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Practicing a New Natureculture of Hope for Multifunctional Great Plains Rangelands

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Abstract

In the US Great Plains, multigenerational ranching livelihoods and grassland biodiversity are threatened by dynamic and uncertain climatic, economic, and land use processes. Working apart, agricultural and conservation communities face doubtful prospects of reaching their individual goals for multispecies sustainability. This study documents the journey of a group of public lands managers, conservationists, ranchers and researchers re-imagining and practicing a different future for the rangelands of the US Western Great Plains. Formed in 2012, the team manages an experimental cattle ranch on the shortgrass steppe (the Central Plains Experimental Range in Nunn, Colorado) via collaborative adaptive rangeland management (CARM). We examine the processes used for a series of meetings to revise management objectives (2016-2018). We do so through the lens of the natureculture concept. In the early days of CARM, the team established locally-relevant multifunctional goals and objectives. Revisions to these objectives reveal changes in the team's conceptual understanding and related practice of rangeland management. We describe and discuss these changes as the beginnings of a new natureculture, based on a sense of place and grounded in hope, emerging from CARM. We consider how these insights can inform broader efforts to create better conservation outcomes within the project and beyond.

Keywords

collaborative adaptive management; goals and objectives; natural resource management; grassland bird conservation.

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Introduction

How are goals for conservation constructed? What better future for biodiversity is possible and probable? and how do managers find a path to progress? In the face of global losses of biodiversity on rangelands, much research has focused on evaluating management strategies relative to conservation or production outcomes (Briske et al. 2008; Briske 2011), but little attention has been paid to the processes by which managers determine and revise their goals and objectives. In light of recent global climate change and Anthropocene discussions, natural resource scholars increasingly recognize that complex links between humans and our environment preclude separate conceptualizations of "Nature" and "Culture" in the modernist sense (Latour 2012; Glaser et al. 2008). They have joined geographers and anthropologists in rejecting human-nature dualism, seeking instead new tools to interrogate social reality and create opportunities to conserve multispecies thriving in an interconnected world (Glaser et al. 2008). For example, the natureculture concept recognizes the "inseparability in ecological relationships that are both biophysically and socially formed" (Fuentes and Wolfe 2002; Haraway 2003; Malone and Ovenden 2016). This concept creates space for novel examinations of relationships between and among species and their environments (Malone and Ovenden 2016; de la Bellacasa 2010).

Goal and objective design is how society formalizes aspirations for these relationships within natural resource management. However, effective goals/objectives require extensive ecological and social knowledge because ambiguous targets that lack specific reference to impact and outcomes for social, environmental and economic values limit management success (Domínguez-Tejo and Metternicht 2018). As an alternative to human/nature, rational/emotional dualisms, natureculture provides a lens to interpret how goals and objectives are constructed on rangelands, where modernist agronomic approaches to land management fail (Sayre 2017) and productivist management goals have given way to multifunctional, or a combination of production, consumption and protection goals (Wilson 2007; Holmes 2006). Natureculture

thinking considers the responsibility species have toward one another, and the role of multiple knowledges in shaping inter-species relationships (de la Bellacasa 2010; Haraway 2003). Experience, emotion and moral reasoning are drivers of these relations (Plumwood 2006; Roesch-McNally, Arbuckle, and Tyndall 2018; Ellis 2013; Nightingale 2011).

Two important concepts inform geographic and emotional specificity in the discussion of rangeland naturecultures: a *sense of place* and *hope*. Sense of place involves the meanings, emotions, and beliefs that tie individuals and communities to landscapes and multispecies networks (Chapin and Knapp 2015; Williams and Stewart 1998). Daily decision making for land managers—both ranchers and conservation managers— depends upon working knowledge of geology, biology, ecology, climatology and the dynamic and multi-scaled social, economic and political context. This decision-making is situated in families, local social networks, and in cultural traditions and history. Management is living knowledge of place.

Hope is "the will and the way" to achieve a different future (Snyder 1995). A goal-directed cognition, hope indicates important, socially acceptable goals that are under one's control, and have some probability of attainment (Averill et al. 2012). Hope provides a foundation of human learning and coping (Snyder 1995), and is distinct from optimism, a positive outcome expectancy that does not necessarily enable navigation of roadblocks to goal attainment (Scheier and Carver 1985; Rand 2017). In natural resource management, hope influences how managers establish goals and adapt these to achieve a sense of progress (Snyder 1995). Ranchers are aging and ranches declining in number across the Western US, but ranchers identify as conservationists and prioritize goals for long term sustainability and lifestyle (Wilmer and Fernández-Giménez 2015; Smith and Martin 1972). Rancher decisions involve trade-offs between profitability and sustainability, often during stressful drought or variable market conditions (Kachergis et al. 2014) These decisions can be intellectually and morally daunting, and emotionally exhausting. The goal of passing a ranch to the next generation is a common aspiration. For conservationists, optimism for reversing the decline of grassland bird species in the Great Plains is fleeting, as bird surveys continue to indicate rapid population declines in many species (North American Bird

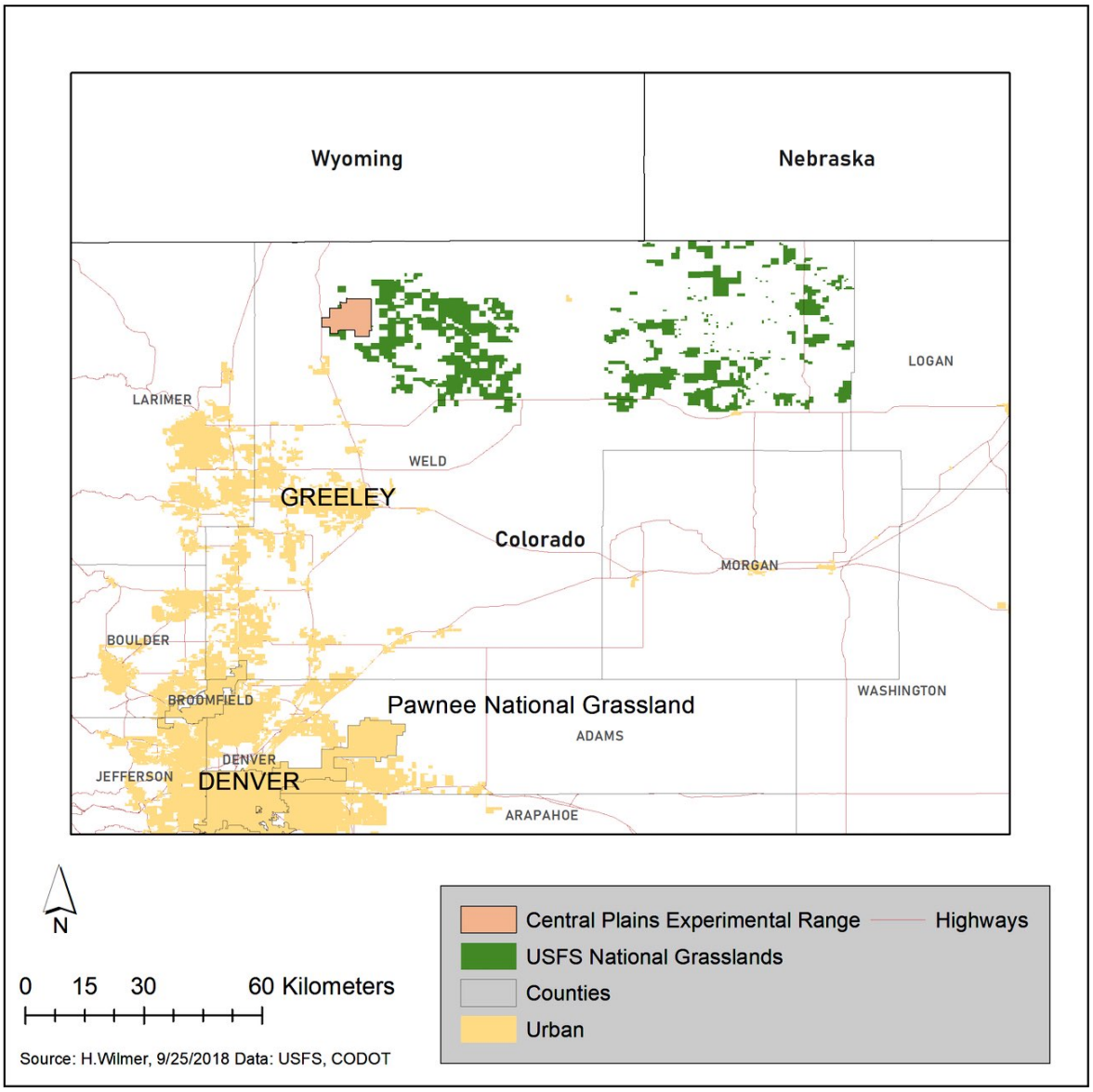
Conservation Initiative, 2009). Hobbs (2013) suggests that conservation practitioners and researchers experience a process of grief in addressing species loss. Finding hope to reverse biodiversity loss may be important to reenergizing conservation and scientific efforts (Jackson 2006).

To explore how objectives for conservation are constructed we apply natureculture thinking as an analytical lens to rangeland management. We first describe the conservation context of the Western Great Plains and the Collaborative Adaptive Rangeland Management (CARM) project, whereby rangeland stakeholders and researchers (the CARM team) "reintroduced" social decision-making into rangeland research in 2012. We then describe how the team revised their management objectives after five years of management and discuss how this process reveals the development and practice of natureculture in CARM (see also Wilmer et al. 2018b).

The conservation context of the Western Great Plains

The working landscapes of shortgrass steppe in the Western Great Plains face high levels of weather and grassland production variability (Map 1). They are managed in large part by ranching families, including those with public land grazing permits, and public land management agencies. Here conservation requires limiting rangeland conversion to farming and development, and restoring and reconnecting heterogeneous native prairie areas where possible to benefit a suite of Great Plains grassland bird species (Fuhlendorf et al. 2012). Some of these bird species require habitats shaped by prairie dogs or fire (mountain plover, *Charadrius montanus*), or short-structured areas formed by large herbivore grazing (McCown's Longspur, *Rhynchophanes mccownii*). Others rely on tall-structured and shrub dominated areas (Lark Bunting, *Calamospiza melanocorys;* Grasshopper Sparrow, *Ammodramus savannarum*) (Derner et al. 2009; Augustine and Derner 2012; Samson and Knopf 1996). Despite the recognition of the importance of restoring "pattern and process" to improve conservation outcomes (Fuhlendorf et al. 2012), conventional grazing practices produce homogenous vegetation structure (Briske 2011). Forage production and diversity are important ecosystem services for these ranching operations, and are highly influenced by variable rainfall.

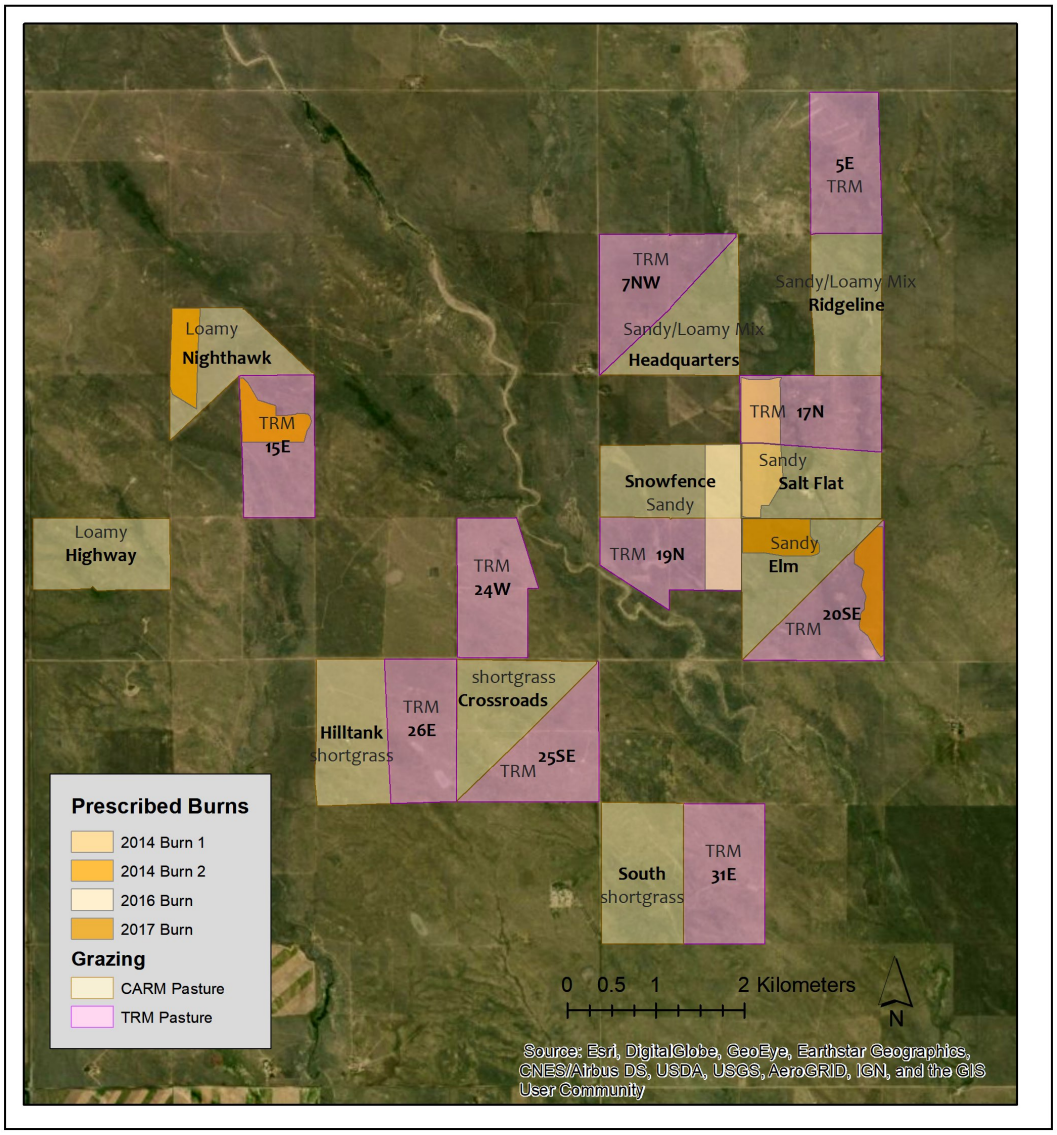
Map 1. The study site within the Western Great Plains.



Working apart, ranching and conservation communities face doubtful prospects of reaching their individual goals for multispecies sustainability. Compounding these issues, rangeland research efforts in the region historically operated as social exclosures, keeping in science and keeping out manager communities. Research began in 1939 at the Central Plains Experimental Range (CPER, operated by the USDA-Agricultural Research Service since 1953) with early efforts emphasizing small-scale, productivist work (Shoop, Kanode, and Calvert 1989). More recently, ranch-scale multifunctional investigations have addressed agroecological interactions. Despite an increasingly multifunctional perspective, end-users of the knowledge generated at CPER were kept at arms-length. Stakeholders were rarely included directly into the research process, or into the evaluation and application of research findings. Increased criticism of this science model and the resultant "science-management divide" that pitted research evidence against manager experience in grazing management erupted in a debate in the late 2000s (Briske et al. 2008; Teague et al. 2013; Roche et al. 2015). This debate led to the collaborative project described below.

CARM as a model for management-science partnerships. The Collaborative Adaptive Rangeland Management project attempts to bridge this science-management divide. Formed in 2012, the CARM researcher and stakeholder team manages an experimental yearling cattle ranch on the CPER (an ARS Long-Term Agro-ecosystem Research site in Nunn, CO) via collaborative adaptive management (CAM). CAM incorporates collaborative decision-making and evidenced-informed practices, in this case within a broader experimental design (Beratan 2014). A group of 11 stakeholders, compromised of conservation, public agency, and ranching community representatives have purview over yearling cattle grazing ten 130 ha (CARM) pastures (Map 2). They work with an interdisciplinary group of scientists to establish goals and objectives and evaluate biophysical monitoring data to make decisions for the spatio-temporal distribution of cattle and prescribed fire on the landscape. A comparison treatment with the same number of cattle using the Traditional Rangeland Management (TRM), is implemented via season-long continuous grazing on a second set (10) pastures paired in site characteristics (See: Wilmer et al. 2018a).

Map 2. Grazing and prescribed fire on named Collaborative Adaptive Rangeland Management (CARM) pastures are compared to numbered Traditional Rangeland Management (TRM) pastures.



In 2017 the CARM team began revising the original 2012 management objectives. The aim of this revision process was to evaluate and apply lessons learned in the spirit of the adaptive management literature (Allen and Gunderson 2011). We collected field notes and transcripts of meetings from January 2017 and April 2018, and compared original (2012) objectives to approved and proposed revisions. We summarized researcher interpretation of these events and the results of our open coding of qualitative data for patterns in how participants revised objectives, iteratively developing two themes with additional consideration of the literature (Charmaz 2006). We describe each briefly in the findings section.

Findings

Sense of place. Through the early years of CARM and during the objectives revision process, the team demonstrated growing attention to spatial, temporal, and theoretical specificities, including naming previously numbered CARM pastures (see Map 2). Their revision of the vegetation production and diversity objectives illustrates this process. The vague 2012 vegetation objectives sought to increase plant diversity and production of desirable forage species everywhere, every year:

"Increase percentage of cool-season grasses and non-shortgrass native plants, by weight and number of plants."

Whereas, the final revised objectives included detailed explanations of rationales, targets and evaluation criteria, summarized as:

A) Attain and/or maintain abundances of cool-season perennial graminoids within 30% of 2015 targets (specific to sandy, loamy and shortgrass-specific sites) for each plot using a three-year running average to assess trend.
B) Maintain or increase plant compositional diversity both within and across pastures using a three-year running average to assess trend.

The modified vegetation objectives included different production targets on three distinct soil/site types across the landscape (see Map 2). The team also team incorporated more specific

temporal dimensions into the revised objectives. They assessed previous research indicating that stocking-rate driven changes in vegetation composition take multiple decades at the site (Porensky et al. 2017). The team discussed whether objectives to increase vegetation diversity and production of forage grasses were achievable in the planned ten-year time span of the project, as one individual noted "*it may be very difficult to get the target in the vegetation objective solely through grazing management. Precipitation may be the number one controlling factor. Having it as an objective could be discouraging."* Ultimately, the team set targets for cool-season grass production in relation to 2015, a year within memory with exceptional production. Rationale for the cool-season-mid grass objectives included the importance of increasing shoulder season forage, providing wildlife habitat, and increasing the capacity for high production in wet years.

The CARM team also examined conventional theoretical frameworks used in rangeland vegetation management relative to their growing spatial and temporal ecological knowledge. Federal public agencies have adopted resilience-based theories of vegetation dynamics illustrated with State-and-Transition Models (STM) , or conceptual diagrams that indicate hypothesized management-driven plant community change at specific sites (Westoby et al. 1989) . Agency stakeholders asked to revise species composition targets using existing STMs. However, STMs for the study site indicate assemblages of species and alternate states never observed there. Further, team members disagreed with how STMs conceptualized "reference", or desired plant communities without accounting for ecological disturbances, climatic changes, or wildlife habitat needs. The team voted to adopt revised vegetation objectives that did not include STMs as references, but had more place-aware targets for production of cool-season forage species and plant biodiversity as two separate objectives.

During the first five years of CARM, stakeholders made several requests to increase the number of tours, pasture photos and maps to help interpret CARM outcomes. In 2018 a stakeholder noted, "*We are learning the place, more and more all the time*," and described the value of field time during quarterly CARM meetings. She lamented that her knowledge of place had been

limited by a lack of time on-the-ground early in the project, as the 2012 objectives were written before the researchers conducted a baseline assessment (in 2013). Multigenerational rancher stakeholders boosted the group's sense of place by sharing their experiences and observations with relative newcomers to the area. To enhance geographical knowledge, the team added annual field tours and increased geospatial data and map-based communications.

Hope: A will and a way. During the objectives revision process, the team discussed limitations of weather, animal behavior, and external human activity on their management objectives. At several points during the process, the team recognized that desired outcomes would be difficult, or perhaps impossible to achieve. They nonetheless moved forward to design aspirational goals, demonstrating a concept we coded as "*responsibility to possibility*", or the sense of responsibility and hope that framed their revision efforts.

The revisions to the wildlife objective illustrate this concept. The original 2012 objectives indicated simply to "maintain populations of McCown's Longspur, Western Meadow Lark and Horned Lark." In the proposed revised objectives, the team established an individual objective for the Longspur because of the exceptional rate of population decline for that species. This was: "Create or maintain high-quality breeding habitat for McCown's Longspurs on 20 – 40% of the total landscape. Prioritize management for McCown's Longspur habitat on loamy ecological sites with flat or gently rolling uplands (shortgrass target areas)."

The team developed the hypothesis "if you graze it, they may come," (echoing a line from a popular movie) during the CARM meetings. This indicated the belief that they could improve prospects for the species by creating habitat, in hopes that habitat would lead to increased Longspur populations. One individual said "*I've always been struck by this, the populations. When most of these birds go away, that's so totally out of our control, in some ways. Having a habitat objective makes a lot of sense to me. I'm not opposed to saying something about the populations. But we can't necessarily say that populations are improving or declining because of anything we've done. Whereas we can, if we are really focused on making sure we have a certain*

amount, whatever that amount is, of the right habitat, we can." In implementing the "if you graze it, they may come" idea in objectives revisions the team discussed how they could act for positive change, even if external factors (weather, farming and grazing practices, and exurban development) drive the species into further decline.

A key aspect of hope in CARM involved responsibility, or "the will" to act for a better future. A subset of team members described the view that the group should take a responsibility to act in any way possible to improve outcomes for the Longspur. One team member expressed concern that a spatial target for bird conservation was too small. He said, "*Why don't we have a more aspiration goal of what we'd like to see?"* Another said, "*Some people wait until they know birds are in decline, or that grazing is impacting birds, and then they act. I assume that we should do something before we know for sure that they are declining. I assume we should act until we have good evidence that they are fine."* He went on to describe what he saw as an "apathy of scale" in conservation, or the attitude that "*someone else will deal with it*" or that "*conservation is beyond our control*" because it is constrained by land use-change or climate and weather. Proposed Longspur objectives, were presented in April 2018 with rationale that recognized the Longspur as the species of "*greatest conservation need in Colorado*" and recognized barriers to success: "*climatic trends, extreme weather events and changes in habitat outside the breeding grounds."* The importance of finding hope for better outcomes in CARM was particularly pronounced for researchers, who spent the most time with the data and were acutely aware of the consequences and limitations of CARM progress. One noted "*As a scientist I see the data first, I experience it when I'm doing point counts. But I wait, and after two years we show the decline at the meeting, and by then there is not much we can do, and I am so frustrated.*" The researchers noted they were motivated to be involved in CARM because it offered a chance to make a positive impact in real conservation and production outcomes, both within the scale of the project and regionally. In this capacity, they felt a strong responsibility to project outcomes and how the objectives were written. Based on these reflections, the research team proposed guidelines for their involvement in CARM decision making that allowed them to provide professional advice without concurrently serving as facilitators or becoming voting members. Revising the scientists' roles

allowed them to explicitly explore their own professional, professional and emotional sense of responsibility to management objectives.

Discussion

The themes of *sense of place* and *hope* illustrate the natureculture concept developing in CARM as team members came to know place- a specific landscape full of interacting wildlife, vegetation, livestock and human communities. The process reveals how the team found a will (taking responsibility for) and a way, via more place-specific objectives, to envision a path forward. This became an emotionally challenging and socially complex experience, particularly for the scientists, as they re-evaluated their roles in the project and their experience as participants. Rather than opting just to maintain habitat or vegetation composition where possible, the team demonstrated hope, writing aspirational, but pragmatic, objectives for improved management at CPER.

Developing a sense of place and practicing multispecies responsibility within a grazing research project like CARM requires manager-inclusive research methods. CARM offers to model and evaluate an alternative scenario for rangeland science and management for multifunctional goals. The team will always be more disconnected from CPER and the ecosystem than if they were living and working on the site together. Those that do not have a connection to ranching are particularly cut off from the physical and emotional labor, financial risk, and lifestyle reward of ranching, as are many of the decision-makers in other collaborative management contexts. This analysis suggests that simple efforts to “reintroduce” local stakeholder groups to the scientific process and the experimental landscape through management responsibility enabled the CARM team to begin to develop and practice a new rangeland natureculture concept. This development relied on their sense of place and a hopeful choice to re-imagine better conservation outcomes on the landscape.

This investigation into the objective writing process offers insights into effective collaborative adaptive management (CAM) and planning at ranch, community and regional scales

(Domínguez-Tejo and Metternicht 2018). The CARM experience suggests that a discussion of natureculture thinking is an important next step for collaborative conservation, which may depend on a sense of place, and the responsibility decision-makers feel to multiple species. Developing individual and community sense of place requires extended experiential time on the landscape and learning from local managers, such as ranchers, especially early in the CAM process and for recent arrivals to the local area. It also requires time for interpretation of local geographical and theoretical knowledge, and for knowledge of regional climate and social contexts beyond the area of interest.

CAM efforts also benefit from opportunities to develop and practice hope, essentially the thought process of effective goal setting and attainment (Rand 2017), and shared moral and cultural aspirations for responsibility to multispecies thriving. Adapting Snyder's (1995) recommendations, hope may be nurtured through celebrations of past success, story-telling and reflection regarding achievement and setbacks, and efforts to cultivate interdisciplinary conversations about moral and ethical aspects of goal setting and responsibility. These processes should explicitly consider and engage team members from all backgrounds, including researchers and facilitators in non-voting roles. As CARM shows, CAM is more than a question of process and scientific method. Effective CAM relies on goal and objective development, the equally important processes by which managers identify and define their own capacity and motivation to participate in responsible natureculture conservation.

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Biographical Notes

Hailey Wilmer is Fellow at the Northern Plains Climate Hub. She is a critical rangeland social scientist studying manager decision-making and climate and weather adaptation in the Great Plains using participatory and ethnographic methods. Hailey completed her Ph.D. from Colorado State University in Rangeland Ecosystem Science, with a certificate in Women and Gender Studies..

Lauren Porensky's research focuses on balancing livestock production with conservation and restoration in semi-arid rangelands. Her broad research interests include plant community ecology, plant-herbivore interactions, landscape ecology, and restoration ecology.

David Augustine is a landscape ecologist. His research interests include plant-herbivore interactions, the ecology and management of semi-arid rangelands, and conservation biology.

Justin Derner is a rangeland scientist and the research leader at the ARS-Rangeland Resources and Systems research unit in Fort Collins/Cheyenne, WY. He leads a multi-disciplinary team of scientists developing and providing private and public land managers with the necessary tools for properly managing semiarid rangelands for multiple ecosystem goods and services with extreme and variable weather.

María Fernández-Giménez is a rangeland and human ecologist and educator who investigates the ecological dynamics of rangeland systems, the management practices that maintain and restore healthy rangelands, and the institutions that facilitate the use of sustainable practices. She teaches rangeland assessment and monitoring, ecosystem management and community-based natural resource management. She also writes poetry.

John Ritten is an agricultural economist with appointments in teaching, research and extension at the University of Wyoming. His focus is sustainable agricultural practices and natural resource economics.

David D. Briske's scholarship and pedagogy focus on the ecological function, management strategies, and policy implications on global rangelands. His teaching program emphasizes preparation of the next generation of leaders to navigate the challenging environmental issues of our time. His scholarship seeks to create translational science to inform natural resource managers and policy makers.

Dannele E. Peck is Director of the USDA Northern Plains Climate Hub. Her area of expertise is decision-making under risk and uncertainty, applied to a variety of agricultural issues, such as: drought preparedness and response in cropping systems; increasing farm/ranch resilience to weather variability and changing climate; and disease prevention and management in livestock and wildlife.