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Influence of Experience on Browsing Sagebrush by Cattle and Its Impacts on Plant Community Structure

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Abstract

Mechanical and chemical methods used historically to rejuvenate sagebrush-steppe landscapes are cost prohibitive. A low-cost alternative is to fashion systems of management in which locally adapted animals use sagebrush as fall and winter forage to reduce feeding costs and to enhance the growth of grasses and forbs during spring and summer. We evaluated the practicality of fall browsing of sagebrush (*Artemisia tridentata* ssp. *tridentata*, ssp. *wyomingensis*) by cattle. To do so, we assessed 1) the foraging behavior and body weights of cattle with varying levels of experience browsing sagebrush, and 2) the ensuing responses of sagebrush, grasses, and forbs to cattle grazing. In spatially and temporally replicated trials from 2007 to 2009, cattle were challenged to eat sagebrush. Pregnant cows with calves (2007 and 2008), bred yearling heifers (2008), and first-calf heifer/calf pairs (2009), supplemented with protein and energy, learned to eat sagebrush as a significant portion of their diet (up to 63% of scans recorded during grazing). Experienced animals consistently ate more sagebrush and lost less weight, or gained more weight, than naive animals in 2008 and 2009 ($P < 0.05$). Cover, production, and percent composition of grasses and forbs maintained or dropped slightly from 2007 to 2008 but then rebounded sharply in 2009 to much greater levels than in 2007 or 2008 ($P < 0.05$). A corresponding reduction in shrub cover, production, and percent composition accompanied the increase in forbs and grasses ($P < 0.05$). Our research suggests grazing by cattle during fall and winter can be effective, biologically and economically, and can lead to habitat renovation and resilience by creating locally adapted systems of management in ways that landscape manipulations with chemical and mechanical treatments or prescribed fire cannot.

Key Words: body weight, holistic management, local adaptation, plant regrowth, targeted grazing

INTRODUCTION

Sagebrush steppe is one of the largest eco-regions in North America, covering millions of acres in Utah, Nevada, Wyoming, Oregon, Washington, Idaho, and Montana (West 1983). During the past century, people attempted to eliminate sagebrush (*Artemisia tridentata* spp. Nutt.) with the goal of stimulating growth of grasses and forbs to suit presumed needs of wild and domestic animals during spring and summer (Winward 1991). Contrary to long-standing beliefs, complete removal of sagebrush adversely affects biodiversity and results in little long-term benefits for perennial grasses and forbs. Indeed, forage production may eventually decline when sagebrush is removed (Winward 1991). Many groups now recognize the multiple year-round benefits of sagebrush for the integrity of soil, plants, animals, and people.

A low-cost alternative to mechanical and chemical removal of sagebrush is to develop systems of management that use sagebrush as a forage resource and to select for domestic animals that use sagebrush as fall and winter forage. These practices can enhance growth of grasses and forbs during spring and summer while maintaining sagebrush as an

important part of biodiversity (Provenza et al. 2003; Provenza 2008). While sheep can rejuvenate sagebrush-steppe (Dziba et al. 2007), sheep numbers have declined in the West to the point that they may not be available to rejuvenate sagebrush steppe in many areas. As cattle are abundant in the Great Basin, we sought to determine if they could also revitalize sagebrush steppe.

Three factors help livestock rejuvenate sagebrush steppe. First, experience can help animals develop morphologically, physiologically, and behaviorally in ways that better enable them to increase consumption of a particular food. Experiences in utero and early in life enable animals to better use forages in environments in which they are conceived, develop, and live over generations (Provenza 2003; Provenza et al. 2003). Second, supplemental nutrients mitigate the adverse impacts of terpenes in sagebrush and increase the success of using livestock at high density to rejuvenate landscapes dominated by sagebrush (Dziba et al. 2007; Woodland 2007; Guttery 2010). Third, animals can positively influence rejuvenation of sagebrush steppe communities through foraging and nutrient inputs to soil in the form of urine and feces derived from supplements and forages (Hobbs 1996; Provenza et al. 2003). Increasing resource availability (water and nutrients) through inputs of carbon and nitrogen, as well as water, can enhance the production and nutritional quality of herbaceous plants while reducing terpene concentrations in plants like sagebrush (Bryant et al. 1983; Herms and Mattson 1992).

Our objectives were to evaluate the practicality of fall browsing of sagebrush (*Artemisia tridentata* ssp. *tridentata*, and ssp. *wyomingensis*) by cattle. To do so, we evaluated 1) use

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