



Contents lists available at ScienceDirect

Rangeland Ecology & Management

journal homepage: <http://www.elsevier.com/locate/rama>

Land Manager Perceptions of Opportunities and Constraints of Using Livestock to Manage Invasive Plants[☆]

M.W.K. Shapero^a, L. Huntsinger^b, T.A. Becchetti^c, F.E. Mashiri^d, J.J. James^e

^a University of California Cooperative Extension (UCCE) Livestock & Range Advisor in Ventura and Santa Barbara Counties, Ventura, CA 93003, USA

^b University of California, Berkeley, Department of Environmental Science, Policy, and Management, Professor of Rangeland Ecology and Management, Russell Rustici Chair in Rangeland Management, Berkeley, CA 94720, USA

^c UCCE Livestock & Natural Resources Advisor in San Joaquin and Stanislaus Counties, Modesto, CA 95358, USA

^d UCCE Livestock & Natural Resources Advisor in Mariposa and Merced Counties, Mariposa, CA 95338, USA

^e UCCE Specialist, University of California Sierra Foothill Research and Extension Center, Browns Valley, CA 95946, USA

ARTICLE INFO

Article history:

Received 3 November 2017

Received in revised form 10 April 2018

Accepted 16 April 2018

Available online xxxx

Key Words:

medusahead (*Taeniatherum caput-medusae*)

extension

land trusts

public agencies

ranchers

socioecological systems

ABSTRACT

The ecological impacts of rangeland invasive plants have been widely documented, but the social aspects of how managers perceive their impacts and options for control have been relatively understudied, and successful, long-term invasive plant management programs are limited. In particular, though a growing body of research has identified livestock grazing as the most practical and economical tool for controlling invasive rangeland plants, to date there has not been a systematic assessment of the challenges and opportunities producers and other land managers see as most important when considering using livestock to manage invasive plants. In-depth, semistructured interviews with California annual grass and hardwood rangeland ranchers, public agency personnel, and nongovernmental organization land managers were used to address this need. Although interviewees broadly agreed that grazing could be an effective management tool, differences emerged among the three groups in how they prioritized invasive plant control, the amount of resources devoted to control, and the grazing strategies employed. Interviewees identified key challenges that hinder broad-scale adoption of control efforts, including the potential incompatibility of invasive plant management and livestock production; a lack of secure, long-term access to land for many ranchers; incomplete or insufficient information, such as the location or extent of infestations or the economic impacts to operations of invasive plants; and the temporal and spatial variability of the ecosystem. By identifying key socioecological drivers that influence the degree to which livestock are used to manage invasive plants, this study was able to identify potential pathways to move our growing understanding of the science of targeted grazing into practice. Research, extension, and grazing programs that address these barriers should help increase the extent to which we can effectively use livestock to slow and perhaps reverse the spread of some of our most serious rangeland weeds.

© 2018 The Society for Range Management. Published by Elsevier Inc. All rights reserved.

Introduction

The ecological impacts of invasive plants on rangelands have been widely documented and include reduction of forage quality and quantity, decreased biodiversity, deterioration of wildlife habitat, alteration of historic fire patterns, and changes in carbon, nutrient, and water cycling (e.g., Whisenant, 1992; DiTomaso, 2000; Havstad et al., 2007).

Despite these well-understood ecological impacts, the implementation of successful, long-term invasive plant management programs has remained limited (Sheley et al., 2011). Multiple barriers may contribute to this limitation including the large areas requiring management, high cost of treatments relative to land production value or available budgets, and uncertainties associated with treatment outcomes. Land managers may be reticent to adopt new practices, may not be aware of the impact of invasive species, or may not be concerned about them. Research has developed tools and strategies to manage invasive plants on rangelands, but if this information is going to be put to widespread use, the social and ecological dimensions of rangeland management must be considered (D'Antonio et al., 2004). Here, interviews of California annual grass and hardwood rangeland ranchers, public agency personnel, and nongovernmental organization (NGO) land managers across the state

[☆] Research was funded in part by Western SARE award EW13-027 and USDA-NIFA Western Regional Integrated Pest Management Program Award 2013-41530-21326. Additional support was provided by the Department of Environmental Science, Policy, and Management at the University of California, Berkeley, and the University of California Division of Agriculture and Natural Resources through the Graduate Student in Extension fellowship program.

<https://doi.org/10.1016/j.rama.2018.04.006>

1550-7424/© 2018 The Society for Range Management. Published by Elsevier Inc. All rights reserved.

Please cite this article as: Shapero, MWK., et al., Land Manager Perceptions of Opportunities and Constraints of Using Livestock to Manage Invasive Plants, Rangeland Ecology & Management (2018), <https://doi.org/10.1016/j.rama.2018.04.006>

are used to develop an integrated understanding of the challenges of using grazing for invasive species management from the perspective of managers.

Domestic livestock grazing is generally recognized as the most practical and economical tool available to manage invasive rangeland plants across large spatial and temporal scales (Popay and Field, 1996; Firm et al., 2013). While substantial progress has been made in understanding the ecology and biophysical parameters of using grazing animals to manage invasive rangeland plants, there has been less effort spent evaluating the opportunities and constraints managers experience when applying these practices. The large amount of technical expertise and ecological information available is to no avail if managers do not choose to make use of it. Control of invasive plants with grazing has social and ecological dimensions. Frost and Launchbaugh (2003), for example, acknowledge that despite grazing's biological efficacy in controlling weeds, the practice will continue to have limited adoption until land managers can be shown that it is compatible with and even beneficial for production goals. Similarly, Davy et al. (2015) admit that while matching the timing of cattle grazing with plant phenology and precipitation was shown to effectively reduce medusahead (*Taeniatherum caput-medusae*) cover, basing livestock management decisions solely on invasive plant suppression is likely infeasible in part because medusahead is most vulnerable to grazing when the forage resources of the pasture as a whole may not be adequate to support animal nutritional requirements. In some instances, the flexibility to use grazing as a management tool may be inhibited by policy factors as when public land managers are constrained by institutional regulation that limits their ability to adapt to changes in invasive plant abundance (Tzankova and Concilio, 2014). Furthermore, it is not clear how important invasive plant control is to managers and whether or not they consider various species a problem. Limited time, money, and labor resources are perennially cited as challenges to any invasive weed control program (George et al., 1989; Eagle et al., 2007; Aslan et al., 2009). In other instances, land managers may not have all the information needed about how to implement grazing as a control tool or may be simply unconvinced that grazing is an effective invasive plant control (Van Der Meulen et al., 2007; Johnson et al., 2011). Being able to bridge the knowledge-practice gap is a fundamental step for accelerating the development and implementation of effective and widely adopted natural resource management programs (Hulme, 2014).

While the aforementioned studies touch on some of the potential limitations managers may face, to date a systematic assessment has not been conducted to clarify the challenges and opportunities that producers and other land managers see as most important when considering the use of livestock to manage invasive plants on rangeland. As a first step toward addressing this need, we interviewed producers and other land managers who work on California's annual grass and hardwood rangelands to examine if and how they apply livestock grazing as a tool to manage invasive plants. By focusing on the rangeland socioecological system of one region with an in-depth qualitative approach, we hope to illuminate some of the specific but generalizable opportunities and constraints that determine if grazing is used as a control strategy. The results from this study should help guide future research and outreach for using grazing animals to manage invasive plants that integrate the social and ecological aspects of invasive plant control.

Methods

Study Area

Interviewees were selected from a geographic area that broadly represents annual grass and hardwood rangeland types in California (Huntsinger and Bartolome, 2014). This included participants in 22 counties, from Tehama County in the north, to Fresno County in the south, and from Santa Cruz County east to the western slope of the Sierra Nevada (Fig. 1).

The species composition of rangelands in California is characterized by a mixture of non-native, naturalized annual grass species and an assembly of native and naturalized annual forbs (Bartolome et al., 2007), often with an overstory of native oaks, ranging from savanna to woodland. The majority of grass and forb species present arrived in the century or so after 18th-century Spanish settlement of the state (Burcham, 1956; Minnich, 2008). In addition to this suite of naturalized species, California rangelands are vulnerable to more recent invasions of noxious weeds, in particular medusahead (*Taeniatherum caput-medusae*), yellow starthistle (*Centaurea solstitialis*), and barbed goatgrass (*Aegilops triuncialis*), whose deleterious effects to ecosystem function and livestock production have been well documented (DiTomaso, 2000). These species have proven especially successful invaders due to their prolific seed production, later phenologies, lack of palatability to livestock, ability to form and thrive in monocultures, and successful dispersal mechanisms. Riparian zones and areas in the state with coastal influence support an expanded number of noxious weed species, which include purple starthistle (*Centaurea calcitrapa*), artichoke thistle (*Cynara cardunculus*), mustards (*Brassica* spp.), hoary cress (*Cardaria draba*), perennial pepperweed (*Lepidium latifolium*), and a variety of thistles (*Cirsium* spp.).

California's Mediterranean climate is one of wet, mild winters and dry, hot summers. Precipitation follows a north-south gradient: average precipitation in Tehama County is 582 mm (Western Regional Climate Center, 2016) while in Fresno County it is 326 mm (US Climate Data, 2016). Elevation in our study area ranged from sea level in the Central Valley to > 2 100' in the Sierra Nevada foothills. The climate and species assemblages of California grasslands are most distinctive for their spatial and temporal variability, most notably for differences in forage production and species composition from site to site within a year and from year to year on the same site (Bartolome et al., 2007).

The study area is a patchwork of public and private land ownership. On the whole, > 80% percent of California hardwood rangelands and annual grasslands are privately owned (Huntsinger and Bartolome, 2014) and >60% of them are grazed by domestic livestock (Huntsinger et al., 2010b). Land settlement in California followed a pattern similar to other regions in the West with one major exception. The Spanish and Mexican land grant system, moving in from the coast, left a legacy of large, privately owned ranches. As a result, there is less dependency on federally owned rangelands than in other western states. In general, lower-lying, more fertile lands are now privately owned while more remote and less productive lands remain under public control (Nelson, 1995; Huntsinger et al., 2010a); the state itself is about half in federal ownership. Hardwood rangelands and annual grasslands are > 80% privately owned (Huntsinger and Bartolome, 2014). Recently, however, as expanding urban development and intensive agriculture has put pressure on California's privately owned rangelands (Cameron et al., 2014), nonprofit NGOs, land trusts, and other special districts (e.g., water, utility, and park districts) have increasingly endeavored to purchase and manage hardwood rangelands and associated grasslands and shrublands for conservation purposes (Merenlender et al., 2004). Many lands now held by governmental or nonprofit organizations were grazed by domestic livestock before acquisition, and agencies frequently depend on the continued cooperation and assistance of ranchers to manage their properties with livestock (Merenlender et al., 2004).

Given its geographic size, the study area contains a diversity of land types, vegetation patterns, land ownership characteristics, parcel sizes, ranching operations, and managing public agencies. By choosing this broad region, we intended to capture and represent a wide variety of approaches to land and invasive plant management.

Data Collection and Analysis

The goal of the study was to capture the diversity of manager ideas, approaches, and attitudes about invasive species; how invasive plants

Download English Version:

<https://daneshyari.com/en/article/8849554>

Download Persian Version:

<https://daneshyari.com/article/8849554>

[Daneshyari.com](https://daneshyari.com)