FINAL REPORT

Toward Fire-Adapted Rangeland Communities: A Policy Analysis of Outcome-Based Approaches to Managing Fire Risk in Idaho

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List of Abbreviations/Acronyms

AUMs: Animal Unit Months

BLM: Bureau of Land Management

EA: Environmental Assessment

EIS: Environmental Impact Statement

NEPA: National Environmental Policy Act

NGO: Non-governmental organization

OBM: Outcome-Based Management

RMS: Rangeland Management Specialist

SRM: Society for Range Management

UI: University of Idaho

Keywords

Bureau of Land Management; fire risk; Idaho; outcome-based management; policy; public lands; ranching; rangelands.

Acknowledgements

Abstract

Policy approaches to rangeland fire management may be most effective if they seek to utilize a full suite of options, including promoting the social and economic wellbeing of working ranches. One avenue for this includes the administration of federal permits livestock producers depend on for their annual forage needs. Permits include terms and conditions such as when and how intensively permittees may graze livestock; these terms and conditions typically do not allow for much flexibility in responding to environmental variability such as annual grass invasion or wildfire. As a result, within the typical lease period, adaptive responses to variable conditions are difficult for managers to implement. To integrate greater adaptability into rangeland administration and potentially leverage fire risk management activities, the Bureau of Land Management (BLM) has been exploring outcome-based management (OBM). Little is known about implementing OBM in the context of rangelands used for livestock production. Our objectives for this study were to: (1) analyze how administrative rules and BLM practices facilitate or impede the use of outcome-based approaches, and (2) identify enabling conditions that allow BLM staff and permittees to navigate policy barriers and promote community wildfire adaptation (both objectives were met).

We examined administrative policies and the barriers to outcome-based approaches to manage fire risk through 70 semi-structured interviews with permittees, BLM staff, and other agency and nongovernmental stakeholders in three Idaho BLM Field Areas. Using comparative case studies, we analyzed how rules and norms in policy implementation contributed to perceptions of barriers within and among the different Field Areas. We find that formal rules, informal factors, and resource condition interact and form perceptions of barriers to implementing OBM. Additionally, differences in informal factors lead to different interpretations of flexibility found within existing policies among the Field Areas. Specifically, history with lawsuits, experience of field office staff, Field Area leadership, and beliefs about the role of grazing in managing fire risks were important in whether and how barriers to implementing outcome-based rangeland management were perceived by study participants.

Outcome-based approaches may contribute to the adaptive capacity of rangeland communities living with risk of fire in cases in which informal factors create conditions for OBM implementation. Informal factors such as shared perspectives between permittees and the BLM, retention of experienced BLM staff, and leadership inclined to experiment help create conditions for permittee and agency collaboration to address community fire risk. OBM offers a potential avenue for community adaptation to fire by capitalizing on permittees' vested interests in healthy, resilient rangelands and providing a flexible setting in which private citizens can partner with public land managers to work across land ownership boundaries in support of landscape-scale activities.

Objectives

We explored how outcome-based approaches can aid rangeland communities in managing fire risk and moving toward fire adaptation. This project included two research objectives with hypotheses; all objectives were met through the study.

Objective 1. Identify and evaluate the degree to which administrative rules and BLM practices facilitate or impede the use of outcome-based approaches

Hypothesis 1-1: Agency interpretation of rules and regulations (a product of culture/norms) creates or removes barriers to implementing outcome-based approaches to manage fire risk.

Hypothesis 1-2: Identification of barriers differs between the BLM and permittees, and also among the State, District Office, and Field Office levels of the BLM, which may constrain implementation.

Objective 2. Identify enabling conditions that allow agencies to navigate policy barriers and promote fire adaptation

Hypothesis 2-1: Partnerships between permittees and BLM staff will enable the implementation of new management alternatives.

Hypothesis 2-2: Local norms (i.e., field office level) allow BLM staff to identify and utilize enabling conditions.

Task statement relevancy

There has been growing interest in community-based fire risk reduction strategies and fire-adapted communities, and previous research on the impacts of fire and invasive plants in rangelands has primarily focused on biophysical rather than human dimensions of these processes (Brunson and Tanaka 2011). This study directly addresses policy questions related to human dimensions of fire. We provide an in-depth assessment of an experimental approach to broader rangeland resource challenges and avenues for leveraging community capacity to manage fire risk in rangeland communities.

Background

Rangelands in the U.S. West are inherently dynamic systems. But guided by federal policies crafted under different ecological, social, and economic conditions than today, it is difficult for public land management agencies to adapt to emerging challenges on rangelands. In the U.S. Intermountain West, invasive annual grasses degrade wildlife habitat and competed with native species (Coates et al. 2016). Proliferation of these grasses due to climate change causes larger, hotter, and more frequent wildfires, which, in turn, affect the long-term viability of rural livelihoods dependent upon public rangelands for livestock production (Brunson and Tanaka 2011, Balch et al. 2013).

Policy approaches to rangeland management may be most effective if they seek to utilize a full suite of management options, including promoting the social and economic wellbeing of working ranches (e.g., Bentley Brymer et al. 2020). The BLM undertakes mechanical thinning, prescribed burning, and chemical treatments to manage fuels (BLM 2020a), but the vastness and mixed ownership of western rangelands make these methods singularly inadequate for influencing fire behavior across large landscapes (Diamond et al. 2012, Davies et al. 2015a). One option for leveraging existing fire risk management activities may be through the administration of federal and state permits livestock producers depend on for annual forage needs. Permits include terms

and conditions such as when and how intensively permittees may graze livestock. Because these terms and conditions are reviewed every ten years, they typically do not allow for much flexibility for responding to stochastic events such as drought, above-average forage production and increased fuel loads, or fires. As a result, it is difficult for rangeland managers to respond to emergent challenges within the lease period in ways that might enhance ecological condition or minimize financial loss.

To address the need for approaches that are more responsive to dynamic conditions, the BLM has sought to integrate greater flexibility into public rangeland administration through outcome-based management (OBM). In contrast to prescriptive approaches, OBM offers a collaborative venue for BLM staff and resource users to adaptively respond to place-specific challenges by identifying desired outcomes for rangeland parcels and the management activities to achieve them. The efforts aim to decrease agency response time to real-time resource conditions and achieve desired ecological, social, and economic conditions for both the BLM and resource users (BLM 2017).

Although OBM has transformative potential for rangeland fire adaptation, but the political and social factors involved in integrating grazing into a suite of fuels management strategies within current policies remain a relatively neglected area of research in rangeland management. Using three case studies of BLM Field Areas in Idaho, this project examined federal policies and informal factors such as cultural norms and local practices that present barriers to BLM field offices and permittees seeking to use outcome-based approaches to manage fire risk on rangelands. We also identify conditions under which some field offices are using outcome-based approaches to manage fire risk, revealing a path towards fire-adaptation for rangeland communities where livestock grazing is a predominant land use.

Materials and Methods

Given that the BLM's interest in outcome-based approaches is relatively new and because there have been no prior studies on implementing OBM, our study design was exploratory and used a combination of document analysis, in-depth interviews, and qualitative induction to address research objectives and triangulate findings (Maxwell 1996). Research protocols were approved by the University of Idaho's Institutional Review Board for compliance with human subjects research requirements (protocol #17-232).

Study Areas

We selected three cases of BLM Field Areas were from the Boise, Twin Falls, and Idaho Falls Districts in Idaho (i.e., BLM Districts with rangelands; Figure 1). Due to the sensitive nature of findings and relatively small sample sizes of BLM staff within field offices, we anonymized the cases and refer to them here as Field Areas A, B, and C. These cases were selected for yielding theoretical contrast (Yin 2014).

Ownerships

Ownerships
- Indian Reservations
- U.S. Forest Service
- U.S. Fish & Wildlife Service
- Bureau of Land Management

Boundaries
- BLM District Offices
- BLM Field Offices

Water
- Lakes

COEUR D'ALENE DISTRICT

BOISE DISTRICT

IDAHO FALLS DISTRICT

TWIN FALLS DISTRICT

Projection: Transverse Mercator
Coordinate System: NAD_1983_StatePlane_Idaho_Central_FIPS_1102_Feet
Data courtesy of ESRI, Inc.; USDA Forest Service; Idaho Geospatial Office.

Cartographer: Chelsea Pennick McIver, University of Idaho
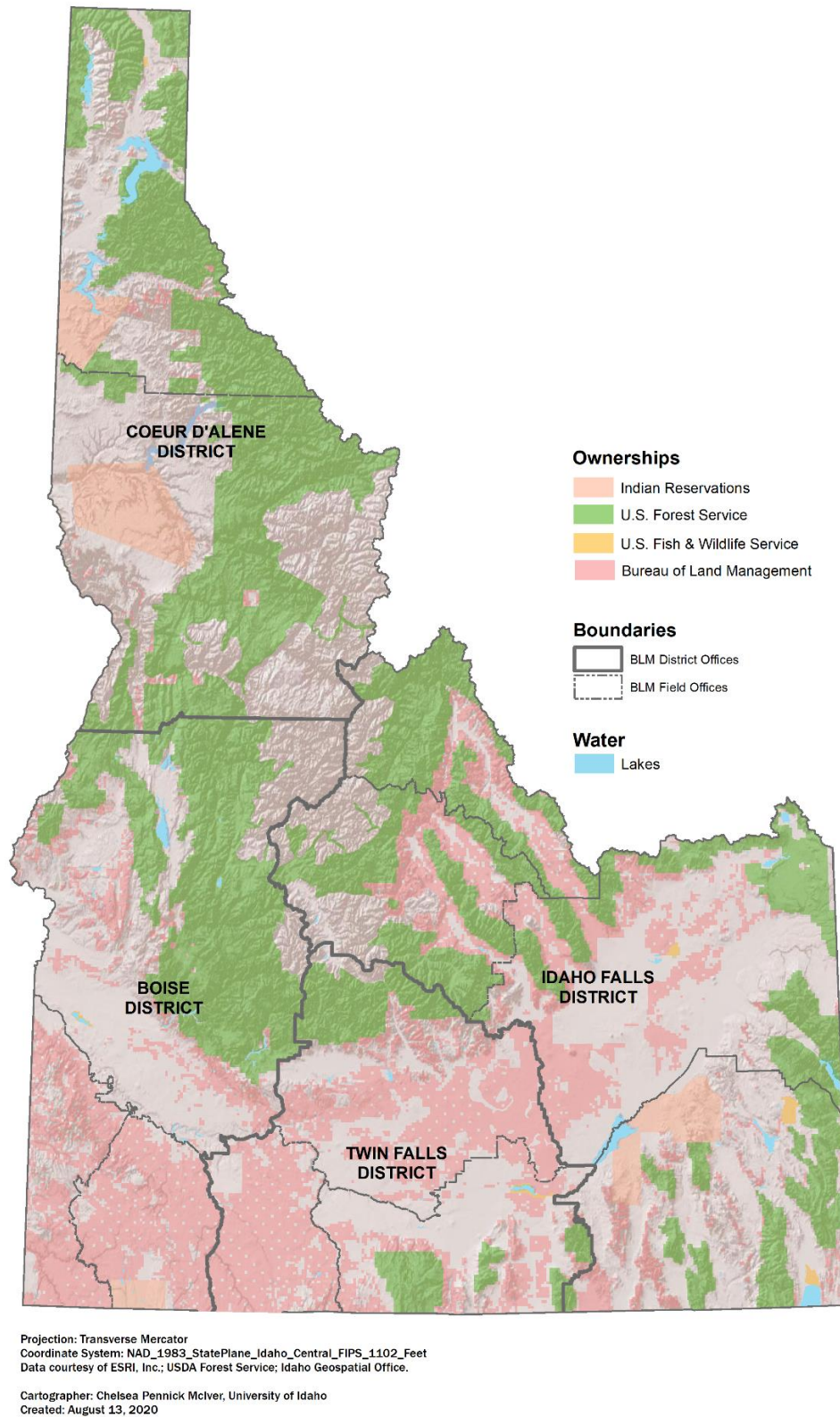Created: August 13, 2020

Figure 1. Map of BLM Districts and Field Areas in Idaho. Three Field Areas were selected as case studies, one from each of the Boise, Twin Falls, and Idaho Falls BLM Districts.

Data collection

1. In-depth, semi-structured interviews: we conducted interviews with BLM staff in field offices A, B, and C as well as with permittees and other relevant agencies (e.g., Idaho Department of Fish and Game, Natural Resource Conservation Service) and non-governmental actors (NGO) within each Field Area (Table 1). BLM participants were purposively sampled for their involvement in grazing permit administration and fuels management. Interviews asked participants to describe desired fire risk management activities for their locale, and then sought to understand (1) activities to manage fire risk that were perceived to be permissible under current policies, and (2) perceived barriers to the approaches that participants believed could not be implemented. To understand enabling conditions for OBM implementation, the interviewer probed using context-specific questions about rules configurations to discover whether perceived barriers to implementation were derived directly from policy or local norms and culture. We interviewed a total of 77 participants in 70 interviews.

2. Document analysis: we gathered relevant documentation including Environmental Assessment (EAs) and Environmental Impact Statement (EIS) documentation for permit renewals, noxious weed and invasive plant management, vegetation treatments, and fuel breaks, Resource Management Plans for each Field Area, BLM manuals for Range and Fire Program Management, and grazing regulations in the Code of Federal Regulations. These documents were used to validate data collected from interviews, particularly regarding the legal and administrative dimensions of policy barriers (Maxwell 1996).

Data analysis

Audio recordings of interviews were transcribed verbatim. We analyzed documents and interview transcripts using NVivo qualitative analysis software. Transcripts were initially coded by categorizing perceptions of barriers to OBM into formal (policy, regulations) and informal (culture, norms, experience) categories. After identifying specific barriers within each category and their relative importance based on frequency of references by participants, the lead author then separated permittee, NGO and other agency, and BLM staff responses to elucidate if there are shared or divergent perceptions of barriers among categories of participants. Findings were discussed among the research team and confirmed by key informants who participated in the study. Finally, we compared findings across cases, seeking to identify differences in how participants in each case perceived barriers to generate new understandings about the roles of local norms in OBM implementation for managing fire risk.

Results and Discussion

This project examined a relatively new effort by the BLM to integrate more flexibility into rangeland administration; what follows are the results of an exploratory study that attempted to inductively generate understandings of processes, interactions, and outcomes of outcome-based efforts.

We found that formal rules and social factors, in addition to resource condition within Field Areas, together can create perceptions of barriers to using outcome-based approaches to implement desired fire risk management activities (Figure 2).
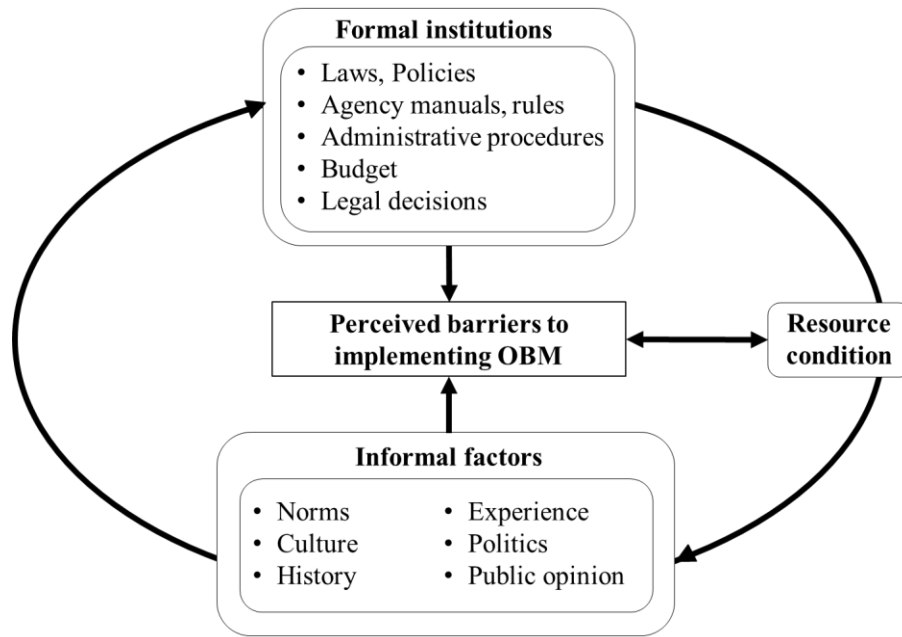
Figure 2. Interactions of formal institutions, informal factors, and resource condition together create perceptions of barriers to implementing outcome-based approaches to manage fire risk.

Factors creating barriers to OBM most frequently referenced by participants were grouped into policies and formal processes, culture and norms, politics and the public, experience, and history within the Field Area (Table 1). Differences in informal factors such as norms and culture among Field Areas lead to different responses to some formal rules and, thus, different perceptions of the feasibility of OBM implementation among Field Areas.

Factor	Institution type	Examples
Policies, formal processes	Formal	Procedures required by NEPA
		Permit terms and conditions
		Budget
		Standards for Rangeland Health
		Legal decisions
Culture and norms	Informal	Leadership
		Inclination to experiment
Politics and the public	Informal	Shared vision (individual, interagency interactions)
		Beliefs about resource management
Experience	Informal	Staff tenure
		Knowledge of allotments, permittees
		Range readiness
		Prioritizing permit renewals
History	Informal	Fire events
		Prior lawsuits

Table 1. Relatively important factors in perceptions of barriers to OBM.

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Desired activities identified by participants were largely focused on those related to management of fuels and fire response, such as construction of fuel breaks to enhance wildland firefighters' responses during incidents (Table 2).

Type of fire management	Desired fire risk management activities
Pre-fire mitigation	Treat invasive annual grasses with herbicides or targeted grazing
	Manage fuels buildup by adjusting timing, duration, or intensity of grazing following the growing season (e.g., fall or winter grazing)
	Increase prescribe burning to reduce fuels, improve rangeland resilience
Pre-fire preparedness	Construct fuel breaks (mechanically or with livestock)
	Maintain existing fuel breaks (planting fire resistant species, discing, spraying)
Post-fire recovery	Graze fall or early spring following fire to exclude annual grass establishment

Table 2. Desired fire risk management activities frequently identified by participants.

Below, we first summarize how some formal policies and informal factors together created perceptions of barriers to implementing these desired fire risk management activities. Then, we describe enabling conditions for OBM, including our finding that, in some instances, informal factors, such as leadership and BLM staff experience in a Field Area, offer avenues for implementing outcome-based approaches to manage fire risk within current policies.

Barriers to outcome-based approaches for managing fire risk

The main policy barriers to outcome-based approaches referenced by all categories of participants were meeting National Environmental Policy Act (NEPA) requirements and BLM Idaho Standards for Rangeland Health. We additionally found that informal factors such as participants' beliefs about resource management, staff experience with allotments and individual permittees, and history of lawsuits in the Field Area were also relatively important in participants' perceptions of barriers. Here, we summarize two ways in which these formal and informal factors interacted in our case studies.

1. The BLM has limited capacity to undertake additional processes that are perceived to accompany outcome-based approaches

To use grazing as a tool to achieve the desired outcome of addressing emergent fire risk factors (e.g., following a particularly productive growing season or annual grass establishment after a fire), most BLM staff in all Field Areas agreed that terms and conditions such as timing, intensity, or duration of grazing would need to be modified on permits for the associated allotments. But changing permits require analysis of the proposed actions under NEPA. These analyses can be time consuming and, as a result, it is difficult for the BLM to authorize activities to address fire risk factors in a timeframe that would affect fuel loads. In practice, most BLM interviewees stated that they focus more of their monitoring and enforcement on allotments that were in poor condition or with permittees who had a history of not following their permit's terms and conditions. All interviewees agreed that, as a result, BLM staff had little capacity to

proactively address conditions indicative of heightened fire risk on allotments. Additionally, BLM interviewees described the need to craft NEPA documentation for outcome-based proposals that would not attract attention from litigants or be able to withstand legal scrutiny should aspects of a grazing permit or other activities on the allotment be litigated. Nearly all interviewees related this barrier to an active history of lawsuits in recent years in Idaho targeting public lands grazing (e.g., Lewin et al. 2019, Bentley Brymer et al. 2020).

Taken together, nearly all interviewees pointed to NEPA requirements, potential risk of lawsuits, and subsequent BLM staff workloads as barriers to outcome-based approaches to manage fire risk. This is consistent with challenges associated with adaptive natural resource management identified in the literature; federal policies generally favor management activities that yield certain outcomes, and do not necessarily leave room for learning and adaptation in response to environmental variability (e.g., Allen et al. 2017). But our study finds that, despite the sideboards provided by policies and grazing regulations, some field offices are implementing outcome-based approaches (see examples in Enabling Conditions section below), which highlights the important role of informal factors in Field Areas moving toward fire adaptation.

2. Balancing grazing to effectively manage fuels and meeting Standards of Rangeland Health create areas of BLM and permittee disagreement and, thus, *barriers to OBM implementation*

Annual grass monocultures or non-native crested wheatgrass (*Agropyron cristatum*) seedings were dominant in many allotments in Field Areas B and C in particular. In these cases, permittees believed their current forage utilization levels were contributing to seasonal fire risk and agreed that being issued more Animal Unit Months (AUMs; the amount of forage needed to sustain one cow or five sheep for one month) would allow them to better use grazing to help manage fuels in some areas of their allotments. However, many BLM and other agency interviewees were skeptical about the effectiveness of widespread grazing to manage fire risk, citing that in order to reduce fuels to an extent that fire behavior is influenced, utilization would need to be increased to such a level that they would have concerns about meeting Idaho BLM Standards of Rangeland Health.

Differences in permittee and BLM staff beliefs about the efficacies of grazing to manage fire risk were particularly notable in Field Area B, where many allotments were identified as annual grass monocultures posing significant fire risk each season. Although ranchers operating on annual grass infested parcels have been found to be more likely to indicate plans to use herbicides, grazing, and revegetation treatments than those who do not (Johnson et al. 2011), we find that factors such as BLM staff experience and agency-permittee relationships were also important in interviewees' perceptions barriers to grazing to manage fuels. Specifically, high turnover among Field Area leadership as well as Rangeland Management Specialists (RMS, who are administer permits) culminated in discontinuity in staff experience with specific allotments as well as low trust and infrequent communication between BLM permittees. Many permittees believed fall or early spring grazing would help them reduce annual grass abundance (and thereby reduce competition with native perennial grasses), but referenced this discontinuity in experience in why they believed their BLM permit administrators would not work with them to implement outcome-based approaches to effectively address frequent fires on their invaded allotments.

Shared perspectives between agency and non-agency actors and collective actions contribute to fire adapted communities (Paveglio and Edgeley 2020); considering invasive annual grasses increase fire risk, frequency, and size, retention of BLM staff experience will inform specific allotment management options and also to build relationships between permittees and agency staff to collaborate effectively to manage the risks invasive annuals pose (e.g., Abrams et al. 2017).

Enabling conditions for OBM implementation

We found that some informal factors created opportunities for OBM implementation within existing policies. Whether outcome-based approaches were implemented or considered was most frequently related to:

- Field office leadership supportive of experimentation
- Low staff turnover, especially long-tenured RMS
- High staff capacity to complete NEPA and renew permits with desired changes (a function of number of staff in the office and staff experience in navigating NEPA processes)
- Shared perspectives between BLM and permittees regarding resource condition and range readiness

These factors contribute to retention of specific knowledge about allotments and individual permittees' practices that is helpful for making decisions about implementing new approaches. In instances where outcome-based approaches were being used to address fire risk, BLM interviewees usually described working within existing permit terms and conditions or approved EAs to overcome staff capacity challenges (i.e., no new NEPA procedures are needed). These activities included, for example, implementing targeted grazing as a biological control measure to manage fuels buildup under an existing EA and dormant season grazing to remove prior seasons' growth in cases where a permit's season of use includes fall or winter.

There was broad agreement among BLM, permittee, and other agency and NGO interviewees that an outcome-based approach would only be appropriate for permittees with proven records of meeting Idaho BLM's Standards for Rangeland Health. We found this in Field Office A's practices under the current Field Manager. For instance, when authorizing permit renewals for permittees with reliable records of stewardship, RMS staff reported writing permits with on and off dates two weeks more than a permittee has historically used, while maintaining the existing stocking rates and AUMs. They explained that this their office's strategy for authorizing permittees to more nimbly respond to real-time range conditions. If the spring was particularly wet or cool, authorized permittees have flexibility, formalized in the terms and conditions of their permit, to wait a few days to turn out livestock until the range condition is ready for grazing. This practice in Field Area A was a result of supportive leadership, knowledge of permittees with proven histories of meeting Standards for Rangeland Health, and shared understanding between permittees and BLM staff regarding range readiness. It was further supported through formal processes, that is, ensuring that all administrative procedures for livestock permitting were completed via the permit renewal process.

Science delivery activities

This work was guided by "needs assessments" with leaders from BLM, Natural Resource Conservation Service, Idaho Department of Lands, Idaho Department of Fish and Game, The Nature Conservancy, and ranchers. Research questions were developed in response to growing interest expressed by these stakeholders in flexible approaches to multijurisdictional rangeland challenges such as wildfire and proliferation of invasive annual grasses. We strove to engage these stakeholders and share results throughout the project.

We presented findings to a manager/practitioner audience in an invited symposium presentation at the Annual Meeting of the Society for Range Management (February 2020). The SRM presentation was also featured in an episode of the Art of Range Podcast (April 2020), which reaches the interested public. The student investigator was also invited to write a blog post sharing project findings for the Fire Adapted Communities Learning Network (to be published September 2020), whose audience consists of Fire Adapted Communities practitioners. We have also prepared a manuscript for submission to a peer-reviewed journal (September 2020). To reach a manager and policy-maker audience, we will be disseminating findings via a policy brief for the UI Policy Analysis Group (September 2020). Importantly, we will provide study participants, BLM offices, and state agencies with copies of our policy brief or a one-page summary.

Conclusions

Using three case studies of BLM Field Areas in Idaho, we examine the formal policies and informal factors that present challenges to BLM field offices and permittees seeking to use outcome-based approaches to manage fire risk on rangelands. OBM is a recent, experimental initiative meant to advance approaches to adaptively respond to annual variability on BLM rangelands. Under some conditions, OBM provides opportunities for land managers to employ a broad suite of strategies to manage fire risk and leverage collaborative efforts of agencies and rangeland permittees. We find that informal factors such as leadership, experience, and history of litigation interact within the formal policy context. Differences in these informal factors lead to different interpretations of flexibility found within existing policies among the Field Areas.

Implications for fire-adapted communities

Ranchers live with fire and have an acute awareness of fire risk to their communities; loss of working ranches have cascading social and economic consequences (Brunson and Tanaka 2011). Outcome-based approaches to managing rangeland fire risk require shared perspectives between permittees and BLM staff. This shared understanding, in some instances, allow permittees to participate in policy implementation by providing BLM staff with access to time- and place-specific information. For example, permittees may offer information to BLM staff regarding areas or conditions indicative of heightened wildfire risk on an allotment that perhaps were not present in previous years.

Adaptive capacity is one of the central components of fire-adapted communities (Paveglio et al. 2009). Folke et al. (2003) specified that adaptive capacity includes learning to live with uncertainty and change, nurturing institutional diversity and reorganization, creating

opportunities for self-organization, and combining different types of knowledge for learning. We find that OBM may contribute to the adaptive capacity of rangeland communities living with risk of fire in cases in which informal factors create conditions for OBM implementation. Informal factors such as shared perspectives, retention of experienced BLM staff, and leadership inclined to experiment help create conditions for permittee and agency collaboration to address community fire risk.

But the OBM effort is new and experimental; opportunities for learning, reflection, and knowledge-sharing will be vital for meaningfully changing public rangelands governance and moving toward fire adaptation (Armitage 2005). Given that, OBM offers a potential avenue for community adaptation to fire by capitalizing on permittees' vested interests in healthy, resilient rangelands and providing a flexible setting in which private citizens can partner with public land managers to work across land ownership boundaries in support of landscape-scale activities (Abrams et al. 2017, Paveglio and Edgeley 2020).

Implications for management and policy

This research has implications for public land management beyond grazing administration. First, it is important in a complex governance system to continue to assess types of barriers to implementation and how they can be addressed; our findings indicate that barriers were not solely derived from inflexible federal policy. Rather, some barriers stem from informal factors and interactions within Field Areas. These barriers residing in Field Areas may be influenced by resource availability (e.g., number of staff, workloads), experience and continuity of place-specific knowledge, and leadership. Second, although substantive policies can set parameters for policy implementers, our study indicates that in the absence added capacity to undertake NEPA procedures for outcome-based approaches, some offices will use OBM to manage wildfire risk and some will not. Finally, broad-scale implementation will rely on knowledge, resources, and individual personalities committed to undertaking new approaches to manage fire risk.

Under some conditions, OBM provides opportunities for land managers to employ a broad suite of strategies to manage wildfire risk and leverage collaborative efforts of agencies and rangeland permittees. However, broad-scale OBM implementation would require:

- Mechanisms for accountability that do not rely on additional BLM resources (e.g., cooperative monitoring with other agencies or permittees)
- Permittees with proven histories of stewardship and cooperation with the BLM
- Clear procedures to improve perceptions of legitimacy and assurances that outcome-based approaches will not result in resource degradation and be able to withstand potential lawsuits
- Opportunities for learning, knowledge-sharing, and adaptation (facilitated by retention of experienced staff, and agency-permittee interactions)

Our study highlights outsized role of Field Area leadership, shared vision, and permittee-agency relationships. The findings here suggest promising avenues for adaptive approaches to managing wildfire risk within this setting characterized by formalization and bureaucracy, but show less promise if local levels lack the capacity and continuity of place-specific experience, are

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disinclined to experiment, or disagree about approaches to complex resource management challenges such as invasive annual grasses.

Implications for future research

Because OBM relies on knowledge of local environmental variability and economic concerns, it warrants learning between BLM staff and permittees. This includes integrating institutional knowledge with local, experiential, or traditional knowledge of community members, building and incorporating knowledge of structure, process, and function of institutions, learning from crises or mistakes, and enhancing social memory (Folke et al. 2003, Armitage 2005). Thus, to better understand how OBM can contribute to fire adaptation in rangeland communities, future research must investigate if and how permittee-agency relationships have changed over time through OBM implementation and if such changes extend beyond the allotment scale.

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Appendix B: List of Completed/Planned Scientific/Technical Publications/Science Delivery Products

1. Articles in peer-reviewed journals (specify whether In Press, accepted for publication, in review [submitted for publication], or planned/in preparation).

Wollstein, K., C.B. Wardropper, and D.R. Becker. In preparation. Outcome-based approaches for managing wildfire risk: Institutional interplay and implementation within the "gray zone." Target journal: *Rangeland Ecology and Management*.

2. Technical reports (specify whether In Press, accepted for publication, submitted for publication, or planned/in preparation).

Wollstein, K., C.B. Wardropper, and D.R. Becker. In preparation. Toward fire-adapted rangeland communities: A policy analysis of outcome-based approaches to managing wildfire risk in Idaho. Policy Analysis Group Policy Brief. University of Idaho: Moscow, ID.

3. Graduate thesis (masters or doctoral)

One chapter *in* Wollstein, K. "Institutions and local context in implementing outcome-based management in Idaho: A new model for public rangeland governance?" Doctoral dissertation, University of Idaho (expected completion date: summer 2021).

4. Conference or symposium abstracts

Wollstein, K.*, C. Wardropper, and D. Becker. "Context matters: Institutional Conditions for Outcome-Based Approaches to Manage Wildfire Risk." Invited symposium presentation at the Annual Meeting of the Society for Range management. February 16-20, 2020, Denver, CO.

Policy approaches to rangeland management challenges may be most effective if they seek to utilize a full suite of management options, including promoting the social and economic wellbeing of working ranches. One avenue for this may be through administration of grazing permits livestock producers depend upon for annual forage. Permits include terms and conditions such as when and how intensively permittees may graze livestock; these terms and conditions typically do not allow for much flexibility in responding to annual variability or unexpected events (e.g., wildfire). There has been growing interest in outcome-based approaches for rangelands, piloted through Outcome-Based Grazing Authorizations by the Bureau of Land Management (BLM), which seek to address this need for adaptability while also remaining within the boundaries of existing federal administrative rules. Through interviews with permittees and agency staff in three BLM Districts in Idaho in addition to content analysis of grazing regulations, we explored policy barriers to implementing outcome-based approaches and identified conditions that aid BLM staff and permittees in navigating these barriers. We find administrative requirements under the National Environmental Policy Act, history with lawsuits, experience of field office staff, shared vision regarding wildfire risk management, rangeland condition and beliefs about the role of grazing in managing wildfire risks were important factors

in whether and how barriers to implementing outcome-based rangeland management were perceived. Interactions of formal and informal institutions also created perceptions of "gray zones," which were perceived by some field offices to afford administrators some flexibility to implement adaptive approaches. This study highlights the importance of local context and the interactions between administrative policies and norms in implementing approaches to managing wildfire risk on public rangelands.