

# **Manager Perceptions of Goals and Outcomes of Public Rangeland Management in San Diego County**

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## **Abstract**

Recognition of the conservation benefits of rangelands and other working landscapes has occurred alongside a trend of conversion to other uses. In many parts of California, such as San Diego County, one response has been the purchase of rangelands from private landowners by or for public agencies. However, the implications of these transfers for rangeland management, including the use of grazing, and for the types of ecosystem services prioritized and produced on rangelands, are not well known. Interviews with rangeland managers revealed four categories of management practices on public rangelands: (1) grazing plays a key role in management, (2) grazing is a new tool, (3) grazing is permitted but declining, (4) grazing is prohibited. Findings also highlight a shift in prioritization, from forage to other provisioning services and from cultural heritage to other cultural ecosystem services. This research outlines priorities among public rangeland managers that can guide future ecological research.

*Keywords:* *conservation; ecosystem services; land tenure; public land; rangeland*

## **Introduction**

GLOBALLY, RANGELANDS ARE the dominant land cover, while they cover one-third of the land area in the United States and 50 percent of California (Silver, Ryals, and Eviner 2010; Reid, Fernandez-Gimenez, and Galvin 2014). They provide a wide range of ecosystem services (ES), including forage, carbon storage, water supply, and habitat for biodiversity, as well as recreation, aesthetic value, and other cultural ecosystem services (Booker et al. 2013; Cameron, Marty, and Holland 2014). However, rangelands are undergoing rapid change, prompted by cultural, technical, social, political, economic, and climate change. In particular, land-use change associated with the demand for rangeland ecosystem services has been cited as one of the predominant sources of change (Reid, Fernandez-Gimenez, and Galvin 2014).

One of the key factors influencing land use in rangelands is land tenure, which may be public, private, or mixed tenure. Globally, the most common tenure in rangelands is government ownership (Reid, Fernandez-Gimenez, and Galvin 2014). In the U.S., rangelands are approximately evenly split between public and private ownership, while in California more than 30 percent of rangelands are publicly owned (Wolf, Baldwin, and Barry 2017; Sayre et al. 2013; Sulak and Huntsinger 2007). However, land tenure is also undergoing rapid change in rangelands from Australia to Africa to the western U.S. (Reid, Fernandez-Gimenez, and Galvin 2014; Farley, Walsh, and Levine 2017). Reid et al. (2014) have noted that changes in rangeland tenure tend to follow four general patterns globally: expanded state ownership; partial privatization; privatization of common-use land; and maintenance and consolidation of private lands. Two of these patterns of changing rangeland tenure are dominant in North America: expansion of public rangelands and consolidation of private ownership (Reid, Fernandez-Gimenez, and Galvin 2014).

The type of tenure influences how rangelands are used and managed, and shifts in ownership are often accompanied by changes in the prioritization of ecosystem services, along with the management practices intended to provide priority ecosystem services. Since management that seeks to improve production of one ecosystem service can lead to reductions in other ES, these management changes often result in tradeoffs, which can be particularly complex when managing multiple uses for multiple ecosystem services (Wolf, Baldwin, and Barry 2017; Bennett, Peterson, and Gordon 2009). On private rangelands, provisioning ecosystem services, which include food, water, timber, and fiber (MEA 2005), often are prioritized, with an emphasis on forage production. At the same time, a range of other ecosystem services are also highly valued, including many cultural ecosystem services, such as recreational, spiritual, and aesthetic benefits (MEA 2005). However, as noted by Yahdjian et al. (2015, 47), “The relative importance of provisioning versus regulating and supporting services [from rangelands] has shifted in recent decades, as demand for recreation services increased.” These shifting priorities may be heightened where land tenure also changes. For example, in a shift from private to public rangelands, the priorities for management may shift from provisioning ecosystem services, such as forage production, to regulating or supporting services, such as water quantity or quality, or cultural ecosystem services, such as recreation (Yahdjian, Sala, and Havstad 2015; Cameron, Marty, and Holland 2014). However, while acquisition of private land is a common conservation strategy in California and elsewhere, the outcomes of this tenure change for ecosystem services often have not been evaluated (Bustic et al. 2017).

The role of grazing in enhancing or diminishing ecosystem service provision is a subject of continuing debate (Wolf, Baldwin, and Barry 2017; Sayre 2005). In California, grazing has been valued by some as a means of maintaining open space and has been found to be compatible with a number of ecological values (Wolf, Baldwin, and Barry 2017; Huntsinger and Sayre 2007). In some cases, government agencies and land trusts incorporate grazing into management for the purposes of fuel reduction, improving habitat, or promoting biodiversity (Wolf, Baldwin, and Barry 2017; Sulak and Huntsinger 2007). However, in the United States and Australia, where public rangelands are often leased for grazing, policies aimed at increasing protection of public rangelands often lead to a reduction in public land available for grazing (Reid, Fernandez-Gimenez, and Galvin 2014). This type of reduction in grazing also involves trade-offs, with values such as recreation and water quality prioritized over livestock production and any ecological benefits associated with grazing (Cameron, Marty, and Holland 2014). However, the question of which ecosystem services benefit from grazing and the degree to which grazing and the production of ES are compatible is an area where research remains limited, particularly for Southern California.

In San Diego County, rangelands are the dominant land cover, and the region is characterized by high biodiversity and a large number of endemic species (Figure 1). As in other parts of California, privately owned rangelands have been susceptible to conversion to other land covers (Alagona 2008; Wetzel et al. 2012). As such, private land purchases for conservation are common, and efforts to conserve land that has not yet been urbanized in San Diego County have led to private land acquisition by federal, state, and local governments as well as land trusts (Syphard et al. 2016; Bustic et al. 2017). Approximately 40 percent of the county consists of publicly owned rangelands, the area of which increased by 9 percent between 1990 and 2009 (Farley, Walsh, and Levine 2017). The area of publicly owned rangelands increased over this time period for all categories of public land, including federal, state, and county/city owned land, but state-owned rangeland increased the most—by 18,228 ha—while county/city-owned rangeland increased by 11,108 ha, constituting a 34 percent increase (Farley, Walsh, and Levine 2017). One factor influencing these changes was the implementation of the Multiple Species Conservation Program (MSCP), which was designed for landscape-level biodiversity conservation through public land acquisition that would allow for the establishment of interconnected habitat reserves. According to Greer (2004, 237), “Acquisition of habitat has occurred rapidly as a result of shared responsibilities and cooperation between local, state, and federal governments.” These shifts in rangeland tenure likely result in

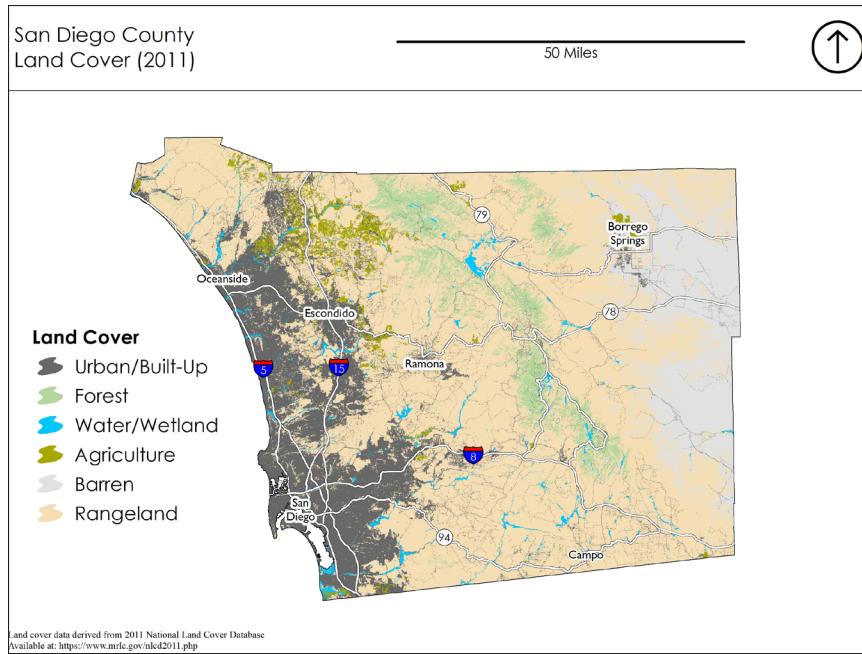


Figure 1.—Land cover in San Diego County.

changes in prioritization of ES and associated management practices, as public rangelands are often managed for different outcomes than private rangelands. However, while this shift in ownership has recently been documented in San Diego County, the implications for rangelands management remain unclear.

Given the changes in rangeland tenure in San Diego County since 1992 and the large percentage of rangelands under public ownership in the county, I sought to evaluate:

*What are the primary management goals on public rangelands?*

*What is the role of grazing in relation to management objectives and what are the perceived outcomes of grazing on public rangelands?*

## Methods

I conducted semi-structured interviews with managers of public rangelands and structured interviews with ranchers in San Diego County. The interviews with managers of public rangelands included a variety of public land types, such as water districts, county land, state land, and military and other federal land. Interviews focused on the following themes: the primary uses of the land before and subsequent to public ownership; primary and

secondary objectives of management; management tools used (including grazing, mowing, or burning); effectiveness of management tools; and perceptions regarding differences between public and private rangeland management and outcomes of grazing. A total of eight interviews were conducted in-person, by phone, or by email, depending on the preference of each interviewee. I also conducted structured interviews with thirteen ranchers in San Diego County focused on participation in conservation programs and use of conservation practices, using a survey modified from Cheatum et al. (2011); many interviewees discussed use and management of public rangelands, and this information is included in this analysis (Farley, Walsh, and Levine 2017). These interviews included owners of private rangeland, some of whom had grazing leases on public and/or private land, as well as those who relied entirely on leased land. Interviews were in person, except for two that were by phone and one that was done by e-mail with a follow-up in person. Human subjects approval was obtained for this research from the Institutional Review Board at San Diego State University.

## Results

### Management Goals

Interviews revealed a range of goals and priority ecosystem services on public rangelands in San Diego County. These goals include providing habitat, in particular for special status species, recreation, protection of cultural resources, fire management, watershed management, and supporting local communities (Table 1). In many cases, public rangelands are being managed for multiple goals, but for many managers there was one priority goal. And, within each type of public ownership (City/County, State, Federal), there were different categories of public rangeland that were managed for different objectives (Table 1).

Table 1.—Management goals on public rangelands in San Diego County, including public rangeland with and without grazing.

Type of Public Ownership	Goals
City or County-level	Resource conservation, including habitat for special status species Recreation Watershed protection
State-level	Habitat for rare and sensitive species Foraging habitat for raptors Fire hazard reduction Sustain or restore ecosystem or habitat Recreation Protect cultural resources Mitigation
Federal-level	Fire management Habitat for threatened and endangered species Water management, improve watershed condition Rangeland health Forage production Support local/rural communities

### The Role and Perceived Outcomes of Grazing

In terms of the role of grazing, the interviews with managers of public rangelands indicated that a wide range of practices are utilized on public rangelands. These can be grouped into four broad categories with respect to the role of grazing:

1. *Grazing plays a key role in management:* Grazing is used to meet a variety of objectives and is seen as either supporting or not in conflict with primary management goals.
2. *Grazing is a new tool:* Grazing is being newly introduced as a tool to manage the land.
3. *Grazing is permitted but declining:* Grazing is allowed in permitted areas but those areas are declining.
4. *Grazing is prohibited:* Grazing was removed when the land became public and is seen as being in conflict with primary management goals.

#### *Grazing plays a key role in management or grazing is a new tool*

In cases where grazing is integral to management, managers described it as producing a variety of outcomes related to habitat management, including

enhancing populations of rare plants and wildlife, increasing native species abundance, reducing weed populations, enhancing vernal pool communities, improving habitat for special status species, enhancing cover along riparian corridors for wildlife movement, and improving foraging habitat for raptors. In other cases, managers cited more general benefits of grazing for habitat management. One stated that “Managed grazing is seen as beneficial for native species and rare plants and wildlife, generally, as well as for specific special status species...and for invasive species and weed management.” Multiple managers cited the value of grazing for Stephens’ kangaroo rat, with one manager stating that they “thrive with grazing operations.” In one case where grazing was removed from an area for five years, the manager observed “a dramatic decline in Stephen’s kangaroo rat,” which had already been declining, but the removal of grazing was seen as worsening the trend.

In other cases where grazing plays a key role in management, fire management or water management are the primary objectives. In the one case where fire management was the primary objective, a five-year period during which there was no grazing provided an opportunity to observe the effects of removal of grazing. Without grazing, “areas where the exotic annuals were chest-high” were observed and “drove home...that the cows really do make a difference.” After grazing was reinstated and a large fire burned through the area, there was “a stark fence-line contrast where there had been cattle and the grasslands barely burned at all.” Further, the grazed areas were observed to respond very similarly to areas that had been mowed.

In all of the cases where grazing was considered integral to management, the lands have been grazed for decades and grazing is seen as an economically viable and effective management tool. It is also seen as a better alternative to options such as herbicide to control invasive species or mowing for fire management, which has a much higher cost. In some cases, the grazing lessee also maintains fence lines, providing an additional financial benefit as well as a presence on the land, which was seen by managers as valuable for monitoring large areas. Although the income from the lease was cited as important in some cases, one of the managers stated, “If we had it my way, we would not make money off of it. I’d rather pay people to do it and have the number [of cattle] I want, on and off when I want, instead of them paying us for the use of the land.”

Where grazing is a new tool, it was seen as one of several possible options for restoring habitat. In this case, the top management priority was rare and sensitive species, and a suite of raptor species were the main reason for

implementing grazing on the property. The manager noted that post-agricultural land in the area can provide important foraging habitat for raptors, but when the grasses are tall and thick, foraging is impeded. At the same time, grazing is used to control invasive species in order to help restore native grasses. In particular, the manager noted that cattle can remove invasive wild oat (*Avena fatua*), allowing native purple needle grass (*Stipa pulchra*) to grow. A secondary priority on this property is fire management, with fire being a “major focus” for the surrounding communities. Several of these perceptions were shared by the ranchers interviewed, who frequently noted that grazed areas can be much healthier than ungrazed areas and noted the benefits of grazing for eradication of some invasive species, such as mustard and several types of thistle, reduction of fire hazard, and compatibility with (if not necessarily benefits for) water production.

One manager implementing grazing as a new tool stated that “We already know that if we leave the land alone it’s not going to heal on its own,” and that “controlling vegetation conditions is key” in managing invasive species. While multiple tools are seen as necessary, weeding and mowing are considered either infeasible or too expensive, so that “fire, chemicals, and grazing are what’s left in the toolbox.” Before grazing was an option on this land, controlled burns were used and the manager noted that “Fire is fast and efficient, but grazing provides slow and methodical change in vegetation conditions on the landscape.” At the same time, for some species, the intensity of prescribed burns can be too high and cattle are seen as doing a better job of increasing the quality of the habitat. This manager also noted that grazing may be more effective and more viable in some locations than in others, and that effects on a suite of species will need to be evaluated as it is implemented in order to better understand the range of outcomes associated with grazing.

#### *Grazing is permitted but declining or grazing is prohibited*

Where grazing is declining, it has historically been seen as one of several appropriate land uses that are historic in those areas and are seen as providing benefits to local communities. Here, the perceived outcomes relate primarily to providing “goods and services” to local communities. Whereas managers in the first two categories viewed managed grazing as a way to produce specific ecological outcomes, managers in this category tended to focus on potential tradeoffs between grazing and ecological outcomes and ways to mitigate or avoid those tradeoffs. This has resulted in a decline in areas permitted for grazing in response to concerns about its potential negative ecological effects, in particular effects on the habitat of some species

of concern. In areas with threatened or endangered species, the removal of grazing can be seen as the least risky approach where there are limited data on the effects of grazing on those species. This has then been reinforced by a broader lack of institutional incentives to maintain grazing on these lands. In contrast to the first two groups, where grazing is seen as providing a financial benefit, in these cases it is seen as creating a financial loss. One manager noted that, in spite of this, the value of allowing grazing is in supporting ranching families who have “...been doing that for generations, to support that community and culture.”

Finally, where long-term prohibition on grazing has been maintained, grazing is viewed as an activity carried out for economic benefit and, as such, is prohibited along with other commercial uses of the land. On these lands, the goal has been to “recreate and sustain something as close in proximity as possible to natural” and “since cows weren’t a native species, the only time it makes sense is when the native ungulate has been removed and that animal had an important role to play.” In this sense, restoration or maintenance of ecological processes is seen as the priority for these public rangelands and grazing is seen as contradictory to that goal. Further, one manager noted that the fire management benefits of grazing were seen as minimal for the area being managed—and less effective than prescribed burning. At the same time, grazing for fire management was seen as potentially having negative ecological impacts, such as on oak regeneration.

## Discussion

### *Prioritization of Ecosystem Services*

This analysis illustrates that the demand for ecosystem services produced on public rangelands includes provisioning ecosystem services (water); regulating services (regulation of fire hazard; water regulation); and cultural ecosystem services (including recreation and cultural heritage values). In addition, there is emphasis on management of invasive species, which are a driver of changes in biodiversity and influence both regulating and provisioning ecosystem services (MEA 2005). In some cases, there is overlap with the demand for ES from private rangelands, such as in the regulation of fire hazard, which is also prioritized by ranchers (Farley, Walsh, and Levine 2017). In other cases, there is a shift in demand from provisioning to regulating or supporting services, reflecting broader trends in rangeland management (Yahdjian, Sala, and Havstad 2015). In general, regulating and cultural services (primarily recreation) were in higher demand from public rangelands than provisioning services. Where provisioning services

were considered a top priority, the focus was on water rather than forage, although forage provision was a secondary goal for some public rangeland managers. And, where cultural ecosystem services were prioritized, the focus was on recreation, with less emphasis on cultural heritage. In addition, public rangelands were associated with a higher demand for ES related to habitat and biodiversity conservation.

Rangeland tenure also affects which stakeholders are involved in management decisions, with public rangeland generally including a wider variety of stakeholders. This influences which ES are prioritized in management and the management tools used, as “Stakeholders vary in both their demand for and valuation of different ecosystem services” (Yahdjian, Sala, and Havstad 2015, 44). For example, the demand for recreation on public rangelands continues to grow, reflected in an increase in the number of users and number of days of use of public lands in California (Wolf, Baldwin, and Barry 2017). Although some private rangeland managers also reported opening their properties to recreationists, the number of people is very small relative to public rangeland and they are permitted access at the discretion of the owners, who maintain authority over management decisions. Regulation of fire hazard is also an ES that can involve a wide variety of stakeholders who advocate for particular management strategies. For example, grazing is used by many private rangeland owners to mitigate fire danger. On public rangeland, agency perspectives, public opinion, and the views of fire departments or others focused on management of fire risks all influence which management strategies are chosen and whether grazing is one of the tools used (Wolf, Baldwin, and Barry 2017).

### ***Perceived Effects of Grazing on Ecosystem Services***

Sayre (2005) noted more than a decade ago about rangelands in the southwestern U.S. that “There is a pronounced shortage of predictive scientific knowledge about the effects of fire and livestock grazing on threatened and endangered species.” This remains largely the case for many parts of the western U.S., as data on outcomes of different management practices on rangelands are very limited, especially for San Diego County. However, interviews revealed a variety of ways that grazing is being used on public lands to produce specific outcomes, and they highlighted a wide range of perceptions of the effects of grazing on ecosystem services. While the purpose of this research is not to measure outcomes of grazing on ES, it serves to outline some of the goals for which grazing is being used and it highlights research needs. Future research that combines the information presented here on the ecosystem services that are prioritized in management

with measurements or modeling of the outcomes of grazing management for those ecosystem services would be extremely beneficial. For example, Bustic et al. (2017) evaluated the effect of land protection resulting from the purchase of private land in Sonoma County and found that four ecosystem services, including carbon storage, sediment retention, nutrient retention, and water yield, were high on the protected public land. This type of quantification of ES would be a valuable area for future research in San Diego County, particularly if it included not only the effect of vegetation type but also vegetation management.

In addition to better understanding outcomes, information on tradeoffs among outcomes is needed. The degree to which there are tradeoffs among priority ES on California rangelands has been evaluated in only a few studies. For example, Syphard et al. (2016, 1) note that “fire risk reduction and biodiversity conservation are often viewed as competing objectives.” They suggest that these objectives can be compatible under some circumstances, but state that management that includes fuels reduction in nonforested ecosystems “often results in negative ecological impacts” and “will likely continue to be in conflict.” In contrast, Wolf et al. (2017, 193), suggest that “grazing could have substantial benefits for wildfire risk reduction, recreational enhancement, and floral and faunal composition of rangelands” in California. In the case of floral and faunal composition, this is supported by research in some parts of California (e.g., Marty 2005; Hayes and Holl 2003). However, site-specific research in Southern California that identifies where priority ES can be met and where tradeoffs exist would be valuable to guide managers in the categories where grazing is a new tool as well as those where grazing is permitted but declining. This type of research also has the potential to support tools for permitting grazing on public lands, such as grassbanks, where “forage is exchanged for one or more tangible conservation benefits.” Under these agreements, “producing conservation is the primary objective” but benefits are also provided to ranchers who participate (White and Conley 2007, 27, 29). The public lands in this study that are providing access to forage in exchange for fire management or invasive species management provide models on which grassbanks could be developed that are suitable to the San Diego County context.

### ***Conclusion***

As the number of stakeholders involved in rangeland management increases under public management, the need to better understand the outcomes of management actions, including grazing, also increases. Land is often conserved through public acquisition with the goal of protecting and enhancing

ecosystem services, but there are few studies that measure whether this goal is being met (Bustic et al. 2017). At the same time, management options are in some cases employed or rejected based on perceptions of whether they will improve or degrade ecosystem services, although quantification of those outcomes is generally lacking. Farmer et al. (2017, 63) note that research on private land conservation has tended to focus on recruitment and retention of participants, but more information is needed on the outcomes following enrollment of land in conservation programs. Such information is also needed on lands that have been conserved through purchase by or for public agencies.

In order to better understand the value of public land acquisition, there is a need for clear delineation of management objectives under public ownership and better information on the outcomes of management actions. This research highlights the range of management objectives as well as the perceived role of grazing in meeting those objectives. Further research is needed to better understand the outcomes of management changes associated with conversion from private to public ownership. Studies that have evaluated provision of ecosystem services with and without conservation as a way to assess the value of land acquisition provide valuable guidance for future research on San Diego rangelands (Kovacs et al. 2013; Bustic et al. 2017). Bustic et al. (2017, 88) note that for quantification of ecosystem services under different ownership or management to be useful, researchers “must be sure that the ecosystem services evaluated fit the priorities of the communities in question.” This research outlines the priorities among public rangeland managers in San Diego County that can guide future research for the region.

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