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Variable Support and Opposition to Fuels Treatments for Wildfire Risk Reduction: Melding Frameworks for Local Context and Collaborative Potential

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Abstract

Fuels reduction projects are an increasing focus of policy, funding, and management actions aimed at reducing wildfire risk to human populations while improving landscape health. This research used in-depth interviews to explore variable support or opposition to three fuels-reduction projects occurring in the same region of north central Washington State, USA. Results indicate that differential support or opposition to each project stemmed from a unique combination of social factors operating in each locality (e.g., past history with fuels treatments, values for public land, environmental advocacy networks), the relationships that local populations had with agency members conducting each treatment, and the ways that managers engaged populations in the design of each treatment. We used existing frameworks for understanding collaborative potential/environmental conflict and for documenting the influence of local social context on adaptive wildfire actions to help explain emergent lessons about support or opposition to each project.

Study Implications: Our results illustrate how support or opposition to proposed fuels-reduction treatments can emerge among socially diverse human "communities" occupying the same small region. We melded existing theoretical concepts and literature to advance an expanded framework for understanding the ways that local social context or circumstances interact with broader agency, political, or procedural processes to influence local support or opposition to fuels treatments. Case study lessons and the framework advance a more systematic process for deriving lessons about local response to proposed fuels treatments, including expanded means for forecasting or anticipating opposition and promoting collaborative development to improve implementation efficiency.

Keywords: wildfire, fuels reduction, conflict, collaboration, community

Both the scientific community and emerging policy prioritize the acceleration of fuels reduction projects at larger landscape scales as one important way to reorient societal relationships with wildfire. Yet much practical experience and research also indicate that the implementation of any fuels reduction project takes place amid a complex array of contextual factors that span existing policy or operational requirements and which engage local human populations whose relationships with surrounding landscapes can differ dramatically (Brenkert-Smith et al. 2020; Paveglio et al. 2019a; Sotirov et al. 2017). For instance, the support or acceptability of fuels treatments among members of diverse publics affected by a fuels treatment continue to be a critical influence on the promotion, speed, and design of many fuels reduction efforts, especially given the growing focus on treatments that cross landownership boundaries in ways that mimic ecological functions (Ager et al. 2021; Eriksen and Prior 2011; Moskwa et al. 2016). Public support for fuels reduction treatments can open new avenues of resources, skills, or revenues that promote additional fuels reduction treatments and that public lands managers or private industry are unable to sustain alone. Likewise, conflict or opposition to vegetation management can slow, block, or modify the prescription of fuels reduction treatments in ways that affect their utility for wildfire management objectives (Jahn et al. 2020; Paveglio et al. 2009a; Remenick 2018). The research presented in this article explores the factors that led to support or opposition to fuels-reduction treatments in the same geographic area to better understand how such responses materialize across populations in the same landscape.

There is a long and established literature about conflict or support for environmental management, including ongoing debates about forest harvest or removal of native vegetation in rangeland systems, and disagreements about the extent to which resource professionals should actively manage "natural" landscape processes (Brunson and Shindler 2004; Shindler et al. 2004; Toman et al. 2013). Similarly, decades of research on collaboration (and more recently co-management) focus on the ways sustained engagement of diverse human populations throughout the process of prioritizing, designing, or implementing fuels-reduction treatments can help streamline legal or procedural hurdles that can hinder their implementation (Charnley et al. 2015; Davis et al. 2020; Schultz et al. 2018). Thus, it is becoming increasingly clear that successful

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prioritization and implementation of fuels reduction efforts can often hinge on understanding and appropriately tailoring fuel treatment efforts to the unique local context characterizing the landscapes where such treatments are most necessary.

Although research on support for fuels-reduction treatments is extensive, it also tends to skew toward the evaluation of individual-level factors or perspectives that might lead to broad support. Less research explores how perspectives stem from collective action by local people who champion fuels treatments or oppose their implementation in specific places (Brenkert-Smith et al. 2020; Dupey and Smith 2018; Paveglio et al. 2015b). A smaller body of literature on collective local action surrounding wildfire management has long acknowledged that the trajectories of wildfire adaptation (including support or opposition to fuels reduction) may look different given the local cultures or relationships that are a vital part of a broader fire "landscape" in a given place. Importantly, existing wildfire literature reveals that the emergence and form of collective action might differ dramatically across even small scales, and that learning how collective action surrounding fuels reduction manifests in specific places can provide generalizable lessons across patterns of cultural diversity (Paveglio et al. 2012, 2018, 2019a).

The research presented in this article extends literature on support or opposition to fuels-reduction treatments by exploring site-specific characteristics of local culture, organizing, and policy that led to variable support or opposition to fuels reduction treatments proposed by different agencies in the same region of north central Washington, USA. Researchers conducted 53 in-depth interviews with 59 residents, professionals, and local leaders associated with three separate fuels-reduction treatments implemented across the Methow Valley to explore the dynamics that led to collective support or opposition of each effort. We use or expand conceptual lessons from wildfire and environmental conflict literature to contextualize emergent findings from each case, including the advancement of systematic frameworks for understanding conflict or collective action surrounding wildfire adaptation.

Literature Review

Conceptual Underpinnings of Fuels Management Conflict or Support

Foundational concepts from environmental conflict and collaboration literature help organize the diverse factors influencing how human populations work together or develop incompatibilities that sow environmental conflict (Ho Lee et al. 2018; Pruit and Kim 2004). One of the clearest articulations of those conceptual realms is the "progress triangle," which outlines how elements of "substance," "procedure," and "relationships" surrounding a given environmental action interact to dictate the collaborative potential of a situation (Daniels and Walker 2001; Walker and Daniels 2005; Walker et al. 2008).

The relationship realm of the progress triangle involves issues such as trust, respect, and legitimacy between parties managing or affected by a resource decision. It often means understanding the range of affected populations involved in the action, determining their worldviews, beliefs, or values, and ascertaining whether they share enough key knowledge and understanding to allow for progress toward a shared outcome (Daniels and Walker 2001; Emborg et al. 2020). The procedure dimension of the progress triangle focuses on the rules and processes that guide parties' interactions surrounding a decision, including policy or legal constraints, past management approaches, shared inquiry or input, and whether there is adequate "space" for alternatives to proposed environmental actions (see also Clarke and Peterson 2016; Walker et al. 2015). Finally, the substance realm of the progress triangle includes tangible and symbolic elements of the resource management decision itself. These elements might include different values or interests for the resource being affected, agreement or disagreement about the facts used to justify or guide a resource management action, the history of interaction between parties managing or affected by resource management decisions in the area, and incompatibilities of cultural orientations, worldviews, or personalities of actors involved in the resource management action (see also Dietz and Stern 2008; Walker and Daniels 2019).

The progress triangle provides a good starting point for organizing and expanding on the disperse range of factors that researchers continue to identify as important influences on support or opposition for fuels reduction treatments aimed to reduce wildfire risk. As such, the following sections organize existing insights from the study of support or opposition to elements of the progress triangle (see Clarke and Peterson 2016 or Walker et al. 2015 for approach). We then juxtapose those findings with an existing framework that helps explicate the influence of social diversity on wildfire adaptation in an attempt to promote theory that can more quickly make sense of differential support for fuels treatment across cases.

Relationships, Trust, and History

A significant body of research on wildfire adaptation suggests that trust between residents and land or emergency managers is a significant influence on support for such projects. Yet trust between residents and managers can take different forms or have differential effects on support for natural resource issues such as fuels treatment projects (Davis et al. 2018; Stern and Coleman 2015). For instance, segments of wildfire social science indicate how residents' trust in managers to effectively carry out fuels reduction that reduces future wildfire risk, including whether they have technical capacity and resources to implement those treatments (e.g., relevant prescriptions for the local ecology, removal of residual slash, understory burns), can significantly influence their support or opposition to ongoing project implementation (Ascher et al. 2013; Brunson and Evans 2005; McCaffrey and Olsen 2012; Shindler and Toman 2003; Toman et al. 2011). Other residents and professionals may be more interested in how fuels-reduction efforts will uphold aesthetic preferences for the landscape (e.g., privacy from other developments) or improve overall landscape health (Brenkert-Smith 2020; Olsen and Sharp 2013; Rasch and McCaffrey 2019; Ribe et al. 2013; Williams et al. 2018). Similarly, numerous studies have demonstrated how professionals and policymakers at multiple scales of land management organizations may modify their plans for fuels-reduction efforts in response to perceived backlash, lack of support, or fear of litigation by groups with whom they do not share trust (Charnley et al. 2015; Shindler et al. 2014).

Trust in those carrying out fuels reduction appears particularly relevant when choosing between methods for fuels reduction treatment, with existing studies demonstrating how the perception of shared values between managers and residents can greatly influence the acceptability of using prescribed

fire, mechanical thinning, or grazing as means to reduce fuels (Czaja et al. 2016; Mylek and Schirmer 2019; Toman et al. 2011). Importantly, residents' experience and associated judgements that professionals' management actions are in line with their desires for how a broader landscape should be valued (e.g., a source of resources, priorities for restoration, conservation of wildlands) also can influence whether the latter oppose or choose to collaborate with proposed management practices such as fuels treatment (Burtz and Bright 2014; Ford and Williams 2016; Sotirov et al. 2017). Other authors have found that past experiences (e.g., positive outcome, past disagreements) associated with fuels reduction actions or wildfires in the region can influence ongoing support about the level of thinning, prescribed burning, or a combination of the two practices across locations (Edgeley and Colavito 2022; Jahn et al. 2020; Paveglio et al. 2015b).

Although trust is a multidimensional concept (Emborg et al. 2020; Stern and Coleman 2019), its relevance to wildfire risk management also appears to bridge institutional and physical scales. That is, multiple studies have indicated that the development of personal relationships with resource managers and firefighters may improve residents' willingness to support fuels reduction treatment based on their trust in individuals who represent agencies, despite a lack of trust in a broader institution (Lachapelle and McCool 2012; Moskwa et al. 2016).

Procedure, Co-development, and Collaborative Policies

The increasing prevalence of programs or policies that bring disparate parties together to collectively deliberate about fuels reduction planning could be viewed as efforts to focus on the procedure elements of the progress triangle. They implicate how the rules, policies, and resources that structure collective decision making among diverse human parties can greatly affect the ultimate form or support for resource management actions such as fuels reduction (see Moseley and Charnley 2014; Toman et al. 2008; Webler and Tuler 2006).

For instance, a wealth of existing research suggests that early engagement of residents in the tailored design of wildfire adaptation programs (including fuels reduction) can help create the types of transparency, legitimacy, and fairness that promote support for fuels treatment actions (McCaffrey 2009; Paveglio and Kelly 2018; Paveglio et al. 2015b). Increased opportunities for various populations to co-develop the criteria, prioritization schemes, or prescriptions associated with fuels reduction management actions also can help produce shared support, or what some authors call "social acceptance," for fuels reduction actions (Brummel et al. 2012; McCaffrey et al. 2013; Shindler et al. 2004). Conversely, conflict or opposition to fuels treatment projects often happens when local people feel they are excluded from decision processes or allowed only late comment in the design of projects, and when relevant scientific perspectives or human values seem unheeded in the ultimate decisions (Cerveny et al. 2018; Olsen and Sharp 2013; Sharp et al. 2013). Finally, conflict and opposition can occur when the technical aspects of the science informing management decisions are seen as too simplistic, lacking veracity, or designed to promote what is perceived as a predetermined outcome (Brenkert-Smith 2011, 2020; Tuler and Webler 2010).

Wildfire social science is replete with examples demonstrating how the legacy of past management actions, including whether local people felt they were adequately informed, consulted, involved, or empowered to aid in the science or decisions surrounding an action, can result in long-term conflict or litigation (Edgeley and Paveglio 2017; Laband et al. 2006; Toman et al. 2014). Existing literature also demonstrates that resource management actions are likely to be influenced by higher-level policies, objectives, or funding constraints that are more ridged and which narrow the decision space that limits the types of projects resource managers can conduct in a specific location (e.g., restrictions on fuels reduction for habitat buffers or protected areas, objectives that focus on removal of certain vegetation) (Abrams et al. 2017; Driscoll et al. 2016; Young 2002).

Early collaborative fuels treatment efforts, such as the Health Forests Restoration Act and Community Wildfire Protection Plans, encouraged local residents, politicians, and fire managers to work with land management agency professionals in the design and prioritization of fuels reduction actions across their shared landscape (Jakes et al. 2011; Palsa et al. 2022; Williams et al. 2012). Meanwhile, more recent efforts such as the Collaborative Forest Landscape Restoration Program, Joint Chiefs Restoration projects, or the Good Neighbor Authority attempt to expand and extend fuels-reduction work to landscapes scales and in ways that incentivize shared contributions by local residents, governments, and land management agencies (Charnley et al. 2020; Cyphers and Shultz 2019; Schultz et al. 2012). Fuels-reduction efforts also interact with foundational legal requirements such as the National Environmental Protection Act (NEPA) and state environmental protection acts, both of which require opportunities for affected publics to comment on and (where practicable) contribute to the decision processes surrounding significant environmental actions such as fuels reduction treatments (Charnley et al. 2015; McIver and Becker 2021).

Expanding sections of wildfire social science explore the increase in forest and range collaboratives—formalized partnerships between residents, industry members, land managers, and environmental groups who organize in part to provide decision input on landscape-level fuels-management projects incentivized by the programs described above (Cerveny et al. 2018; Western et al. 2017). Lessons from case studies of collaboratives and Joint Chiefs projects all continue to describe a need for shared development of decision rules, collaborative deliberation about place-based science that informs decisions, or negotiation of power dynamics or ultimate decision authority that create opportunities for shared contribution (Charnley et al. 2020; Davis et al. 2017).

Substance, Framing, and Values

Disagreements about the parameters of a proposed fuel treatment (e.g., boundaries of treatment, species to be removed, how much vegetation to remove) or the purpose behind such efforts (e.g., to reduce future risk to human structures, to improve range health) are perhaps the mostly easily recognized and tangible elements of the progress triangle. However, the substance behind such disagreements often stems from much deeper understandings, disagreements, or symbolic meanings that groups of people develop about the management action in question (Eriksson et al. 2018; Paveglio et al. 2009a; Ryan 2005). For instance, documented opposition to fuels-reduction treatments may revolve around a desire for natural systems to be free of human management because stakeholders believe that forest thinning is driven primarily by

profit, they are concerned that the outcome of fuels reduction treatments will not result in stated goals (e.g., improvement of landscape health), or they believe environmental management might expose them to other unwanted outcomes (e.g., negatively affect a place they like to recreate, expose them to smoke, affect area aesthetics that are important to a local economy) (Engebretson et al. 2016; Jahn et al 2020; Maier and Abrams 2018; Paveglio et a. 2011; Seijo et al. 2020). Meanwhile, support for treatments might be fostered when populations agree on the shared need to reduce dominant risks of wildfire to ecosystem functioning, livelihoods, and property, when all parties agree that the action is in response to unhealthy ecosystem conditions (e.g., overstocked forests, juniper encroachment), and when they agree on the science or assumptions guiding the parameters of the specific treatment (Burns and Cheng 2007; Diaz et al. 2016; Toman et al. 2014).

Perhaps the best way to approach the nuance needed to understand agreement or disagreement surrounding the substance of a given fuel treatment begins with fundamental processes of "cognitive frames." A cognitive frame represents the linked meanings, knowledge, and information that humans draw from when making sense of a new phenomenon and structuring the subjective ways they choose to act (Daniels and Walker 2001; Davis and Leweicki 2003). Frames can also be heavily influenced by the people we respect, interact with, or engage during the process of forming individual values and identities. Groups of actors pursuing, managing, or affected by a fuels reduction project may engage in the "framing" of circumstances surrounding that action by promoting particular aspects of their shared reality in an effort to engender specific interpretations, evaluations, or treatment recommendations associated with that management action (Castello et al. 2019; Champ et al. 2012; Jahn et al. 2020). Potential agreement over the meanings articulated in frames, or the incompatibility in the primary meanings different groups promote with regard to a specific fuel treatment, are thus critical to shared support or conflict over an action (Ascher et al. 2013; Seijo et al. 2020; Williams et al. 2018).

Frames are useful because they illuminate how people come to define the nature of problems and reason through whether they have enough common understandings to resolve them through collective action. Yet the literature on environmental conflict and collaboration also indicates that frames stem from the particular meanings that local people and professionals come to associate with the management action itself and how those new efforts uphold or change their relationship with one another and the landscape where the management will take place (Cheng et al. 2003; Paveglio et al. 2011; Rawluk et al. 2017). Meanings and frames often stem from an expression of who people are, including the communities or ways of life that they wish to perpetuate. It is for these reasons that much conflict management and collaboration literature stresses the important need to understand patterns of values and populations who inhabit landscapes where fire occurs and to develop approaches for more quickly understanding how local conditions might lead to flexible approaches for fostering agreement about fuels-reduction treatment action (Paveglio 2021; Paveglio et al. 2016).

A Process for Understanding Place-based Support and Opposition

Existing work on wildfire adaptation, including support for fuels reduction efforts, increasingly stresses that landscapes are not monolithic collections of individuals, groups, or communities who share the same values, ways of organizing, or frames related to ongoing wildfire management (McCaffrey 2015; Meldrum et al. 2018; Paveglio and Edgeley 2020; Paveglio et al. 2017, 2019b). Findings from that work suggest that each landscape can be thought of as a complex patchwork of local cultures and communities who come to develop specific and evolving relationships with their landscape, other communities in the region, and with representatives of professional agencies. Select authors from the research traditions described above stress how human communities *emerge* across broader landscapes, and that community is best understood as the potential for human populations (e.g., residents, local politicians, emergency professionals, land management professionals) to collectively mobilize their shared meanings and understandings in response to needs for collective action (e.g., fuels reduction treatment) (Paveglio 2021; Paveglio et al. 2015a, 2018, 2019a). Associated notions of social fragmentation describe how divergent meanings, values, or abilities of people to form working relationships can fracture broader landscapes into progressively smaller units where action can take place (Billings et al. 2021; Paveglio et al. 2019b). Such social fragmentation is likely to influence the ability of individuals, organizations, and groups to agree on the substance of fuel treatments, mobilize their relationships toward a decision, or structure procedures that give legitimacy to management outcomes across ownerships.

Of particular use to our efforts in this article is the "interactional approach to adaptive capacity" (hereafter the interactional approach) developed by Paveglio and co-workers (Paveglio et al. 2009b, 2012, 2018, 2019a; Paveglio 2023). The interactional approach outlines 22 potential characteristics of place-based human populations that combine to help explain the capacities and actions they take in response to wildfire risk. The "adaptive capacity characteristics" are organized into four broad categories to help best understand how they might combine to structure evolving response to wildfire management efforts: (1) interactions and relationships among residents, (2) access and ability to adapt scientific or technical knowledge networks, (3) place-based knowledge and experience, and (4) demographic/structural characteristics (See figure 1). Systematically documenting adaptive capacity characteristics among populations provides a means to more quickly distinguish emergent communities across a landscape; design tailored procedures, programs, or processes that respond to local values; and understand or build support for various wildfire adaptation initiatives (e.g., home ignition zone mitigations, support for fuels breaks, engagement with agency partners, evacuation preferences) (Edgeley et al. 2020; Paveglio 2023; Stasiewicz and Paveglio 2018).

Our efforts in this article attempt to meld insights from the progress triangle and the interactional approach by exploring how the two might provide strategic theoretical and temporal complements in understanding support or opposition to fuels treatment projects. That is, the local social characteristics that help define unique populations or communities across a landscape invariably influence their interaction with other parties (e.g., agency professionals, local politicians, other communities) during negotiations about fuel treatment design or in the ways they react to outside forces implementing change in their local landscape. As such, we could think of the interactional approach as embedded within the progress

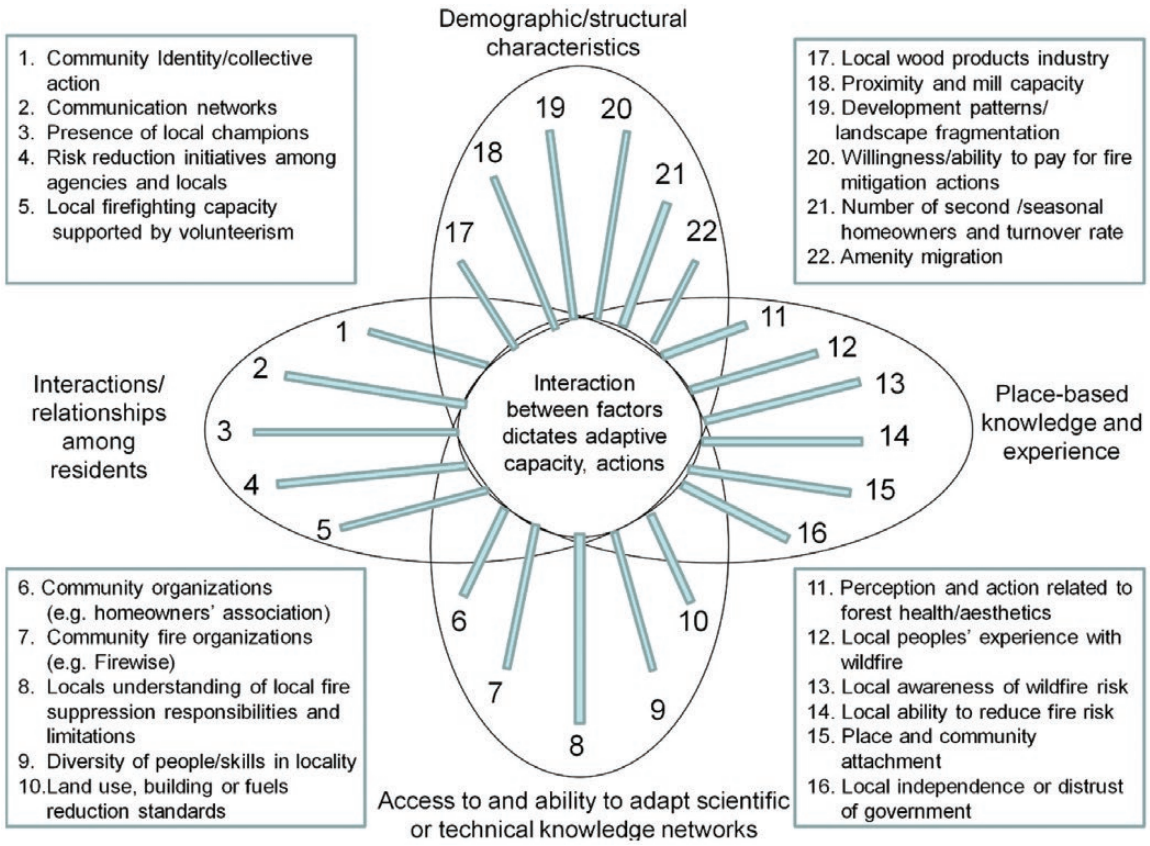

Figure 1 Characteristics influencing differential adaptations or support for mitigations among diverse communities (adapted from Paveglio et al. 2012). Each numbered characteristic in figure 1 is represented as a linear bar to reflect that different communities may possess varying degrees or levels of each characteristic. The length of bars does not necessarily reflect the magnitude of characteristics. See Paveglio et al. (2015, 2018) for examples of the ways that resultant capacities lead to different outcomes and Paveglio et al. (2012) or Paveglio (2023) for descriptions of each characteristic.

triangle, or as a wildfire-specific "stakeholder analysis" that often precedes engagement of affected populations in environmental collaboration. Stakeholder analyses help determine the unique values, understanding, and relationships that will guide ongoing interaction (see figure 2) (Clarke and Peterson 2016; Daniels and Walker 2001; Reed et al. 2009). Similarly, lessons surrounding the interactional approach suggest that landscape-level fuels treatments may encompass many unique communities and deal with many different groups of human actors (Paveglio 2021; Paveglio and Edgeley 2017; Paveglio et al. 2019b). Dealing with the diversity of human populations influencing and affected by a given fuels-reduction treatment may necessitate thinking about the landscape as a series of interlinked progress triangles, each with their own unique local context that influences differential response to treatments. Accordingly, we ask the following research questions:

1. How do elements of local community functioning influence support or opposition to proximal fuel treatments?
2. How do relationships, processes, or meanings (i.e., substance) associated with fuels reduction projects influence local response to proposed fuel treatments in a shared landscape?
3. What factors best help explain the potential for differential response to fuels reduction treatments in the same landscape?

Methods

We adopted an inductive, multiple case study approach for this research. Case study approaches are well suited for exploring comparisons across circumstances or linkages between units of analysis (e.g., fuel treatment projects). More specifically, this research adopted elements of what are referred to as maximum variation and theoretical case study selection (Flyvbjerg 2011; Yin 2003, 2013). We describe how our case study selection processes reflect these established methods in the following sections.

Case Study Selection and Context

We began our search for potential cases of wildfire adaptation and co-management in the Wenatchee priority landscape by engaging key informants spanning the region. The Wenatchee priority landscape extends across much of the eastern Cascade Mountain range of Washington State and spans much of Chelan, Douglas, Kittitas, and Okanogan Counties (see Ager et al. 2021 and USDA 2022 for definitions related to the Wenatchee priority landscape). A key informant refers to an individual who has specialized knowledge or experience with the topic of interest, including an understanding of the local context most applicable to the management issue being investigated (Bryman 2012). Initial key informants in the Wenatchee priority landscape included fire chiefs or fire district outreach professionals, local leaders of Firewise efforts, conservation district professionals, members of forest collaboratives, Washington Resource Conservation and

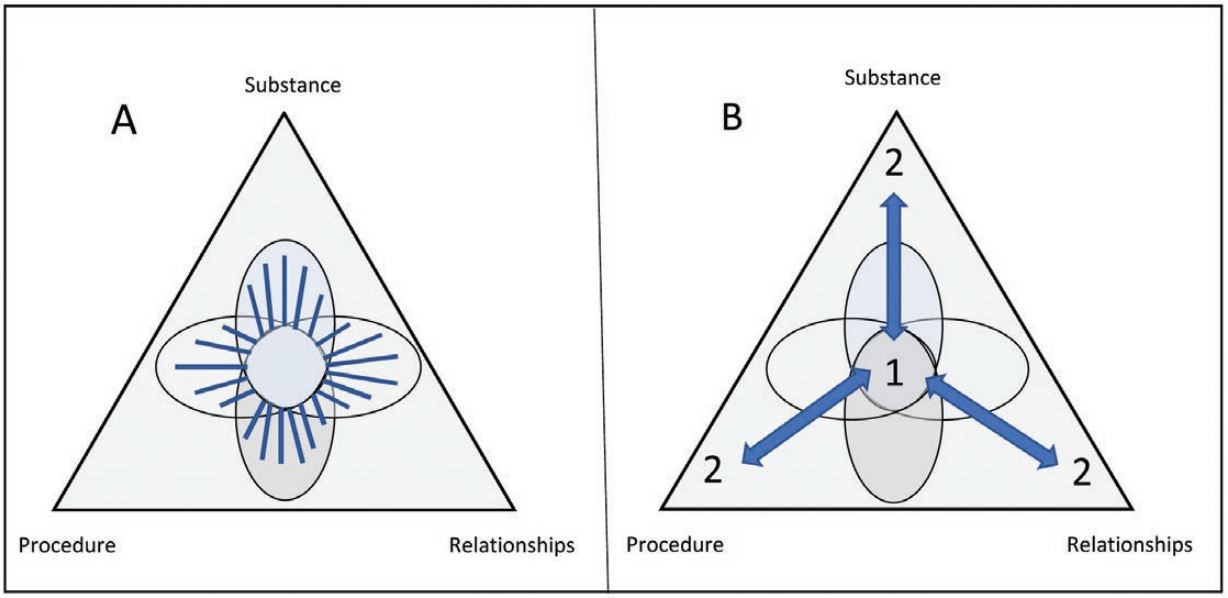

Figure 2 Combining theoretical processes for understanding place-specific influences on support or opposition to management actions such as fuel reduction treatments. A: Combining the interactional approach to adaptive capacity (inner figure) and the progress triangle (outer figure) may provide strategic opportunities to (1) catalog the unique place-based characteristics of individual communities potentially affected by a proposed fuels treatment to understand potential support or opposition; and (2) consider how processes for negotiating, planning, or implementing fuels treatments may influence collaboration or conflict among those involved. B: Existing literature and practice suggest that understanding the characteristics of affected or engaged community members is a valuable early step in collaborative action (see number 1, panel B). Assessment of local context can then progress to thinking about how existing relationships, experiences, capacities, or values may affect interaction with others engaged in a management action (e.g., agency professionals, regulatory officials, policymakers, environmental groups, NGOs, etc.) (see number 2, panel B).

Development staff, members of the Washington Fire Adapted Communities Coalition, and representatives of the Nature Conservancy.

The senior author conducted informal interviews with six of the aforementioned key informants over the phone to obtain a range of wildfire adaptation efforts that key informants felt were either effective or ineffective across the Wenatchee priority landscape. The researchers later visited a range of potential case studies in the Wenatchee priority landscape and conducted 15 additional key informant interviews with individuals who had personal experience with candidate case locations suggested by earlier key informants. We used insight from key informants and visits in the decision to conduct case studies of the Lost Driveway, Virginia Ridge and Mission Restoration projects that all occur in the same region.

The Lost Driveway project was led by the USDA Forest Service in collaboration with the National Forest Foundation (NFF) (National Forest Foundation 2023). The project was funded in part through the Joint Chiefs' Landscape Restoration Partnership, a collaboration between the Forest Service and Natural Resources Conservation Service (NRCS) to restore public forests and grasslands. The project also received funding through the NFF Treasured Landscapes Program, which directs additional funding for restoration of forests and ecosystem services on iconic public lands. The Lost Driveway project spanned approximately 2,400 ac of forest restoration spanning various disaggregated units of the upper Methow Valley, a scenic area extending into the heart of the North Cascades Mountain Range, and which features world-class outdoor recreation opportunities such as hiking, biking, cross-country skiing, and a Wild and Scenic River (Methow River). Treatments associated with the Lost Driveway project primarily included thinning, pruning, hand piling, and pile burning. In contrast, the Virginia Ridge Forest Improvement Timber Sale (FIT sale) was a 735 ac contiguous project led by the Washington State Department of Natural Resources (DNR) on state lands close to the city of Winthrop and within sight of select project units from the Lost Driveway project (Stamper 2018). The project primarily involved reducing the number of trees per acre through commercial harvest, with some slash removal through pile burning or chipped biomass. The Virginia Ridge project was subject to the Washington State Environmental Protection Act (SEPA, a state level policy that is adapted from NEPA) process requiring public comment on significant efforts to manage public land. Researchers reviewed all publicly available comments submitted as part of the SEPA process and obtained additional comments from the agency as part of the data used to triangulate understanding of the project. The project was eventually halted and subsequently revised in collaboration with concerned local residents of the Methow Valley.

Finally, the Mission Restoration Project was a 50,000 ac treatment proposed by the Forest Service in conjunction with the North Central Washington Forest Health Collaborative, a diverse group of regional stakeholders, including timber industry representatives, conservation groups, tribal governments, elected officials, and resource managers (USFS 2023). The Mission Restoration Project was slated to take place predominantly across public lands in the Libby Creek and Buttermilk Creek sub-drainages. It was designed to improve ecosystem health and forest resilience, including the reduction of wildfire risk and impact to ecosystem services. The Mission Restoration Project included multiple treatment prescriptions (e.g., light or heavier mechanical thinning of commercial and precommercial size, pile burning, use of prescribed underburning, modification of road systems) across a contiguous

area of both drainages based on site-specific ecological conditions, analyses of historic forest or upland conditions, and in an effort to address declining aquatic habitats. The project was subject to an Environmental Assessment (EA) under NEPA, which requires a higher level of analysis and public participation than the categorical exclusion obtained for the Lost Driveway project described above. Researchers obtained and reviewed all public comments provided during the EA process for the Mission Restoration project to gain initial understanding of support or opposition to the effort.

The contrast between the Lost Driveway, Virginia Ridge, and Mission Restoration projects provided an interesting opportunity to explore how local social dynamics, management strategies, and engagement tactics might lead to very different outcomes in the same landscape where shared wildfire adaptation often is prescribed by outside policymakers and scientists. These factors reflect what is often referred to as maximum variation sampling for case studies, as researchers are interested in how differing dynamics lead to similar or varied outcomes in terms of some collective action. The above criteria also reflect the logic of theoretical case study sampling, which focuses on selecting cases based on the presence of factors in existing theory or literature (Flyvbjerg 2011; Yin 2003, 2013).

Interview Data Collection

Researchers conducted 53 interviews with 59 individuals in the late fall of 2018 during two additional in-person visits to the Methow Valley. All interviews were recorded with participant permission and later transcribed word for word. Researchers conducted the vast majority of interviews in-person, with six interviews being conducted over the phone because participants were not able to schedule an in-person interview. Both authors attended the majority of the interviews, with one author serving as the lead interviewer and the other taking notes or asking follow-up questions throughout the interview. Interviews lasted between 25 minutes and 183 minutes, with an average interview time of 60 minutes.

We selected interview participants based on a combination of theoretical and snowball sampling. Theoretical sampling is concerned with the selection of diverse and representative respondents who have specialized knowledge about the focal topic(s) of the research (Charmaz 2000; Creswell and Plano Clark 2018). In this case, that meant interviewing (1) valley residents who would be affected by each fuels reduction treatment; (2) members of the broader public who wrote comments or letters in favor of or opposition to each project; (3) local politicians or land management professionals involved with each project (e.g., Forest Service or Department of Natural Resources personnel); (4) conservation district or NFF staff who collaborated on the design or implementation of projects; (5) members of local environmental groups, organizations, or collaboratives who influenced the outcomes of each project; and (6) area fire/land management professionals, including both local fire districts and state or federal agency representatives.

Snowball sampling supports theoretical sampling through participant suggestion of additional interviewees who ensure accurate representation of the phenomenon studied to ensure that a full range of perspectives on an issue are included in the research or to illuminate further phenomenon (Lindlof and Taylor 2010; Silverman and Marvasti 2008). We only halted recruitment for additional interviews when we agreed that the perspectives, circumstances, influences, or additional interviewees described by research participants were no longer yielding new information, a process referred to in qualitative methods as "theoretical saturation" (Bryman 2012; Morse 1995).

We developed a semi-structured interview protocol to guide the data collection. Semi-structured interview protocols allow for some consistency in the type of questions asked and the flexibility to explore emergent ideas or the unique experiences of interview subjects through probing questions and prompts for elaboration about important topics (Miles and Huberman 1994; Patton 2014). Protocol questions covered a range of topics, including (1) justifications behind the design of fuels-reduction treatments selected for case study; (2) involvement of residents, professionals, and managers in decisions about the fuels reduction treatments; (3) local support or opposition to the fuels treatment projects and reasons for those reactions; (4) lessons learned from the fuels-reduction project implementation process; and (5) how experiences with fuels-reduction treatments were likely to influence future wildfire adaptation processes in the region, including relationships between agencies and area residents.

Analysis

Data analysis was conducted in three linked phases. Researchers began the analysis process in the field by summarizing emergent ideas and notable patterns each night to develop preliminary emergent themes (Guest et al. 2006; Sutter 2012). Phases two and three of the analysis process used the qualitative software QSR NVivo 12 (QSR International, Burling, MA). Analysis conducted during phase two focused primarily on word-for-word transcriptions of the 53 formal interviews conducted for data collection, although it also encompassed initial key informant interviews described above. Phase two of the analysis was guided by processes of analytic induction and thematic analysis. Analytic induction provides a systematic coding process for deriving shared causal explanations of phenomena, including the comparison of factors, perspectives, or relationships that might influence the outcome of linked case studies (Gomm, 2009; Ryan and Bernard 2000). Thematic analysis provides a compliment to the analytic induction process by helping to identify the shared or divergent experiences, meanings, and ideas that influence human action surrounding a given event (e.g., a fuels reduction project) (Boyatzis 1998; Bryman 2012).

We applied processes of both analytic induction and thematic analysis to create a multiple stage, increasingly restrictive coding process designed to uncover and articulate themes across linked case studies. More specifically, researchers conducted the following three rounds of coding, each of which constituted a separate "reading" of the data: (1) "topic coding" that focuses on labelling each segment of text in accordance with the primary subject matter discussed; (2) descriptive coding, which helps to summarize participants perspectives surrounding each topic discussed, or which identifies salient influences surrounding support or opposition to fuel treatments; and (3) analytic coding, which focuses on developing consistent relationships between perspectives, experiences, or influences that influenced ultimate case study outcomes (i.e., support or opposition to proposed treatments) (Richards 2005, Gibbs 2007, Saldaña 2016).

All phases of the coding process described above were linked to unique "code families" representing each of the

three fuels-reduction case studies selected for this research. That is, every topic code, descriptive code, or analytic code uncovered were also coded to the fuels treatment project(s) being discussed. This process allowed for comparison of significant influences or contextual factors leading to support or opposition across the three cases compared in the study (see Paveglio and Edgeley 2017 for previous use).

A final phase of the coding process entailed organizing emergent themes uncovered during phase two across each case and using progressive categories of influences, namely (1) elements of local social context articulated in the interactional approach to adaptive capacity and that help define unique human communities who engaged with or might be affected by each fuel treatment (Paveglio et al. 2012, 2015a, 2018, 2019a); (2) the substance, process, or relationship categories of the progress triangle that help explain negotiation, dialogue, or interaction among human actors engaged in the planning of each treatment (Daniels and Walker 2001; Walker et al. 2008); and (3) how the interaction between elements 1 and 2 interacted in the production of local support or opposition. These types of coding are referred to as a priori coding or pattern coding (Saldaña 2016). We present results from the final phase of coding in the discussion section because existing case study research guidance and wildfire literature stress the importance of inductively uncovering unique local context and then comparing it to existing literature on the topic (Paveglio et al. 2018, 2019, 2020).

Results

Residents, professionals, and policymakers interviewed were quick to articulate the significant amount of social diversity that characterizes the Methow Valley—and which extends across the three fuels treatments that are the focus of this research. One significant source of that social diversity stemmed from what respondents described as successive "waves" of migrants to the Methow Valley. Earlier migrants in the "60s, 70s and 80s" sought to live more rural, "back to the land" lifestyles, promote sustainable agriculture, and preserve the "natural" amenities in the area. Later and ongoing influxes of residents chose to retire or buy second or recreational homes in places with outstanding natural amenities and recreation opportunities. The latter waves included a growing number of Airbnbs or rental properties that perpetuated growing recreational tourism in the upper Methow Valley. As one resident described:

> Up toward Mazama there's more, say, Microsoft and Amazon type money, and when you get down to Twisp there's still some ranchers, but there's a lot of sort of, I don't want to be too pejorative but, burned out hippie type people.

Respondents were quick to outline how ongoing waves of migrants to the region, many of whom came from the more populated west side of Washington across the Cascade Mountains, created a wide diversity of perspectives about environmental management, use of public lands, and resource extraction. Interviewees indicated that ongoing changes in the composition and types of residents occupying different parts of the valley follow both broad patterns (see first quote of this section) and create distinct, smaller communities of like-minded individuals who tend to work together on collective issues. As one respondent summarized: "Each drainage has its own different mindset a little bit."

Interviewees, written comments, and newspaper coverage all indicated very different responses to the fuels reduction treatments studied for this research. Interviewees attributed differential support or opposition across the three fuel reduction treatments studied to the distinct local cultures, histories, and values of human communities proximal to each proposed treatment. Likewise, respondents described key differences in the ways that agencies had approached the collaborative design of each project, the historic relationships each community had with the land management agency proposing the treatment, and their ties to broader environmental groups or nongovernmental organizations (NGOs) in the area. In the following sections, we articulate the case-specific elements and processes that our research identified as influencing resident and broader public response to each of the three fuel treatments studied. We then compare influences across cases in the discussion section using a combination of the interactional approach to adaptive capacity and the progress triangle.

Lost Driveway

Managers and residents involved in the Lost Driveway project outlined how initial planning of the effort had been tailored to the local conditions and specific social context that characterized the upper Methow Valley. Professionals from the Forest Service, local conservation district, and Washington State DNR had long worked with residential populations in the area on small-scale fuels reduction efforts near communities, regarding access and management of recreation opportunities on public lands that drew people to the area, and through cost-share programs for fuels reduction on private property. The result of these efforts had built trust between agencies like the Forest Service and distinct populations in the upper valley. As one participant described,

> It's been like a multi-pronged, multi-generational (effort). You've got to keep hitting them because people keep moving, but it's word of mouth. People see it, they just build their trust level. There's a whole contrary example on Libby Creek…

It became clear to professionals from each of the aforementioned agencies that the area where the Lost Driveway project would eventually take place contained many smaller pockets of residential populations. They described successful implementation of a landscape-level project in the upper Methow Valley as revolving around collaboration with these various communities early in the process and design of the effort as a series of smaller treatments that achieved coordinated purposes for both the Forest Service and community members.

Professionals from the Forest Service and other agencies, such the Okanogan Conservation District, encouraged communities in the region to build local support for individual units of potential landscape-level fuel treatment. For instance, support for treatment in the Lost River residential area of the Lost Driveway project had been built primarily through local outreach and organizing by key residents who went door-to-door gaining shared support for fuel breaks near collections of high-risk properties or the shared roadway. In the case of Wilson Ranch, a formal homeowners association near Mazama that had long been active in the Firewise program, a dedicated and paid community coordinator with past forestry

experience helped facilitate community inclusion in the project. In each case, existing networks, homeowners associations, or other formal mechanisms binding residents together as a community helped facilitate collective support sufficient to situate smaller treatments. As one respondent summarized: "The whole project started because the people were on board with it. That's my interpretation. This little thing got off the ground."

Resident input into the design of the Lost Driveway project was described by various participants as important because there was a clear need for both landscape restoration and reduction of risk to private properties in the region. Participants described how partnerships between the two groups would help meet the specific requirements necessary to obtain larger grants such as those that were eventually obtained through the Joint Chiefs Landscape Restoration Partnership program or the NFF. As one participant described,

> There was community input for the various projects so the community also...or some members of the community, assisted in helping select which projects were ultimately going to be chosen. I think one of the big draws for this particular project was that the Forest Service was going to be able to get funding.

A willingness to partner with smaller communities across the upper valley, rather than proposing one large landscape treatment, was described by interviewees in the region as an effective way to sustain local support and trust in fuels treatments. Those collaborations also enabled additional opportunities for shared "buy in" or corresponding risk-reduction actions by private landowners. For instance, members in various communities near treatments were able to work with the Okanogan Conservation District and Washington State DNR to help conduct thinning on their properties (and which were supported by multiple streams of funding, including the Joint Chiefs project or DNR cost share matches), thus extending adjacent Forest Service treatments. Multiple communities allowed Forest Service contractors or hired crews to cross private land or use private roadways to access pieces of public land that would otherwise be inaccessible due to topography and existing road networks. In turn, the Forest Service opened up opportunities for residents to gather firewood in areas where the thinning took place and which helped reduce the volume of pile burning the Forest Service was still conducting when the research took place. One participant described the shared buy in as such:

> Part of the issue with a lot of that is a lot of the Forest Service land there is land-locked. We have no access except through private, and so a lot of the land that was treatable at the toe of these 60-80% slopes with no road going into wilderness…the only access…So it's private, a little strip of Forest Service and then…It was really important for us to have that buy-in…

Participants described a number of additional factors that intersected to promote continued buy in or influence on the ultimate design of various treatments that comprised the Lost Driveway project. For instance, residents in the area were primarily supportive of treatments that would help serve multiple goals of improving landscape health *and* reducing wildfire risk to high-value residential properties near public lands. They described how the culture of various communities in the upper Methow Valley had long been centered around support for restoration of "natural" landscapes and perpetuation or enhancement of the outdoor recreation amenities of the area (e.g., cross-country ski trails, Wild and Scenic Methow River corridor). This meant support for removal of smaller diameter timber and thinning the forest, but not a commercial harvest or "clearcut" that many residents described as unacceptable. As one resident described:

> I mean it wasn't long before a lot of the landowners got organized, and the NFF came in and did that project that you guys looked at. To me, that was the perfect, like it wasn't overreach. It was very focused. It was all understory stuff. It looked good right after, like people have trouble with how forestry operations look…and these projects all looked good kind of right away.

Further supporting the light thinning that ultimately characterized the Lost Driveway project is that fact that much of the area is designated as Late Successional Reserve for the northern spotted owl. Late Successional Reserve, and the iconic nature of the upper Methow Valley, including its linkages to outdoor recreation tourism, all meant that significant reduction in forest volume were not possible throughout much of the proposed treatment areas. It also meant that any NEPA review of a more aggressive treatment (e.g., more volume of trees removed, larger trees removed) might involve significant work or deliberation. Thus, professionals in the region helped cultivate funding opportunities such as Joint Chiefs and the Treasured Landscapes Campaign as strategic ways to open up opportunities for performance of work that could not pay for itself through the utilization of timber or biomass. Paired with support from area communities and the design of smaller units comprising a larger project, the circumstances surrounding the treatment allowed the potential for a "categorical exclusion" under NEPA, which reduced the work or environmental assessment needed to implement the project.

Residents and professionals in the region ultimately saw the Lost Driveway project as a positive advancement in managing fire risk while also helping to improve local landscape health. For instance, one professional described the project as a "turning point" in their 12 years of experience working in the valley due to its high level of support. However, both residents and professionals also recognized that the effort was a strategic compromise; although some fuels reduction had been carried out, the combination of unique reasons for local support, existing ownership boundaries, and longstanding policy designations (Late Successional Reserve) meant that the treatments performed were likely not aggressive enough to fully eliminate the significant risk to private property in the area. As one participant put it:

> Let's not pretend that the agencies aren't subject to political pressure and public pressure. Somewhere in there, somewhere between what they did and that pre-Columbian state…probably would've been ideal for the greatest number of people.

Virginia Ridge

One of the most notable elements of the Virginia Ridge treatment, at least to respondents, was what they described as

a delayed wave of opposition that emerged with regard to the project. Initial proposal of the state lands project by the DNR did not garner high amounts of awareness or scrutiny from local residents and environmental groups. Department officials from the DNR followed public involvement requirements associated with the SEPA, including consultation with select local representatives and the opportunity for public comment. However, residents in the area felt that earlier and more comprehensive engagement of local people about the purpose and design of the treatment may have been a better approach to the project. As one interviewee summarized,

> From my perspective it was just the communication of the whole project was so bad from the beginning that it never had a chance to actually...go anywhere, because (community name) Firewise, part of their homes are... abut Virginia Ridge and were really close to that sale, right? And so I would have assumed there would be support for it, but they did it so hamfistedly that it just immediately set off everybody's alarm bells.

Participants explained that increased collaboration and consultation were especially important for the Virginia Ridge project because Methow Valley residents were not as familiar with managers from the DNR. The DNR offices are further east in the state and the agency had fewer large tracts of state land in the valley. Residents had not developed the same kind of trust with DNR state land managers that they described sharing with the Forest Service professionals, the conservation district, or outreach foresters with DNR who had spent more time working on projects or private lands in the valley. Likewise, residents were not as familiar with the goals and policy directorates that guide management of state forest lands, including the trust mandate that directs the agency to generate revenue for roads and schools through the sale of timber. The result, as one participant summarized, was the potential for misunderstanding or distrust about the purposes and parameters of the treatment:

> I didn't really feel they were trying to hide anything from anyone. I think it was, they were doing what they usually do and that didn't always involve providing all of the information that people might need for their particular point of view to be understood.

Study participants articulated how grassroots opposition to the Virginia Ridge project grew over time and had its origins among individuals who lived near the project or who were involved with regional conservation groups. Initial opposition by these participants ultimately activated a much broader network of concerned citizens and conservation groups that have a long history of activism in the Methow Valley and who help reinforce pride in residents' ability to protect the natural amenities of the region against commercial development. The result, as respondents described, was the explosion of SEPA comments and coordinated resistance to the proposed project. As one resident and conservation professional described,

> I think you guys have heard the story from more than a few people, I think, about how that could've been rolled out maybe a little bit more effectively or presented differently to the community. But what you have here in the Methow is a hyper-aware and sensitive and connected network.

Although it was existing networks that facilitated coordinated resistance to Virginia Ridge, respondents also noted that opposition stemmed from incongruent values about the purpose of the fuels reduction project and the scientific or policy basis behind proposed actions. For instance, individuals involved in early scrutiny of the project stressed a need to look at particular treatment parameters, including the amount of fuels removed, clumping of remaining trees, and best practices for removing slash left after the FIT project. Resident organizers engaged other locals who also had backgrounds in forestry or wildfire research and who argued that the proposed project prescription was not the most effective way to improve forest health or reduce wildfire risk as outlined in the new 20-year East Side Forest Restoration Strategy produced by the DNR (in fact, the treatment had been planned before the release of the strategy). Local organizers also engaged outside consultants to create simple visualizations emphasizing what participants described as an unwelcome and unattractive amount of thinning, including uniform clusters of remaining trees on the site.

Select groups eventually went so far as to start calling the Virginia Ridge treatment a "clearcut," which invoked what some describe as an almost visceral opposition from members of local communities who had developed a particular disdain for that practice due to their previous experience on the west side of Washington. As one participant described: "I think some of these (fuels treatments) get labeled and then it's pretty hard to change the label. This was, and still is, you'll go see something about Virginia Ridge and people will go, 'Oh, the clearcut.' Or, 'Oh, the timber sale.'"

Additional sources of opposition to the Virginia Ridge project centered on the impact that the action would have on the scenic nature of the Methow Valley, including associated tourism or recreation activities on state public lands. For instance, respondents described how the Virginia Ridge project would be highly visible in the valley and closer to the town of Winthrop, with the former being especially true given how aggressively trees would be removed from the slope. Others cited a popular lodge and significant valley employer that overlooks the valley and that would face the Virginia Ridge treatment. All of these concerns augmented broader arguments about the treatment not reflecting resident values, spurring opposition from those who had access to decision-makers high up in the management of the Washington DNR.

The DNR officials involved in the design of the project described being somewhat surprised at the increasing wave of opposition they encountered on the Virginia Ridge project. Although they were aware of residents' desire for careful protection of natural amenities in the Methow Valley, they considered the treatments proposed as being in line with historical best practices on state lands. Faced with mounting opposition, DNR officials halted the project as planned and reengaged local representatives through organized field trips to other treatments being conducted in the valley, including those associated with the NFF Treasured Landscapes Campaign in the Methow. As one DNR official described,

> Lost Driveway went through, there's a Forest Service treatment adjacent to Virginia Ridge that we used as a sample. This is similar to what ours, this (Virginia Ridge) is gonna look like at 21 trees per acre. It looks great. People are like 'Yeah, it looks great.' When DNR proposed that same prescription, 'Oh, you're cutting too many trees. You need to

> leave 40 trees per acre.' Which is, leaving for that site, too many trees. I don't understand.

The Washington State Commissioner of Public Lands personally addressed area residents about the Virginia Ridge project during a town hall meeting in nearby Winthrop and worked through her office to clarify the requirements of management on state lands. The DNR officials ultimately redesigned the Virginia Ridge treatment with local representatives by nearly doubling the number of trees to retain per acre, revising the spacing of remaining trees, and addressing the management of slash left on site. However, that work required a significant amount of effort from the agency, with one official suggesting that the agency had nearly doubled its staff and agency costs for a normal project before even beginning implementation.

Local residents, environmental groups, and NGOs described being pleased with the agency and the commissioner following renegotiation of the Virginia Ridge project. They indicated that the interactions had opened up the potential for more trust with the DNR in future efforts. However, they also articulated that the entire process demonstrated the political power, local expertise, and influence they could marshal to help influence land management in the valley going forward. Select interviewees indicated that they felt emboldened to use that influence in the future to further influence management of public lands for wildfire.

The DNR officials also described being pleased with the increased dialogue between parties in the upper Methow, although some were concerned with the way that resident and regional groups lobbied officials at high levels of the agency rather than attempting to first work with professionals in the region. Both professionals and select locals also expressed some concern that the legacy of opposition to the Virginia Ridge project may make the DNR less likely to work in the region. As one participant summarized,

> I worry that when it's done is that instead of connecting the community closer to the people who are on the ground, I worry that it made the community more likely to go to the Commissioner and I wish that the process would have done the opposite. I wish that it would have helped the community be more connected with the local forester and the unit forester and the district manager people on the ground to strengthen those relationships.

Libby Creek and the Mission Restoration Project

Members of the Libby Creek community have a relatively long history in the Libby Creek drainage where they live and which abuts large tracts of public lands. Respondents described the original inhabitants of the community as people who became disenchanted with components of modern life in the 1960s and 70s; they moved to the area to live simply and sustainably with the land. Respondents described how Libby Creek residents built strong connections among landowners across the drainage, helping one another establish what they described as sustainable or rural lifestyles (e.g., small scale farming or agriculture, off grid systems) that emphasize self-reliance. Others with similar mindsets moved into the drainage or bought property from community members who could no longer live in the area, joining a community that members describe as having a strong local culture. Community members established the Libby Creek Watershed Association in the 1970s as part of what some respondents described as the original "back to the land movement" in the Methow Valley. Members of the community and association described valuing strong protections for the area environment and advocating for sound management that enhances or protects natural landscape processes. As one Libby Creek resident described,

> It (the Libby Creek Watershed Association) was primarily started to address the roadside spraying of herbicides that were really affecting the ground water in the area. It's been a very loose knit, open organization since them. As long as you have some interest in preserving the health and vitality of the land and you define that in some quasi-sense of a way, then you can be a member. There's no money in it so it's not very official in that sense.

Both residents of Libby Creek and area professionals described a long history between the community (including the Watershed Association) and the Forest Service. Residents of Libby Creek had opposed longstanding grazing leases in the watershed and had previously blocked or pulled out of efforts described as timber sales or fuels reduction projects in the area. Opposition to those past efforts was described by Libby Creek residents (some of whom were former resource managers or scientists) as forest practices and road building that would degrade ecosystem health (e.g., fish and wildlife habitat, create erosion, disturb self-regulating landscapes) to use timber and make money from its sale. One resident described Libby Creek residents' desire to protect intact ecosystems near where they live as such:

> I'd like to see areas like some of these that are not economically that productive, that are reasonably in-tact, that are adjacent to large roadless areas or wilderness areas. Those are national heritages. I'd like to pass down to my daughter and have her have some place that isn't racked. Not to be cynical, but I don't see any of these Forest Service guys wanting to go vacation in these restored areas. I'm waiting to see that.

Residents of Libby Creek described proposal of the Mission Restoration project as another in a long set of attempts to perform active management that they felt was not necessarily aimed at improving health, but rather maximizing profit or cutting trees to meet broader targets in the region. They indicated that the justifications for the proposed treatment and its potential impacts were more important sources of conflict than the size of the planned treatment. In fact, one consistent narrative among residents was that a portion of the larger Mission project design was a potential punishment for past opposition by people in the Libby Creek community. As one respondent described: "This one has a lot of feel of, you guys screwed us a few times. We're just going to come in and do it, and there's no stopping you."

For their part, Forest Service managers described being well aware of the potential for opposition from the Libby Creek community. The Mission Restoration Project had been initiated in part by the North Central Washington Forest Collaborative, a collection of agency, industry, and conservation groups working to promote landscape-level management in the region. Those involved in planning the project for the Forest Service made sure the proposed project went through a

full EA under NEPA rather than apply for a categorical exclusion. An EA requires additional scientific analysis to support treatments—it would also allow for additional consultation and comment by area residents. The collaborative helped facilitate work on the Mission Restoration project, including the production of new science that could guide the EA.

Participants from a range of backgrounds all described the escalating conflict over the Mission Restoration project as stemming in part from the design of the collaborative process for the project and disagreement about the science used to arrive at the decision. But also underlying both those components were the deeper disagreements in values about management of natural resources in the area and the ways that broader society, including agencies, should address wildfire risk. As one manager described,

> That was a case where it didn't matter how much science, how much proof you provided to them (members of the Libby Creek Community), that what we were doing was actually beneficial. They just, as individuals within this community, they just were opposed to logging of any kind.

The Libby Creek Watershed Association was invited to be part of Mission Restoration project meetings hosted by the North Central Washington Collaborative. However, members of the community described feeling excluded or marginalized in the collaborative process because their views about management were at odds with a desire to increase pace and scale of fuels treatments in the region. Community members referenced the presence of timber industry representatives in the collaborative as an additional point of concern. Others complained that their involvement in the collaborative process was not as privileged when compared to more politically connected or wealthy communities who had helped develop the lighter prescriptions in the Lost Driveway or Virginia Ridge projects. As one participant described,

> I think they'd ramrod it through anyway because they made the decision before they formed the Collaborative. In fact, that's why we weren't a part of it, because they said there was only room for people to move this forward. There wasn't room for people to oppose it.

Libby Creek residents described being somewhat offended by the proposition that the Mission Restoration Project was designed in part to reduce wildfire risk to private properties. They did not think that protection of private properties should be a primary justification for a forest treatment project nor were they supportive of their own risk being used to support portions of the broader management action. Residents of Libby Creek described a desire to focus on the completion of smaller scale fuels reduction efforts around private properties and promotion of landowner responsibility for living in a place where fire was inevitable. As one respondent described,

> I think a fundamental problem with Libby Creek was that there was enough of us who were like, 'This is not about my property. This is not about protecting my house. And this is not about, like, me being afraid of fire.' Quite the contrary. This is me wanting to see you apply these best, most sensitive forestry practices possible in this given situation. I saw you guys do it up in Mazama (i.e., the Lost Driveway Project), why can't you do it down here?

Another source of disagreement about the Mission Restoration Project centered around the science behind the treatments. Thinning efforts proposed in various zones of the larger Mission Restoration project were designed through use of an ecosystem management tool that models historic conditions across a range of dry forest types. Interviewees described how the tool was based on both ongoing science conducted by Forest Service professionals and academics in the region and historic photos or records that provide baselines for past forest conditions. Residents in Libby Creek described the tool used for analysis as somewhat of a "black box"—they did not feel that they were given enough information on how the model worked or the ways that it reflected healthy conditions for the larger landscape. As one participant described,

> I really think the way that Forest Service uses the term science, there's a confusion between science and technology. There's the tools that we use. Developing a gun requires science. But a gun is not a scientific tool. It's something that was designed scientifically, but that doesn't mean that you can't do something else with that. I think there's a profound confusion with that.

Collaborative members, land managers, and the scientist hired to use the modeling tool all described efforts to help engage Libby Creek community members about the logic behind the analysis conducted for the proposed Mission Restoration project. This included how the model might weigh different objectives to help inform the selection of prescriptions across different zones. Likewise, some of those involved in the development and application of the model acknowledged that it is best used to inform dialogue about potential prescriptions and that it needed to be adapted to the conditions where the project was taking place.

Libby Creek community members eventually reached out to a broader network of regional environmental groups that community members had existing relationships with. This included local environmental groups based in the Methow and communities near other treatments associated with the project. Local environmental groups and some additional residential populations ultimately supported implementation of the project. Regional and national environmental groups were described by participants as sharing Libby Creek community members' concerns about sound scientific management that maximized forest health. Regional environmental groups assisted Libby Creek community members in filing comments as part of the EA, and the Alliance for the Wild Rockies eventually sued the Forest Service over the Mission Restoration Project in concert with select local residents. That lawsuit was later dismissed and the project moved forward toward implementation.

Discussion

The purpose of this article was to explore the ways that local social dynamics influenced support or opposition to proposed fuels reduction treatments across populations in the same region. We found that site-specific local social conditions influenced divergent local responses to the three fuels reduction treatments studied, suggesting that support or opposition can vary at smaller, community scales. Perhaps more importantly, we uncovered how differences in support or opposition to treatments arose from a unique intersection of community

cultures (including local peoples' values, networks, and relationships) and the processes, policies, or agency relationships associated with each proposed treatment. We expand on each of these notions in the following sections.

Broadly speaking, our results substantiate growing understanding that the "social landscape" of wildfire risk can and does operate at scales much smaller than ecological understandings that are currently a driving influence on wildfire management policy (Billings et al. 2021; Paveglio et al. 2017, 2018, 2019). We found that unique populations associated with each proposed fuels treatment featured different combinations of characteristics that influenced the way they interacted with outside forces (e.g., agencies, policies, framings of fire risk) in the process of implementing fuels treatments. Differences in the makeup, values, and means of organizing among these populations occurred across each of the three treatments studied, suggesting some evidence of social fragmentation across the same valley (see Paveglio 2021 for broader argument). Differences among human populations influenced divergent support or opposition to each treatment. In the case of the Lost Driveway project, multiple communities existed within even the upper portion of the Methow Valley where the fuels treatment was slated to take place. Careful efforts to understand the scale, values, and perspectives of these populations, communities who have both a legal right and potentially a vested interest in decisions about forest management, were viewed by participants as an effective way to garner support for a treatment and led to the implementation of smaller actions that were both tailored to local populations and could add up to landscape-level goals. Thus, despite the social fragmentation inherent in the upper valley, targeted and collaborative design of treatments (what some might call community development) allowed for uniform support across a larger set of communities with some important similarities in their values (see also Davis et al. 2018; Edgeley and Colavito 2022).

Understanding the social dynamics operating across landscapes becomes important when considering the constellation of factors that must align to implement the vast number of fuels-reduction treatments scientists and policymakers suggest are necessary to both reduce wildfire risk to human populations and increase landscape health (Eriksson et al. 2018; Steelman 2016). Much emerging science surrounding the prioritization or effectiveness of fuels treatments in the United States operates at large scales—hundreds of thousands of acres—and does less to incorporate any type of place-specific stakeholder analysis that might uncover diverse communities in the areas where such fuels treatments are scheduled to take place. Such efforts focus on "priority landscapes" or "firesheds" where different landowners can "transmit" wildfire risk across property boundaries (see Ager et al. 2021; USDA 2022). Likewise, regional-, state-, or national-level efforts to "map" human populations particularly vulnerable or capable of contributing to wildfire mitigations predominantly rely on demographic data or coarse indicators of social dynamics (e.g., wealth, age, race) to make assumptions associated with broad sociopolitical boundaries (e.g., county, state) and existing data collection units (e.g., census tracts, census blocks) (see Davies et al. 2018 or Palaiologou et al. 2019 for examples).

Fuels-treatment prioritization or vulnerability mapping may be good starting points in planning fuels-reduction treatments. However, our results suggest that neither approach may provide information at small enough scales to capture the unique populations that we uncovered in our research and that occur across the same region (see Paveglio et al. 2018b or Ager et al. 2019 for similar conclusions). This is problematic given that those differences among populations led to collaborations or opposition that ultimately enabled or greatly extended the time, money, and effort that was necessary to implement the fuels reduction treatments studied. Our results and others suggest that planners, policymakers, and managers will also need more comprehensive, systematic ways to better understand the social landscape that can operate at much smaller scales and encompass deeper relationships, values, and perspectives that cannot be understood using secondary data alone (Charnley et al. 2020; Paveglio et al. 2016, 2018).

Extending Theoretical Understanding of Support or Opposition

Situating our emergent lessons within a melding of the progress triangle (Daniels and Walker 2001; Walker et al. 2008) and the interactional approach (Paveglio 2023; Paveglio et al. 2009b; 2012, 2018) provides one avenue for more systematically understanding or learning from the diverse influences that give rise to local support and opposition to proposed fuels treatments. We demonstrate the preliminary utility of this expanded theoretical framework by applying it to two of our cases.

Emergent lessons from the Lost Driveway case are presented in figure 3. Characteristics of local populations that our respondents described as critical influences on support for the Lost Driveway project are situated within the interactional approach (i.e., the inner lobes of the figure). Numbered bars correspond with the numbered characteristics outlined in the interactional approach (see figure 1), whereas their site-specific expressions from the Lost Driveway communities are listed to the left of the progress triangle. For instance, we found that key local champions in each of the smaller communities studied for the Lost Driveway project helped organize and spearhead local interest in situating smaller fuels treatments near their properties, whereas existing homeowners and property owners associations helped facilitate that organizing (see also Brenkert-Smith 2011; Paveglio et al. 2019a). Similarly, local community members' desire for actions that promote forest health, facilitated by their place attachment to outdoor amenities or recreation and built through their amenity migration to the area or frequent use of areas as vacation properties (i.e., second or seasonal homes), were primary influences on the types of fuel treatments (e.g., lighter, forest health oriented, private property targeted risk reduction) they are likely to support in the region (see also McCaffrey and Olsen 2012; Paveglio et al. 2015a). As our results demonstrate, the local characteristics shown in figure 3 combine to help explain how and in what ways local people are likely to be engaged in collaborative processes (i.e., what Paveglio et al. 2015a call adaptive capacity) surrounding fuels treatments in the broader landscape.

The adaptive capacities of local people also interact with broader, process-based circumstances enabling and influencing the need for mitigation action in the form of fuels treatments, which is where the progress triangle provides potential insight (see figure 3). We have organized emergent lessons surrounding the planning and negotiation of the Lost Driveway project at the points of the progress triangle in figure 3. Lettered characteristics or influences

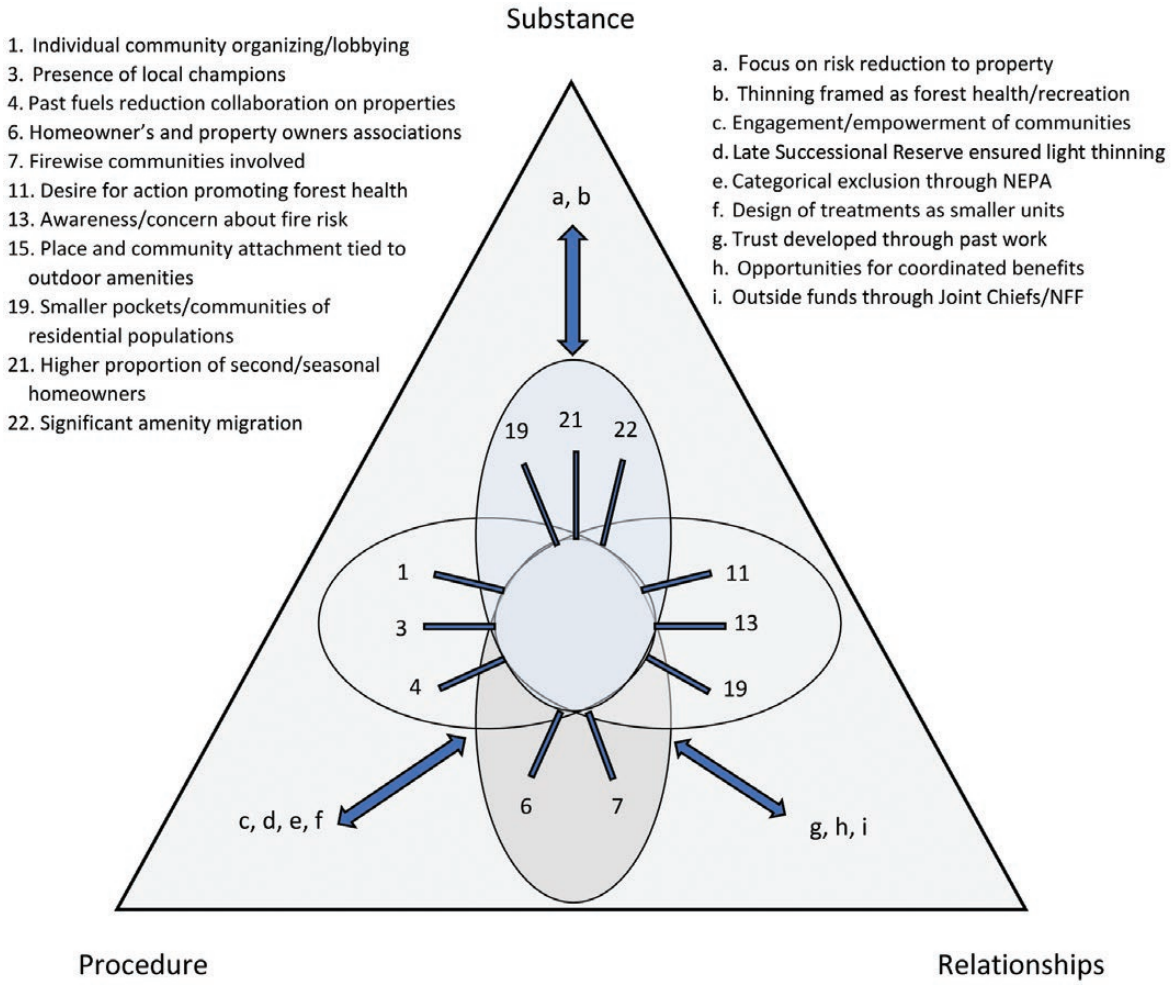

Figure 3 Systematic organization of factors leading to support for the Lost Driveway fuels reduction project. Numbered bars in the inner diagram represent prominent characteristics present in the local community/communities for the case and correspond to numbered factors implicated in the interactional approach to adaptive capacity (see figure 1). Letters at each vertex of the triangle are site-specific expressions of dynamics that emerged from each case and correspond with concepts implicated in the progress triangle. The interaction of local community characteristics implicated by the interactional approach and external factors represented by the progress triangle help explain support for the fuels treatment project by articulating how specific local characteristics were compatible with the planning process (see main text for examples).

that our study participants identified as influential to the design of the Lost Driveway project can be organized by initial groupings of substance, procedure, and relationships. For example, a primary focus or objective surrounding the design of the Lost Driveway project was on risk reduction to private property. The treatment was also framed as a means to improve forest health and recreational opportunities in the area (e.g., substance elements of the progress triangle) (see also Burns and Cheng 2007; Jahn et al. 2020; Shindler and Toman 2003; Williams et al. 2012). Such foci were reinforced or enabled through existing policy requirements for light thinning in Late Successional Reserve and outside funding in the form of Joint Chiefs or the NFF Treasured Landscapes Campaign (e.g., procedure elements of the progress triangle). Likewise, existing trust between community members and local agency personnel influenced fruitful circumstances for planning of the new project (e.g., relationship elements of the project triangle). We can thus see how ongoing processes and broader influences might interact to set the stage for support or opposition to a broader action by local people (see also Cerveney et al. 2018; Cyphers and Schultz 2019).

One contribution that stems from melding the interactional approach and progress triangle is a recognition that the compatibility of local social characteristics (what some call bottom up or grassroots influences) and the process-oriented influences on fuels-treatment design (what some call external or top down influences) can help provide more systematic understandings about the basis for opposition or support among local residents. Drawing out the emergent lessons from above, the framing of the Lost Driveway project as a means to improve forest health and reduce wildfire risk to private properties was strategically compatible with the values of the local communities who were interested in contributing or supporting the effort, which was necessary both to obtain outside funding and to streamline the planning effort through a categorical exclusion during the NEPA process. Additionally, agency professionals' strategic tailoring of the larger effort to smaller communities, in collaboration with local organizing by key champions in each community, combined to influence the ultimate design of the project as a series of smaller treatments serving strategic and complimentary benefits for all parties (e.g., access to hard-to-reach places for the agency, firewood and risk reduction for residents) (see also Castello et al. 2019; Champ et al. 2012). Therefore, we would

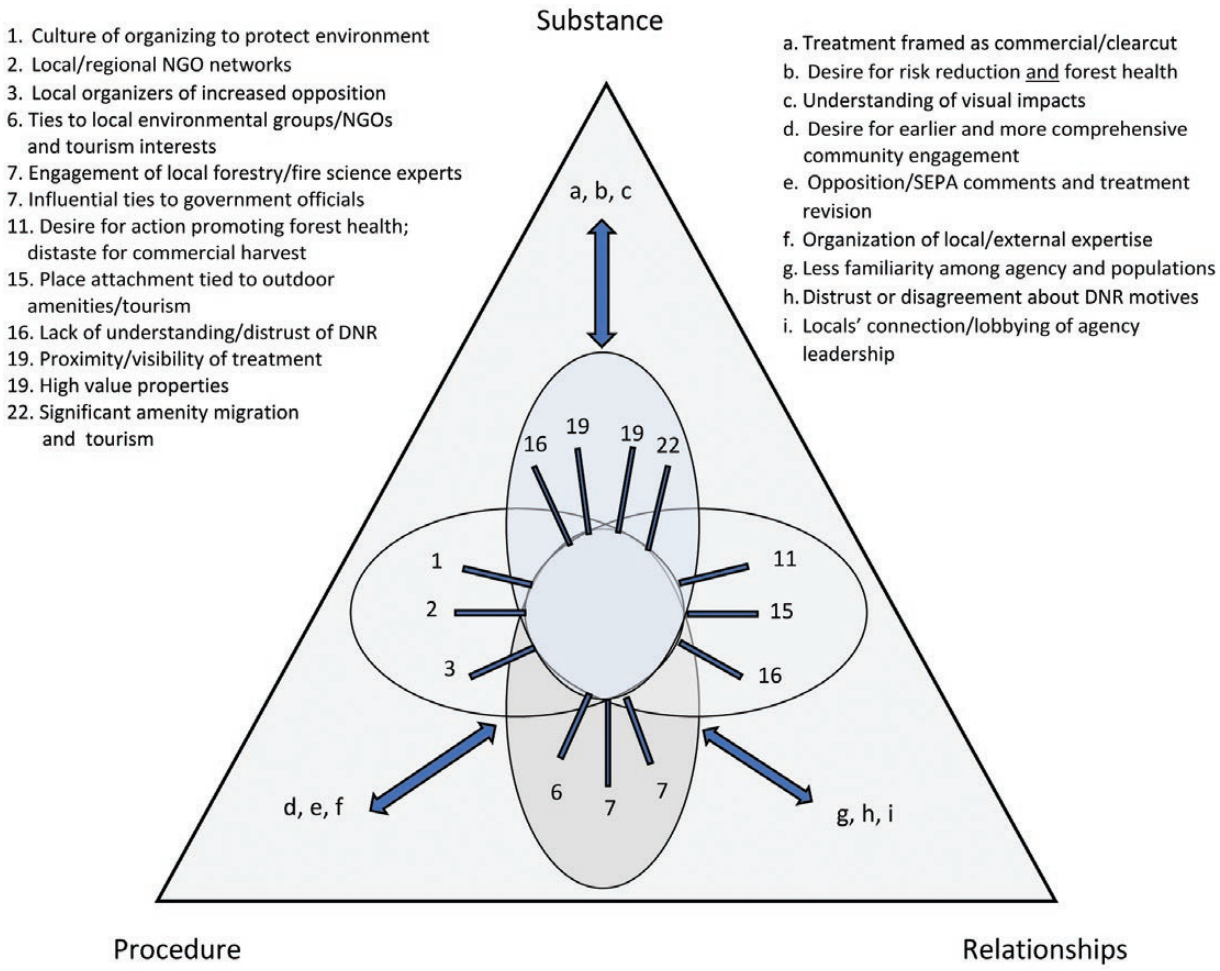

Figure 4 Systematic organization of factors leading to initial opposition of the Virginia Ridge fuels reduction project. Numbered bars in the inner diagram represent prominent characteristics present in the local community/communities for the case and correspond to numbered factors implicated in the interactional approach to adaptive capacity (see figure 1). Letters at each vertex of the triangle are site-specific expressions of dynamics that emerged in each case and correspond with concepts implicated in the progress triangle. The interaction of local community characteristics implicated by the interactional approach and external factors represented by the progress triangle help explain opposition to the Virginia Ridge project by articulating incompatibilities between local characteristics and the planning process (see main text for examples).

suggest that support for the Lost Driveway fuels project was the result of strategic alignments between process-based factors and local characteristics of the populations most affected by the treatment, and which facilitated ongoing collaboration. Some of these conditions cannot be influenced by local or regional residents and professionals, but careful negotiation of those circumstances did provide a path by which action could be coordinated. Thus, merging of the interactional approach and the progress triangle provides one structure through which to systematically document the interconnected web of factors and influences that span actors and scales comprising the collective action. As such, it could serve as progress in the development of systematic approaches for understanding and possibly forecasting potential alignments or misalignments that might lead to support or opposition.

Emergent lessons from the Virginia Ridge case study are presented in figure 4 using the same melding of the interactional approach and the progress triangle. The expanded framework not only helps catalog or identify the unique characteristics and circumstances that led to opposition of the project by local people, but it also provides a means to compare with other cases. For instance, in the Virginia Ridge case, we see the same presence of local organizers or champions present among local populations, desire for actions promoting forest health, and place attachments tied to outdoor amenities that were present among local populations affected by the Lost Driveway project (see also Eriksen and Prior 2011; Paveglio et al. 2012). However, other notable characteristics of engaged local populations active in the Virginia Ridge project interacted with the aforementioned conditions and process-based influences in producing a wave of opposition. For instance, a lack of understanding or value for the DNR trust mandate or distrust about agency motives behind the treatment, perceived visibility of the proposed treatment or its effects on tourism and recreation, and the engagement of local and regional NGO conservation networks all facilitated opposition that reinforced a longstanding culture of organizing to protect the environment of the Methow Valley (see also Brenkert-Smith et al. 2020; Brunson and Shindler 2004; Rasch and McCaffrey 2019).

Opposition to the Virginia Ridge treatment had much to do with broader dialogue and engagement surrounding the project, which can be more systematically understood

using the progress triangle (Daniels and Walker, 2001). For instance, in Virginia Ridge, a perceived lack of comprehensive community engagement influenced local questioning of the project, including concerns about its impact to viewsheds and framings that it would not improve forest health in ways mandated under DNR authorities or plans (see also Olsen and Sharp 2013; Sharp et al. 2013; Shindler et al. 2003). Likewise, the lack of familiarity and trust that local people had with the DNR, including their lack of regular interaction with on-the-ground managers, allowed for the emergence of framings that the treatment was a commercial harvest or clearcut designed primarily to make money. In turn, these initial framings were reinforced by the organization of local expertise whose questions promulgated that narrative (see also Emborg et al. 2020; Jahn et al. 2020; Paveglio et al. 2011). A lack of mechanisms for discussing these more substantive, relationship-based, or procedural questions about the treatment led local people to lobby agency leadership through their external networks, essentially going above managers' heads, which could further strain relationships between regional managers and residents in the future. Emergent incompatibilities leading to opposition in the Virginia Ridge case span interactions of substance, relationships, and procedure outlined in the progress triangle. However, that might not always be the case. Future use of the expanded framework presented here in other locations may find that certain interactions between local context and the progress triangle are incompatible whereas others are not. This would lead to more precise identification or prioritization of efforts to increase support, which we turn to next.

As we have begun to demonstrate, use of the expanded framework described above can begin to identify site-specific lessons or forecast insights about the management of individual fuels-treatment projects. It also could eventually provide the means to compare or document combination conditions that lead to different outcomes. However, we would caution against assuming that the same practices should be followed everywhere. This is because the social, biophysical, and political circumstances influencing outcomes are likely to differ across fuel treatments proposed. Rather, one strength of the expanded approach outlined here is a framework through which to draw lessons about the ways that key influences operating in a broader social landscape will likely influence the approaches (e.g., collaborative processes, local values prescription parameters, policy requirements, treatment framings) for landscape-level management of fire. Where sociopolitical conditions might be similar to existing cases or lessons, partners should carefully adopt and expand tactics used by others in tailored ways that are likely to achieve support or be prepared to counteract opposition (see Paveglio et al. 2019a or Paveglio 2021 for further description). Others could use existing categories and descriptions from the international approach and the progress triangle as guides in conducting a stakeholder analysis, which often involves documenting both the site-specific local context and external factors that interact to influence collaborative potential (Clarke and Peterson 2016; Daniels and Walker 2001; Reed et al. 2009). That systematic stakeholder analysis, guided by the framework expanded on here, could provide more efficiency in forecasting specific engagement needs, including the early identification of shared or incompatible understandings about proposed treatments, key foci or planning needs across ownerships, and the co-development of critical message framings that are needed to increase support or implement of projects that span private–public boundaries.

There are numerous site-specific lessons that can be derived for any of the cases described in this research, although we are limited to discussing only a few examples for the sake of article length. For instance, in the Virginia Ridge project, early recognition by the DNR that local populations had the means and capacity to organize influence against the project and an acknowledgement of a local culture that has a history of championing environmental protections while celebrating the scenic nature of the valley could have led to strategic changes at the onset of the project. Those recognitions and acknowledgements could have been facilitated with more comprehensive stakeholder analysis at the onset of a project or careful engagement of key informants, local managers, social scientists or collaboration practitioners who have been trained to recognize emergent dynamics of social context. More specifically for the Virginia Ridge project, DNR managers could have partnered with other trusted agencies, organizations, or researchers earlier in the project to provide demonstration sites that served as an explicit preview for the amount of vegetation to be removed as part of the project and how it might look following fuel reduction. Those same tactics were useful in the negotiation and redesign of the final treatment, although the costs of revising the project in terms of time, effort and money were far greater given that it occurred primarily after initial opposition. Expanded stakeholder analysis processes may also require a careful assessment about the availability of social science or collaboration specialist capacity. A number of authors suggest such place-based capacities are lacking both within federal or state agencies and across outside industries, which may hamper fire adaptation initiatives such as fuels reduction (Abrams et al. 2021; Paveglio 2021; Williams et al. 2022).

Local residents' use of their influence and network connections to go above managers' heads in the Virginia Ridge case by engaging DNR leadership perpetuates longstanding tactics used by certain populations opposing environmental management actions (see Cerveney et al. 2018; McIver and Becker 2021 or Maier and Abrams 2018). It should be noted that fostering such actions as normative behavior might lead to problematic or strained trust relationships between managers and residents in the region.

Regarding the Lost Driveway project, locals and managers strategically capitalized on a set of favorable and fortunate circumstances in the performance of a project spanning the upper Methow Valley. However, that project may not have gone far enough in terms of actually reducing wildfire risk to properties in the area or improving landscape-level health. Thus, strategic compromises may have made the project less effective than some would have liked or if other criteria were a driving influence on the prescription and design of the treatment (e.g., forest health, risk reduction, payment for the treatment). Knowing the conditions, values, and processes that are present in the Upper Methow Valley might mean using this most recent experience as a catalyst for fostering ongoing adaptation. For instance, collaborators could agree on proportions of private residents who would need to conduct defensible space in the upper Methow Valley before agencies could host additional treatments or further thinning in Lost Driveway project areas that now serve as

demonstration properties for many in the valley. Residents could explore more aggressive fuel breaks on private properties that extend into lighter prescriptions on Forest Service lands of Late Successional Reserve, with more of project funds going toward cost-share.

Conclusion

This article provides site- and place-specific evidence of the social dynamics that will undoubtedly influence many United States and international landscapes where increased fuels-reduction treatments are proposed to occur. Our results suggest that the characteristics of local populations can and do influence the time, effort, and prescriptions of fuels treatments on public lands. Likewise, continued calls to accelerate the pace and scale of fuels reduction treatments to reduce wildfire risk, including expanded policy or funding to carry them out (e.g., Bipartisan Infrastructure Law), will inevitably meet the increased interest and influence that local and extra-local residents can have on the process of managing public lands. There is much to learn from existing scholarship on wildfire management and environmental collaboration and conflict about the best ways to address the various perspectives and organizing strategies that are necessary to help manage wildfire at landscape scales. However, there also must be more systematic evaluation, training, and professional capacity building about the ways that local culture or circumstances intersect with broader agency, political, or procedural processes during implementation of fuels treatments in specific places. We used existing literature and emergent findings from our case studies to articulate an expanded framework that helps better systematically document the potential conditions that build local support or foster opposition to proposed fuel reduction treatments. We suggest that further development of such frameworks and their use in scientific inquiry or professional planning for fuels treatment implementation (e.g., stakeholder analysis or after-project reviews) could help provide more generalizable lessons that recognize landscapes as a collection of diverse communities who may have varying attachments to a landscape, perspectives about management of wildland vegetation for wildfire risk, or trust in agencies conducting fuels treatment. Likewise, efforts to systematically uncover the combination of local and extra-local factors that combine to influence collaborative processes surrounding fuels reduction could help increase managers', residents', or extension specialists' abilities to recognize patterns of unique conditions that are likely to influence each project. They can then adjust accordingly by considering adaptive changes in the ways they engage and empower communities about fuels reduction efforts.

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Conflict of Interest

The authors have no conflicts of interest to declare.

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