

Human Infrastructure and Invasive Plant Occurrence Across Rangelands of Southwestern Wyoming, USA

Author(s): D. J. Manier, C. L. Aldridge, M. O'Donnell, and S. J. Schell

Source: Rangeland Ecology & Management, 67(2):160-172. 2014.

Published By: Society for Range Management

DOI: <http://dx.doi.org/10.2111/REM-D-12-00056.1>

URL: <http://www.bioone.org/doi/full/10.2111/REM-D-12-00056.1>

BioOne (www.bioone.org) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/page/terms_of_use.

Usage of BioOne content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

Human Infrastructure and Invasive Plant Occurrence Across Rangelands of Southwestern Wyoming, USA

D. J. Manier,¹ C. L. Aldridge,² M. O'Donnell,³ and S. J. Schell¹

Authors are ¹Ecologist and ³Spatial Data Analyst, US Geological Survey, Fort Collins Science Center, Fort Collins, CO 80526, USA; and ²Assistant Professor, Department of Ecosystem Sciences, and Natural Resource Ecology Lab, Colorado State University, in cooperation with US Geological Survey, Fort Collins Science Center, Fort Collins, CO 80526, USA.

Abstract

Although human influence across rural landscapes is often discussed, interactions between the native, natural systems and human activities are challenging to measure explicitly. We assessed the distribution of introduced, invasive species as related to anthropogenic infrastructure and environmental conditions across southwestern Wyoming. to discern direct correlations as well as covariate influences between land use, land cover, and abundance of invasive plants, and assess the supposition that these features affect surrounding rangeland conditions. Our sample units were 1 000 m long and extended outward from target features, which included roads, oil and gas well pads, pipelines, power lines, and featureless background sites. Sample sites were distributed across the region using a stratified, random design with a frame that represented features and land-use intensity. In addition to land-use gradients, we captured a representative, but limited, range of variability in climate, soils, geology, topography, and dominant vegetation. Several of these variables proved significant, in conjunction with distance from anthropogenic features, in regression models of invasive plant abundance. We used general linear models to demonstrate and compare associations between invasive plant frequency and Euclidian distance from features, natural logarithm transformed distances (log-linear), and environmental variables which were presented as potential covariates. We expected a steep curvilinear (log or exponential) decline trending towards an asymptote along the axis representing high abundance near features with rapid decrease beyond approximately 50–100 m. Some of the associations we document exhibit this pattern, but we also found some invasive plant distributions that extended beyond our expectations, suggesting a broader distribution than anticipated. Our results provide details that can inform local efforts for management and control of invasive species, and they provide evidence of the different associations between natural patterns and human land use exhibited by nonnative species in this rural setting, such as the indirect effects of humans beyond impact areas.

Key Words: anthropogenic influence, land use, noxious weeds, sagebrush steppe, semiarid ecosystem, species distributions

INTRODUCTION

The distribution and spread of invasive plants is the result of complex combinations of determinants, including attributes of the species and ecosystem conditions (Richardson et al. 1994; Thomas and Maloney 2013). Although many invasive species are well-adapted to spread and reproduce based on biological factors (e.g., Thompson et al. 1995; Smith and Knapp 2001; Decker et al. 2012), ecosystem conditions and human-mediated disturbance can have a critical role in determining potential for invasion (Beans et al. 2012; Catford et al. 2012; Decker et al. 2012; Uddin et al. 2013). A review of multiple factors and recent research approaches that illuminate these relationships was recently provided by Decker and others (2012); findings indicate that despite the important interactions of biotic potential of species and natural environmental patterns, human activities and density of human occupancy have positive associations with invasive plant distributions (Decker et al. 2012). Further, Decker and others (2012) recognized that

studies that are limited to the distribution of a single species are common, but provide limited ability to make generalized inferences about invasive plant distributions; this project provided a multiple-species perspective that helps inform comparative interpretation and assess the relative potential for these species to influence ecosystem conditions.

Interactions between human society and natural ecosystems are extensive, affecting landscapes globally, and often with persistent or maintained effects. Although vast tracts of land in western North America remain minimally occupied by human residents, economic, domestic, sustenance, and recreational activities generate both extensive, and intensive, patterns of human influence across these landscapes. The distribution of roads, for example, in rural areas can be both regionally extensive and locally intensive, and the ecological effects of roads, beyond habitat displacement and fragmentation, are often discussed, occasionally modeled, but rarely measured directly. Additionally, modern disturbances and landscape fragmentation are superimposed on a long history of land use with various impacts. Although some level of human manipulation of the landscape has likely existed for thousands of years (Bahre and Shelton 1993; Baisan and Swetnam 1997; Grayson and Millar 2008; Jacobs and Whitlock 2008; Bjorkman and Vellend 2010), the influential and manipulative occupation of open rangelands resulting from modern activities including oil, gas and mineral extraction, urban and exurban

Funding for this research was provided by the US Geological Survey, Energy and Ecosystems Divisions.

Correspondence: D. J. Manier, US Geological Survey, Fort Collins Science Center, 2150 Center Ave, Bldg. C, Fort Collins, CO 80526, USA. Email: manierd@usgs.gov

Manuscript received 4 May 2012; manuscript accepted 8 January 2014.

© 2014 The Society for Range Management

Download English Version:

<https://daneshyari.com/en/article/4404488>

Download Persian Version:

<https://daneshyari.com/article/4404488>

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