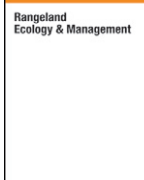




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Compatibility of Livestock Grazing and Recreational Use on Coastal California Public Lands: Importance, Interactions, and Management Solutions[☆]

Kristina M. Wolf^{a,*}, Roger A. Baldwin^b, Sheila Barry^c

^a College of Agriculture and Environmental Sciences - Russell Ranch Sustainable Agriculture Facility, Research Coordinator, University of California, Davis, CA 95616, USA

^b Department of Wildlife, Fish, and Conservation Biology, Human-Wildlife Conflict Specialist, University of California, Davis, CA 95616, USA

^c University of California Cooperative Extension, Livestock and Natural Resources Advisor and County Director, University of California, Santa Clara, San Jose, CA 95112, USA

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ABSTRACT

While the primary use of rangelands for over a century has been livestock grazing to produce food and fiber, elevated demand for recreational land has increasingly brought livestock-recreation interactions to the forefront. California's coastal range is a hotspot for graziers and recreationists alike and is an important region in which to address the challenges and opportunities of concurrent grazing and recreation. Here we review issues related to livestock grazing on publicly owned recreational lands, discuss potential areas of conflict, and highlight promising avenues for fostering positive livestock-recreation interactions. Managers grazing livestock on public lands have adopted a variety of management practices to minimize conflicts and maximize benefits derived from multiple uses of public lands. However, even a few perceived negative recreationist experiences may prompt some public land agencies to remove livestock grazing entirely. California's grasslands—a large component of public lands—are the most “at-risk” habitat type for development, and increasing economic and social pressures on ranchers who utilize leased public lands make it more likely that ranchers would sell their private lands to developers if access to public grazing land were eliminated, further increasing threats to our already dwindling rangelands. The continued accessibility of public lands for grazing is thus inextricably linked to the protection of private rangelands and the critical resources they provide. Novel approaches to public education and collaborative land management are critical to reducing negative livestock-recreation encounter and ensuring continued conservation of wildlands.

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Introduction

More than 700 million acres (300 million ha) of public and private rangelands in the United States support livestock grazing and recreation and provide ecosystem services necessary to sustain human and wildlife populations (Foley, 2005; Havstad et al., 2007; Millennium Ecosystem Assessment Program, 2003). In California alone, 30% of public land is rangeland, covering more than 32 million acres (13 million ha; Fire and Resource Assessment Program, 2010). While the primary use of rangelands for thousands of years has been wildlife habitat (Forest Service, 2012)—and within the past few centuries livestock grazing to produce food and fiber (Huntsinger and Bartolome, 2007)—an elevated

interest in and demand for already limited public recreational areas and grazing lands has increasingly brought livestock-recreation interactions to the forefront (Forest Service, 2012; Hallissy, 2001).

California's coastal range, which is home to most of the 280 California State Parks (Moss, 2009), is a hotspot for graziers and recreationists alike and thus an important region in which to address the challenges and synergies of concurrent grazing and recreation (Hayes and Holl, 2003). While livestock production on western US rangelands is common, the coastal regions, particularly the mesic central and northern coasts, are unique in being highly productive (Burcham, 1957; D'Antonio and Vitousek, 1992) and are interspersed with dense urban and rural areas (Hayes and Holl, 2003) that have high amenity values, which increase surrounding land value and attract nearby recreationists (Moss, 2009; Radeloff et al., 2005). Limitations on suitable land for recreation constrain recreational demand and often put recreationists at odds with graziers. Graziers also face increased constraints on the amount of land available for grazing, economic costs associated with grazing on a limited land base (Fire and Resource Assessment Program, 2010; Hallissy, 2001; Resnik et al., 2006),

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* Correspondence: Kristina M. Wolf, College of Agriculture and Environmental Sciences - Russell Ranch Sustainable Agriculture Facility, Research Coordinator, University of California, Davis, CA 95616, USA.

E-mail address: kmwolf@ucdavis.edu (K.M. Wolf).

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reduced forage and water resources due to climate change and long-term drought (Bureau of Land Management, 2009b; Forest Service, 2012; Holland, 2015), and heightened regulations by government agencies that can limit grazing management options (Huntsinger and Bartolome, 2007).

Changes to wildland habitats due to land-use conversion and climate change threaten wildlife habitat and reduce connectivity and migration pathways (Resnik et al., 2006). In the western United States, nonmetropolitan population growth is three times higher than in the rest of the country and occurs disproportionately on forests and rangelands (Hansen et al., 2002). Across central and northern coastal California counties containing state parks, populations are estimated to increase by almost 4 million people (a 40% increase from 2010) by the year 2060 (California Department of Finance, 2014). The goods and services demanded from wildlands by the public will increase, and balancing the needs of a growing population with sustainable natural resource management will be a continuing challenge. Access to grazing land on the California coast is becoming more limited, due to not only conversion to residential and agricultural uses but also public open space (Forest Service, 2012). For example, in just the 2013–2014 fiscal year, California State Parks holdings increased by > 17 000 acres (6 900 ha), much of which included acquisitions in coastal regions (Trute, 2014). However, most California State Parks do not allow grazing, and when it does occur, it is frequently removed for a variety of reasons (Cuff and Nardi, 2013; Tam, 2011; Tempest, 2004) and the number of grazing permits has decreased over time (Fire and Resource Assessment Program, 2003). Grazing lands will thus decrease in area, while demand for recreational areas will simultaneously increase (Brunson and Steel, 1996; Forest Service, 2012). As grazing increasingly moves beyond previously privately owned open rangelands onto public lands, encounters between livestock and recreationists are likely to increase (Forest Service, 2012). However, while grazing and recreational uses of land may at times be at odds, these uses may also be compatible, and even mutually beneficial.

Objectives

Due to the likely increase in future livestock-recreation interactions, we conducted an extensive literature review to better clarify for public land agencies and managers the impetus for livestock grazing on publicly owned recreational lands, identify potential areas of conflict, and highlight promising avenues for fostering positive livestock-recreation interactions. We address three major topics in this review: 1) current trends in, and 2) outcomes of, livestock grazing and recreation on public lands, and 3) common livestock-recreation interactions. Next, we derived expert knowledge obtained through interviews and surveys of public lands' managers (Wolf et al unpublished manuscript) descriptions of practices that managers have adopted to minimize conflicts and maximize benefits from multiple uses of public lands. Our geographic focus for both the literature review and description of practices was coastal California, primarily central and northern California.

For the purposes of this review, we define "livestock-recreation interactions" as encounters between livestock and recreationists. This could also include encounters between the effects of livestock and the effects of recreation (e.g., livestock moving through a gate opened by recreationists, companion animals coming into contact with livestock).

Current Trends in Livestock Grazing and Recreation on Public Lands

Livestock grazing has been the primary use of rangelands in California since the arrival of European settlers until today (Jackson and Bartolome, 2007; Wagner, 1989). However, California's grasslands are the most "at-risk" habitat type for threat from development and conversion to cropland (Forest Service, 2012; Holland, 2015). Ranchers often seek public land grazing allotments to conserve their private land resource base or overcome loss of access to grazing land due to urban

sprawl (Fire and Resource Assessment Program, 2010; Sulak and Huntsinger, 2007; Tempest, 2004).

Continued loss of rangeland habitat supporting the provision of meat production has forced some to seek public land grazing leases to remain financially viable. In California 63% of rangelands are privately owned, and while this may give the impression that ranchers have plenty of land on which to graze, approximately 47 000 ac (19 000 ha) of California rangelands are converted to other uses *each year*. This leaves ranchers with a dwindling resource base, and frequently, the only sustainable environmental and financial option is to obtain a grazing lease on public land (Fire and Resource Assessment Program, 2010). The continued accessibility of public lands to grazing is therefore inextricably linked to the protection of rangelands and the critical resources they provide (Sulak and Huntsinger, 2007).

As populations and environmental pressure increase, the need to enhance and benefit from multiple ecosystem services has led to managing for trade-offs and concurrent multiple uses on rangelands (Forest Service, 2012; Herrero and Thornton, 2013). For example, recreation has increased in the United States over time, with the total number of recreationists increasing 7% from 2000 to 2009, and the number of days during which public lands were utilized for recreation increased by 30% over the same period. California State Parks reported increases in the 2013–2014 fiscal year of 7.38% in day-use visitors, 6.14% in camping, and approximately 7.27% in visitor attendance from the previous year, and these numbers are believed to be substantially underestimated (Trute, 2014). Greater demand for recreational land will increase pressure on public lands (Bureau of Land Management, 1994, 2009b; Dutton, 1953; Fulbright and Ortega-Santos, 2006; Havstad et al., 2007; Landstrom, 1965; Menke and Bradford, 1992; Veblen et al., 2014; Wilkinson, 1992). This may exacerbate conflicts between recreational users and graziers given that livestock grazing on public lands has already come under fire for its perceived negative impacts on natural resources and recreational pursuits (Eisenstein and Stampe, 2006; Tempest, 2004).

Outcomes of Livestock, Recreation, and Their Interaction on Public Lands

Although land managers recognize more than ever that multiple land uses are often compatible and even desirable for more efficient use and better management of rangelands, multiple uses may result in net positive or negative outcomes for livestock grazing, recreational purposes, or environmental health (Nelson et al., 2010). Trade-offs depend on the focal resource, and the magnitude of their effects are spatio-temporally diverse and culturally context dependent (Herrero and Thornton, 2013; Herrero et al., 2009; Plieninger et al., 2012). For example, the central and northern coastal California regions have a mesic climate that produces a plant community which may respond differently to grazing than interior regions. In light of extensive plant invasions, coastal lands may require some grazing disturbance to maintain native grasslands and reduce woody encroachment and exotic invasion (Callaway and Davis, 1993; Hayes and Holl, 2003).

Rangelands are an important conservation target for the critical ecosystem services they impart (Havstad et al., 2007; Plieninger et al., 2012), thus linking them to humans (Huntsinger and Hopkinson, 1996; Walker and Jansen, 2002), many of which are described in this following section.

Benefits of Livestock Grazing for Public Lands Management and Recreation

California's native grassland and oak woodland communities have undergone an unprecedented transformation to largely annual, non-native cover primarily due to invasion by Mediterranean grasses and forbs, resulting in sweeping changes to ecosystem processes, including changes to fire regimes (Mooney and Drake, 1986). Grazing is frequently supported by fire departments and other public organizations to reduce

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