems management is being utilized and how well land agencies are adapting to their new responsibilities. This study employs an institutional analysis and development framework to examine how and why on-the-ground decisions and outcomes differ. Decisions and outcomes are discussed as a function of the multiple layers of institutions that guide and constrain the decision processes of line officers who are responsible for developing and executing fire and fuel management projects.

Over the past 20 years, large wildfires in the interior West of the United States have become more frequent, intense, destructive, and expensive. Since the turn of the millennium, the American West has witnessed some of the worst fire seasons ever recorded, with seven Western states experiencing their worst and largest fires in the last 100 years. The 2002 Rodeo-Chediski fire in Arizona, for example, consumed almost half a million acres in just a few days. In contrast, a fire of 500 acres was considered extremely serious 30 years ago. Fueled by drought, infestation, and overgrowth, however, so-called mega-fires are increasingly common. Figure 1 illustrates the surge of wildfire in the Western United States.

Charged with managing 193 million acres of mainly forestland, 80 percent of which is located in the Western states, the U.S. Forest Service has attracted significant negative attention over the increase in catastrophic fires and concomitant forest conditions. Part of the criticism has focused on past decades of utilitarian rather than ecologically oriented management policies, highlighted by a total fire suppression policy that gradually compounded forest fuels and fire risks (Busenberg 2004; Davis 2001; Nelson 2000). Having officially abandoned the fire suppression regime in the 1970s, the Forest Service nevertheless has received heavy criticism for its struggle to adequately reduce fuels and restore forest conditions—a problem thought to be rooted in the agency’s inability to transform its decision making and organizational structure to accommodate true ecosystems management (GAO 2002, 2007; NAPA 2001).

Deteriorating forest conditions and heightened fire risks are not exclusive to the national forests. Some of the most destructive fires in recent years started within the boundaries of other public land agencies.1 Indeed, unusually fire-prone forest conditions have become widespread throughout the interior West. Consequently, fuel reduction and restoration have become central land management objectives for almost all public land agency units with responsibility for forestland. But even though they share similar forest conditions, wildfire threats, fuel management goals, and even many regulatory and compliance procedures, public land agencies exhibit systematic differences in their fuel reduction strategies, techniques, and outcomes. This article examines why this is the case and, moreover, why the Forest Service has attracted such a large share of negative attention regarding its efforts (or lack thereof).

While the particular focus here is on fire and fuel management, systematic differences in on-the-ground

Source: Intermountain Fire Sciences Lab, courtesy of Robert Mutch.

Figure 1 Millions of Acres Burned by Wildfire in 11 Western U.S. States
management practices speak to broader, interrelated natural resource management issues. First, they raise questions about the extent to which ecosystems management guides or can guide management decisions about public lands under existing institutional arrangements. In theory, ecosystems management is especially pertinent to fuel reduction in that the goal is to restore a level of “health” to the environment. Achieving this objective necessarily implies a technical approach based on the best available science, analogous to medical doctors diagnosing and treating a sick population. And although a balance must be struck between treatment (ecological) effectiveness and maximizing the amount of forest that can be treated given limited resources (efficiency), ostensibly there are objectively better and worse fuel reduction methods. Second, different on-the-ground practices provide an indication of agency adaptability insofar as agency officials are able to formulate and execute management projects that address new imperatives. As the fire-prone conditions of Western public lands have risen to the level of a national environmental crisis, no issue currently tests land agency adaptability more.

Perhaps the biggest obstacle to adaptive and ecologically oriented management has been identified as so-called institutional arrangements (Doremus 2001; Nie 2008), an issue that certainly has been identified in the wildfire policy arena (see NAPA 2001; Nelson 2000; USFS 2002; Wise and Freitag 2002). Obstacles associated with institutional arrangements refer to the decision-making incentives produced by a dizzying array of conflicting and unclear institutions that attempt to balance directives and accountability with management flexibility. While such explanations no doubt are on point, there could be greater consistency in terms of what is meant by institutional arrangements and how they are analyzed. Indeed, it would be helpful to understand more broadly how land management institutions are arranged, how they affect and interact with each other, and how they lead to decision outcomes that are important to the public.

**Analytical Framework and Methods**

To improve this understanding, decision making and outcomes are presented here through the lens of the institutional analysis and development (IAD) framework developed by Elinor Ostrom and her colleagues (Ostrom, Gardner, and Walker 1994). A key element of the IAD framework is a recognition of nested institutions (rules) and the crucial interactions between them. It is useful for policy analysts to distinguish among three levels of institutions: (1) constitutional choice, (2) collective choice, and (3) operational, each of which is nested in (and influenced by) the previous set (Ostrom 1999). This provides for a holistic analysis of institutional effects on outcomes. Within each level, the IAD framework focuses on how patterns of interaction among actors within a policy arena create outcomes. These patterns of interaction are framed by institutions or rules, as well as by physical attributes and community attributes. Institutions guide and constrain decision processes by prescribing which actions are required, prohibited, or permitted (Ostrom 1999).

The outcomes of interest in this study relate to on-the-ground management decisions. Thus, much of the focus is on the day-to-day decision making of line officers, who in this case are responsible for developing and executing specific fuel reduction projects within the guidelines and constraints produced by the entire structure of nested institutions affecting their agencies. Decision making at this level is compared in the U.S. Forest Service (USFS), National Park Service (NPS), and state land trust agencies. The data come from a survey and from in-depth, semistructured interviews with 61 fire and fuel line officers from 26 national forests, 13 national parks, and six state land trust agencies within six states in the Rocky Mountain region.²

There are a limited number of fire and fuel officers in the region. To achieve candid responses and to prevent backlash, interviewees were assured that their identities would be kept confidential. Additional interviews were conducted with seven environmental group directors, seven academic fire ecologists, and five timber contractors in the same region.

Each of the agencies analyzed must cope with increasing wildfire threats involving catastrophic fire, drought, an ever-expanding wildland–urban interface, and funding shortfalls. While many variables affect fuel management decisions (including the specific ecological conditions of particular forest plots), the agency units selected for analysis all lie within six contiguous states in the Rocky Mountain West and contain significant overlapping ecological (fire regime) comparability. Likewise, no significant differences were found in federal and state agency officials’ beliefs regarding appropriate forest management. Overt contrast between the agencies’ most basic constitutional choice institutions specifically guided selection.

As discussed earlier, there is a need to clarify what is meant by “institutional arrangements.” Figure 2 illustrates a conceptual framework of how institutional levels interact to affect on-the-ground management. The USFS, NPS, and state trust agencies serve distinctive functions by emphasizing different sets of values that ostensibly are held by the public. These values are expressed in the organic acts, enabling acts, and other broad mandates in the constitutional choice institutions that launched or fundamentally defined the agencies. At this level, the USFS, NPS, and state land trust agencies are best defined by a broad multiple use mandate, a “dominant use” recreation and preservation mandate, and a mandate based on maximizing economic returns with undivided loyalty for specified beneficiaries, respectively. As Nie notes, “In making decisions, agencies look to their statutory mission and mandate for guiding principles, or to the explicit instructions provided by Congress” (2008, 45). While broad constitutional mandates are likely to influence on-the-ground management decisions, those influences also are filtered through collective choice institutions (e.g., the National
Environmental Policy Act [NEPA], National Forest Management Act, Endangered Species Act, 1995 Federal Wildfire Policy, etc.) that further specify management priorities and organize planning procedures. Many of these collective choice institutions apply to multiple agencies, but the effect that they have on on-the-ground management differs in each agency because of interactions with an agency’s constitutional choice institutions. For example, the NEPA appeals process can be invoked by actors that are interested in both USFS and NPS decisions. However, the fundamental resource values emphasized by these two agencies are likely to draw different actors, produce different patterns of interaction, and influence planning and documentation strategies. Ultimately, on-the-ground strategies and techniques produced at the operational level are influenced not only by ecological considerations (physical attributes), but also by a concatenation of institutional effects that run from an agency’s mission down through collective choice institutions and patterns of interaction.

**Agency Objectives: Framing Fuel Management Strategies and Techniques**

Despite overlapping ecosystems and the shared threat of catastrophic wildfire, institutional differences among the USFS, NPS, and state trusts can translate into different ways of addressing fire and fuel management. This section examines how fire and fuel officers perceive their roles within their agencies and forest or park units in terms of (1) how they rate the relative importance of different resource values within their units, (2) how an understanding of mission and resource values translates into particular fuel and fire management strategies, (3) the role and necessity of fuel reduction in each agency, and (4) the techniques of fuel reduction employed and emphasized by different agencies.

**How Fire and Fuel Officers Understand Their Role in Their Agencies and Units**

For line officers, their understanding of their agency’s and unit’s mission helps them evaluate which resource values are important, and this, in turn, helps them develop appropriate fire management strategies focused on protecting and enhancing those values. In the fire and fuel officer survey, each respondent was asked to rate the importance of eight resources used in their forest or park unit on an 11-point scale, where 0 denoted “not important” and 10 denoted “extremely important.” In all, 27 USFS, 18 NPS, and 12 state officers responded. Table 1 reports the average responses and standard deviations for each of the three agency categories.

The data in table 1 are telling on several dimensions. First, officers in state trust agencies acknowledged a high priority placed on commodity-based resource uses such as timber, grazing, and mineral extraction. This is not surprising because of the constitutional mandate of state trusts. On this same basis, the NPS responses also are not surprising in that recreation, wilderness protection, and aesthetic value were rated highest. While wildlife habitat was rated lower, the value’s high standard deviation reflects variable species distributions among different parks and thus the influence of each unit’s physical attributes. The USFS responses offer evidence of more mixed resource priorities, suggesting that the agency’s expanded range of resource priorities over the last few decades effectively has trickled down to the minds of fire and fuel officers. Recreation and watershed were rated highest overall, while traditional commodity uses were rated lowest. The high standard deviation among commodity uses highlights the importance of each unit’s physical attributes—that is, some national forest land contains marketable resources, while others do not.

**Figure 2 Conceptual Framework of How Institutional Levels Interact to Affect On-the-Ground Management**

![Diagram of the conceptual framework for how institutional levels interact to affect on-the-ground management.](image-url)

**Table 1 Fire and Fuel Officers’ Ratings of the Relative Importance of Eight Resource Uses within Their Units**

<table>
<thead>
<tr>
<th>Resource Uses</th>
<th>USFS (N = 27)</th>
<th>NPS (N = 18)</th>
<th>State (N = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial timber</td>
<td>4.57 (2.77)</td>
<td>—</td>
<td>7.13 (2.59)</td>
</tr>
<tr>
<td>Recreation</td>
<td>8.70 (1.26)</td>
<td>9.00 (1.18)</td>
<td>6.23 (2.42)</td>
</tr>
<tr>
<td>Wildlife habitat</td>
<td>7.48 (1.25)</td>
<td>7.82 (2.63)</td>
<td>5.68 (1.76)</td>
</tr>
<tr>
<td>Wilderness protection</td>
<td>7.30 (2.36)</td>
<td>8.68 (1.71)</td>
<td>—</td>
</tr>
<tr>
<td>Aesthetic/scenic value</td>
<td>7.80 (1.58)</td>
<td>8.43 (1.52)</td>
<td>5.36 (2.58)</td>
</tr>
<tr>
<td>Watershed and waterflow</td>
<td>8.54 (1.55)</td>
<td>7.39 (2.77)</td>
<td>6.95 (2.15)</td>
</tr>
<tr>
<td>Grazing</td>
<td>5.59 (2.44)</td>
<td>—</td>
<td>7.50 (1.43)</td>
</tr>
<tr>
<td>Mineral extraction</td>
<td>3.61 (2.65)</td>
<td>—</td>
<td>7.60 (1.90)</td>
</tr>
</tbody>
</table>
Translating Roles into Strategic Objectives
How does a broad understanding of one’s forest or park unit’s resource priorities translate into specific objectives for fire and fuel officers? A number of open-ended questions were asked to elicit what officers believe are their most important fire and fuel management objectives. While each unit has unique resources and needs, the USFS officers emphasized four broad and interrelated objectives: (1) restoring forest conditions to their historical norm; (2) allowing fire to play its natural role as a regulating force in forest ecosystems; (3) mitigating risks to structures, homes, and communities; and (4) preventing the next big catastrophic fire. Several officers also stressed the critical importance of protecting watersheds in their particular locations.

The NPS objectives diverged from the USFS objectives less in kind than in emphasis. The NPS officers consistently stressed that their strategic emphasis revolves around allowing fire to play its natural role on park land. Likewise, they closely linked this objective to returning park lands to their historical norms, much of which is significantly altered. While they acknowledged a responsibility to protect structures and communities, this did not appear as salient as it was for USFS officers. The NPS officers frequently and directly referred to the agency’s preservation and tourism-oriented mission. For instance, great emphasis was placed on their role of habituating the public to the idea of fire as common and natural. The tension between preservation and tourism values was evident, however, in that some officers mentioned calling off prescribed burns on high visitation days for aesthetic reasons. As one NPS officer put it, “Remember, as the summer comes closer, the Forest Service gears up for fires—we gear up for visitors.”

The inclusion of multiple states in the analysis resulted in some variability in terms of roles and strategic objectives on state trust lands. For instance, funding mechanisms for activities such as fuel reduction vary and thus circumscribe the extent to which these projects can be carried out within each state. Another variable is the official in charge of fire and fuel management. In many cases, regional foresters shoulder the responsibility for fire management along with almost all else, reflecting a management structure similar to the USFS prior to the 1970s (Koontz 2002). Nevertheless, as a result of the constitutional mandate to generate revenue for the trust, fuel management is conducted through strategically located timber and salvage sales. As expressed by state officers, however, sustainable industrial forestry requires healthy forests, and a few vegetation management projects may be funded through operations budgets, special requests from the state, federal cost-sharing grants, or leftover emergency search and rescue funds.

The Relative Necessity of Fuel Reduction on USFS, NPS, and State Lands
As part of the 2000 National Fire Plan, all federal agencies are required to map units according to a 1- to 5-point fire regime class (type of fire ecosystem) and a 1- to 3-point fire regime condition class (the ecosystem’s deviation from its historical norm as a result of fuel buildup), where 1 denotes “normal” and 3 means “dangerously overloaded.” According to the federal officers interviewed, almost all of the national forests and parks included in this analysis encompass some mix of condition classes 1, 2, and 3. Of the 25 USFS officers who provided a summary of the condition classes on their forest units, 20 stated that most land was either in condition class 2 or 3. Of the 15 NPS officers who provided a summary, seven reported that the parks were primarily in classes 2 and 3, while eight reported a wide mix of 1, 2, and 3. A few USFS and NPS officers noted that the class system is, at best, a heuristic that cannot replace experience and specialized knowledge; overall, however, fuel conditions are deplorable. For the most part, state trusts do not use the same classification system, although more state land is being zoned in concert with federal agencies. Instead, most develop their own state forest management plans, relying on zoning systems that suit their particular needs. Nevertheless, according to state officers’ assessments, there are significant fuel load problems in many state forest regions.

To measure fire and fuel officers’ own assessments of their units’ conditions, officers were asked to state whether they expected unwanted wildfires in their units to (1) get better, (2) stay the same, or (3) get worse over the next 15 years. The results, shown in figure 3, indicate that 14.3 percent of USFS, 17.6 percent of NPS, and 16.6 percent of state officers anticipated that unwanted fires on their units will get better. Further, 39.3 percent of USFS, 23.5 percent of NPS, and 25 percent of state officers indicated they will stay the same. And 46 percent of USFS, 58.8 percent of NPS, and 58.3 percent of state officers anticipated worse unwanted fires. Thus, according to line officers, conditions are not significantly better or worse for any agency group.

There are many reasons, other than fuel levels, why certain wildfires may be unwanted and why they may become worse in the future, including an expanding wildland–urban interface and the proliferation of bark beetles. However, from a management point of view, the different variables call for fuel reduction; each agency has its own methods of accomplishing that.

Fuel Reduction Techniques
While many fuel reduction techniques exist, the most common are mechanical thinning, prescribed burning, wildland fire use (letting natural fires burn), and timber or salvage sales. From an ecosystems management perspective, the techniques used in a particular project depend chiefly on the physical attributes (conditions, risks, etc.) of the targeted plot. However, institutional differences among agencies significantly influence the techniques used.

From an interagency perspective, the USFS uses the widest array of techniques. All aforementioned techniques are used in some combination in most of the forest units analyzed. Though it is expensive, mechanical thinning (using chainsaws and machinery) is a valuable option for the USFS. This method is used primarily to protect structures, but it also can be used on a larger scale. If conditions are right, prescribed burns are a preferred and often-used option for landscape scale projects because of their typically lower costs and...
their role in reintroducing fire into the ecosystem. Wildland fire use by the USFS is limited in the Rocky Mountain region, largely because national forests contain a small portion (18 percent) of the nation’s designated wilderness areas. Outside these areas, the condition requirements are often so stringent that it is not seriously considered.

Finally, the ability to conduct timber sales starkly differentiates the USFS from the NPS. According to USFS officers, timber and salvage sales offer great potential in helping them achieve their fuel management goals while helping defray costs. In principle, timber projects often encompass multiple goals or are themselves part of larger forest management projects, sometimes known as “big gulps.” In reality, however, several factors limit the use of timber sales for such purposes: (1) the material most in need of removal is largely of low market value, (2) proposed timber sales in this region encounter significant resistance by advocacy groups, and (3) a downturn in timber production since the 1990s has led to a paucity of local mills and contractors.

The NPS instituted an official prescribed burn policy in 1968—a decade ahead of the USFS. However, like their counterparts in the USFS, NPS officers may not always be able to follow this policy because of tourism, dangerous fuel loads, and restrictive smoke regulations. According to NPS interviewees, however, the use of prescribed burning is pushed heavily because of its consistency with the NPS’s naturalistic land management philosophy. This, as well as the fact that parks often encompass designated wilderness areas, places many national parks in a good position to use wildland fire use. The NPS’s naturalistic land management philosophy can create barriers to the employment of other potentially effective methods, however. For instance, while the NPS may employ mechanical thinning, it rarely is used on a landscape scale, and it must be accomplished using low-impact and thus low-tech methods such as horse logging. As a result, progress can be slow and expensive. Moreover, coordinated interagency fuel reduction projects often result in a lack of forest continuity on the borders between agencies.5

The mandate of state trusts to generate income for specified beneficiaries translates directly into their fuel management techniques. Several state officers reminded the interviewer that they are running industrial forestry operations. Therefore, managing fuel problems through commercial timber sales is one of the only realistic options. However, state forest management now faces serious challenges as a result of the decline of mills throughout the region. This is a case in which the evolving decisions and strategies of the federal agencies have had an indirect but remarkable effect on the range of strategies available to state agencies. In the Rocky Mountain region, USFS land, rather than state or private land, historically has produced the lion’s share of commercial timber, thus driving the industry. But when national forests radically reduced their timber outputs in the 1990s, the mills migrated, merged, or shut down. Thus, state agencies that once relied on numerous local mills found it more difficult to sell anything other than large-diameter, high-grade timber—the removal of which does not ordinarily meliorate fuel problems. Consequently, the indirect reliance of state agencies previously on federal agencies (through the support of a timber industry) has been transformed into a direct reliance through interagency fuel reduction programs, often involving some degree of cost sharing.

Agency Constraints: Factors Delimiting Agency Objectives

Decision making is not simply a function of raw goals, but also of constraints that limit a range of actions. In the arena of fire and fuel management, common types of constraints include physical conditions, a lack of funding and manpower, as well as institutions that guide planning and interaction with stakeholders. Interview responses indicated that fire and fuel officers in all agencies are very eager to both reduce fuels and manage from an ecosystems perspective. Yet the eagerness of line officers does not necessarily ensure that management actions will be determined primarily by ecological needs. Just how well do the line officers feel they are able to achieve their objectives? The survey asked officers, “To what degree would you say your forest/park is achieving its goals in terms of reducing the risk of large or unwanted wildfires?” Responses were given on an 11-point scale, where 0 denoted “not achieving goals” and 10 denoted “achieving all goals.” In all, 27 USFS, 15 NPS, and 11 state officers responded. Figure 4 displays the average response and standard deviation for respondents in each agency group.

On average, USFS officers offered the lowest ratings, while NPS officers offered the highest. Even with high standard deviations, two-tailed t-tests indicate a significant difference between USFS and NPS responses (p = .01), as well as between USFS and state responses (p = .10), but not between NPS and state responses (p = .26). It may be the case that NPS officers are able to be more effective in keeping fuel levels under control, but it is important to note that the NPS interviewees generally were less likely to see wildfires as unwanted in the first place. Moreover, as one NPS officer put it, “We’re realistic about what we’re trying to do here.” Therefore, it is possible, at least, that NPS officers may be operating under different expectations than their USFS counterparts rather than experiencing better outcomes in terms of acres restored. An overall lower level of stakeholder conflict also may contribute to that impression (see the section on “Patterns of Interaction”). The data in figure 4 indicate that, on average, officers in the different agencies do not feel completely paralyzed and, for the most part, are able to find ways to achieve most of their objectives. But these data (and more so in open responses) also suggest that officers feel their efforts are not altogether as effective as they might wish.

Figure 4 Degree to Which Forest/Park Units Are Achieving the Goal of Reducing Unwanted Wildfires
Fire and fuel officers were offered multiple opportunities to discuss constraints and obstacles in their own words. To be systematic, several interview questions focused on specific institutional dimensions, including budgets, planning and compliance procedures, interest group interaction, and the agencies’ general stewardship objectives enshrined in their constitutional-level institutions. While a struggle to achieve certain management objectives may reflect a lack of agency leadership and accountability (see GAO 2002), it also may reflect an unresolved tension between an agency’s institutional priorities. To be sure, gridlock attributable to incompatible or inadequately specified management priorities is a common theme in the public lands arena (Cawley and Freimuth 1997; Hoberg 1997; Nie 2008). To examine the role of institutional tension and ambiguity from the perspective of fire and fuel officers, all officers were asked to rate the overall clarity and compatibility of their agency’s array of stewardship objectives on an 11-point scale, where 0 denoted “not clear/compatible” and 10 denoted “extremely clear/compatible.” In all, 28 USFS, 18 NPS, and 12 state officers responded. Figure 5 displays the response averages.

The responses in figure 5 suggest that, on average, federal officers find their agencies’ stewardship objectives tolerably clear and compatible overall. Moreover, it is reasonable to expect that officials in any bureaucracy will find a few puzzling or frustrating components of their mission. However, the responses of their state counterparts indicate that land management does not necessarily have to come from the perspective of fire and fuel officers, all officers were asked to rate the overall clarity and compatibility of their agency’s array of stewardship objectives on an 11-point scale, where 0 denoted “not clear/compatible” and 10 denoted “extremely clear/compatible.” In all, 28 USFS, 18 NPS, and 12 state officers responded. Figure 5 displays the response averages.

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Open responses demonstrated, however, that officers were quite comfortable critiquing specific laws and compliance procedures. The survey asked all officers to list “any acts, procedures, or regulations you can think of that make it particularly challenging for your park/forest to achieve its fuel reduction goals.” The question was open ended (respondents were not supplied with a list of options). However, responses fell within a finite number of categories. Some respondents listed one or more specific institutions; some answered that none came to mind or was particularly challenging; and some responded that the major challenge was not one in particular but the combination of all of them put together (coded in table 2 as “The Whole Combination”). Table 2 displays the number of respondents in each agency group that listed an answer that fell into a particular category. Percentages are included for cross-agency comparison.

As illustrated in table 2, state respondents found regulations and compliance procedures less challenging than their federal counterparts. The data suggest that when the NEPA is applied to state lands in the context of joint projects, however, state officers can find it just as challenging as federal officers. It is noteworthy that state officers would even mention the NEPA. Nevertheless, state officers expressed that a lack of money, manpower, and mills present much greater challenges to their fire management objectives than compliance procedures.

In contrast, many federal officers in both agencies shared a sense that compliance can be challenging at times. Less than one-third of federal respondents reported no challenges. Some differences between the USFS and NPS responses are indicated. For instance, the percentage of USFS officers who found the NEPA challenging is more than twice that of NPS officers. This is not entirely surprising. According to open responses by both USFS and NPS officers, even if the procedures that outline public involvement in decision making are the same for both agencies in law, the different missions of each agency draw different interests and dynamics into the decision process. Thus, the degree of challenge presented by procedures such as those contained in the NEPA may well depend on the parties that invoke them, which, in turn, largely is determined by an agency’s high-level institutions. As one NPS officer suggested, “Groups that have cause to complain are usually onboard with our general mission, so the parks are left alone. The Forest Service has pressure from everywhere so they have plans up the wazoo.”

The term “challenging” does not imply insuperability. Indeed, many federal officers who listed particular institutions as challenging also mentioned in their open responses that some of the more challenging procedures are functional and/or important despite adding delays or expense to the process. As one officer stated, “[NEPA is] a good management tool until they start playing cute with the process and use it as a club to beat you with.” However, some interviewees expressed more direct condemnation of the laws themselves. For interagency comparison, a follow-up question was presented: “To what degree would you say these acts, procedures, or regulations [listed by respondents] impede your forest/park’s progress in achieving its fuel reduction objectives?” Answers were given on an 11-point scale, where 0 denoted “do not impede” and 10 denoted “impede greatly.” In all, 30 USFS, 16 NPS, and 12 state officers responded. Figure 6 displays the average response and standard deviation for each agency group.

A salient feature of the data in figure 6 is the high standard deviation for each agency group, reflecting, in part, variation among

Table 2 Acts, Procedures, or Regulations that Fire and Fuel Officers Find Particularly Challenging

<table>
<thead>
<tr>
<th>Acts, Procedures, Regulations</th>
<th>USFS (N = 30)</th>
<th>NPS (N = 16)</th>
<th>State (N = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing particularly challenging</td>
<td>7 (23%)</td>
<td>5 (31%)</td>
<td>8 (67%)</td>
</tr>
<tr>
<td>National Environmental Policy Act (NEPA)</td>
<td>20 (67%)</td>
<td>5 (31%)</td>
<td>3 (25%)</td>
</tr>
<tr>
<td>Endangered Species Act (ESA)</td>
<td>14 (47%)</td>
<td>6 (38%)</td>
<td>2 (13%)</td>
</tr>
<tr>
<td>Air and smoke regulations</td>
<td>19 (63%)</td>
<td>4 (25%)</td>
<td>3 (25%)</td>
</tr>
<tr>
<td>State historic preservation office regulations</td>
<td>7 (23%)</td>
<td>3 (19%)</td>
<td>0</td>
</tr>
<tr>
<td>Conflict regarding roadless rule</td>
<td>7 (23%)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Appeals process in particular</td>
<td>12 (40%)</td>
<td>1 (6%)</td>
<td>—</td>
</tr>
<tr>
<td>Whole combination</td>
<td>15 (50%)</td>
<td>7 (44%)</td>
<td>0</td>
</tr>
<tr>
<td>State version of NEPA</td>
<td>—</td>
<td>—</td>
<td>2 (13%)</td>
</tr>
</tbody>
</table>
individual forest and park units in terms of local conditions, both natural and political. From an interagency perspective, officers in the two federal agencies felt that their progress generally is more impeded by compliances than their counterparts in the states agencies. It is also noteworthy that almost all of the federal officers who listed no specific compliance procedures that were particularly challenging in the previous question still offered a positive value, indicating impediment, for the follow-up question.

Open responses by federal officers reveal that frustration over compliances often is more focused on the rate of policy change and instability rather than the laws themselves. Many volunteered comments such as, “Our paradigms keep changing … It’s like every four years you have to relearn all the policies and processes,”10 “It’s like flavor of the month,”10 and “Just learning to adapt to new policies is an obstacle. The rate of change is phenomenal. You have to adapt or get out—it’s really frustrating.”11 According to these officers, the primary difficulty with such rapid change is uncertainty over which strategies to invest in, making it difficult to address a problem that, ecologically, operates on a long-term time scale.

**Patterns of Interaction: Communication, Coordination, and Obstruction**

While appropriate fuel reduction techniques essentially depend on the current and desired physical conditions of an ecosystem, the process of restoring a forest plot can vary depending on the institutions and actors guiding the decision process. An agency’s mission, as well as the institutions that support and facilitate that mission, helps determine which actors may be involved and the nature of that involvement. In general, federal agencies promote more citizen participation in forest management decisions than state trusts (Koontz 2002). But while many of the statutory procedures that define citizen participation (such as the NEPA) may be shared among federal agencies, other institutional factors such as an agency’s mission may produce different patterns of interaction and, ultimately, different outcomes.

Patterns of interaction and, ultimately, different outcomes. Other institutional factors such as an agency’s mission may produce different patterns of interaction and, ultimately, different outcomes. For federal agencies, project-level plans that include fuel reduction measures are required under the NEPA. In accordance with the NEPA’s administrative appeals procedures, the public has the right to appeal federal agency decisions. Because of the urgent need for fuel reduction, the federal appeals process has become a major focus of contention, with some actors arguing that it has delayed restoration, while others contending that, overall, appeals have not been an obstacle to genuine ecologically oriented fuel reduction work (Cortner and Vaughn 2004).

The potential delay or increase in costs associated with appeals is dwarfed by lawsuits—should they occur—as they potentially can take years and massive resources to resolve. The sharp increase in lawsuits directed at USFS decisions in recent years has made contentious litigation a defining feature of public land policy (Hoberg 1997). Responding to the horrendous fire seasons of 2000 and 2002, a Government Accountability Office report (2004) found that neither appeals nor lawsuits had a significant impact on non-timber-related fuel reduction projects on a nationwide basis. The USFS responded, however, that appeals and lawsuits significantly hold up projects in particular regions and forests, and, moreover, that the frequent threat of appeals and lawsuits promoted a costly, redundant, inflexible, and legalistic planning process on a widespread scale. Open responses by USFS officers confirmed that significant time and resources are devoted to making proposed projects “appeal-proof” and “lawsuit-proof.” In an effort to compare the perceived impact of the specter of lawsuits between agencies, the survey asked all officers, “To what degree does the anticipation of lawsuits constrain your forest/park’s ability to reduce fire risks, if at all?” Answers were given on an 11-point scale, where 0 denoted “does not constrain” and 10 denoted “constrains greatly.” In all, 27 USFS, 16 NPS, and 12 state officers responded. Figure 7 displays the average and standard deviation for each agency group.

The data in figure 7 pertain to the threat of lawsuits only, not the threat of appeals. While the threats of lawsuits may be pervasive in many national forests, there typically is only one lawsuit filed for every eight appeals against USFS decisions (GAO 2003). The relatively low averages across all agency groups in figure 7 support the GAO’s finding that lawsuits do not have a significant impact on non-timber-related fuel reduction projects overall. On the other hand, the high standard deviations support the USFS’s contention that some of the fiercest battles between stakeholders are focused on certain forests. On a comparative dimension, the data in figure 7 indicate a significant difference between USFS and NPS response averages. Two averages are included for the NPS: one with every response included and one with one park (two respondents) excluded. According to the officers interviewed, interaction has been exceptionally contentious at this particular park. The differences between USFS and NPS responses indicate support for the NPS officer’s remark (quoted earlier) that, in contrast to the USFS, groups that have cause to complain are usually onboard with the NPS mission, and so the parks generally are left alone.
Most interaction with stakeholders does not revolve around lawsuits. However, according to USFS officers in particular, a great deal of time and expense (often the majority of their work) goes into making project documents “appeal-proof”—an effort that may feel reduces both effectiveness and efficiency. Some USFS officers noted that stakeholders have adopted a strategy of blocking projects on the basis of procedure rather than opposition to a project’s goals. NPS officers mentioned far fewer conflicts with outside actors than their USFS counterparts. According to federal officers, there are two primary reasons for this. First, the USFS’s multiple use mission produces a great variety of actors with interests or stakes in forest management. As one USFS officer put it, “At the 11th hour you get people giving their concerns, coming out of nowhere—all different groups, all wanting different things.” Second, strategic and contentious blocking is more common when commercial timber sales are involved (the NPS does not conduct timber sales). Yet commercial timber sales alone do not explain the USFS’s challenge, as external opposition does little to thwart timber sales on state trusts. It is, instead, an interaction between the USFS’s constitutional mission, which includes timber production, and collective choice institutions that promote heavy external involvement in decision making.

No officers were asked specifically about internal interaction within the agency or forest or park unit—an oversight that became apparent during interviews with NPS officers. In response to questions about generic obstacles to fuel reduction, 3 of 30 USFS officers mentioned internal disagreements. In contrast, 10 of 18 NPS officers volunteered that internal disagreements present significant obstacles to fuel reduction work—some going as far as to say that these present the biggest obstacles of all. Given that both national parks and forests employ a range of different specialists, this finding is somewhat unexpected. If there is a systematic difference between federal agencies in this regard, it may be attributable to agency norms or institutional differences not identified in this study. With less external conflict overall, however, it is possible that NPS officers’ attention is more easily drawn to squabbles that occur within. An important exception occurs in what NPS officers identified as “political parks,” so named because of their high public profile. In these parks, a high level of interest group conflict, appeals, and lawsuits presents significant challenges for NPS fire and fuel officers. In these cases, the absence of commodity-based resource uses does little to shield the agency when institutions that promote potent citizen involvement are combined with a particularly high profile.

In contrast, management processes on state lands do not attract a wide range of powerful interests, nor are state planning documents legally enforceable by outside parties. The former is largely attributable to the latter, as interest group resources are better spent on agencies they are more likely to affect. Most state agencies have formalized processes by which the public can air their views, including advisory meetings, posting notices, and even streamlined state versions of the NEPA. However, in most cases, negotiating with complainants is informal. For the most part, state interviewees indicated that they try very hard to coordinate with the interests of the public. Moreover, there was little evidence that they saw their relationship with outside actors as adversarial—with the exception of a few private landowners who would not allow contractors hired by the state to cross their land (state employees cannot be refused access, but private contractors can). As mentioned, state and federal joint fuel projects are increasingly common. According to officers on both sides coordination is usually easy and professional. However, state officers remarked that such projects are frustratingly slow because of federal compliance procedures.

**Effects on Time and Costs**

State officers’ views on joint projects are put into perspective when the time and costs associated with fuel reduction projects are considered. Federal officers provided anecdotal evidence that fuel reduction projects can be unnecessarily long. Unfortunately, none of the agencies included in this study maintains records of the actual amount of time invested in their efforts. In order to gain a comparative impression, each officer was asked to estimate approximately how long it takes to complete a “typical” fuel reduction project within his or her forest or park unit from start to finish, where “start” begins with the initiation of the project planning process and “end” represents the completion of the work. In all, 28 USFS, 17 NPS, and 12 state officers responded. Figure 8 displays average responses and standard deviations for each agency group.

There is no significant difference between the average estimates offered by officers in the two federal agencies. However, there is a clear disparity between the estimates offered by state and federal officers. All respondents were asked to estimate a time frame regardless of method. Responses by both state and federal officers indicate that planning and compliance procedures are the controlling factors in terms of time investment; therefore, the particular technique does not significantly affect the time estimation for a typical project. State officers offered estimates that included timber harvesting as a fuel reduction technique. Although the time frame disparity between state and federal projects may reflect a difference in project scale (i.e., bigger projects take longer), many state timber harvesting projects rival those of the USFS.

The costs of fuel reduction are difficult to compare on an interagency basis, in part because the state agencies analyzed were not able to provide financial data regarding fuel reduction. In addition, federal records do not separate out the costs associated with planning and compliance procedures—costs estimated by federal officers to compose well over 50 percent of their fuel budgets. With that ratio in mind, however, implementation costs do provide a notable contrast. Three years of implementation expense data for the six states analyzed in this study (see table 3) indicate that national parks spend almost four times per acre as the USFS.

Although the implementation costs are not broken down by prescribed burn (“Rx burn”) and mechanical thinning (“mech”), both agencies applied them in approximately the same ratios. The cost disparity is largely a reflection of the strategies and techniques utilized, which, in turn, flow from the institutional mission of the

![Figure 8: Average Time Required to Complete a “Typical" Fuel Reduction Project from Start to Finish](image-url)
agencies. As noted, the NPS often must use low-impact and thus low-tech methods to achieve their fuel reduction objectives.

Discussion
So-called institutional arrangements previously have been identified as one of the biggest obstacles to adaptive, ecologically oriented management (Doremus 2001; Nie 2008). However, it is the opinion of the author that arguments linking management challenges to institutional arrangements can benefit from the structure provided by the institutional analysis and development framework. In this regard, an acknowledgment of nested institutional levels is helpful in that it allows an examination of outcomes as a result of the effect and interactions of multiple layers. The outcomes of interest here pertain to on-the-ground management decisions. In focusing on the institutional guidelines and constraints faced by the line officers who are responsible for developing and executing fire and fuel management projects, the analysis sheds light on how well these agencies are adapting to the wildfire crisis. Institutional effects on decision making and outcomes for each agency group are discussed in this context here.

How is the USFS adapting to the wildfire crisis? From a political perspective, considering the negative attention they are receiving, not very well. The criticism is understandable because progress is slow and expensive, there is significant conflict over many projects, and conditions seem to be getting worse, even from the perspective of fire and fuel officers. These variables are interconnected. Progress is slow and expensive because there is significant conflict over many projects, defining the patterns of interaction at this level of decision making. Even if a project does not attract actual appeals or lawsuits, line officers are inculcated with the need to produce exhaustive, legally defensible plans and documents. Yet doing so is not based on their professional judgment of what constitutes an appropriate management approach. Indeed, most officers referred to the planning process overall as redundant, expensive, and even wasteful. But, as many also mentioned, the (collective choice) institutions that specify planning procedures are important mechanisms for accountability and oversight and are not the themselves the problem. Instead, they only become a problem when interests “use it as a club” to beat them with. But the USFS happens to get hit with that club frequently, largely because of its constitutional institutions, which present the USFS as a true multiple use agency. The interaction of the agency’s constitutional institutions, which attract a huge range of stakeholders, interacts with a wide variety of federal collective choice institutions that provide potent modes of external participation in agency decision making. From the perspective of on-the-ground management, the result is fuel reduction activity that is episodic, expensive, and highly contested.

Although the USFS has received the most attention from politicians and the media, the ecological conditions of national parks generally are not better. Moreover, fuel reduction on park lands tends to be less efficient. In this case, however, this is not attributable primarily to conflict over specific projects, but rather to the low-impact, low-tech techniques that derive from the preservation dimension of their constitutional-level institutions. These constitutional-level institutions also help explain why the NPS faces less external opposition to management projects overall. As one NPS officer explained, groups that have cause to complain are usually onboard with the NPS’s general mission, so the parks are left alone. So, while NPS and USFS share many collective choice institutions, including protocols outlining planning and public involvement, transaction costs associated with external conflict often are lower. It should be noted, however, that the struggle to manage fire in “political parks” (i.e., high-profile parks) demonstrates that these shared regulations and compliance procedures present the same potential for stakeholder conflict, along with added expense, delay, and negative attention. From this analysis, it appears that, overall, national parks are adapting better than the USFS politically because of the lower levels of conflict and scrutiny. However, from an on-the-ground management perspective, there is little evidence that their fuel reduction efforts are more successful.

Are state trusts adapting better to the shared wildfire crisis in the interior West? It is tempting to say that for officers in charge of fire and fuel management on state trusts, decision making is relatively unconstrained. There are fewer planning constraints for state land management (Koontz 2002). Moreover, the collective choice institutions of federal agencies promote more citizen participation as well as formalized, legal processes by which citizens can force concessions likely to add delays, expense, and technical compromise to particular projects. As a result, state projects often are conducted faster and more cheaply. Management decision making on state trusts still is very much constrained, however, by the constitutional mandates to generate income for the trusts. In fact, a series of school right-of-way court decisions in the last half of the twentieth century established that the definition of “land trust” precludes land uses that conflict with income generation for specified beneficiaries (Souder and Fairfax 1996). While this does not exclude management strategies that provide benefits to the general public, it means that fuel management involves timber sales. Even if this process is faster and cheaper than those on federal lands, however, it does not necessarily mean that it produces better results, especially from the perspective of ecological restoration (recall that 58 percent of state officers stated that unwanted wildfires most likely will become worse on their units over the next 15 years). Moreover, the reduction of the timber industry infrastructure in the Rocky Mountain region has made state agencies increasingly dependent on joint fuel projects with federal agencies.
A comparative analysis of the ecological effectiveness of fuel reduction conducted under different land agencies is beyond the scope of this study. However, it should be clear that on-the-ground management practices by all of the agencies analyzed are not driven solely by ecological considerations or from “adaptive management” principles. In fact, much of the adaptation occurring in fuel management practices is to institutions (and patterns of interaction) that circumscribe how, when, and where fuel projects can be implemented.

On a final note, while the IAD framework perhaps is associated most closely with studies of small-scale, resource governance scenarios in developing countries, this study affirms its utility for understanding large-scale natural resource issues in more advanced democracies.

Notes
1. For example, the disastrous Cerro Grande fire, which destroyed structures at the Los Alamos National Laboratory, started as a controlled burn by the National Park Service.
2. States include Arizona, Colorado, Montana, New Mexico, Utah, and Wyoming. Interviews were conducted in June–August 2005, June–September 2006, and June–August 2007.
3. Personal interview, NPS fire management officer.
4. Interviews with state trust officers support Koontz’s (2002) findings that state and federal foresters do not differ significantly in their qualifications and beliefs. As Souder and Fairfax note, “The forestry profession’s ideological commitment to sustained yield has become an important component of timber trust management, with or without statutory direction” (1996, 167).
5. NPS officers were well aware of the trade-offs between their techniques and those of other agencies. As one NPS officer put it, “I’ll give you an example: we were coordinating with another agency and they did one side of the road and we did the other. On our side we had to use very careful and meticulous mechanical removal, and on their side, they were able to use big mulching machines, and they did it much faster than us—so the forest lacks continuity there” (personal interview).
6. Personal interview, NPS fire management officer.
7. Personal interview, NPS fuels specialist.
8. Personal interview, USFS fire management officer.
9. Personal interview, USFS fire management officer.
10. Personal interview, USFS fire management officer.
11. Personal interview, NPS fire management officer.

References


