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Are Landowners, Managers, and Range Management Academics on the Same Page About Conservation?

By Lina Aoyama and Lynn Huntsinger

On the Ground

- Conservation of California rangelands hinges on partnerships among ranchers, agency and nongovernmental organization managers, and academics.
- A sustainable use perspective on conservation was predominate among ranchers, whereas a more preservation-oriented perspective was common among managers; the perspective of academics was in between the two.
- Conservation priorities among ranchers and managers largely overlapped, except that ranchers prioritized livestock production and ranch succession, and managers prioritized habitat protection.
- Land use change was a shared concern among the three groups.
- Opportunities for rangeland conservation included improving communication among diverse stakeholders and applying recent scientific developments to on-the-ground range management.

Keywords: range, conservation priorities, development, land ethic.

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A patchwork of private and public lands, California rangelands are managed and studied by a diverse group of people. The Central Coast Rangeland Coalition brings together ranchers, land managers, and academics who are interested in conserving rangelands in the Central Coast region. Each year since 2008, the Coalition has provided funding to encourage graduate students to research or review topics identified in the Coalition's Needs Assessment, and to present the results at their biannual forum. This serves the purpose of supporting range education and encouraging students to learn about the range community, and also provides the membership with information they need to support their activities and programs. In 2018 the topic was on barriers to conservation that agencies and nongovernmental organizations (NGO) could help address.

Ranchers, managers, and academics come to the rangeland conservation "table" with a wide variety of perspectives, values, and priorities. Although ranchers (who of course are also managers) and agency/NGO land managers share the broad goal of conservation, differences in definition and values can become barriers to building trust, communicating effectively, and reaching agreement on conservation strategies. It is critically important for all rangeland management stakeholders to understand "where one another is coming from." Although there are studies that describe ranchers' perceptions of conservation,[1,2] there are none that compare the views of ranchers, managers, and academics. The purpose of this study was to fill this gap. We asked the following five interrelated questions:

1. How do different stakeholders define the term conservation?
2. What are their conservation priorities?
3. What conservation practices do stakeholders employ, and what do they perceive as barriers to using them?
4. What do stakeholders perceive as threats to rangeland conservation?
5. What are perceived opportunities to improve conservation?

To answer these questions, we conducted interviews and online surveys of ranchers, managers, and academics, as detailed below.

Study Area and Data Collection

Interviewees were selected from 13 counties in the Central Coast region of California, an area characterized by annual grass and hardwood rangelands (Fig. 1). Most of the

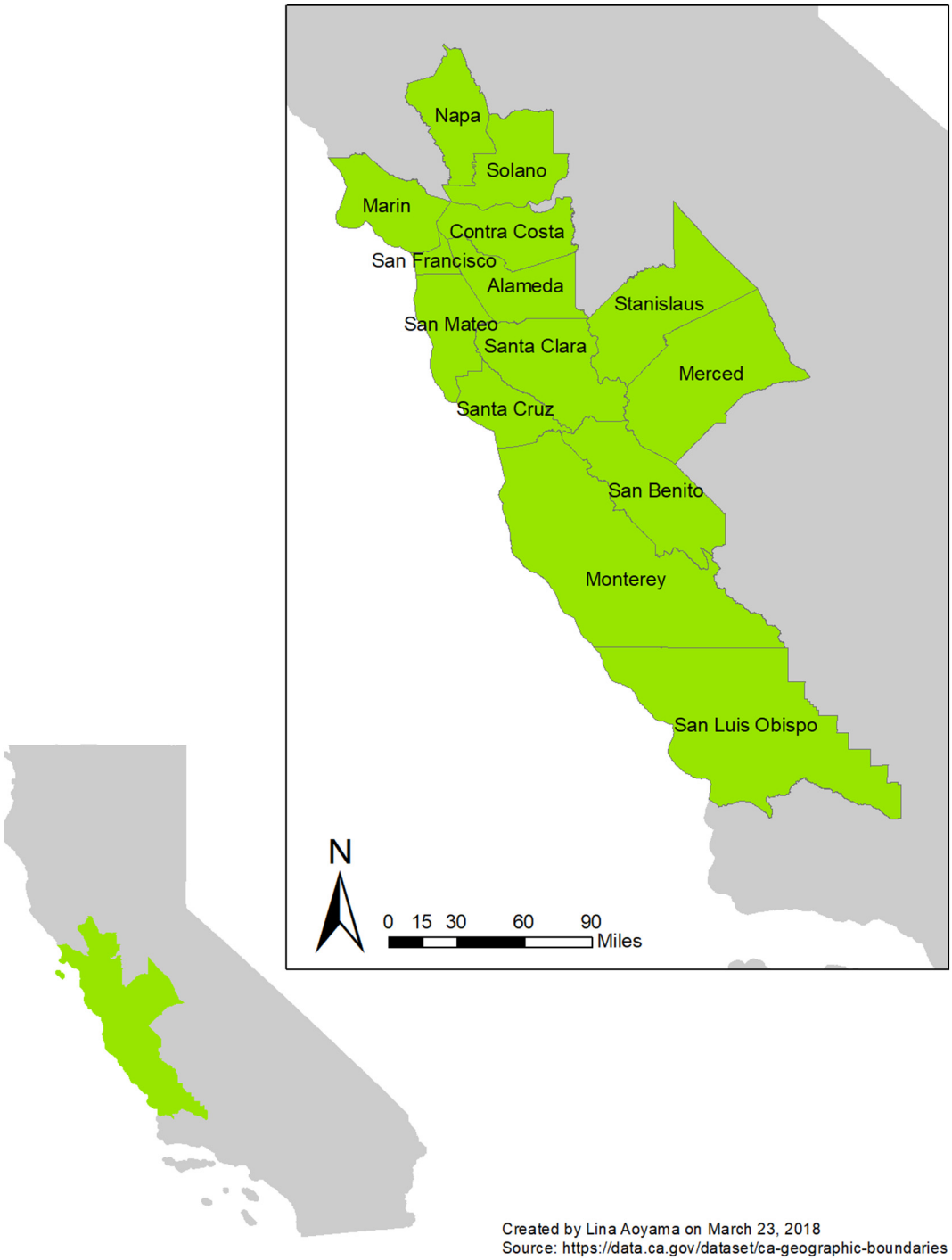

Figure 1. Counties of the study area in the Central Coast region, California, USA. Interviews were conducted with individuals who manage rangelands in the counties shaded in green.

rangelands in the Central Coast region are privately owned. The rest are owned by the federal government (United States Forest Service, Bureau of Land Management, National Park Service, and the Department of Defense), watershed and utility districts, open space districts, state and local governments, and land trusts. The climate is Mediterranean, with hot, dry summers and cool, wet winters that support growth fall through spring. Average annual rainfall is around 500 mm with a high coefficient of variation, generally exceeding 35% along the central coast. This means stochastic abiotic factors, particularly rainfall, have a major influence on plant species composition and biomass each year.[3] Communities of the California Central Coast region include Mediterranean annual grassland and forb meadows, Mediterranean scrub, and oak woodlands. Grasslands are generally dominated by non-native annual grasses and forbs, although native perennial bunchgrasses are more prevalent near the coast than in drier parts of California.[4]

Intense economic and social pressure on private ranchers to sell their land has resulted in the loss of tens of thousands of rangeland acres per year over the past decade in California.[5] Land conversion is of particular concern in the Central Coast region of California, where population is increasing. Despite tapping into niche markets such as grass-fed beef, ranching businesses in California typically suffer from low profitability, high management costs, and high opportunity costs associated with competing uses that contribute to conversion of these lands to other uses.

In-depth, structured interviews based on the five aforementioned questions were conducted with ranchers and managers in the Central Coast region of California (IRB Protocol #2017-11-10460). This is a qualitative study using purposive sampling, so inferential statistics are not applicable. In-depth qualitative research has been argued to be a much-needed complement to the existing survey research on rangeland management and use.[6]

We started with a list of 14 livestock operators (referred to here as "ranchers") and 11 range managers (referred to here as "managers"), but those who agreed to participate in this study were 10 and 5, respectively. The 10 ranchers interviewed for the study had varying lengths of ranching experience (from 10 years to 63 years). Of the 10, two operated only on their own private lands and eight on both private and public land; the ratio of ranchers on private land to public land is smaller compared with the whole population. The five interviewed managers were employed by parks, land trusts, and municipal water districts. Interviews were conducted from February through March of 2018 by phone and lasted approximately 1 hour each. Because of the short time frame of the study, the sample size was small.

A five-question online survey was conducted to complement the rancher and manager interviews (Appendix A). The online version of the survey also was completed by 10 rangeland science researchers and educators (referred to here as "academics") at the University of California, the University of California Cooperative Extension, and the California State Universities.

Perceptions of Conservation

When asked to define the term "conservation," rancher, manager, and academic groups in this study had similar but distinctly different answers. We selected verbs, adjectives, and objects that were mentioned by two or more respondents per group. Ranchers commonly used verbs like "take care," "manage," and "steward," whereas managers commonly used verbs like, "preserve," "protect," and "keep." Five out of 10 academics used the verbs "maintain" and "use." The word "natural" was the most commonly used adjective by all three groups. Ranchers listed land, wildlife, and natural resources as objects to be conserved; managers listed habitat, land, and population; and academics listed land, species, environment, ecosystems, and functions.

The perception of conservation among interviewed ranchers, compared with that among interviewed managers, can be better understood by referring to the dichotomy between Aldo Leopold's ideas about conservation and sustainable use and John Muir's ideas about preserving nature without evident human use, although the differences are much less extreme. Most rancher definitions of "conservation" and the role of the landowner resonated with Aldo Leopold's land ethic, in which humans have a moral responsibility to care for the natural world. Leopold stated that "It is inconceivable to me that an ethical relation to the land can exist without love, respect, and admiration for land, and a high regard for its value."[7] As one interviewed rancher said, "[conservation is] to respect and to take care of the land, enhancing various plant life and natural systems on the land you are working on." Leopold recognized that economics is a factor in landowner decisions, saying that understanding economic land use as well as the land was critical to conservation.[7] Another interviewed rancher defined "[conservation as] a wise and thoughtful use of natural resources." Leopold wrote that, "Land health is the capacity for self-renewal in the soils, waters, plants, and animals that collectively comprise the land." Overall, his focus was on an individual's ethical relationship to the land, not the duty of governments to dictate the limits and parameters of use. Reflective of rancher interest in cost share and easement programs, Leopold believed that "conservation will ultimately boil down to rewarding the private landowner who conserves the public interest."[8]

On the other hand, interviewed manager definitions of "conservation" seemed a bit closer to John Muir's philosophy of "consecrating a small part of nature."[9] Although the managers had accepted grazing and some active management as necessary to meet conservation goals, they work for organizations (mostly governmental) that control land, and like Muir they embrace this nonlandowner control in conservation. According to the interviewed managers, conservation is "[to] preserve a natural state" and "[to] protect native species and habitats in decline." The word choices of "preserve" and "protect" implied that humans do not generally play a positive part in natural processes or the production of ecosystem services.[10] In other words, the main difference between the two groups in this study was that ranchers viewed humans as taking an active role in managing and even enhancing the land or natural resources, whereas managers more often were concerned that nature (usually biologically meaningful taxa or communities) needed to be set aside or protected from too much human use. For example, one interviewed manager said her role was to "make sure livestock do not infringe on wildlife."

Academics working in the field of rangeland management tended to be somewhere in between. One academic defined conservation as "maintaining all species and the processes that support them." This reflects John Muir's statement that, "When we try to pick out anything by itself, we find it hitched to everything else in the Universe," and Leopold's statement that, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise."[7]

Recognizing the nuances in perceptions of conservation may improve communication among various groups. Basically, for the ranchers in this study, the "who" is critical: for them,

the landowner was the person who should take responsibility for the land. For the managers, it is the government agency that is ultimately responsible for resource protection. Interviewed academics work with both groups, and the mechanisms and outcomes of conservation were more of their focus than "who" takes responsibility.

Conservation Priorities

Ranchers and managers were asked to list their top three conservation priorities for the land they manage or use. Some of the conservation priorities of ranchers were congruent with those of managers (Table 1). Both groups prioritized water infrastructure implementation and vegetation management.

Ranchers in this study operating on both private and public lease lands prioritized, first and foremost, the economic viability of their operations. They also listed stewardship of feed, water, and soil as high priorities, because they are essential to their operations. They said their conservation priorities on public lands are not that different, with the addition of a few that are important to the agencies, such as meeting specific residual dry matter (RDM) requirements or protecting habitat for special-status species. Some conservation priorities mentioned by ranchers but not by managers were management of soil, maintenance of livestock body condition, and succession of their operations.

Most interviewed mangers focused on a specific type of habitat (e.g., steelhead habitat, riparian area, wetland, or grassland) as their conservation priority. Only one manager included the economic sustainability of ranching as a priority. In this study, a conservation priority mentioned by managers but not by ranchers was management of wetland and riparian areas.

Obviously, there are some priorities that conflict. For example, when controlling for invasive plant species with prescribed grazing, or maintaining wildlife habitat, research has shown that managers often want to graze livestock in an area long enough or at a high enough stocking rate to reduce undesirable plants or litter, but that ranchers found it difficult to attain the desired livestock body condition under such a grazing regime.[11,12] Depending on the season, weather, and available resources, some practices are not feasible. Therefore, frequent communication between ranchers and managers about their priorities is important.

Conservation Practices and Barriers

Ranchers and managers were asked what conservation practices had they implemented on their ranches in the last 10

Table 1. Conservation priorities on the land they manage, as mentioned by ranchers and manager respondents

Ranchers	Managers
Plants • Protect special status species • Manage amount and quality of feed • Reduce fuel loads • Protect native plants • Meet residual dry matter levels • Reduce yellow star thistle (*Centaurea solstitialis*) • Enhance or promote biodiversity	Plants • Maintain special status species populations • Preserve native plants • Control invasive plant species
Water • Manage amount and quality of water	Water • Manage amount and quality of water
Wildlife • Protect special status species • Create wildlife habitat	Wildlife • Maintain populations of listed species • Protect wildlife corridor • Protect steelhead and their habitat
Manage healthy range	Improve range
Manage soil	No priority mentioned about soil
Ensure ranch succession	No priority mentioned about ranch succession
Provide for the family	Economic sustainability of ranching
Maintain body condition of livestock	No priority mentioned about animal performance
No priority mentioned about specific habitats	Habitats • Improve riparian areas • Manage wetlands • Maintain annual and mixed grassland habitat

Note: Priorities are not listed in a particular order.

years. Ranchers listed 10 practices, of which seven 7 are Natural Resources Conservation Service (NRCS) approved; managers listed 13 practices, of which 4 are NRCS approved (Table 2). For the most part, interviewed ranchers and managers implemented conservation practices that aligned with their conservation priorities and available resources. Common conservation practices implemented by both groups were improvement of water infrastructure, invasive plant species control, and various forms of rotational grazing. These were practices that ranchers and managers worked on together at the pasture scale. Only one rancher listed RDM monitoring in the fall as a practice. Not surprisingly, only a few ranchers and managers in this study prioritized landscape-scale practices, such as watershed health or habitat connectivity for large mammals, yet as rangelands become more fragmented and land uses become intermixed, it is increasingly necessary to coordinate management for wildlife, water, and fire hazard reduction across property boundaries.[13]

Two of the most common barriers to implementing conservation practices mentioned by ranchers and managers were limited time and financial resources, but they also reported other barriers that kept them from implementing more conservation practices (Fig. 2). Five out of 10 ranchers mentioned the lengthy permitting process with the local NRCS office as a major obstacle to implementing conservation practices (e.g., water development projects and stock pond rehabilitation). Ranchers and managers highlighted the following issues associated with the permitting process: cumbersome paperwork, long turnaround time, scheduling with biologists, and frequent agency staff turnover. One rancher expressed his frustration, saying that "the work is the easy part; the hard part is getting the green light for doing it."

In addition, ranchers operating on public lands noted that they faced the challenge of maintaining aging infrastructure and public access issues when implementing rotational grazing. Public recreation visitors sometimes left ranch gates open, hindering control of cattle access to certain pastures.

Table 2. Practices implemented for conservation in the last 10 years according to respondents

Practices	Implemented by ranchers	Implemented by NGO and agency mangers
Rotational grazing	Most respondents	Most respondents
Intensive grazing for special status species	Few respondents	Few respondents
Invasive plant species management (e.g., prescribed grazing, mowing, spray of herbicides, prescribed burning, had removal)	Most respondents	Most respondents
Extensive period of deferment	Few respondents	None
Water development (e.g., trough, storage tank, pipeline, spring)	Most respondents	Most respondents
Water quality and stream survey	None	Few respondents
Acorn planting	Few respondents	None
No grazing in oak woodland in summer months	None	Few respondents
Riparian planting of trees and shrubs for wildlife	Few respondents	Few respondents
Stock pond clean-up and restoration	Few respondents	Few respondents
Wetland restoration	None	Few respondents
Wildlife-friendly fences	Few respondents	None
Fencing riparian areas	None	Few respondents
Range planting (e.g., seeding rose clover and subclover)	Few respondents	None
Mapping vegetation	None	Few respondents
Road rehabilitation and commissioning	None	Few respondents
Specific calving season and strict animal health standards	None	Few respondents
Place supplements on higher elevation Sites	None	Few respondents

NGO indicates nongovernmental organizations.
* NRCS-approved conservation practices.

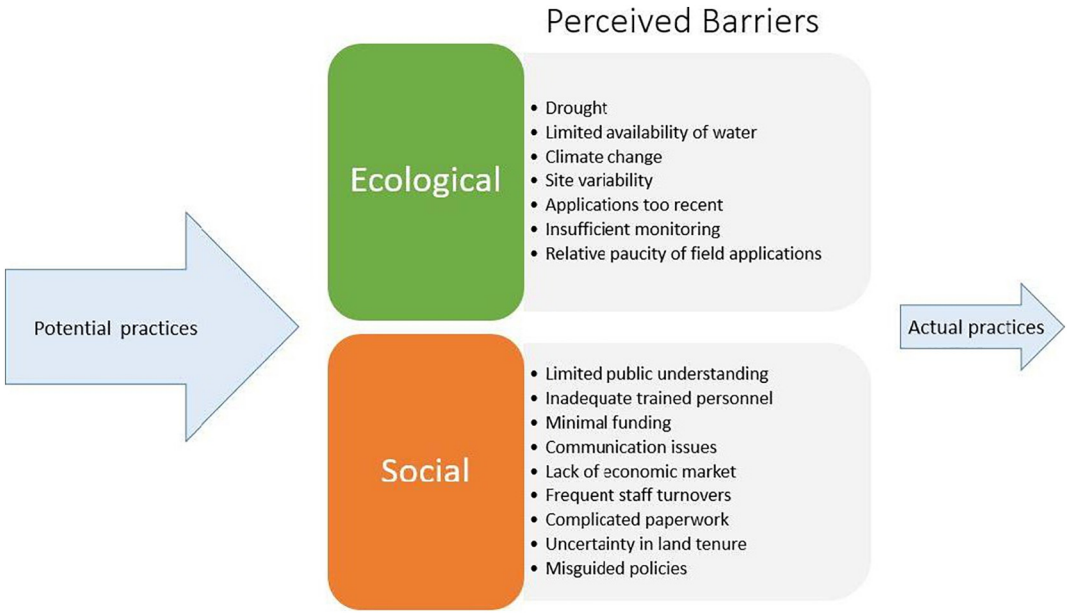

Figure 2. Ecological and social barriers that ranchers and managers said limited implementation of conservation practices.

Some obstacles to implementation were not controllable, such as rainfall and availability of water. For example, one rancher described a situation when prescribed grazing was ineffective because late spring rain resulted in a vigorous growth of yellow starthistle. Another rancher described a situation when there was not enough water supply for cattle to do targeted grazing or to reduce fuel load. A study of ranchers and managers throughout California and their approaches to invasive plant control revealed that one factor limiting willingness to invest in control practices was the high risk of failure owing to unpredictable rainfall and weather conditions.[12]

Threats to Conservation on Central Coast California Rangelands

Interviews revealed that fragmentation of rangelands from land use change was the most common shared concern among ranchers, managers, and academics in the Central Coast region. Over 100,000 acres of California grazing lands were lost to conversion between 1999 and 2004, and it is estimated that 750,000 additional acres will be lost by 2040.[14] Researchers have reported that with the high opportunity costs of ranching, some ranchers are either selling their land to developers or converting their property to vineyards or orchards.[15] If many more livestock production businesses were to close down in the Central Coast California region, the "critical mass" of ranches that can support ranching and marketing infrastructure would be jeopardized.[16]

Other threats to conservation perceived by managers and academics in this study were climate change and drought. Interestingly, although California had just coped with the state's most severe drought in the last 500 years, no ranchers in our study mentioned multiyear droughts as a threat to conservation. One proposed climate scenario predicts 4 degrees Celsius of warming and increased rainfall in California. This would likely cause many scattered shrub-grass communities in the Central Coast Californian rangelands to shift to predominantly shrubland.[17] This does of course have implications for future forage supply, and for increased wildfire risk. Furthermore, the suggested future scenarios for climate change and land use change interact with each other to reduce water supply and priority habitat for wildlife.[18] Coordinated efforts across jurisdictions to share grassbanks and other resources in time of severe drought, reconsidering regulations to allow prescribed fire and grazing where it has been reduced or removed on wildlands to control shrub invasion, and prioritizing conservation efforts on areas with water deficits are some opportunities to alleviate future climate change impacts.

Other threats to conservation perceived by the ranchers were social. One area of concern was managers' lack of range management experience or knowledge. Ranchers were concerned that "people in resource management positions either do not know or do not care about the cost of implementation [of conservation practices]." This finding is consistent with research from other regions that highlights the importance of stakeholder trust in organizations or agencies that manage rangelands.[1,19,20] According to an interviewed rancher, one of the main components of this lack of trust was the belief that nonranchers do not appreciate ranchers' need to maintain a positive financial bottom line. A second area of concern brought up by some interviewed ranchers was that corporation or investment groups leasing their conservation easement property to ranchers for grazing could be a threat to conservation if they did not see value in implementing practices to enhance biodiversity or the habitat quality of their land. A third area of concern echoed by ranchers, managers, and academics,

was public misconceptions of ranching. On public grazing lands, recreationists may startle livestock because they are fearful of the animals, perhaps owing to past experiences, but more often owing to lack of familiarity.[21] On rare occasions, it has been reported that ranchers received threats from those who oppose livestock grazing on public lands.[22] As studies have shown, there are plenty of opportunities to inform the public about the purposes for grazing on public lands.[23]

Opportunities for Rangeland Conservation

Ranchers and managers were asked what other conservation practices they would like to implement if they had more resources. Four out of 10 ranchers said they would implement more fencing and water projects. One rancher said he would rehabilitate creeks. Two out of six managers said they would investigate impacts of grazing on certain plant species, and two others said they would better distribute the livestock by taking salt and protein supplements to higher ground.

Surveyed academics identified the following opportunities for rangeland conservation:

- Encourage public interest in rangeland ecosystems and the services they provide.
- Tax the public for the services provided by rangelands.
- Create incentives or markets supporting payment for ecosystem services.
- Extend the Ecological Site Descriptions and state and transition platform statewide.
- Engage in outreach to decision makers for better policies.
- Promote estate-planning support and conservation easements.
- Create more opportunities for ranchers, NGO and agency managers, and academics to share information.

In general, keeping "working landscapes" working is a good rule-of-thumb for rangeland conservation because economically sustainable ranches, and landowners who are benefiting from their properties, have more resources and incentives to invest time and money in management.[10] One way to reduce further conversion is to focus on lands at risk. The Williamson Act restricts development on 37% of California rangelands, and 24% more, including 4% in easements, is permanently preserved from development by private conservation organizations or public agencies.[15] The Williamson Act does not prevent conversion to intensive agriculture, and the remaining 39% of rangelands have no development or conversion restrictions.[15] Engaging with landowners on lands vulnerable to subdivision and development to discuss the possibility of conservation easements is an underutilized strategy for rangeland conservation. All interviewed ranchers who own a private property said they would consider participating in conservation easement. Some ranchers said it depended on the contract; if the contract was too inflexible or limiting they would not want to participate.

Another way to promote conservation and learn about the needs of ranchers in particular is to work with the organizations that provide information to them. In this study, ranchers stated that they obtained information about regional conservation issues from the California Cattlemen's Association, California Rangeland Conservation Coalition, Central Coast Rangeland Coalition, University of California Cooperative Extension, local NRCS and Resource Conservation District offices, and other ranchers. Managers obtained information from the California Invasive Plant Council, California Native Grassland Association, and local conservation leagues in addition to the outlets mentioned previously. Opening two-way channels of communication with these groups offers an opportunity to disseminate information and share knowledge and experience. In particular, The Central Coast Rangeland Coalition and the California Rangeland Conservation Coalition play an important role of sharing conservation-relevant information among ranchers, agencies and land trusts, and researchers.

Implications

According to the surveyed academics, a number of research advances related to range science are not sufficiently translating to on-the-ground management. These are in the following areas of research and practice:

- Ecosystem services provided by native plants and animals
- Soil carbon
- Prevention of introduction and spread of invasive plant species
- Ecological Site Descriptions and state and transition models
- Adaptive management
- Social-ecological systems theory
- Management in a nonequilibrium system

Details about these concepts are outside the scope of this paper, but their application may shed light on some of the issues raised by interviewed ranchers and managers. For example, social-ecological systems theory is a conceptual framework for analyzing how the social and ecological components of a system influence one another,[24] making it possible to identify potential conservation interventions in either or both realms. Identifying feedbacks between social and ecological drivers on ecosystem services at multiple scales is helpful in achieving rangeland sustainability.[10] For example, bureaucratic red tape and uncertain land tenure on public land could ultimately create a feedback loop that leads ranchers to sell their private land. Draconian environmental, processing, and marketing regulations could feed back to the ranch operation by reducing profitability and leading to the eventual failure and sale of the ranch. On the other hand, if ranchers manage in ways that demonstrate the conservation values of ranching, it could feed back to more public and private investment in conservation easements and incentive programs, and better rancher access to public rangelands.

Another example of the utility of newer scientific findings is in the area of nonequilibrium vegetation dynamics. The equilibrium model stresses the role of biotic factors such as

competition among plants as a driver of ecosystem change, whereas nonequilibrium models highlight the role of stochastic abiotic factors such as variable rainfall as major drivers of system.[3] Using this framework, Bartolome et al[25] show that the influence of the abiotic environment, including the soil type, elevation, precipitation, and temperature, is particularly important in the California Mediterranean environment. Understanding where the site they are managing resides in the equilibrium versus nonequilibrium continuum would help range managers develop management strategies to cope with drought and site variability that are the best fit to the system, and avoid pursuing methods based on manipulation of processes that have weak or nonexistent influence on the system.

Other research advances mentioned by academics that are more directly linked to management are NRCS Ecological Site Descriptions and state and transition models and soil carbon dynamics on rangelands. Ecological Site Descriptions and state and transition models are underutilized tools to manage heterogeneous landscapes with limited financial resources.[26] They are designed to identify landscape divisions with the highest chances of responding favorably to specific management activities.[26] They could be used to prioritize where and when to implement conservation practices and restoration projects.

As for soil carbon, notable work in California has shown that, although variable by site, California grasslands are sequestering carbon in the soil now without assistance.[27] In 2016, the California Department Food and Agriculture established the Healthy Soils Program, a payment for ecosystem services program that promotes healthy soils—defined as increased soil organic matter—on Californian farms and rangelands.[28] However, some academics stated they were dubious about the magnitude of the opportunities in this area, calling for additional research-based information. If an application is too recent and understood too simplistically, it could be a barrier to on the ground application. These "knowledge blocks," in other words, scientific knowledge that is not translated into practical management solutions, need to be addressed by universities and University of California Cooperative Extension to lower barriers to conservation on Californian rangelands. These should also be topics adopted for future Central Coast Rangeland Coalition workshops. This fits well with a growing interest in "usable science" for rangelands.[29] Combining usable science with the local knowledge and experience of ranchers and managers could be a powerful force for rangeland conservation in California.

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Appendix A

Survey questions:

1. In your own words, please define the term, "conservation."
2. In your opinion, what are the top 3 conservation priorities in CA rangelands at the state level?
3. What do you see as research progress related to range science that is not translating to range management progress?
4. What do you see as threats and barriers to conservation in CA rangelands?
5. Can you identify any opportunities to alleviate these barriers?

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