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Original Research

Strategic Partnerships to Leverage Small Wins for Fine Fuels Management ☆

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ABSTRACT

Rangeland wildfire is a wicked problem that cuts across a mosaic of public and private rangelands in the western United States and countless countries worldwide. Fine fuel accumulation in these ecosystems contributes to large-scale wildfires and undermines plant communities' resistance to invasive annual grasses and resilience to disturbances such as fire. Yet it can be difficult to implement fuels management practices, such as grazing, in socially and politically complex contexts such as federally managed rangelands in the United States. In this Research-Partnership Highlight, we argue that private-public partners in such settings must be strategic in their selection of tasks to generate "small wins" in order to build the trust, competency, and legitimacy needed to advance an approach for landscape-scale fine fuels management. We highlight a fine fuels reduction partnership consisting of public and private entities in southeastern Oregon that established a research and education project and applied dormant season grazing on three pastures within the Vale District Bureau of Land Management. We describe the impetus for the partnership, antecedents, strategic tactics, and ongoing learning and reflection used to revise processes. In this example, implementing dormant season grazing as a research and education project allowed the partners to assess the efficaciousness of the treatment, as well as the operational logistics and administrative competencies necessary to apply the treatment to manage fine fuels at broader scales. Because dormant season grazing may, in some instances, conflict with established practices and norms, small-scale projects such as this allow partners to refine understandings of the social and administrative conditions that make implementation possible. Generating small wins through projects such as this is a critical precursor for partnerships seeking to take on larger, more complex endeavors that involve increasing ecological, economic, and social uncertainty.

Introduction

Rangeland wildfire is a wicked problem; the causes and consequences are inextricably intertwined and crosscutting and cannot be addressed by a single entity (Brunson 2012). Wildfires are recorded on all continents with forest and rangeland ecosystems demonstrating that the growing problem transcends sovereign boundaries with climate change and management closely linked to widespread ecological devastation (Krawchuk et al. 2009;

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Liu et al. 2010; Adams 2013; Bento-Gonçalves and Vieira 2020; Collins et al. 2021).

To address these global challenges, it is helpful to learn from collaborative approaches to mitigate wildfires and strengthen different ecosystems worldwide. For example, in the autonomous community of Catalonia—in northern Spain—government agency personnel, researchers, citizens, and stakeholders promoted resilient landscapes by developing participatory planning networks that managed wildfire risk (Otero et al. 2018). Likewise, the Dampier Peninsula Fire Working Group in the west Kimberly region of Western Australia convened indigenous ranger groups, traditional owners, agency personnel, nonprofit organizations, scientists, and broader groups to improve fire management within the region (Wysong et al. 2022). In Venezuela and Brazil, participation among indigenous communities, scientists, and public institutions developed participative planning tools used to create fire management decisions (Eloy et al. 2019).

In the northern Great Basin in the western United States, herbaceous fine fuels accumulation drives frequent, large-scale wildfires (i.e., > 400 ha; Smith et al. this issue). Livestock grazing is a widespread tool for managing fine fuels on this landscape (Perryman et al. 2018); when strategically deployed, it can reduce ignition probability, fuel continuity, and fuel loading (Davies and Nafus 2013). Dormant season grazing, in particular, shows promise for reducing herbaceous fuel loads, increasing fuel moisture, and, as a consequence, lessening burn severity (Davies et al. 2016a). Although dormant season grazing can be deployed on individual parcels where managers have the authority to do so, the benefits of these efforts are diminished if they are not coordinated and fail to meaningfully modify the occurrence and outcomes of fire at the landscape scale (Wollstein and Johnson, this issue). Partnerships are imperative for deploying tactics such as dormant season grazing in this complex social ecosystem because this landscape is spatially extensive, composed of different landownerships and associated rules, and supports multiple uses. More importantly, environmental governance literature from the past few decades highlights the importance of input from broad groups in the decision making process to support durable solutions (Lemos and Agrawal 2006).

Recent examples of collaborative efforts in rangeland contexts point to the integral role of public-private partnerships in taking on complex challenges and securing mutual benefits (Abrams et al. 2017; Derner et al. 2021; Meredith and Brunson 2021; Wilmer et al. 2018). The reason these partnerships are successful is that they engage in social learning, deliberation, and joint action (Daniels and Walker 2001). However, the collaborative capacity required to achieve these functions is developed over time (Cheng and Sturtevant 2012; Ryan and Urgenson 2019); a new partnership initially lacks the trust, competencies, and legitimacy needed to take on complex problems (Emerson et al. 2011).

In this paper, we argue that a nascent partnership can be strategic in its selection of tasks and generate "small wins" that build the trust, competency, and legitimacy needed to advance a model for landscape-scale fine fuels management using grazing. We focus on the incremental and strategic aspects of new partnerships given the complex social and political context in which they are folding with a public that is closely following grazing decisions on lands managed by the federal government. In our example of a partnership in southeastern Oregon, being strategic involved selecting a spatial scale, tactics and activities, and developing processes that enabled success and were exportable. We discuss the antecedents and early strategic decisions. We conclude by exploring the capacities that need to be developed in order to eventually parlay the partnership into successive management endeavors at larger scales. In our example, the partnership recognized that initially engaging in a strategic, smaller-scale effort would serve as a critical precursor to taking on larger, more complex endeavors that involve increasing ecological, economic, and social uncertainty (Fernández-Giménez et al. 2019). This "small wins strategy" builds trust, competency, and legitimacy over time, which is essential for partnerships to effectively function in a complex social-ecological landscape (Bours et al. 2021).

Fuels Reduction Research and Education Partnership—Regional Context

The research and education partnership we are highlighting is focused on a large grazing allotment, the Three Fingers Allotment, located within the Malheur Resource Area on the Vale District Bureau of Land Management (BLM) District in Malheur County, Oregon. It is one of the largest allotments in the Vale District with 54 779 ha managed by the Malheur Field Office. The allotment is approximately 150 km east of Burns, Oregon and is characterized by rolling and steep terrain ranging in elevation from 700 m to 1 830 m. Precipitation is approximately 254 mm annually. Vegetative plant communities vary across public and private lands situated within the allotment boundaries. Common plants include bluebunch wheatgrass (*Pseudoroegneria spicata* [Pursh] A. Löve), Idaho fescue (*Festuca idahoensis* Elmer), Sandberg bluegrass (*Poa secunda* J. Pres), and crested wheatgrass (*Agropyron cristatum* Nutt.) with remnants of Wyoming big sagebrush (*Artemisia tridentata* Nutt. Subsp. *wyomingensis* Beetle & Young) within the higher-elevation portions of the allotment. Lower-elevation valley bottoms and foothills are heavily dominated by the invasive annual grasses, medusahead (*Taeniatherum caput*-medusae [L.] Nevski) and cheatgrass (*Bromus tectorum* L.), following frequent fires in the area.

The Three Fingers Allotment is set within a region that has experienced several large wildfires over the previous decades (Figure 1). Between 2010 and 2019, nearly 1.2 million ha of sagebrush rangelands cumulatively burned in wildfires that have extended into the Vale District BLM. A combination of limiting factors such as a paucity of improved roads, remoteness, complex topography, agency capacity, and budgetary constraints contribute challenges related to detecting and then deploying a timely response to fires (Wollstein et al., 2022).

Antecedents to the Partnership

Antecedents that are widely recognized as essential drivers of effective collaborative work include principles of common crisis, shared vision, mutual benefit, and leadership (Plummer and Fitzgibbon 2004; Emerson et al. 2011). These preconditions indicate how likely it is that a group or community will actively and successfully engage in a high-functioning partnership. In this example, there is recognition of a common crisis; a shared vision for desired ecological, social, and economic conditions; a mutually beneficial arrangement that motivated participation; and leadership committed to problem solving. We describe how each of these were present at the outset of the partnership.

Common Crisis

Invasion by annual grasses negatively impacts functionally healthy rangelands at the landscape scale. Due to the vast area and rugged terrain, traditional management strategies using herbicide are economically and ecologically limited. In particular, the common crisis shared between public and private rangeland managers is when a shrub-bunchgrass community trends toward an invaded annual grassland after fire (Stringham et al. 2003; Briske et al. 2006). The altered grass-fire cycle is of ecological concern and generates similar economic and social concerns (Chambers and Wisdom 2009; Brunson and Tanaka 2011). Between 2013 and

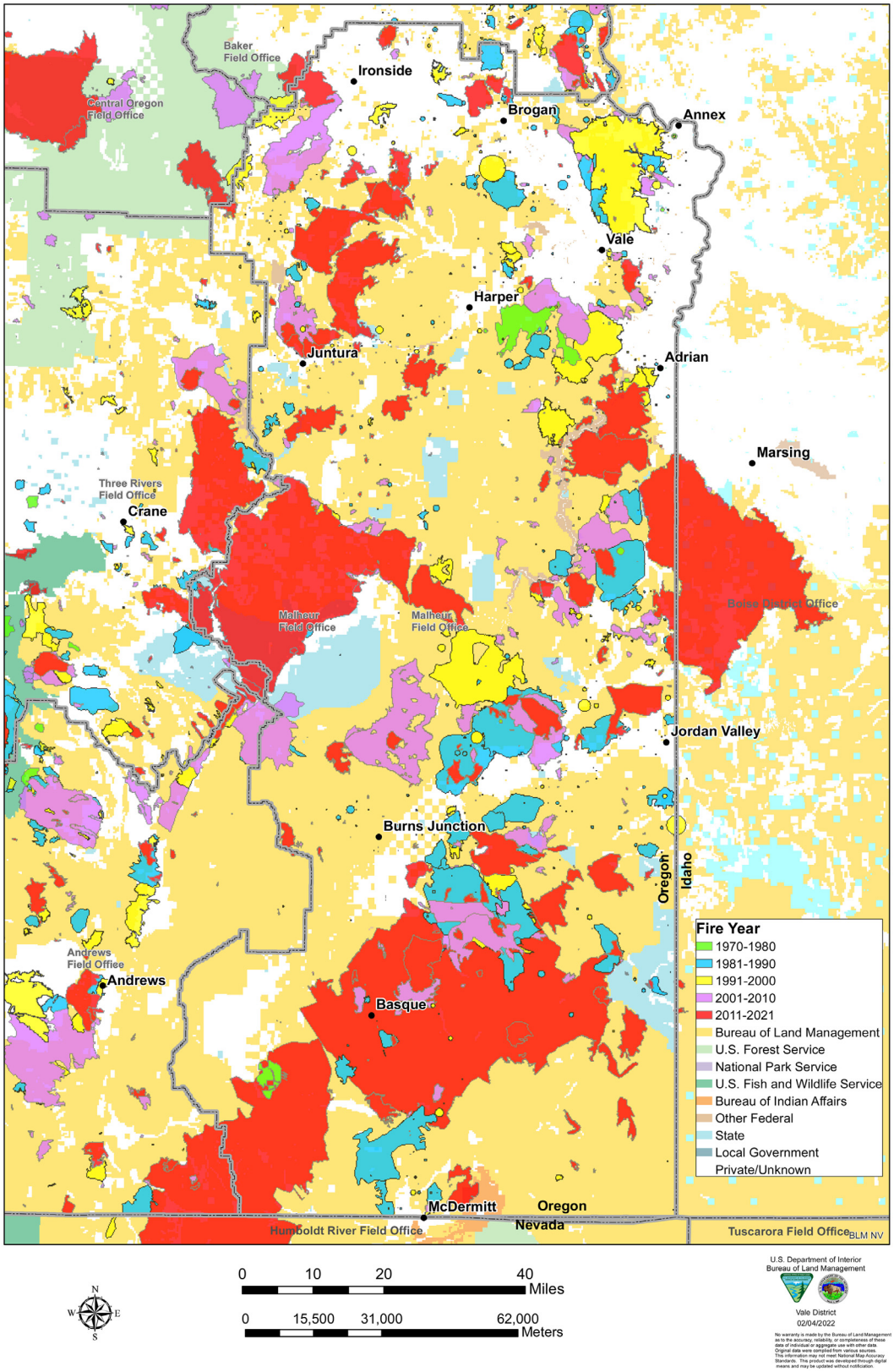

Figure 1. Wildfires associated with lands managed by the Vale District Bureau of Land Management from 1970 to 2021.

2016, three fires cumulatively burned 142 791 ha that negatively impacted ecosystem function, recreational opportunities, wildlife habitat, rangeland-based businesses, private property, and the rural economy. After the 2016 Cherry Road Fire burned the northern region of the Three Fingers Allotment, affected grazing operators and Vale District BLM administrative personnel recognized that relying solely on suppression responses was not a viable strategy for reducing the incidence of large-scale wildfires. There was also recognition among the affected parties that deploying proactive management strategies would require a partnership in this complex, spatially extensive landscape, composed of landownerships with different associated rules and multiple uses.

Common Vision

On November 4, 2016, Malheur Field Office BLM personnel, a livestock grazing operator permitted to graze on the Three Fingers Allotment, and local Oregon State University (OSU) Extension Service—Malheur County livestock and rangeland field faculty met to discuss desired ecological outcomes in the context of recent large fires in the region and the Southeastern Oregon Resource Management Plan (USDI BLM 2001). When one livestock grazing operator attended the meeting, he shared perspectives from four other grazing operators who wanted to contribute to the dialogue. At that time, the local Extension Service field faculty member was asked by BLM personnel and the individual representing the livestock operators to present relevant science that implemented grazing in the fall and/or winter and facilitated an upward trend in ecological health. Subsequently, the Extension Service faculty summarized relevant fuels reduction research using grazing (Schmelzer et al. 2014; Strand et al. 2014; Bruegger et al. 2016; Davies et al. 2016a; Davies et al. 2016b). Within the literature, winter-grazed plant communities retained higher fuel moisture from July through September compared with the no-graze treatment (Davies et al. 2015). Another study demonstrated that cattle on a fall grazing regimen can be strategically herded with protein supplements to reduce herbaceous fuel loads on western rangelands (Bruegger et al. 2016). Yet another study highlighted that strategic implementation of fall grazing could reduce cheatgrass fuel loads in the Great Basin (Schmelzer et al. 2014). One critique brought up after examining the scientific literature was the limited scale relevant to those managed by the BLM. In particular, experiments at a site scale demonstrated efficacy of grazing-based fuels management, yet questions remained about if or how treatment responses would scale up on a landscape level within an adaptive management context. The public lands livestock grazers and Malheur Field Office BLM rangeland personnel coordinated with local OSU Extension Service livestock and rangeland field faculty in Malheur County to implement a fine fuels management extension and research project. A primary goal of the partnership was to establish a sustainable approach to preemptive fine fuels reduction that could be evaluated on scalability and exportability within the region.

Mutual benefit—incentivizing participation

The Fuels Reduction Grazing Research and Education Project on the Three Fingers Allotment began with a history of respect and trust between livestock grazing operators and Malheur Field Office BLM administrators and managers. In particular, five livestock grazing operators who hold BLM grazing permits in the area expressed concern about recent wildfires and inquired about the potential of fall-winter grazing to manage fine fuels created by invasive annual grasses. They expressed interest in expanding their role in proactively addressing the rampant wildfire problem in the region. For the grazing operators, there was some economic benefit to dormant season grazing when they would otherwise be purchasing hay for their operations. In addition to immediate cost savings in feed, the potential reduction of fire risk via grazing has the added long-term benefit of predictable forage (i.e., reduced fire likelihood means reduced likelihood of loss of forage due to either the occurrence of a fire or a temporary allotment closure to promote postfire recovery). Also, managing invasive annual grasses can improve bunchgrass components over time, which can increase overall landscape resilience to wildfire. The grazing operators associate other social values with reduced fire risk, such as reducing the future possibilities of allotment closures and forage losses, thereby providing for the long-term viability of an operation (Wollstein and Davis 2017).

Malheur Field Office BLM administrators previously recognized that wildfire and related increases in invasive annual grasses negatively impacted rangelands at the landscape scale. At the time, 1.6 million ha within the Malheur Field Area were identified as threatened to be converted to a monoculture of invasive annual grass species (Bureau of Land Management 2017). BLM personnel identified that grazing was a potentially viable management tool since traditional fine fuels and invasive annual grass management techniques like herbicide application were economically and ecologically infeasible at needed scales (Bureau of Land Management 2017). As a result, the BLM was interested in exploring the efficacy of broader-scale implementation of grazing to manage fine fuels and invasive annual grasses. In particular, the BLM viewed participation in the project as a means to building legitimacy and public confidence in the approach, which would represent important precursors to subsequent broader implementation.

Participation by public natural resource and wildlife management personnel was motivated by the interests and mutual benefits to the respective agency mission. For example, wildlife personnel added shrub sampling protocols to determine if treatments influenced shrub density or cover.

Researchers and Extension Service personnel were motivated by the research and educational endeavors. Researchers were presented the opportunity to test the efficacy of dormant season grazing for influencing fine fuels at management-relevant spatial and temporal scales within an adaptive decision making framework. Extension Service personnel were given the opportunity to build a public education component promoting rangelands resistant to invasive annual grasses and resilient to disturbances like wildfire.

Leadership

Decisive and local leadership was foundational before establishing a strategic partnership. For instance, the Vale District BLM administrative personnel weighed the annual grass-wildfire threat and dedicated agency capacity. BLM administrators provided capacity and established the supervisory rangeland management specialist and supervisory natural resource specialist as persons of contact for fine fuels management dialogue. While the two supervisory BLM specialists provided leadership in local meetings, BLM administrators supported the supervisory specialists to work through formal procedures and establish fine fuels reduction as a priority. Once that was established, BLM administrators initially found capacity to build fences using existing materials and labor, which then led to equipment. After 5 yr, strong district-level leadership elucidated a funding mechanism for dedicated labor toward the fine fuels reduction.

Likewise, leadership was exhibited through the local Extension Service field faculty who had developed widespread trust and a collaborative relationship with rangeland, natural resource, and agricultural managers in Malheur County. Two years prior, the Extension Service contact was a key partner in the county

Table 1
Timeline of partnership activities and outcomes.

Date	Activity	Participants	Outcomes
November 2016	Initial meeting to promote functionally healthy rangelands Inquiry into dormant season grazing	Malheur Field Office Extension Service Private Landowners	Review of fine fuels management within the scientific literature
December 2016 through August 2017	Recruiting research and extension partners Establishing ecological goals and objectives	Malheur Field Office Extension Services (Idaho, Nevada, Oregon) Private Landowners US Fish & Wildlife Service Oregon Department of Fish & Wildlife Natural Resource Conservation Service Soil & Water Conservation Service Agricultural Research Service Researchers	Developed research and extension goals and objectives Identified a research site Established a research design and sampling protocols Solicited widespread input from activist group
October 2017 through February 2018	Preliminary fine fuels reduction on Bannock Pasture Vegetation protocols and data collection before after grazing	Extension Service	Preliminary data collected and graphed
March 2018 through August 2018	Meetings	Researchers Malheur Field Office Extension Service Oregon Department of Fish & Wildlife US Fish & Wildlife Service	Modified research protocols
September 2018	Memorandum of Understanding Authorization Letter for Research Project	Vale District BLM Oregon State University Malheur Field Office	Formal documentation establishing a partnership Allowing dormant season grazing

Greater Sage-Grouse Programmatic Candidate Conservation Agreement with Assurances, which consisted of tribal, federal, state, local, and nonprofit partners. The sustained local presence and trust equipped the contact as a logical leader who purposefully brought together entities to exchange ideas and information. The local Extension Service contact coordinated with multiple stakeholder groups for meetings and field days where regional knowledge, science, and experiences were shared. The contact proved instrumental in bringing together broad groups and navigating a shared leadership with the BLM administrators.

Fuels Reduction Grazing Research and Education Partnership

Early strategic actions—setting the table for success

Several initial actions were strategically implemented to support a sustained partnership inclusive of broad commitments and interests. In particular, being strategic early on in the process involved selecting a spatial scale, identifying feasible tactics and activities, and developing processes that were aligned with partners' authority and capacity to act. Likewise, the recruitment of researchers, Extension Service partners, public agency personnel, and livestock operators were important actions that provided broad perspective and support within the region (Table 1). Partners wanted to ensure that research protocols and findings could further establish dormant season grazing experiments and demonstration sites.

Conducting a research and education project

The early decision to conduct a research and education project was strategic for several reasons. It offered the partnership, the BLM in particular, flexibility to evaluate data that measured ecological outcomes associated with research objectives and treatments. Establishing the effort as a research and education project also presented different, less onerous National Environmental Policy Act implications and possibilities compared with a more process-ladened decision to alter existing grazing permits (Wollstein et al. 2021). In addition, the involvement of regional researchers and Extension Service personnel, who designed and implemented rigorous monitoring protocols, helped to build credibility and increase the BLM's comfort to authorize the project. Vegetation data were collected using a modified Fire Effects Monitoring and Inventory System protocol (Lutes et al. 2006) and modified BLM Assessment, Inventory, and Monitoring Program sampling methods (Taylor et al. 2014) to collect relevant rangeland ecological conditions. In particular, the parameters assessed included herbaceous density, height, cover, fuel continuity, and biomass, as well as shrub cover and density.

Within our partnership, trust and legitimacy are furthered through continued collaboration and annual authorization. The Vale District BLM evaluates if the Extension Service and project partners are fulfilling formal responsibilities outlined in a memorandum of understanding between the BLM and OSU. Specifically, OSU must work with the BLM to provide geographical information system data of study plots, implement sampling, share data, develop a science-based guide related to applying dormant season grazing, create dormant season grazing extension videos, meet with BLM management twice a year, and participate in conference calls as needed. Since 2018, the BLM has authorized the project annually.

Additionally, this network of extension and research faculty and scientists provided a means to share information with the public throughout the region using a variety of outreach techniques including educational field days, newsletter and popular press articles, and social media posts.

Importantly, implementation of a research and demonstration project fit within BLM policy and district level decision making authority. In particular, hypothesis testing and protocols were consistent with FLPMA, Title I, Section 101, which would protect public lands in their natural condition, as well as Title II, Section 303, which indicates the Secretary of the Interior is to manage public lands under principles of multiple use and sustained yield. The proposed goals and objectives conformed to meet land management goals and objectives within the Southeastern Oregon Resource Management Plan (USDI BLM 2001), which gave provision to manage toward plant diversity and distribution of desirable vegetation communities. It was also supported by the Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (Bureau of Land Management 2015), which allowed methods for vegetation treatment, including but not limited to biological control of which targeted grazing is provided as an example.

Table 2
Responsibilities and tasks performed by partners and participants using a responsible (R), accountable (A), consulted (C), and informed (I) matrix.

Tasks	BLM	Extension Service	Natural Resource Agency personnel	Wildlife Management Agency personnel	Nonprofit organizations	Grazing operators	General public	Researchers
Extension								
Create goals & objectives	A	R	C	C	C	C	I	C
Content delivery	C	R	I	I	I	A	I	C
Research								
Create goals & objectives	A	R	C	C	C	A	I	R
Develop sampling protocols	A	R	C	C	C	C	I	R
Data collection	A	R	C	I	C	C	I	R
Data analysis	A	R	I	I	I	I	I	C

Targeted grazing applied during the dormant season was independent of permits, and those grazing operators were identified by the local OSU Extension Service program contact.

Identifying a project area

The partnership strategically identified the project area on three pastures within the Three Fingers allotment for several reasons. First, neither of the three pastures—Saddle Butte (3 781 ha), Camp Kettle South (1 888 ha), and McIntyre (3 067 ha)—were socially or politically complicated. In particular, the three pastures selected did not contain important designations, such as Wilderness Study Areas, Herd Management Areas for wild horses, or priority greater sage-grouse habitat. At the same time, these designated areas were within the Three Fingers Allotment and a wildfire within the project area corridor would have the potential to negatively affect those important designated areas. Second, the three pastures included in the research project area contained specific areas invaded by annual grasses with remnant deep-rooted perennial bunchgrass communities and thereby offered vegetation and fuels conditions suitable for testing the efficacy of targeted dormant season grazing for managing fine fuels. The short-term goal in the first 3 yr was to reduce the fine fuel amount while the long-term goal was to promote rangelands with plant communities that were resilient to disturbance and resistant to invasive annual grasses. Third, the agreed-upon aim was to select an area large enough to meaningfully affect evolving landscape level wildfire risk conditions at a management-relevant scale yet localized enough to foster the interchange and cooperation within the partnership required to enable coordinated actions (see Wollstein and Johnson, this issue). Finally, the area was identified due to proximity and access from livestock operators who committed up to 1 700 cows to the research project. Five livestock operators have their home ranch within 10 km of the pastures, which was convenient and provided readily available labor related to managing cattle grazing distribution and numbers within the three research pastures (Davies et al. 2022b).

Defining a process

Establishing a clear process was instrumental in establishing a successful partnership that would carry out the fine fuels reduction research and education project. While the memorandum of understanding between the BLM and OSU clearly highlighted responsibilities between partners, participants created a clear process by which roles and responsibilities facilitated communication.

Foundational to the partnership was a neutral convening entity represented by the local Extension Service field faculty. The Extension Service was a nonbiased collaborator with a proven history of having worked with both livestock grazing operators and BLM personnel. In prior years, the local Extension Service contact served as a bridging organization by connecting diverse public and private stakeholder groups. For the current project, the individual served as the direct contact with the five grazing operators committed to targeted grazing during the dormant season, as well as BLM administrative and field personnel.

The next step was to identify an advisory committee for the fine fuels reduction research and education project. The local Extension Service contact created an advisory committee to promote accountability and transparency, which parlayed into trust and confidence. The advisory committee consisted of two federal research scientists, two grazing operators, and BLM personnel. In particular, it was created to promote consistency and strategy with previous dormant season grazing research projects.

Additionally, the local Extension Service contact recruited additional researchers, Extension Service contacts, and additional natural resource and wildlife personnel from across the northern Great Basin. The recruitment of professionals with a breadth of expertise was strategic in that the research project was similar to surrounding sagebrush rangelands with similar ecological threats like invasive annual grasses. Furthermore, contacts in neighboring BLM districts had active projects demonstrating the use of dormant season grazing to mitigate fine fuels. Collaboration with lead investigators from the existing demonstration sites was intended to promote educational opportunities whereby land managers could learn about ecological outcomes associated with established dormant season grazing efforts. Natural resource personnel from federal and state agencies were strategically recruited to promote agency values. Furthermore, their involvement enhanced transparency and contributed to the legitimacy of the fine fuels reduction research and education project. Table 2 highlights tasks performed by multiple partners associated with the fine fuels reduction partnership.

Transparency and accountability were important to establish as priorities within the fine fuels reduction partnership. Within the memorandum of understanding between the BLM and OSU, partners agreed to meet twice a year to share data, feedback, and concerns. Furthermore, the meetings were a place for shared learning, idea exchange, and reflection on challenges. For example, meetings were scheduled to incorporate feedback from all partners, including advisory committee members. They began with introductions that clearly aligned with roles, responsibilities, and interests before the group reviewed project goals and objectives that focused on the original project intent. Afterwards, participants reviewed rangeland and remote sensing associated with the research component of the project before they engaged in further discussion. Data from all vegetation sampling protocols were assessed for either trends or statistical significance. Meetings also provided an opportunity to highlight educational opportunities with partners within the region. Finally, the meetings provided a place whereby BLM and grazing operators had ample opportunity to highlight their unique perspectives.

After partners designed the research study and focused on positive ecological outcomes, the next step was to share the draft proposal with broader interest groups. Natural resource and wildlife agency personnel within the partnership initially provided input consistent with their respective missions, but now the local Exten-

sion Service contact reached out to nonprofit organizations with a history of aversion to public lands grazing in designated areas on publicly managed land. In particular, the local Extension Service contact presented the research and education project goals, objectives, and grazing treatments on the Three Fingers allotment and requested critical feedback from an Oregon nonprofit organization. The executive director of the nonprofit did note that our endeavor was outside the nonprofit organization's priorities.

Additionally, the partners worked with the Malheur Field Office BLM to conduct a 30-d public scoping period, which seeks input from those who expressed interest in public land management actions occurring within the Vale District, as well as posting the Fuels Reduction Grazing Research and Education Project within the Three Fingers Allotment to the BLM's National Environmental Policy Act Register. The project description strategically positioned the proposal as an education and research activity by describing treatments and providing a clear experimental design. The application included plans to conduct 1 yr of preliminary data collection on the Bannock Pasture, a pasture that would not be part of the long-term research study to refine research protocols. The preliminary year was intentional to collect data to share with partners and refine protocols before we implemented the research project. The partners specified they would use up to 1 700 cows for late-fall and winter grazing during the dormant season, between October 15 and February 28, a period when desired perennial vegetation is not actively growing and herbivory has the least potential impact to perennial bunchgrasses and native plants (Davies et al. 2016b). The BLM included two categorical exclusion (CE) exemption categories to support the application. Educational and research activities were justified by 516 DM2, Appendix 1, CX 1.11, whereas exclosures necessary for the research were supported by 516 DM 11.9, CX (J)(9). The BLM received and responded to five substantive comments after they sent a record of plan notification to the appropriate American Indian Tribes and published public notices in pertinent newspapers. The nonprofit organization contacted by the local Extension Service contact did not submit formal comments. A Record of Decision was issued for the project on October 11, 2017. In brief, the Malheur Field Office Manager authorized activities the partners proposed through the Fuels Reduction Grazing Research and Education Project within the Three Fingers allotment. Furthermore, the document contained information with the ecological rationale, federal authority, and appeals process.

Selection of tactics

Selecting dormant season grazing as a primary approach to manage fine fuels and support ecological outcomes promoting a perennial bunchgrass-shrub plant community was strategic. Given the increased risk of wildfire in any given year, as well as its eventual return at shorter intervals, the partners sought strategies that not only changed fuel loads but also increased the probability of changing an annual grass–dominated plant community to a more productive and less flammable, desired perennial herbaceous community. Implementing livestock grazing treatments during the dormant season reduced the potential for negative impact to other resource values. More precisely, selecting dormant season grazing as the primary management tactic was chosen to negatively influence invasive annual grasses in the vegetative stage by reducing photosynthetic tissues hindering the development of seed and reducing plant litter that benefits seed germination and establishment (Evans and Young 1970), ultimately shifting the competitive balance to favor native plant species (Trowbridge et al. 2013; Schmelzer et al. 2014). To promote desirable perennial bunchgrasses, which have been found to reduce annual grass proliferation (Chambers et al. 2007; James et al. 2008), dormant season grazing was selected to modify microsites favorable for invasive annual grasses. Evans and Young (1970), for example, found that medusahead seedlings under litter were 47 times greater than on bare ground. Over time, medusahead and cheatgrass form dense thatch (or litter) cover that alters temperature and moisture conditions necessary for desired species establishment while creating an ideal habitat to further promote germination and establishment of undesired species (James et al. 2011; Nafus and Davies 2014). When litter is removed by herbivory and/or hoof action, plant establishment of desired perennial species can improve (Sheley et al. 2007; DiTomaso et al. 2008). Therefore, dormant season grazing had the potential to meet the management ecological goals and objectives with the most social acceptance and reduced risk of irreparable misstep as partners learned how to apply it at a management-relevant scale while building associated confidence in the management tactic. Ultimately, learning how to do this while working within a partnership had fewer potential ramifications, such as impacts on grazing permits, lawsuits, and/or negative impacts for natural resource values.

Discussion

This effort offers an example of an early partnership that coalesced to test an approach to address a complex issue requiring the involvement of a federal agency, researchers and university Extension, and livestock operators. Participants believed that partnering would yield meaningful results (i.e., they had a shared vision and saw the mutual benefits of their time and resource investments). There was also shared understanding of what the partnership could reasonably achieve together. Although reduced occurrence of large-scale wildfires is the idealized outcome, the partnership understood that a series of strategic steps and small wins would be needed to develop the capacity, competencies to navigate inevitable difficulties, and legitimacy for such an approach to be scaled up or transmitted to other appropriate applications in the Vale BLM District and beyond.

In contexts such as public land grazing, in which antagonism among rangeland stakeholders has historically been high (Sheridan 2007; Lewin et al. 2019; Nemerever 2021), scholars have recognized that a series of small wins are useful for demonstrating the advantages of partnerships and collaboration (Berkes 2009). In our example, the partnership agreed on a problem—frequent large-scale wildfires—and explored opportunities for addressing it through the application of livestock grazing to treat herbaceous fine fuels. The partnership was cognizant that they were not only evaluating the efficaciousness of dormant season grazing to mitigate fire risk; they also set out to test and understand the administrative and social conditions necessary to implement such a treatment. This required being strategic about actions undertaken and ongoing learning and reflection within the partnership while revising processes.

While trust is developed over time as partners progress through phases of a project (Imperial 2005; Emerson et al. 2011), small wins early in a partnership that yield concrete outcomes can engender greater levels of trust (Berkes 2009; Huxham et al. 2000). Small wins are intermediate outcomes (Ansell and Gash 2007); learning from small wins propels a group's ability to take on more complexity (Pahl-Wostl et al. 2007; Fernández-Giménez et al. 2019; Meredith and Brunson 2021; Wilmer et al. 2021). In our example, regular meetings of the partners created a learning environment in which scientific and experiential knowledge could be shared and integrated into procedures. For instance, it was clear that application of livestock grazing was contingent on livestock operators who were willing to devote attention to cattle distribution in the treatment area (Davies et al. 2022b). As a consequence, five livestock operators worked with the local Extension personnel to ensure cat-

tle that were naïve to the dormant season grazing pastures did not congregate in fence corners.

Small wins nurture partners' commitment and trust that new approaches are possible and also generate broader credibility and social license to implement further innovations over time (Pahl-Wostl et al. 2007; Emerson and Gerlak 2014; Termeer and Dewulf 2019). Termeer and Dewulf (2019) discuss the need for groups to demonstrate the feasibility of new initiatives and produce visible results to generate confidence among partners in undertaking new challenges. To promote the credibility of the partnership's strategic approach to fine fuels management, the group understood that its activities must demonstrate the feasibility and efficacy of grazing to manage fine fuels, garner public confidence, and meet the BLM's mandates and minimize the potential for an appeal from a public that has historically scrutinized public land grazing. First, the partnership opted to implement dormant season grazing as a research project, including testable hypotheses, monitoring, and evaluation. Second, to garner public support, the partnership selected a site that had relatively few resource concerns (e.g., not sensitive sage-grouse habitat), invited public comment on the proposal, and established an Advisory Board for transparency and accountability. Lastly, the selection of dormant season grazing as the primary tactic for fine fuels management was critical for the BLM to reduce its risk of legal appeal by demonstrating that fuels treatments were in compliance with federal grazing regulations and aligned with meeting Standards for Rangeland Health in the project area.

In addition to trust, learning, and credibility, leadership is essential for building a partnership's capacity for joint action (Emerson et al. 2011). Support from Vale District BLM administrators and managers was essential; BLM leadership willing to take risks can aid in institutionalizing experimental approaches (Wollstein et al. 2021). Leadership roles also include convening or linking participants, navigating difficulties, gathering or generating knowledge, and developing a vision for change (Emerson and Gerlak 2014). Here, university Extension served as a bridging organization by spanning participants' knowledge and skills. The local Extension Service contact provided leadership that facilitated information flow across science (i.e., ARS researchers), practice (i.e., livestock operators and BLM Rangeland Management Specialists), and policy (i.e., Vale District BLM) arenas (Berkes 2009; Sternlieb et al. 2013; Davis et al. 2021).

Shared vision, learning, leadership, and trust alone do not solve wicked problems; new institutional structures such as rule changes or new norms within the Malheur BLM Field Office or Vale District will be essential to integrate new strategies into common practice (Wollstein et al. 2021). Although resistance to changing established practices is not uncommon (Bours et al. 2021), generating credibility from the partners' small wins will improve the palatability of implementing new practices for fine fuels management for BLM staff, the public, and livestock grazing operators. Bours et al. (2021) refer to the "institutionalization of small wins" (i.e., as successes accumulate over time, new norms are integrated into existing policies and practices). In our example, undertaking dormant season grazing as a research project allows the partners to assess in a relatively low-risk context the efficaciousness of the treatment, as well as the social and political dynamics that may constrain future applications of this approach (Termeer et al. 2017).

To lead to broadscale transformation of fine fuels management on public rangelands in southeastern Oregon, small wins such as applying dormant season grazing on the Three Fingers Allotment must accumulate and connect (Termeer et al. 2017; Berry and Berry 2018). Couplings across initiatives within the Vale BLM District, for example, would build local momentum toward institutionalizing the practice (Berry and Berry 2018). As a bridging organization, Extension may have a role in transmitting lessons learned from individual projects to other BLM Districts (Nourani et al. 2019). Lastly, there must be a critical assessment of project design and implementation, in which partners reflect on the exportable features and the institutional structures that will be necessary to support new practices in the long term. Evaluation must assess the evolving social acceptability of dormant season grazing, progress toward the partners' shared vision, and navigate barriers as they arise. If such efforts are to be scaled up over time, it will be essential to incorporate lessons learned from previous iterations of such projects (Berkes 2009).

Conclusion

Strategic partnering and securing small wins are essential for accelerating the diffusion of local innovations that accumulate over time in support of a larger vision for change (Termeer et al. 2017; Berry and Berry 2018). The fuels reduction research project within the Vale District BLM in Malheur County offers lessons for other nascent partnerships formed to treat fine fuels and improve ecological outcomes on western rangelands. Existing literature supports that ecological conditions can be improved on degraded sagebrush rangelands invaded by annual grasses (Davies et al. 2021a; Davies et al. 2021b; Perryman et al. 2021; Davies et al. 2022a). The partnership's small wins strategy involved testing management tactics through research and configuring processes to prepare for future opportunities to export the approach. This is especially salient in arenas where a larger change, such as an overhaul of livestock grazing permits, may be contentious (Lewin et al. 2019).

Learning by doing and experiencing success through small wins can create credibility for a partnership's strategic approach, which can produce a favorable environment for experimentation with new understandings (Termeer and Dewulf 2019). In order for dormant season grazing to be viable for treating fine fuels at a larger scale (e.g., throughout a Resource Area), it was essential that the partnership reflect on the conditions that made this project feasible.

Lastly, it is important to acknowledge that these activities occurred before the development of new institutional structures or specific policy support. The research project within the Vale BLM District provided an example that offered lessons on the administrative, political, and social conditions necessary for broader implementation and eventual institutionalization of dormant season grazing to treat fine fuels. Implementation may conflict with established practices and norms, so small-scale projects such as this serve as a proof-of-concept that builds confidence and momentum to implement new approaches to fine fuels management.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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