The Future of Social Science Integration in Rangelands Research

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The future of social science integration in rangelands research

By Mark Brunson, Lynn Huntsinger, Gwendŵr Meredith, and Nathan Sayre

On the Ground

- Researchers have studied human dimensions of rangelands since the earliest days of US rangeland science, usually focusing only on white, male, English-speaking ranch owners.
- To address questions of rural prosperity and collaborative management, social scientists and the Long-Term Agroecosystem Research (LTAR) Network must turn their attention to the perspectives, practices, and experiences of indigenous, non-Anglo, female, and "new rural" rangeland stakeholders as well.
- Social science researchers can learn from scholars in related fields whose work is less often consulted in rangeland science, including those working internationally with pastoral communities and in the United States with rural youth.
- Understanding these communities is likely to require broadening our conceptions of what constitutes "knowledge," with a greater focus on seeking just outcomes for the full range of people who depend upon rangelands and rangeland communities for their lives and livelihoods.

Keywords: Broadening participation, Long-Term Agroecosystem Research Network, Historical rangeland research, Research agenda, Rural prosperity, Sustainable intensification.

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Introduction

Applied research builds upon past scholarship to address the problems of the present in pursuit of a more enlightened future. To further that goal, range scientists periodically take stock of their collective work, assess how well that work meets current management challenges, and propose a research agenda that addresses crucial unanswered or emerging questions for sustainable rangeland stewardship. Here we focus on how the work of social scientists can become better integrated into rangeland research, with particular emphasis on advances that can be achieved through long-term agroecosystem research.

A symposium at the 1993 annual meeting of the Society for Range Management (SRM) traced the path of range research as the profession looked forward to a new century. Summarizing ideas from that symposium, Martin Vavra[1] observed that social science had "played a subdued role in range science throughout the twentieth century." Human dimensions had not been entirely absent, but it was clear looking ahead that as demands on rangelands grew more complex, the need for social analyses would grow. A proposed research agenda called for studies to define the social context of rangelands, identify public perceptions of range environments, describe public knowledge about rangelands and find the best ways to increase that knowledge, and explore the complexity of uses and demands by rangeland visitors. As seen in recent literature reviews by Bruno et al.[2] and Wulfhorst et al.,[3] those topics were indeed the focus of considerable research in the years that followed.

Some 28 years later, this issue of *Rangelands* marks a milestone—the first issue of a US rangeland journal devoted entirely to social science contributions. The articles published here examine the role of social science in the USDA Long-Term Agroecosystem Research (LTAR) Network, a partnership among 18 agricultural research sites across the United States charged with developing national strategies for sustainable intensification of agricultural production. In reviewing the path rangeland social science has taken over the past three decades, Wulfhorst et al.[3] describe how research on the human dimensions of rangelands and range management has drawn upon multiple social science disciplines, increasingly integrating that work with ecologically based science. They suggest that the incorporation of social science perspectives into the

work of the LTAR network offers a new and expanded opportunity to explore the myriad ways that humans and rangelands are linked. Other articles have explored how LTAR social scientists are addressing critical issues in contemporary range science and management. Addressing aspects of stakeholder engagement, Meredith and Brunson[4] describe achievements and barriers in relationship building for collaborative management of the area burned by the 2015 Soda Fire in southwest Idaho and southeast Oregon, and Wilmer et al.[5] share their evaluation of the processes and outcomes used in the 10-year Collaborative Adaptive Rangeland Management experiment in Colorado. Bentley Brymer et al.[6] explore research on the effects of rangeland policy and management decisions on social processes and human well-being in rangeland households and communities. Because many connections between humans and rangelands are difficult to monitor, Spiegal et al.[7] present an indicator framework for measuring how well range management can achieve the LTAR goal of "sustainable intensification" of agroecosystem production, including social and human well-being considerations. Sorice et al.[8] describe how an ecosystem services framework can be used to understand impacts of non-native species invasions in the northern Great Plains. Rajala and Sorice[9] employ a lens from geography and environmental social science, sense of place, to merge social and ecological science perspectives. Meredith et al.[10] synthesize LTAR social science efforts to propose a comprehensive framework for integrating human dimensions into agroecosystem research. All of these contributions share a common concern with sustainable transformations of rangeland social-ecological systems.

It is clear from these analyses that rangeland social science research has reached a critical mass that didn't exist when Vavra's[1] agenda was published. The added momentum gained by incorporating human dimensions into LTAR research offers an opportunity to further strengthen the conceptual and methodological integration of the social sciences into rangeland science. In this concluding article, we use the other papers in this special issue as a springboard. We begin by looking even further back into past literature to explore how scientists seeking to understand the role of people in range management anticipated subsequent patterns in research, and how they did not. We then suggest areas of study that have been neglected by rangeland social scientists and/or are likely to grow in importance to rangeland stakeholders and ecosystems. Finally, we reconsider the role of social science in long-term research, looking beyond the current LTAR focus on sustainable intensification to consider how social science can help illuminate other ongoing or predicted rangeland transformations.

Looking back

Rangeland science emerged at the close of the 19th century as a response to social needs, and social topics remained important through its formative decades. Indeed, if social science is the systematic, rational, and empirical investigation of society, then the roots of rangeland social science are deeper than those of rangeland science itself. The first such inquiries were prompted by the discovery, in the 1870s, that cattle could thrive through the winter on the cured grasses of the High Plains, exciting the interest of settlers, investors and railroad boosters.[11,12] Soon thereafter, the USDA sent botanists to catalog the range grasses of the West, not only to advance knowledge but also to advance settlement.[13] With similar motivations, the Bureau of Animal Industry's[14] 1892 *Special Report on the History and Present Condition of the Sheep Industry of the United States*, which ran to 1,000 pages, focused as much on demographic and economic matters as it did on breeds and management. As competing interests and opportunities bred social conflicts over rangelands, scientists were enlisted to help arbitrate. In its 1897 report, a special committee of the National Academy of Sciences[15] condemned livestock grazing on the recently established Forest Reserves, invoking John Muir's famous epithet ("hoofed locusts") and prompting the secretary of agriculture to dispatch his chief botanist, Frederick Coville, to study the matter. Coville's[16] subsequent report, *Forest Growth and Sheep Grazing in the Cascade Mountains of Oregon,* was a milestone in applied ecology, combining botanical observations, ethnographic interviews, and rigorous logical analysis in pursuit of policy relevance. It was also the direct progenitor of rangeland science itself—10 years later, when Coville designed and supervised a research project to test his recommendations, the young scientist he recruited to conduct the study was none other than Arthur Sampson,[17] fresh out of Frederic Clements's lab at the University of Nebraska. The rest, as they say, is history.

Given these origins, why did social science recede from view in 20th century rangeland science? In most cases, what was expected from these authors was a certain kind of science, one whose authority depended on detached impartiality—a view from everywhere and nowhere, in Donna Haraway's[18] formulation. It was by carefully avoiding any overt sign of favoritism or interest, for example, that Coville could preempt critics and persuade policymakers, even as he provided support for the positions of his good friend and ally in Washington, Gifford Pinchot. This does not necessarily discredit the results of his and others' efforts, however, nor does it change the fact that research into social matters persisted well into the next century, albeit as an ever-smaller portion of the whole. The USDA's 468-page *Selected Bibliography on Management of Western Ranges, Livestock and Wildlife*, published in 1938, provides a rough and ready metric.[19] Entries about "Range plants" filled the first 145 pages, followed by 45 pages on "Range management" and 137 pages on "Range livestock." "Range influences" took up the next 38 pages, a scant two pages were devoted to fire, and "Wildlife management" filled another 30 pages near the very end. The only section focused on social topics was the penultimate one, on "Range and livestock economics," which in 36 pages listed 644 articles but comprised only eight percent of the whole. Subdued, yes, but hardly nonexistent.

So, what can we learn today from the rangeland social science that was conducted, most of it now nearly forgotten? One

major strand—nearly 300 entries in the 1938 bibliography—concerned "land utilization" or "what use can best be made of the land" (p. 373).[19] Here one finds continuities between Coville's report on sheep grazing in the Cascades and a string of studies well into the 20th century, such as "Range Investigations in Arizona,"[20] "The Range Problem in New Mexico,"[21] "Beef-Cattle Production in the Range Area,"[22] "Ranch Organization and Methods of Livestock Production in the Southwest,"[23] and "The Public Domain of Nevada and Factors Affecting its Use."[24] Largely descriptive, these reports shared a common concern with how open access and the absence of fences promoted uncontrolled grazing and range degradation on the public domain. Passage of the Taylor Grazing Act in 1934 largely resolved these concerns, and New Deal programs built much of the fencing needed to implement the law. Subsequently, land use studies drifted away from rangeland science and into other fields such as agricultural economics. From this we might draw two lessons: first, that social science is called for when a problem originates with humans; and second, that rangeland social scientists might benefit from revisiting these antecedents, given the prominence of land use change and fragmentation as threats to rangelands today.

Less numerous in this early literature but also noteworthy are studies based on ranchers and their management, rather than on controlled experiments on designated research stations. In some cases, this amounted to treating selected ranchers' practices as post hoc quasi-experiments. Lantow[25] mailed surveys to ranchers "asking for information in regard to practices of range management that prove the most profitable." He hoped to learn "what is actually practiced on the ranges of New Mexico, and parts of Texas and Arizona," to complement the experiment-based recommendations of his colleagues. In other cases, ranchers themselves were the subjects under study. With Walker, Lantow[26] conducted a highly detailed study of 127 New Mexico ranches, stratified by region and based on in-depth interviews. They reported data on land and herd size, investment levels, income and debt, labor costs, receipts and expenses, costs of production, credit sources, management practices, marketing, profitability, and more. Although rancher surveys have been a staple of rangeland social science in recent decades, such a thorough-going inquiry into the financial status of ranches today is hard to imagine, even though its value would be at least as great now as it was in the midst of the agricultural depression that gripped rural America in the 1920s. Studying ranchers waned in the immediate post-war period but returned as urbanization and outmigration brought increased public focus on the open lands of the western United States in the latter part of the 20th century. The main finding of this renewed research, first reported by Martin and Jefferies[27] in 1966 and supported by a stream of studies since then,[28-30] is that ranching defies the economic assumption of market optimization. Many ranchers prize the nonmarket values of ranching—rooted in land, family, tradition, lifestyle, or identity—and they absorb significant opportunity costs as land values rise to levels well above what livestock production can sustain. This phenomenon has significant implications for adoption of new practices and technologies, response to outreach and policy, financial behavior and land management, and ranch decision-making in general.

A third set of lessons concerns the sociology of range science itself. The creation of the Soil Conservation Service (now the Natural Resources Conservation Service) in 1933 and the Division of Grazing (precursor to the Grazing Service and Bureau of Land Management) in 1934 afforded the first federal employment opportunities outside of the Forest Service for scientists interested in rangeland management. Some of these scientists proceeded to challenge Forest Service rangeland orthodoxy on matters such as fixed carrying capacities, Clementsian succession, and fire.[17] Another example was Marion Clawson,[31] the first director of the BLM, who recognized that from a rancher's perspective, rainfall variability was more decisive than average precipitation for effective management. Outliers such as these can help alert today's rangeland social scientists to mid-century blind spots and to the contingent nature of science more generally—the past could have turned out differently, and so could the future.

Finally, there are topics whose omission from early range science is total or nearly total, and which from a social scientific perspective are diagnostic precisely by their silence. Of the 8,229 entries listed in the 1938 bibliography mentioned above, for example, only about three dozen explored Native American rangelands, management practices, or ethnobotany, and many of these simply reported information without regard to the views or interests of the people living there (e.g., "Flora of the Navajo Reservation").[32] There is one lone entry about Spanish and Mexican presence on the rangelands of what is now the United States, despite the long history of range livestock production associated with Hispano settlement; indeed, the words "Hispano" and "Spaniard" do not appear at all. Also missing entirely are the words "women" and "gender." Suffice to say that the normative, unmarked subject of rangeland science was a White, male, English-speaking livestock producer, and knowledge about other users and uses of rangelands were marginalized or excluded altogether. This group remains important, as it includes the managers of most private rangelands and public land grazing permittees. However, the knowledge provided by rangeland social science is incomplete without also understanding the full spectrum of goals, needs, and contributions in the ranching and grazing community. This need for broader inclusion has been recognized by social scientists who focus on other realms of North American agriculture as well.[33-35] Without this broader perspective, there is a risk of offering policy, outreach, and technical advice that is misguided for some groups that play an important role in the stewardship of western rangelands.

The way forward

In 2018, the Society for Range Management launched its #WeAreRangelands campaign aimed at promoting the relevance of rangeland science and management to people. As we look forward to the next era of rangeland social science, aug-

Figure 1. Amah Mutsun Land Trust Native Steward Christopher Sanchez monitors a pile burn of Douglas fir material in a project to restore coastal grasslands at Quiroste Valley Cultural Preserve, Pescadero, California. Photo courtesy of Alexii Sigona.

mented by the inclusion of social science into LTAR studies and by sustained growth in the number of social scientists who are interested in range issues,[2-3] we see a critical need to expand the scope of people encompassed by that vision. Range science in North America developed in a context of settler colonialism, characterized by great faith in the cultural values and norms of the colonizer and dismissal of the knowledge, culture, views, and practices of the colonized.[36] The field has been colored by a firm belief in the superiority of Western science and Western experts, and a dismissal of what is not called "science." As Native American, Hispano, and Mexican communities were dispossessed, and vast areas of the western United States were transferred to federal ownership and management, the value of local and indigenous knowledge was discounted, sometimes to disastrous effect. For example, Native American use of fire was dismissed by early 20th century land managers in favor of a full-suppression policy rooted in European forest science. Only now, after decades of evidence showing the failure of that approach, is there a renaissance of interest in restoring Native American burning practices (Fig. 1).[37]

This myopic perspective is reflected in range social science as well, and not solely in the early years of the field. Analyzing nearly 300 rangeland social science papers published between 1970 and 2017, Bruno et al.[2] found that ranchers, farmers, and landowners were the focus of 81% of those publications. Issues of race or ethnicity were rarely considered. Yet Spanish ranching predates the entire history of English-speaking settlement in North America, and its culture remains vibrant in many parts of the United States. Africans and their descendants were also critical players in the development and diffusion of range livestock production in the Americas. Historians and geographers have documented these groups' influence in detail.[38-40] Yet few range scientists have explored today's Hispano or African-American ranching communities, how they use land and manage animals, or the challenges they face.[33] Native Americans have been managing rangelands for much longer still; here, too, historians and anthropologists have done valuable work,[41-44] but the rangeland social science literature is extremely limited.[45-47]

Similarly, the contributions of women—as ranchers, landowners, or stakeholders—also warrant more attention. In their study of women ranchers' cultural resilience in the Southwestern United States, Hailey Wilmer and Maria Fernández-Giménez[48,49] describe how their research subjects have engaged in a variety of practices to maintain their way of life. By foregoing their own needs during difficult financial times, communicating with nonrancher networks, and working to transfer their cultural and technical knowledge, women ranchers are playing an active role in maintaining the cultural ecosystem services contributing toward their way of life. Studies focusing on the role of women in North American range management are increasingly common but still relatively rare, even though researchers such as Maria Fernández-Giménez and Layne Coppock have worked with female pastoralists in the developing world for decades.[50-53]

What can we learn from these groups' approaches to land, livestock, and livelihoods? What challenges do they face in maintaining or revitalizing traditional practices within a larger culture and economy built on models that do not consider them or their knowledge? Collaborative and participatory research and management models offer one way to address these questions and obtain the benefits of the experience and knowledge of groups that are so often overlooked. There are both ethical and scientific reasons to employ co-produced, collaborative methods and research models.[46] Numerous collaborative efforts have been initiated to attempt to bring more people into public lands decision-making, and considerable rangeland social science has focused on the details of this process. Who participates is of vital importance, and empowering people from traditional and nontraditional backgrounds provides an opportunity to increase the depth and breadth

Figure 2. A Kazakh woman milks her horse in Central Asia. Kazakhs are traditionally nomadic pastoralists. Horses are a revered part of Kazak life, providing transportation, clothing, labor, meat, and milk. Fermented mare's milk, or Kumis, is a cherished treat, often served to guests. Photo courtesy of Lynn Huntsinger.

of information used. Unfortunately, sometimes these efforts are described as if the goal was solely to obtain information and passive consent, seemingly oblivious to the power differentials and histories of dispossession undergirding the entire process.[54] Moving beyond will require a more genuine commitment to "co-management" and co-production of research.[55]

In these and other areas, North American rangeland social science could be well-served by greater collaboration with international range researchers. Insights from outside North America have had a major influence on our field, often because of an integration of social and ecological research that seems more common elsewhere. While rangeland science was for a long time relatively blind to "cultures" of rangeland use in the United States, researchers working in Africa and Asia have been exploring the relationships between culture and rangeland use and management for decades (Fig. 2). Participatory and collaborative management models have long had a central place in international development research, where it is now a given that it is not enough to "represent" or "study" multiple affected groups but necessary to give them voice.[56] The literature on pastoralists is much larger than the social scientific literature on ranchers. A number of landmark studies in range science derived insights, at least in part, from researchers' attention to pastoralist knowledge and practices, particularly in Africa.[57,58] More recently, research teams have highlighted important socio-ecological issues facing rangeland-dependent peoples worldwide.[59-61] Meanwhile, new tools have enabled archaeologists to understand prehistoric pastoralist societies in much greater detail than was possible before.[62] But for the most part, rangeland science (especially in the United States) has treated the developed world (ranching) and the developing world (pastoralism) in isolation from one another, and in fact has treated pastoral systems largely as needing modern governance improvements and the benefits of Western science. Dialogue across this divide has resulted in research that enriches rangeland social science by connecting it with a more diverse set of voices, perspectives, and geographies,[51,56] and more is needed. Comparative and co-produced research between ranching and pastoralist communities can help us better understand and support both communities.

A question all these cases can help address is how to derive sustained livelihoods from highly variable and marginal environments. A symbiotic relationship with livestock is the common attribute of pastoral and ranching communities, past and present, that has enabled people to inhabit an enormous diversity of landscapes otherwise unsuited to their needs. It is also, arguably, what best distinguishes rangeland socio-ecosystems from other biomes. The wide spectrum of macroeconomic conditions found on rangelands, from subsistence to entirely commercial orientations (and everything in between), creates virtually limitless comparative possibilities to illuminate the interactions of social and ecological conditions, climatic and market forces. And these lessons are likely to have ever wider relevance going forward, given that climate change is projected to make weather in many parts of the world more variable, more prone to extremes of drought and flood, and less predictable (i.e., more like rangelands) as warming progresses. There is a lot to learn about flexibility, adaptation, and adaptive land tenure models from indigenous pastoral communities, as well as from Native American and Hispano communities. Without casting a broader research net, range social science will be much less likely to inform the path of rangeland social-ecological systems (SES) as society confronts inevitable changes.

The role of social science in long-term research

To truly understand SES change, social and ecological research must be integrated and studied over long time periods and at multiple sites—a distributed network approach. There are various examples of ecological research networks, most notably the National Science Foundation's Long-Term Ecological Research (LTER) Network, but we know of none that has successfully incorporated social science at the network scale. In 2004, scientists from diverse fields advocated for the integration of social sciences into the LTER Network, even putting forth a name change to explicitly include social science: Long-Term Social Ecological Research Network.[63] Nearly two decades later, LTER is still primarily an ecological research network, with the exception of three urban sites. So how can a large-scale research network successfully transition to integrative social-ecological science?

The much younger LTAR Network is currently at the same crossroads as LTER 15 years ago. LTAR has recently invested in increased human dimensions research capacity.[10] Unlike LTER, its focus is directed toward nonurban working landscapes in the United States, including rangelands. The network is built on the premise that the nation can contribute significantly to meeting the rising global demand for food using practices that can increase production while sustaining environmental values and enhancing rural prosperity (i.e., "sustainable intensification"). Range ecosystem management since the early 1990s similarly has sought to protect the "three-legged stool" of ecological, economic, and social values.[64,65] Social science can contribute most effectively to the social leg of the stool—what LTAR calls rural prosperity. However, LTAR's focus on sustainable intensification tends to emphasize the food and fiber production capabilities of rangelands, and as a result gears research toward private lands and large landowners. In reality, rangelands confer a wide variety of benefits beyond provisioning ecosystem services (Fig. 3).[66] LTAR stands to be a transformative leader in rangeland social science if it can pivot to be more inclusive of an array of rangeland valuations and stakeholders.

In other words, who are to be the beneficiaries of rural prosperity? Contemporary rangeland communities encompass not just racial and ethnic diversity, but also many people whose labor makes rangeland economies and institutions possible—agricultural laborers, service workers, and others—without owning significant tracts of land. It may be efficient to focus on the landowners who manage the most land area, but it excludes large portions of the communities whose prosperity is at issue.

The emphasis on sustainable intensification also downplays the role of nonagricultural, "new rural" landowners whose actions influence rangeland ecosystem services and rural prosperity. Urban flight and subsequent subdivision of rangelands, sometimes for second homes, is a transformation that has been underway for 30+ years. Areas with attractive natural resources are seeing a surge of rural in-migration that can lead to shifts in how residents interact and cultivate community.[67] During the 1980s, land ownership in regions such as Montana's Rocky Mountain Front began to shift from career, resident ranchers to new, often absentee, landowners who bought large parcels of land and valued natural amenities unrelated or antithetical to cattle ranching.[68,69] In these communities with growing amenity-tourism development, subsequent structural and economic shifts shape and then reinforce community changes.[70] Social scientists will be crucial to understanding long-term effects of potential rangeland in-migration and transformation of working landscapes.

Compounding rangeland community transformation is the out-migration of rural youth[71] and proportion of ranchers who are nearing retirement. As making a living from rangelands has proven increasingly difficult, many ranching operations are diversifying their income streams by seeking other additional enterprises such as recreation and hunting,[72] or entering into voluntary conservation easements that preserve ecosystem services for the public good.[73] When such enterprise shifts are insufficient, undesirable, or infeasible, decreasing profitability makes inheriting the ranch a tough sell for rural youth. As more young people find job opportunities outside of ranching or other rangeland professions, rangeland community dynamics will shift. When older ranchers no longer feel they can continue to operate their enterprise, lacking an heir is a primary reason they are forced to sell.[73] Because escalating land prices make it difficult for prospective new ranchers to enter the market, ranches that are sold are often converted to nonproduction-oriented users, thereby feeding into the trend of amenity-based in-migration. Understanding subsequent changes in place identity, place attachment, and sense of place,[9] and the effects these may have on community cohesion, is an important and understudied topic for rangeland social science.

Without long-term social science to study each of the aforementioned rangeland transformations, we may miss key leverage points that would help direct how transformation occurs going forward. Within LTAR, there already are examples of research that expressly consider social factors, from which LTAR can model future efforts. The Central Plains site in Colorado is host to the Collaborative Adaptive Rangeland Management (CARM) experiment initiated in 2012. As described elsewhere in this issue,[5] the project aims to foster science-management partnerships for diverse management objectives (livestock production, grassland bird conservation, and vegetation structure and composition) and to understand contributions of adaptive management and human dimensions research to the outcomes of rotational grazing. By including multiple stakeholder interests in rangeland management, the CARM team co-developed management plans that generated new social, economic, and ecological knowledge. The experiment has also led to increased respect, trust, and understanding among the team members. Although this project is relatively young and further results are forthcoming, CARM provides an example of how social science could contribute to LTAR's rangeland management re-

Figure 3. Livestock operators often manage to provide multiple ecosystem services, as on the southeast Utah's Dugout Ranch, where an experiment with Mexican heritage breed cattle is under way in an effort to better sustain the ranch's soils and plant communities. Photo courtesy of Mark Brunson.

search, particularly where applied participatory methods are feasible.

Participatory approaches that aim to increase trust and understanding among diverse stakeholder groups typically require years to develop.[74] Noticeable outcomes likely will require commitment beyond the average duration of research funding within the USDA-Agricultural Research Service (ARS), which manages most LTAR sites. Also critical to this effort is an institutional culture within LTAR units that values broad inclusion of scientific disciplines and stakeholder perspectives, including in ARS 5-year planning processes. Until more systemic changes are made that can enable longer-term funding streams, LTAR scientists may need to find other ways to engage in longitudinal social science research, such as collaborating with university colleagues and obtaining outside grant funding.

The very aims of sustainable intensification could drive significant changes to rangelands. For example, with increasing incentives to cultivate marginal lands traditionally used for grazing cattle, large areas of rangeland may be converted for grain production.[75] When such shifts occur, social science has a role in examining the potential social and cultural impacts of these landscape transformations. Moving beyond the scope of LTAR, there is also a role for long-term social science research to study transformations that may be counteractive to or independent of improved sustainable production of food and fiber on rangelands.

Rangelands provide social-ecological services beyond those that can be easily measured or monetized,[60,76] and as Sorice et al.[8] describe elsewhere in this issue, the connections between those services and rangeland stakeholders can be complex and nonlinear. Cultural SES services are crucial to individuals' sense of place,[9] mental health, and well-being, yet are often excluded or undervalued in ecosystem service assessments in favor of provisioning services. Yet, nonmarket rangeland services greatly impact individual and community well-being, and influence management decisions and rangeland health, a phenomenon researched as far back as the 1960s.[28] In the ensuing decades, the ecosystem services that are considered in ranch decision-making have only broadened.[77] If we know that ranchers incorporate more than financial outcomes into decision-making, what can we learn about how these nonmarket benefits influence peoples' use and management of their lands? Looking forward, efforts to "value" rangelands need to acknowledge that many values are unquantifiable and instead focus on the complex interactional pathways between social change processes, human well-being, and ecosystem health.[6,78]

As we conclude this special issue, we challenge rangeland social scientists to think beyond a search for "true" knowledge. It is also necessarily to search for justice (i.e, for a just representation of who defines "knowledge"). Listening is an important skill, and one that has not been used enough in range management. Social science in LTAR and throughout the rangeland science community should not be solely oriented to government agency needs or missions, but it needs to help us find what is just, and subsequently, socially and ecologically sustainable.

Declaration of competing interest

The authors certify that they have no financial interest in the subject matter described in the manuscript. M.W.B. is a past member of the *Rangelands* Steering Committee and G.R.M. is a Guest Editor for this special issue of *Rangelands*, but neither were involved with the review or decision process for this manuscript.

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