Article

Accountability in Collaborative Federal Programs—Multidimensional and Multilevel Performance Measures Needed: The Case of Wildland Fire Prevention

American Review of Public Administration
2022, Vol. 52(2) 95–108

DOI: 10.1177/02750740211050367
journals.sagepub.com/home/arp
SAGE

Charles R. Wise[1]

Abstract

Collaborative programs among Federal agencies, state and local agencies, and private sector organizations are often prescribed to address difficult interdisciplinary and intersectoral problems. Accountability for these efforts is difficult to achieve and has frequently proved elusive. This research explores the nature of the accountability dilemma in collaborative programs and analyzes and illustrates them in the context of wildland fire prevention in the United States. It suggests a multilevel–multimeasurement approach is key to achieving a fuller picture of accountability in collaborative networks.

Keywords

Wildland Fire, Accountability, Collaboration

Introduction

In 2021, the Dixie Fire destroyed more than 60,000 acres in California and constituted the second-largest fire in California's history and burned the town of Greenville. In August 2021, 31,000 Californians across seven counties were under evacuation orders and the Calder fire destroyed most of the town of Grizzly Flats (Firozi et al., 2021). In 2020, California's August Complex forest fire burned over one million acres across seven counties—an area larger than the State of Rhode Island. It cost US$10 billion in property damage and over 2 billion in fire suppression expenses. That was just one fire. California experienced 9,639 fires consuming 4,397,809 acres of land or 4% of California's land. Five of the 10 largest wildfires by acreage in California's history occurred in 2020. Across the United States, 8.6 million acres were burned in 2020. Although this is for just one year, the 10-year average for area burned rose by 150% from 1992 to 2019.

With climate change and prolonged drought in the west, wildland fire problems in the United States will worsen dramatically. The average acres burned annually and the federal appropriations for wildland fire management activities increased and will continue to do so. Federal agencies such as the Forest Service and the Department of Interior have increasingly treated wildfire-prone Federal lands in an attempt to prevent catastrophic fires. Nonetheless, these efforts have not significantly decreased the amount of forest land destroyed as that has increased. The Forest Service has observed about these efforts, "Yet catastrophic wildfires and the corresponding loss of lives, homes, and natural resources have continued to grow, partly because our treatments have been uncoordinated and not at the right scale" (U.S. Forest Service, 2018).

The property losses due to wildland fire have been increasing. Wildfire insured losses in the 10 years between 2002 and 2011 totaled US$7.0 billion, which is a US$6.2 billion increase over the previous decade (Haldane, 2013). These losses are destined to grow due to more buildings near forest lands. From 1990 to 2015, 32 million new homes were built in the wildland–urban interface—a 145% increase (Mietkiewicz et al., 2020).

Congress and the public have been increasingly frustrated not only with the increasing damage to homes and natural resources but also with their inability to ascertain accountability for wildland fire programs, and to discern if there is a way forward to achieve results that would portend problem solution or significant reduction. A significant reason for this frustration is that wildland fire prevention and suppression is the responsibility of Federal, state, and local agencies, which also involves the private sector. Congress has mandated that the Federal efforts be collaborative, and as discussed below, a collaborative structure has

[1]John Glenn College of Public Affairs, The Ohio State University, Oro Valley, OH, USA

Corresponding Author:
Charles R. Wise, John Glenn College of Public Affairs, The Ohio State University, Columbusy, OH, USA.
Email: wise.983@osu.edu@gmail.com

been established. Nonetheless, accountability for these collaborative efforts is not evident. Frederickson (2007) has pointed to a certain tense dynamic between accountability and collaboration: "From the perspective of effective public administration, both the accountability and collaboration movements are positive and important. But there should be no illusion as to their incompatibility" (p. 11).

As such, the wildland fire accountability problem, and the attempts thus far to address it illustrate the nature of accountability issues in collaborative networks. Accountability does not naturally emerge from network processes. Some organizations will collaborate and avoid accountability (Agranoff, 2007; Agranoff & McGuire, 2001; Weiner, 1990), some will collaborate to avoid accountability, and some will hide behind collaboration to escape accountability (Bryson et al., 2016). As Bovins et al. (2008) put it, "When public policy is produced in complex networks featuring multiple, overlapping coordination mechanisms… accountability easily gets lost in the cracks of horizontal hybrid governance" (p. 240). In fact, governments often initiate a collaborative network without knowledge of whether the activity is effectively solving the problem and without effective measures that reveal the extent of the impact of network activities on outcomes (Koontz & Thomas, 2006, p. 240). As will be demonstrated, the wildland fire network exemplifies these phenomena. The questions are of what accountability consists in such a collaborative network, and what measurement approaches are workable in achieving it. This article engages these questions, examines the wildland fire network's efforts in establishing accountability, suggests some measurement approaches, and draws some lessons for furthering accountability in collaborative networks.

Difficulties in Achieving Wildland Fire Prevention: Issues in Network Accountability

The wildland fire prevention problem has been recognized at the highest level of The Federal Government. On December 21, 2018, a Presidential Executive order declared, "For decades, dense trees and undergrowth have amassed in forests, rangelands, and other Federal lands, fueling catastrophic wildfires…With the same vigor and commitment that characterizes our efforts to fight wildfires, we must actively manage our forests, rangelands and other Federal lands to improve wildfire risk" (E.O. 13,855). This order denotes that it is national policy to manage Federal lands in order to reduce the risk of wildfires and sets out goals for Federal departments.

The dilemma that the President, Congress, and the public immediately confront in demanding accountability for Federal wildland fire prevention efforts is that the prevention of wildfires is not the responsibility of a single department or agency. The management of Federal lands is spread among the Department of Agriculture's Forest Service and the Department of Interior's Bureau of Land Management, Fish and Wildlife Service, National Park Service, and Bureau of Indian Affairs. A national focus on wildland fire prevention cannot even be confined to these Federal agencies because state forest lands and private forest lands are too intermingled with Federal lands. A fire that starts in non-Federal lands can readily spread into Federal lands and vice versa. Thus, the responsibility for preventing wildland fires in the United States is really that of a network of Federal and state agencies and some private actors. So, in its essence, the Federal Wildland prevention problem is not an agency problem but instead a network problem.

Until recently, the Federal government did not approach the issue as a network problem. For decades, it was treated as an individual agency by individual agency responsibility. Agencies just planned and executed programs on their own in an uncoordinated fashion. This began to change in the early 2000s. Encouraged by congressional committees, the Departments of Agriculture and Interior in 2002 established the Wildland Fire Leadership Council (WFLC) to support the implementation and coordination of Federal fire management policy. WFLC is an intragovernmental and intergovernmental committee of Federal, state, tribal, county, and municipal officials convened by the secretaries of Interior, Agriculture, Homeland Security, and Defense. Its mission is to provide strategic recommendations to ensure policy coordination and accountability and effective implementation of Federal wildland fire management policy.

With respect to accountability, the Council did at one time undertake the issue of performance measurement. In January 2013, a performance measurement task group was convened and proposed several performance measures that could be used to track progress in achieving the broad agenda of wildland fire prevention. However, the Wildland Fire Executive Council, a former advisory council to the WFLC, concluded that while performance information for many of the 2013 task force group's proposed measures could be collected using reporting measures the agencies already had in place, fully implementing the proposed performance measures would likely place undue burdens on the agencies and nonfederal partners (GAO-17-357, p. 40). Subsequently, no unified performance measurement system was adopted or implemented. So, while the Federal agencies have formally recognized that wildland fire prevention must be a collaborative enterprise among Federal agencies (and nonfederal entities), the network leadership has declined to adopt a coordinated accountability mechanism.

Developing a Network Strategy: Accountability is Missing

Although the land management agencies have individually developed plans to reduce wildfire risk for the lands they individually manage, for a long time and for a number of

reasons, they worked largely on an individual basis. There was not a cohesive overall Federal Government plan and program or accountability measures to achieve a national reduction in wildland fire. Critics have pointed to the lack of appropriate accountability mechanisms for agencies in charge of implementing the National Fire Policy. Too often, the accountability has been pursued episodically and focused on what went wrong in preplanned burns or fire suppression without an appropriate appreciation of the necessary balance between accountability and risk (Wise & Freitag, 2002). Because of accountability concerns, in the late 1990s, congressional committees asked the General Accountability Office (GAO) to investigate what the land management agencies—Departments of Interior and Agriculture—were doing to manage fires and fire preparedness programs and their associated costs.

In a series of reports, GAO found that the absence of a cohesive federal government strategy that encompassed and guided management of all the programs being operated by the Departments of Agriculture and Interior were hindering the ability of the Federal Government to address the growing incidence of wildfires and the rapidly increasing costs of containing them. In a series of reports, GAO recommended a cohesive strategy to better address the interrelated nature of fuel reduction efforts and wildland fire response (GAO-05-147, 2005; GAO-06-67IR, 2006). In 2009, GAO reiterated its findings that a cohesive strategy was required and reported that while the land management agencies had primarily concurred with the recommendation, they had yet to develop a cohesive strategy, for example, laying out various potential approaches for the growing fire threat, estimated costs associated with each approach, and the trade-offs involved. In response to this finding, Congress passed the Federal Land Assistance, Management, and Enhancement Act of 2009 (Flame Act of 2009), which directed the Secretaries of Interior and Agriculture, acting jointly to submit to Congress a report that contains a cohesive wildfire management strategy, consistent with the recommendations described in the reports of the GAO regarding management strategies. The cohesive strategy was intended to provide a nationwide framework designed to integrate fire management efforts across jurisdictions, manage risks and protect firefighters, property, and communities (GAO −09 877, 2009). It was supposed to push agencies to come together to set national goals for wildland fire prevention and establish accountability for reaching them.

Federal Departments Adopt a National Strategy

The National Cohesive Wildland Fire Management Strategy was issued jointly by the Secretaries of Agriculture and Interior in 2014. It specifies three goals:

1. *Restore and maintain landscapes:* Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
2. *Fire-adapted communities:* Human populations and infrastructure can withstand a wildfire without loss of life and property.
3. *Wildfire response:* All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions (National Strategy, 2014, p. 3).

The National Strategy was produced in a collaborative effort by Federal, state, local, tribal governments and nongovernmental partners, and public stakeholders. It explicitly calls for collaboration among the parties to execute it. Specifically, it calls for:

- Strategic Alignment, where all parties agree to the same goals, principles, and strategic course of action.
- Collaborative Engagement, which includes governance, shared information, resources, communications, and monitoring and accountability.
- Programmatic Alignment, where an individual agency or organizational objectives are explicitly supportive of the national cohesive strategy goals (National Strategy, 2014, p. 2).

With respect to accountability, the Strategy calls for three types of measurement—a set of national outcome performance measures, intermediate measures, and efficiency measures. The national outcome performance measures are supposed to allow Congress, the National Wildfire Management Community, and other stakeholders to monitor and assess progress toward achieving the results for each of the three national goals. Agencies and organizations with a stake in wildland fire management are encouraged to seek alignment with or incorporation of a shared set of national outcome measures into their own planning and performance processes. Intermediate measures are supposed to be specified. They are statements describing the level of performance to be accomplished within a time frame expressed as a tangible, measurable objective or a quantitative standard, value, or rate. In the wildland fire context, this logically translates to actual outputs, such as the number of acres treated so as to prevent catastrophic fire. They are intermediate in that achievement of a certain number of acres treated may or may not lead to projected outcomes, such as reduced fire hazards. Outcome measures are also needed. Efficiency measures are also supposed to be employed. The Strategy does not definitively specify efficiency measures but states they are used to track priority investments by Cohesive Strategy goal over time, with the intent of establishing trend information on the effects of investments to achieve goal outcomes and to help assess which investments are achieving the most cost-effective means of achieving goals. Thus far, however, there is

no national integrated measurement system. After reviewing the state of performance measurement in the U.S. Forest Service, Schultz et al. (2019) call for "…more dialog about the import of different performance measures and how to prioritize them. At present, priorities are unclear and different measures provide conflicting incentives. Further, some aspects of success as defined by the agency have no clear associated measures" (p. 13). Thus, the accountability for wildland fire prevention on a national basis is not evident. The question is how to achieve national accountability. This requires consideration of the nature of accountability.

Accountability in Public Administration

Accountability in the field of public administration has been conceptualized in various ways (Mulgan, 2002) and various types of accountability approaches and mandates have been observed in governmental systems (Dubnick & Frederickson, 2011; Romzek & Dubnick, 1994). Accountability has evolved from being characterized as "… a fundamental but underdeveloped concept in American public administration" (Romzek & Dubnick, 1987, p. 228) to one in which "[t]he scope and meaning of accountability has extended in a number of directions well beyond the core sense of being called into account for one's actions (Mulgan, 2002, p. 55). Nonetheless, one core sense of accountability is that it embraces being called into account to some authority for one's actions. Increasingly, there has been a recognition that the concept of being called into account should include accounting for impact on society. The new public management paradigm emphasized results management with a focus on outcomes and demanded that specified outcomes be readily demonstrable (Behn, 1999; Durant, 1999).

In the practicing realm of governance, the demands for accountability on the part of policymakers and the public have evolved over time. Expectations have moved from just being able to demonstrate adherence to lawful authority and accounting for inputs to demonstrating efficient production of outputs, and then to measuring the effectiveness of agency programs on producing improved outcomes in society. In public education, for example, the public is no longer satisfied with school systems reporting on a number of students taught, hours of instruction, or a number of graduates but demands the demonstration of educational outcomes in terms of student learning and graduates' ability to perform in jobs postgraduation. The No Child Left Behind Act and subsequent Federal legislation is a manifestation of that. So, too was the Congressionally enacted Government and Performance Results Act (GPRA). The GPRA embraced the demand for Federal agencies to demonstrate the impact of agency programs on desired outcomes. However, the Act is directed at individual agencies demonstrating the effectiveness of their individual programs. The Act does not effectively address those areas of Federal government responsibility that involve multiple agencies—particularly those activities that require the collaboration of multiple agencies to integrate their activities to achieve desired outcomes (GAO-13-518).

Accountability in Collaborative Networks

As defined by Provan et al. (2007) whole networks refer to "a group of three or more organizations connected in ways that facilitate achievement of a common goal and are formally established and governed and goal-directed, rather than occurring serendipitously, and relationships among network members which are primarily non-hierarchical" (p. 282). Networks typically involve a multiorganizational arrangement for solving public problems that cannot be achieved, or achieved easily, by single organizations and which are led or managed by government representatives (Agranoff & McGuire, 2001, p. 296). In public administration collaboration among entities has increasingly been the focus of scholarly inquiry (Agranoff, 2012; Blomgren-Bingham & O'Leary, 2009; Emerson, 2015). As one researcher has opined, "Collaboration has become the predominant approach to solving complex public problems" (Silvia, 2018, p. 472). Prominence, however, does not guarantee that those adopting the approach in practice will be effective in solving particular problems. As has been pointed out, many difficulties can arise in achieving effective collaborations. So, in determining how to collaborate, public managers along with their partners should think critically about the nature of their joint work, the expected duration of their joint activities, the level of investment they are willing to make in the collaborative process, and the kind of public value they want to generate (Prentice et al., 2019). The task is complex in that there are many public values at play (Clark, 2021).

Thus, in assessing whether a particular network initiative is worth it, it is incumbent upon policymakers to assess their effectiveness. Government officials and public administration researchers may hold various rationales for desiring accountability from networks. Whatever rationale is adopted, just having a rationale, however, does not ensure that accountability will be attained. Page's study of interagency collaboratives revealed that 60% of the collaboratives examined did not have any outcome measures (Page, 2004). As Silvia observed, "Regardless of the philosophic rationale for the accountability strategy, accountability is very complicated in a collaborative environment" (Silvia, 2018, p. 473). The difficulties in determining the effectiveness of programs in a collaborative enterprise are understandable given the various organizational participants who constitute the network. Each network participant faces the potential of three different influences as they conceptualize what effectiveness means to them. They have their own opinion, the perspective of their home organization that they represent, and the collective view of the network (Silvia, 2018; Head, 2008). To these, should be added the perspectives of political overseers and the public.

When it comes to assessing network effectiveness, Mandel and Keast advocate that benefits be considered at three levels of network operations—operating, organizational, and environmental. The operational level refers to interaction between network participants, such as whether they have developed a shared language and culture; the organizational level refers to the network itself, including things such as whether a shared vision has been created; and the environmental level involves the network's ability to successfully meet the needs of stakeholders and constituencies (Mandel & Keast, 2008). Silvia (2018) points out that one evaluation challenge is the question regarding when to assess the effectiveness of collaboration and suggests, "…predominantly organizational and operational level effectiveness measures are appropriate at the early stages of collaboration" (p. 475). This then brings evaluation at the environmental level to the fore. "The home organization wants evidence to justify their decision to expend resources in support of the network. The constituencies of the collaborating organizations want to see their funds are being used wisely. And those who are being served by the network want their situation to be improved as a result of the collaborative endeavor" (Silvia, 2018, p. 476).

The attributes of wildland fire prevention exhibit several particulars explained in the public administration literature. The network, the WFLC, was initiated to bring together agencies to coordinate their fire prevention activities (as well as their fire suppression activities). This constitutes a recognition that wildland fire prevention is a network problem requiring a collaborative network solution. After considerable time and being nudged by Congress, the WFLC did produce a shared vision in the form of the National Cohesive Strategy. However, as Bovins et al. (2008) has observed what often happens in networks, accountability "got lost in the cracks of horizontal hybrid governance" (p. 240). Thus, the focus now extends beyond the operating and organizational levels to the environmental level, that is, effectiveness in impacting the occurrence and intensity of wildland fire. The multiple agencies involved each have their own opinions about effectiveness. Measuring effectiveness at the individual organizational level has progressed somewhat. Measuring effectiveness at the environmental level has lagged.

The accountability challenge for wildland fire prevention requires multiple measures at multiple levels. The levels include Program, Bureau, Department, Federal Government, State and Local Governments, and Network.

This implies recognition that performance measures are needed at the various levels to guide decision-making at those levels. It also means that it cannot be assumed that measures employed at one level can necessarily be aggregated to serve to illuminate goals attainment at other levels. For example, measures employed at the program level may be useful at that level but may not reveal how the entire Federal government is performing in achieving national goals.

Developing an Accountability System for Wildland Fire Prevention at the Federal Level

So, what should constitute an accountability system for Federal wildland fire prevention? The answer to that question starts with an examination of the goals for prevention. In the National Cohesive Strategy, wildland fire prevention is set out with the following goal: "Restore and maintain Landscapes: landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives." The Strategy calls for "a set of national outcome measures, intermediate measures, and efficiency measures" (National Strategy, 2014, p. 68) but does not specify what they should be. Instead, with regard to outcome measures, for example, it merely states, "Agencies with a stake in wildland fire management will be encouraged to seek alignment with or incorporation of a share set of national outcome measures into their own planning and performance processes" (68). The National Cohesive Strategy does not specify what constitutes "landscape resilient disturbances." Instead, it leaves it to the individual agencies to develop an aligned performance measurement system, which to date they have not accomplished.

Part of the challenge in developing overall performance measures for the Federal government is achieving goal clarity across the multiple agencies that constitute the government. Even within agencies, achieving goal clarity has been difficult. Schultz et al. examined policies and performance measures within the U.S. Forest Service and found two competing definitions of the fire problem—one which views fire as an ecological process and a natural process to be managed, and another which views fire as risk, focusing on catastrophic fire and the need to protect resources and control fire. They conclude "Our observation is that, rather than utilizing a complex definition of the fire problem, current agency policy effectively includes two competing definitions of the fire problem. Thus, the problem as structured within the U.S. Forest Service involves goal ambiguity in multiple ways, including how to reconcile these two conceptualizations of fire priorities among the risks associated with decision making in various aspects of fire management, and how to evaluate success, given that performance measures often track competing outcomes" (2019, 9). Schutz et al. find that this goal ambiguity has consequences for Forest Service performance measurement "…performance measures track different priorities and sometimes competing objectives without clear priorities for accomplishment" (2019, 9).

It should be expected that agencies pursue multiple goals, some of which are overlapping, others which are competing with each other, and some of which stand alone. Thus, measures adapted to various goals may be appropriate at the program and agency levels. Nonetheless, it cannot be assumed that existing agency level measures are easily aggregated to reveal progress at the Federal government or

network levels, signifying the degree of achievement of the national goals. The way forward cannot be for the land management agencies to continue to disagree on goals and for that disagreement to continue to cause no overall performance measurement. That means no accountability for federal wildland fire programs. Although there may be other goals worth measuring, the degree of reduction of wildland fire hazards should be a priority if the National Cohesive Fire Management Strategy is to have any meaning and impact.

It is not just clearing up goal ambiguity that is the problem with the overall wildland fire effort. Determinations must be made about competing goals to focus network operations. One choice is to focus on reducing wildland fire hazards closest to the Wildland Urban Interface (WUI) where buildings are close and/or intermingled with wildland vegetation, in order to try to minimize the damage to human lives and property. That choice would focus on hazard reduction operations closest to inhabited areas but could incur more cost per treated area resulting in fewer hazardous acres treated. Another choice is to maximize overfall forest resilience that is threatened by catastrophic fires. That may focus operations on areas that exhibit the highest hazard categories for catastrophic fire. Many of these are a good distance from inhabited areas. Another choice is to maximize timber production in order to both reduce fire incidence and generate additional revenue to offset the cost of fire prevention. That may focus operations on areas with trees most valuable for wood production. However, it cannot be assumed that those areas containing the highest value timber exhibit the highest levels of fire hazards. They can be just those areas that contain the largest trees, and which provide the easiest access.

Since the formation of the National Cohesive Strategy, the President has set goals and performance measures for wildland fire management focused on prevention in the form of a presidential executive order. Executive Order 13,855 issued on December 21, 2018, "Promoting Active Management of America's Forests, Rangelands, and Other Federal Lands to Improve Conditions and Reduce Wildfire Risk" directs the Secretaries of Agriculture and Interior to develop goals and implementation plans for wildfire prevention activities and programs. It directs them to establish specific quantitative objectives to accomplish wildfire prevention. It directs the Department of Interior with respect to DOI administered lands to:

(A) Treat 750,000 acres to reduce fuel loads
(B) Treat 500,000 acres to protect water quality and mitigate severe flooding and erosion
(C) Treat 750,00 acres for native and invasive species
(D) Offer 600 million board feet of timber for sale to reduce vegetation
(E) Perform maintenance on public roads to provide access for emergency services and restoration work

It directs the Department of Agriculture with respect to Forest Service administered lands to:

(A) Treat 3.5 million acres to reduce fuel load
(B) Treat 2.2 million acres to protect water quality and mitigate severe flooding and erosion
(C) Treat 750,000 acres for native and invasive species
(D) Offer for sale 3.8 billion board feet of timber to reduce vegetation
(E) Perform maintenance on public roads to provide access for emergency services and restoration work

The Executive Order also provides that the Secretaries shall consider annual objectives that "meet or exceed" those specified in the order and refine and develop performance metrics to better capture the risk reduction benefits achieved through the application of these management tools. It also directs the Secretaries to identify their administered lands with the highest probability of catastrophic wildfires, as well as areas on those lands where there is a high probability that wildfires would threaten people, structures, or other high-value assets in order to direct and prioritize actions to meet land management goals and to protect communities.

Pursuant to the President's Executive Order, the Secretary of the Interior issued a Secretary's order (3372) to implement the President's order. It states, "During the past three years, wildfires have covered an average of 3.49 million acres of Department-managed land per year" and "directs the heads of Interior's bureaus to collaborate with the Department of Agriculture" to "identify Federal lands with the highest catastrophic wildfire risks" and to "submit a plan to revise or amend their underlying Land Management Plans to the Deputy Secretary within 60 days of the date of this Order." It also directs the heads of bureaus to "develop performance metrics that better capture the risk reduction benefits of fire management tools enunciated in" the President's Executive order and the Secretary's order (Secretary of Interior, 2019).

GAO reported that Agriculture and Interior together estimated that over 100 million acres they manage are administered at high risk from wildfires. For fiscal year 2007 through 2018, the Forest Service and Interior implemented fuel reduction projects that treated respectively approximately 1.4 million and 1.1 million acres per fiscal year on average (GAO-20-52, p. 11). For fiscal years 2009 through 2018, Congress appropriated approximately US$5 billion in fuel reduction funds to the Forest Service and Interior, with the Forest Service and Interior annually receiving on average about US$339 million and US$177 million, respectively (GAO-20-52, p. 12).

It will be recalled that the National Cohesive Strategy called for a set of national outcome measures. However, what has occurred is that the individual departments and bureaus have their individual reporting measures. GAO found that the agencies use "success stories" but these

"focus on individual projects or efforts and do not generally indicate the role, if any, that the National Cohesive Strategy played or describe the extent to which the projects of efforts have individually or cumulatively contributed to achieving the strategy's goals. More broadly, the WFLC—the interagency organization responsible for oversight and leadership in implementing the Cohesive Strategy (and which includes the Forest Service and Interior as members)—has not developed measures to assess progress on the part of federal and nonfederal participants in meeting the national goals of the Cohesive Strategy" (GAO-17-357, 2017, p. 40). The GAO did observe, "The Forest Service and Interior each have performance measures to monitor and assess their wildland fire management efforts. For example, one of Interior performance measures is the amount of fuel reduction conducted in the wildland-urban interface (WUI), which is consistent with the Cohesive Strategy's emphasis on resilient landscapes. However, these agency measures are intended to separately assess each agencies performance—or in some cases the performance of specific programs—and do not represent the set of measures to assess national progress toward meeting the Cohesive Strategy's goals as called for in the strategy" (GAO-17-357, 2017, pp. 40–41). GAO concluded, "By working with their WFLC partners to develop measures, the Forest Service and Interior could better assess national progress toward achieving the goals of the Cohesive Strategy" (GAO-17-357, 2017, p. 41). GAO has specifically recommended that the Secretaries of Agriculture and the Interior direct the Chief of the Forest Service and the Director of the Office of Wildland Fire to work with the WFLC to develop measures to assess national progress toward achieving the Strategy's goals.

Thus, overall Federal Government Accountability for wildland fire prevention has yet to be established, but GAO concludes that it can be done. GAO investigations report that many of the measurement efforts now employed in the Federal government are at the program level. The President's Executive Order focuses on the departmental level but concentrates on outputs, that is, acres treated, and not on outcomes, such as degree of hazard reduced, and the prevalence of acres burned. Measuring outputs alone may lead away from risk reduction. GAO's interviews with agency officials revealed that some officials stated that as their annual targets for acres of fuel reduction increase, they may feel pressure to choose projects in locations where they can treat more acres to meet their targets, even if those acres may not be located in the areas at highest risk from wildfire damage (GAO-20-52, p. 36). This is not to say that outputs such as acres treated should not be included. They can and should constitute a part of the set of measures at multiple levels. To ensure that wildland fire risk is reduced; however, measures are also needed that focus on the number of high hazard areas that are moved to a lower level of hazard.

This brings into focus the scale of the Federal government effort and the network effort required to significantly reduce wildland fire intensity and prevalence. The Federal agencies estimate that over 100 million acres they manage or administer are at high risk of wildfire. In 2018, they treated approximately 3 million acres (GAO-20-52). If that treatment rate was to continue, it would take 33 and one-third years to treat all the existing high hazard areas one time. That even is insufficient, because an area once treated must be retreated, or it can revert to a high hazard condition over time. Agency officials try to balance conducting fuel reduction projects in new areas with maintaining areas that have already had initial fuel reduction projects completed. Conducting fuel reduction projects in new areas can be more expensive than conducting projects in previously treated areas to maintain them, because of the different types of treatments needed. For example, officials from one national forest stated that initial mechanical treatments may cost from US$300 to US $1,500 per acre depending on the area to be treated, while conducting prescribed burns to maintain a previously treated area may cost from US$25 to US$100 per acre (GAO20-52, p. 35).

The scale of the wildland fire prevention problem suggests that it is necessary to measure performance at the whole of the Federal government and then for the entire network including states and private lands. This implies for the entire Federal government that the degree of overall hazard reduction in Federal lands should be monitored. This could include not only those lands managed by the Departments of Agriculture and Interior but also the Department of Defense. The whole of government approach also implies joint responsibility between the executive and legislative branch political and policy officials and the administrative departments. If the legislative officials do not appropriate sufficient funds to meaningfully reduce the number of high hazard acres, then it is inevitable that not only will wildland fire intensity and prevalence continue but it will increase. To the public, meaningful accountability does not just mean that some acres were treated, but that the extent of wildland catastrophic fires is reduced.

A Multimeasure Approach for Assessing Wildland Fire Prevention

Multiple performance measures need to be employed to assess accountability. As called for in the National Cohesive Strategy, intermediate measures, efficiency measures, and outcome performance measures need to be included. Intermediate measures or outputs would include the types of measures that are included in the presidential executive order. Nonetheless, when measuring acres treated, it would be important to include all types of treatments including fire use, which involves allowing naturally starting fires to burn in low intensity. This recognizes and

uses the historical role of fire in maintaining forest health and can be just as effective in preventing catastrophic fire as mechanical thinning of preplanned burns. In sum, in many areas treated, it would be important to break out the acres treated by treatment modality—mechanical measures, preplanned burns, and fire use. In addition to both fire use and preplanned burns, it would be important to measure the number of acres burned that went out of bounds (outside the planned area) and exceeded low intensity, that is, damaged acres. These latter measures provide an indication that the modalities are achieving their intended uses.

Efficiency is the third accountability issue embraced in the National Cohesive Strategy. Congress has become increasingly concerned about the rising costs of attacking the wildland fire problem. The Department of Interior reports the percentage of area treated to a better condition per million dollars of gross investment for both WUI and non-WUI acres. The results for 2014 to 2018 are found in Table 1.

As can be seen, the efficiency in the WUI area was better than in the non-WUI area, but there is no trend of improvement in efficiency in either. In part, the better efficiency in the WUI area can be attributed to the fact that the non-WUI areas are more remote and more difficult to access and contain more difficult treatment characteristics. Given this differential, in order to get a more valid measure of efficiency, it would be useful to measure efficiency separately in WUI areas and also in non-WUI areas.

High-value resources (such as houses, businesses, utilities, etc.) have significant concentrations in the WUI. In light of greater ease of access, land management agencies may be disposed to concentrate more treatment activities in the WUI areas. Agencies may be further incentivized to do so by congressional and public desire to protect such assets. However, spatially explicit analyses of exposure to wildfire at large spatial scales have been used to estimate the risk associated with managing wildfire to preserve resources (Ager et al., 2010; Ager et al., 2014). Such analyses reveal that often the areas that pose the greatest risk to such resources as housing are outside the WUI (Ager et al., 2014; Stephens et al., 2016). Such results argue for the use of multiple measures and suggest that measures solely focused on acres treated in the WUI should not constitute a singular focus of accountability. Monitoring of reduction of high hazard areas that may not be close to the WUI should also be conducted. Measures of both would give a fuller picture of hazard reduction.

The next set of measures should focus on outcomes. The first measure could be the percentage increase or decrease in new acres burned by catastrophic fire. After all, the public has witnessed more and more wildland being burned by catastrophic fire and wishes to see less burned. Data posted by the U.S. Department of Interior reveal that acres of all public and private managed lands in the United States experienced burning from 2009 to 2018 for a 10-year average of 6,972,600 acres burned per year. The data also show that the number of acres burned has been increasing over the period. In addition, the amount of area burned from large fires has been increasing over the last decade (Calkin et al., 2015; Westerling et al., 2006). This has been occurring despite federal activities to treat fire-prone lands.

Table 2 shows the number of acres burned by year in the first five-year period and the second five-year period of the decade. The figures show that for the first five-year period, 6,340,332 acres were burned. In the second period, 7,724,868 acres were burned for an increase of 21.8%. Table 3 shows that the increasing pattern persists regardless of land ownership.

The percentage increase for the Department of Interior lands was 26.5%, for the Forest Service 35.2%, and for other 7.1%. It is not the case that all fires are bad for the forests. Low-intensity fires have historically helped to make forests less prone to high-intensity fires by thinning the forests and clearing away low underbrush leaving larger trees less vulnerable. Advocates for incorporating low-intensity fires that are naturally caused argue that fuels treatment "should focus on creating conditions in which fire can occur without devastating consequences" (Reinhardt et al., 2008, 1998). Thus, rather than measuring just the occurrence of fire and the size, measures of intensity could also be employed (North et al., 2012, p. 393). That is, measuring the number of acres burned by high-intensity fire which is highly damaging to forest health and separately measuring acres burned by low-intensity fire that actually preserves forest health would provide a fuller picture of actual

Table 1. Percentage of Acres Treated Moved to a Better Condition Class per Million Dollars of Gross Investment—Department of Interior.

	WUI	Non-WUI
2018	22%	11%
2017	23%	15%
2016	30%	14%
2015	23%	9%
2014	31%	9%

Note. WUI = Wildland Urban Interface.

Table 2. Acres Burned on All Public and Private Lands in the United States, Fiscal Years 2009–2018.

2013	4,319,546	2018	8,767,482
2012	9,326,238	2017	10,026,086
2011	8,711,367	2016	5,509,995
2010	3,422,724	2015	10,125,149
2009	5,921,786	2014	3.595,613
Total	31, 701,661		38,624,343
Avg.	6,340,332		7,724.868
Increase			21.8%

Table 3. Acres Burned by Entity Ownership, Fiscal Years 2009–2018.

	Interior	Forest Services	Other*	Interior	Forest	Services	Other
2013	1,590,130	1,368,644	1,363,644	2018	2,313,690	2,307,439	4,1146,363
2012	4,440,276	2,680,233	2,205,729	2017	3,334,551	2,866,031	3,825,504
2011	1,599,92	1.729,937	5,381,768	2016	1,702,258	1,247,906	2,559,831
2010	1,299,601	1.729,937	5,381,768	2016	1,702,258	1,247,906	2,559,831
2009	2,193,476	715,677	3,013,133	2014	1,241,347	871,876	1,482,390
Total	11,117,175	6,811,221	13,773,037		14,062,300	9,209,554	14,752,481
Avg.	2,223,405	1,362,244	2,754,607		2,812,460	1,841,910	2,950.496
Increase	26.5%	35.2%	7.1%				

*Other includes all federal, tribal, state, and private land not managed by departments of Interior or Agriculture.

outcomes. Thus, one way to proceed is to measure overall acres burned and then in addition provide the subset measures of acres burned by high-intensity fire and the acres burned by low-intensity fire.

A second outcome measure would be directed at resilience. The concept of ecological resilience has been the subject of multiple interpretations (Newton & Cantarello, 2015; Stephens et al., 2016). One way to interpret whether the network's agencies are improving wildland fire resilience is by measuring acres in terms of the level of hazard for fire existing on managed lands. Schultz et al.'s analysis of Forest Service land found that 11% of the wildland acres burned with uncharacteristically high severity. They concluded, "Current treatment rates are insufficient to fully create and maintain resilient landscapes especially in frequent fire rotation areas" (2017, 306). Analysis by Vaillant and Reinhardt of Forest Service lands found that the moderate hazard class represented the greatest land area (41.6 million acres), followed by the high hazard class (35.3 million), then the very low (34 million), then the low class (30 million), and then the very high class (23 million). However, with regard to acres treated by the Forest Service, they found "In the very low and low hazard categories, almost twice the area was treated than burned by wildfire of any severity. The opposite was true for the high and very high hazard classes, where wildfire of any severity accounted for two-thirds of the disturbance each year" (Vaillant and Reinhardt, 2017, p. 305). In effect, treatments were being done more in the low hazard areas than in the high hazard areas. Schultz et al.'s findings were similar, "the very high hazard class had the lowest treatment percentage and the highest incidence of uncharacteristically high severity wildfire out of all hazard classes" (2017, p. 306).

Valliant and Reinhardt concluded that the health and maintenance of fire resilient landscapes include contemporary disturbance (which includes preplanned controlled burns, mechanical and chemical treatments, and managing desirable low-intensity fire) that approximates historical disturbance rates. For this to occur, 6.2 million acres of National Forest lands now need to be treated or experience beneficial wildfire annually (Vaillant & Reinhardt, 2017, p. 305).

Both the Forest Service and the Department of Interior have programs to treat forest areas under their control to reduce wildfire propensity. These programs involve various activities, including preplanned burns, mechanical thinning, chemical treatment, and managing low-intensity fire that starts extemporaneously. The presidential executive order directed the Department of Interior to treat 770,000 acres per year to reduce fuel loads and 500,000 to protect water quality and mitigate flood and erosion. It directs the Forest Service to treat 3.5 million acres to reduce fuel, 2.2 million to protect water quality and to offer 3.8 million board feet of timber for sale. In 2018, the Forest Service began focusing on two main targets—fuels acres treated, and timber volume sold (Schultz et al., 2019, p. 6). These align with the President's directive. These directives may be considered as intermediate measures of agency activities. They are outputs. They reveal how much activity was completed, but not how much impact on the problem was ascertained. Timber volume sold may or may not indicate progress in reducing fire incidence or severity. It may incentivize the Forest Service to focus activities on places that are expected to yield the greatest timber volume, even though timber actions in those areas may not have the greatest impact on fire management (Schultz et al., 2015). Thus, it is necessary to measure these outputs but insufficient.

The further step is to determine outcomes—how much fire hazards is reduced. An index named Wildland Fire Potential and a corresponding map for all lands in the coterminous United States has been developed. It has been used for estimating fire hazards for Forest Service lands. Roughly, 58.24 million acres (34% of Forest Service lands) have either high or very high wildland fire potential and could be candidates for treatment (Dillon et al., 2014).

The Department of interior employs a three-category classification of fire hazards for lands they manage from lowest = 1 to highest = 3. The Department currently measures the number of acres that are moved to a better condition annually, both in the WUI areas and the non-WUI areas. It then calculates the number of acres moved to a better condition class as a percent of total acres treated. For a number of acres treated, the Department reports the number of acres in fire regimes

1,2, or 3 moved to a better condition in both WUI and non-WUI areas. The total number of acres treated moved to a better condition in non-WUI areas was 11% in 2018, 16% in 2017, 14% in 2016, 9% in 2015, and 9% in 2014. For WUI areas, the percentages were 2018—22%, 2017—23%, 2016—30%, 2015—23%, and 2014—31%. Thus, the measurement of treated acres alone has not revealed the degree of resilience achieved by wildland treatment.

In 2008, Interior treated a total of 822,822,833 acres in the WUI. Of these, it moved 283,111 acres to a better condition. Given the goal is to achieve resilience, an additional measure that could be employed is the number of acres that are not in class 1 that are moved into class 1.

Achieving Accountability at the Network Level

To this point, the analysis has focused on the Federal Government level. However, the wildland fire network of actors extends beyond the federal agencies and is in fact an intergovernmental network. This is recognized in the make-up of the WFLC which has representatives of all five Federal wildland fire agency heads as well as state, tribal, and county officials. Many of the same issue challenges that exist within the Federal Government extend over into the network, including goal ambiguity and competing goals.

Goal ambiguity and competing goals within agencies and among intergovernmental actors are not the only issues hampering overall network performance measurement. However, network leadership in the form of the WFLC has recognized that integration of activities requires improvement, as the WFLC meeting minutes demonstrate:

- Projects designed at the WFLC table are too broad, while the projects designed in the field are too specific. We need to be strategically looking at the scale.
- Experience shows we know how to work together, we know exactly what treatments are needed but things are too episodic right now.
- The Cohesive Strategy is successful, but we need to dig deeper into the framework of creating resilient landscapes. We need to be adaptable to the issues at the right scale.
- An implementation plan needs to be developed to tie into the Cohesive Strategy (Wildland Fire Council minutes, September 17, 2018).

If accountability for wildland fire prevention on a national level is to be achieved, it is important to extend performance measures to state and local lands as well. The fact is, particularly in the western states, the Federal Government is a very large landowner, but its acreage is intermingled with that of state and local governments as well as private landowners.

For example, in California, forests constitute 33 million acres. Of this total, U.S. Federal agencies own 57%, state and local agencies own 3% and 40% are owned by native-American tribes, companies, and families. In Arizona, the Federal Government owns 30,741,287 acres of land and the State of Arizona owns 9.2 million acres. In both states, forested areas and grasslands subject to burning are intermingled with each other, and so a fire that starts on one plot can rapidly spread to another. If the nonfederal lands continue in a high hazard state, the achievement of national goals for prevention is made more problematic. A National Academy of Public Administration panel that investigated and analyzed Federal wildland fire programs concluded, "… reducing fire hazards on wildlands and at the interface with communities needs common commitment, joint action, and effective sharing by all parties. The problem is far too big to be addressed successfully with anything short of a large-scale joint effort that crosses borders now artificially separating federal, state, local, tribal governments and private landowners" (NAPA, 2002, vII).

Some wildland fire networks involving Federal, state, and local agencies do exist in some areas of the western states, although they do not cover all of the lands in those states. An analysis of six wildland fire mitigation networks, three in Arizona, and three in California revealed that in addition to Federal agencies, they included state and local agencies as well as business groups and venders/service providers. Some included native American tribes, and some included environmental groups (Wise & Mcguire, 2009, p. 732). In five of the six, communities did participate in wildland fire mitigation activities, and five of the six had funds from multiple sources. Only two showed evidence of shared, comprehensive visions, along with identification of projects that were directed at landscape scale risk reduction, and only three had completed risk assessments. Of the three with risk assessments, only one did so on a cross-jurisdictional basis. None of the networks addressed future risks systematically. Planning ranged from very advanced to almost none among the networks, and even for those that had plans, the translation of those into a detailed project list for joint programming was largely missing. None of the networks had a process for tracking measures that would yield information about how wildland fire risk is being reduced (Wise & Mcguire, 2009, pp. 733–740).

It is possible to measure the degree of hazard on nonfederal lands as well as on federal lands. As discussed earlier, Dillon et al.'s methodology covers all lands in the coterminous United States. As such, it provides a continent-wide tool for identifying and prioritizing areas most in need of hazard reduction. In order to reduce fire intensity (Dillon et al., 2014, p. 61), the tool incorporates data from LANDFIRE, a multipartner project of the Forest Service and the Department of the Interior. LANDFIRE produces comprehensive maps and data describing vegetation, wildland fuel, fire regimes, and ecological departure from historical conditions across the United States (Rollins, 2009).

Table 4. Potential Performance Measures by Level.

Bureau Level—e.g. Bureau of Indian Affairs
1. Acres treated to reduce fuel loads
2. Acres treated to protect areas of cultural value
3. Acres moved to a better condition
    (a) Acres moved from condition 3 to condition 2
    (b) Acres moved from condition 3 or 2 to condition 1
4. % Acres treated to a better condition per million dollars of investment
5. Acres burned by high-intensity fire
    (a) % increase/decrease from prior year
6. Acres burned by low-intensity fire
    (a) % increase/decrease from prior year

Department Level
1. Acres treated to reduce fuel loads
    (a) Acres treated by mechanical or chemical means
    (b) Acres treated by preplanned burns
    (c) Acres treated by fire use
2. Acres treated to protect water quality
3. Acres treated for invasive species
4. Board feet of timber offered for sale
5. Acres moved to a better condition
    (a) Acres moved from condition 3 to condition 2
        1. In WUi areas
        2. In non-WUI areas
    (b) Acres moved from condition 3 or 2 to condition 1
        1. In Wui areas
        2. In non-WUI areas
6. % Acres treated to a better condition per million dollars of investment
7. Acres burned by high-intensity fire
    (a) % increase/decrease from prior year
8. Acres burned by low-intensity fire
    (a) % increase/decrease from prior year

Federal Government Level
1. Acres treated to reduce fuel loads
   Acres treated by mechanical or chemical means
   Acres treated by preplanned burns
   Acres treated by fire use
2. Acres treated to protect water quality
3. Acres treated for invasive species
4. Board feet of timber offered for sale
5. Acres moved to a better condition
    (a) Acres moved from condition 3 to condition 2
        1. In WUi areas
        2. In non-WUI areas
    (b) Acres moved from condition 3 or 2 to condition 1
        1. In Wui areas
        2. In non-WUI areas
6. % Acres treated to a better condition per million dollars of investment
7. Acres burned by high-intensity fire
    (a) % increase/decrease from prior year
8. Acres burned by low-intensity fire a. % increase/decrease from prior year

State Level
1. Acres treated

(continued)

2. Acres moved to a better condition
   (a) Acres moved from condition 3 to condition 2
      1. In WUi areas
      2. In non-WUI areas
   (b) Acres moved from condition 3 or 2 to condition
      1. In WUI areas
      2. In non-WUI areas

Network Level
1. Acres in condition 1, 2, and 3
2. % change in conditions 1, 2, and 3 from prior year.

Note. WUI = Wildland Urban Interface.

Thus, it should be possible to obtain measures of wildland fire hazards at the network level.

It is inadvisable to measure performance exclusively at the network level or even just at the overall Federal government level. Instead, multilevel performance measures are needed. This is because public programs are multifaceted, and accountability issues for public services are not unidimensional. Concomitantly, performance measures at one level do not necessarily serve all the decision needs at other levels. As pointed out earlier, just measuring performance at the Forest Service or Interior Department levels does not provide adequate information about progress for congressional or presidential decision-making or for the concerned public. Similarly, measurement at the network level will not serve all the decision needs of program heads. Relatedly, it is inadvisable to rely on a single performance measurement indicator at any level. As pointed out earlier, while outputs do need to be measured (i.e., acres treated), such measures do not reveal information on outcomes (i.e., hazard reduction).

An example of what a multilevel–multimeasure wildland fire accountability approach could look like is presented in Table 4. This framework is offered to be illustrative of what could serve as inputs into national policymaking with regard to wildland fire prevention. Various policymakers variously situated would place different priorities on various measures, but this type of approach forms the basis for joint examination and dialog among policymakers that govern the network and its constituent parts.

It is useful to consider performance measures in the context of policymakers' needs and the decisions for which they are responsible. With regard to wildland fire mitigation, policymakers at the overall Federal level (Congress and the President) need to understand the extent to which federal agencies are meeting their goals for wildland treatment and how efficient they are in doing so, but they also need to understand the extent to which these efforts are actually reducing wildland fire hazards. They also need to understand the degree to which the whole network is achieving its goals and the extent to which nonfederal partners are or are not contributing to the national effort. If the federal agencies are meeting their output and hazard reduction goals with the resources allocated to them, but fire prevalence and intensity is not reduced or is still increasing on federal lands, then national policymakers need to examine their resource allocation decisions, and also examine the extent to which the nonfederal partners are engaged in significant hazard reduction. Alternatively, if federal agencies are not meeting their output and hazard reduction goals, then Congress needs to exercise oversight to determine what program decisions have led to those outcomes and what corrective actions are needed.

In order to be in the position to make such examinations, policymakers need to understand that they must insist that the types of performance measures that reveal network accomplishments are developed and implemented, and if additional resources are needed, to see to it that they are allocated. Although the objection may be made that such expenditures detract from program delivery, this can be countered with the realization that just continuing operations without the knowledge of actual impact carries with it a much higher risk of resource misallocation.

Conclusion

This analysis has demonstrated what accountability means in the context of the collaborative network engaging wildland fire prevention in the United States. As such, it has revealed some of the barriers, as well as opportunities to overcome such barriers in order to develop a performance management approach to inform the national strategy for wildland fire prevention. It has illustrated a measurement approach that is multilevel and multimeasure. In doing so, it suggests several lessons for approaching collaborative network accountability.

First, institutional network relationships may facilitate joint focus on strategy, problem-solving, communication, and even some joint actions, but they do not naturally lead to joint performance measurement that demonstrates accountability of the collaborative network. This probably requires nudging from oversight officials. Second, goal ambiguity and sunk costs in current individual organization

measurement approaches present challenges to achieving overall network performance measurement, and thus, collaborative network accountability. Third, accountability is a multilevel issue. Variously situated policymakers and decision makers require measurement information that sheds light on performance at different levels—program, organization, governmental, and network. It cannot be assumed that measures suitable for decision makers operating at one level will serve the needs of decision makers concerned with other levels. Fourth, multiple measures revealing various dimensions of objectives and operations are often necessary to provide a more fulsome picture of public problems and government activities to ameliorate them. Fifth, nonetheless, it is possible to develop a multilevel–multimeasurement approach to further accountability for such a collaborative network initiative such as wildland fire mitigation. Sixth, the challenge is to take collaboration beyond overall strategy and process to an agreement on a panoply of measures and a plan for implementing them. Seventh, collaborative network managers as well as oversight policy makers need to exercise leadership in terms of implementation to ensure that the performance measures are executed.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship and/or publication of this article.

ORCID iD

Charles R. Wise https://orcid.org/0000-0003-2372-1823

References

Ager, A., Day, M., McHugh, C., Short, K., Gilbertson-Day, J., Finney, M., & Calkin, D. (2014). Wildfire exposure and fuel management on western US national forests. *Journal of Environmental Management*, *145*(1), 54–70. https://doi.org/10.1016/j.jenvman.2014.05.035

Ager, A., Vaillant, N., & Finney, M. (2010). A comparison of landscape fuel treatment strategies to mitigate wildland fire risk in the urban interface and preserve old forest structure. *Forest Ecology and Management*, *259*(8), 1556–1570. https://doi.org/10.1016/j.foreco.2010.01.032

Agranoff, R. (2007). *Managing within networks: Adding value to public organizations*. Georgetown University Press.

Agranoff, R. (2012). *Collaborating to manage: A primer for the public sector*. Georgetown University Press.

Agranoff, R., & McGuire, M. (2001). Big questions of in public network management research. *Journal of Public Administration Research and Theory*, *11*(3), 295–326. https://doi.org/10.1093/oxfordjournals.jpart.a003504

Behn, R. (1999). The new public management paradigm and the search for democratic accountability. *International Public Management Journal*, *1*(2), 131–165. https://doi.org/10.1016/s1096-7494(99)80088-9

Blomgren-Bingham, L., & O'Leary, R. (2009). *The collaborative public manager*. Georgetown University Press.

Bovins, M., Schillemans, T., & Hart, P. (2008). Does public accountability work: An assessment tool. *Public Administration*, *86*(1), 715–731. https://doi.org/10.1111/j.1467-9299.2008.00716.x

Bryson, J. M., Ackerman, F., & Eden, C. (2016). Discovering collaborative advantage: The contributions of goal categories and visual strategy mapping. *Public Administration Review*, *76*(6), 912–925. https://doi.org/10.1111/puar.12608

Calkin, D., Thompson, M., & Finney, M. (2015). Negative consequences of positive feedback in US wildfire management. *Forest Ecosystems*, *2*(9), 1–10. https://doi.org/10.1186/s40663-015-0033-8

Clark, J. (2021). Public values and public participation: A case of collaborative governance of a planning process. *American Review of Public Administration*, *51*(3), 199–212. https://doi.org/10.1177/0275074020956397

Dillon, G., Menakis, J., & Fay, F. (2014). Wildland fire potential: A tool for assessing wildfire risk and fuels management needs. In R. E. Keane, M. Jolly, R. Parsons, & K. Riley (Eds.), *Proceedings of the large wildland fires conference* (p. 73). MT. Proceedings of Rocky Mountain Research Station, Ft.

Dubnick, M., & Frederickson, H. G. (2011). Public accountability, performance measurement, the extended state, and the search for trust. National Academy for Public Administration. Available at SSRN: https://ssrn.com/abstract=1875024

Durant, R. (1999). The political economy of results-oriented management in the "neo administrative state": Lessons from the MCDHHS experience. *The American Review of Public Administration*, *29*(4), 307–331. https://doi.org/10.1177/02750749922064454

Emerson, K. (2015). Evaluating the productivity of collaborative governance frameworks: A performance matrix. *Public Performance and Management Review*, *38*(4), 717–747. https://doi.org/10.1080/15309576.2015.1031016

Firozi, P., Lati, M., & Paul, M. L. (2021, August 18) Caldor fire explodes, leveling parts of a California town and forcing thousands to evacuate, Washington Post, p. 5.

Frederickson, H. G. (2007, February). When accountability meets collaboration, *PA Times*, 11.

GAO-05-147 (2005). U.S. General Accountability Office, Wildland fire management: Important progress has been made, but challenges remain to completing a cohesive strategy.

GAO-06-671R (2006). U.S. General Accountability Office, Wildland fire management: Update on federal agency efforts to develop a cohesive strategy to address wildland fire threats.

GAO-17-357 (2017). U.S. General Accountability Office, Wildland fire risk: Multiple factors affect federal—non-federal collaboration, but action could be taken to better measure progress.

Haldane, M. (2013). Insurers, government grapple with costs of growth in wildland urban interface. *Insurance Journal 13*(4), 56–61. Available at: www.insurancejournal.com/news/national/2013/08/15/301833htm

Head, B. (2008). Three lenses of evidence-based policy. *Australian Review of Public Administration*, *29*(4), 307–331. https://doi.org/10.1111/j.1467-8500.2007.00564.x

Koontz, T., & Thomas, C. (2006). What we know and need to know about the environmental outcomes of collaborative management. Special issue. *Public Administration Review*, *66*(S!), 111–121. https://doi.org/10.1111/j.1540-6210.2006.00671.x

Mandel, M., & Keast, R. (2008). Evaluating the effectiveness of interorganizational relations through networks. *Public Management Review*, *10*(6), 715–731. https://doi.org/10.1080/14719030802423079

Mietkiewicz, N., Balch, J., Schoennagel, T., Leyk, S., St. Denis, L., & Bradley, B. (2020). In the line of fire: Consequences of human-ignited wildfires to homes in the U.S. (1992–2015). *Fire*. September 7, 2020. https://tinyurl-com.proxy.lib.ohio-state.edu/y4hrv6h2

Mulgan, R. (2002). Accountability: An ever-expanding concept. *Public Administration*, *78*(3), 555–573. https://doi.org/10.1111/1467-9299.00218

NAPA (2002). *Wildfire suppression: Strategies for containing costs*. National Academy of Public Administration.

National Strategy. (2014). The final phase in the development of the national cohesive wildland fire management strategy, Accessed at http//wwwforestandrangelands.gov/CSPhaseiiiNationalStrategyApril2014.pdf

Newton, A., & Cantarello, E. (2015). Restoration of forest resilience: An achievable goal? *New Forests*, *46*(6), 645–668. https://doi.org/10.1007/s11056-015-9489-1

North, M., Collins, B., & Stephens, S. (2012). Using fire to increase the scale, benefits, and future maintenance of fuels treatments. *Journal of Forestry*, *110*(7), 392–401. https://doi.org/10.5849/jof.12-021

Page, S. (2004). Measuring accountability for results in interagency collaborations. *Public Administration Review*, *64*(5), 591–605. https://doi.org/10.1111/j.1540-6210.2004.00406.x

Prentice, C., Imperial, M., & Brudney, J. (2019). Conceptualizing the collaborative toolbox: A dimensional approach to collaboration. *American Review of Public Administration*, *49*(7), 792–809. https://doi.org/10.1177/0275074019849123

Provan, K., Fish, A., & Sydow, J. (2007). Interorganizational networks at the network level: A review of the empirical literature on whole networks. *Journal of Management*, *33*(3), 479–516. https://doi.org/10.1177/0149206307302554

Reinhardt, E, Keane, R, Calkin, D, & Cohen, J (2008). Objectives and considerations for wildland fire treatment in forested ecosystems of the interior western united states. *Forest Ecology and Management*, *256*, 1997–2006.

Rollins, M. (2009). LANDFIRE: A nationally consistent vegetation, wildland fire, and fuel assessment. *International Journal of Wildland Fire*, *18*(3), 235–249. https://doi.org/10.1071/wf08088

Romzek, B., & Dubnick, M. (1987). Accountability in the public sector: Lessons from the challenger tragedy. *Public Administration Review*, *47*(3), 227–238. https://doi.org/10.2307/975901

Romzek, B., & Dubnick, M. (1994). *Issues of accountability in public personnel systems, in new paradigms in government: Issues in the changing public service*. In P. Ingram & B Romzek (1st ed). *Josey-Bass*.

Schultz, C., Matthews, A., & McCaffrey, S. (2019). Forest service fire management and the elusiveness of change. *Fire Ecology*, *15*(13), 1–15. https://doi.org/10.1186/s42408-019-0028-x

Schultz, C., Mosely, C., & Katherine Mattor, K. (2015). Striking the balance between budgetary discretion and performance accountability: The case of the US forest service's approach to integrated restoration. *Journal of Natural Resources and Policy Research*, *7*(2-3), 109–123.

Secretary of the Interior, Order No. 3372, U.S. Department of the Interior, Washington, D.C.

Silvia, C. (2018). Evaluating collaboration: The solution to one problem often causes another. *Public Administration Review*, *78*(3), 472–478. https://doi.org/10.1111/puar.12888

Stephens, S., Collins, B., Eric, E., & Fuel, P. (2016). U.S. Federal fire and forest policy: Emphasizing resilience in dry forests. *Ecosphere (Washington, D C)*, *7*(11), 1–19.

U.S. Forest Service (2018). Toward shared stewardship across landscapes: An outcome-based investment strategy. FS-118.

Vaillant, N., & Reinhardt, E. (2017). An evaluation of the forest service hazardous fuels treatment program: Are we treating enough to promote resilience or reduce hazard? *Journal of Forestry*, *115*(4), 300–308. https://doi.org/10.5849/jof.16-067

Weiner, M. E. (1990). *Human resources management* (2nd ed). Wadsworth.

Westerling, A. L., Hildago, H. G., Cayan, D. R., & Swetnam, T. W. (2006). Warming and early spring increase western US forest wildfire activity. *Science (New York, N Y)*, *313*(5789), 940–943. https://doi.org/10.1126/science.1128834

Wise, C., & Freitag, C. (2002). Balancing accountability and risk in program implementation: The case of national fire policy. *Journal of Public Administration Research and Theory*, *12*(4), 493–523. https://doi.org/10.1093/oxfordjournals.jpart.a003545

Wise, C., & Mcguire, M. (2009). Wildland fire mitigation networks in the Western United States. *Disasters*, *33*(4), 721–746. https://doi.org/10.1111/j.1467-7717.2009.01106.x

Author Biography

Charles R. Wise is Professor Emeritus in the John Glenn College of Public Affairs at the Ohio State University. He is the former President of the National Association of Schools of Public Affairs and Administration. He has been awarded the Mosher Award for best academic article in the Public Administration Review three times.