Targeted Grazing with Small Ruminants to Control Encroachment of One-Seed Juniper Saplings

Utsumi, S [1], A. Cibils[1], R. Estell [2], J. Walker [3].and S. Cox [4] [1] New Mexico State University, Department of Animal and Range Sciences, Las Cruces, NM 88003, [2] USDA-ARS Jornada Experimental Range, Las Cruces, NM 88003, [3] Texas A&M University, Texas Agricultural Experiment Station, San Angelo, TX 76901, and [4] Corona Range and Livestock Research Center, Corona, NM 88318

Introduction

Supression of one-seed juniper (*Juniperus monosperma* [Engelm.] Sarg.) reinvasion is of critical importance to maintain previously restored rangelands in New Mexico. If encroachment is not controlled at early growth stages (saplings < 1 m tall), forage production and carrying capacity for livestock and wildlife decline. Targeted grazing with goats can have synergistic effects in integrated vegetation management approaches that use mechanical removal, fire, and herbicide treatments. Alternatively, grazing by goats may be a viable vegetation management option when other practices are not feasible. The efficacy of goats in suppressing juniper, however, depends on their ability to consume large amounts of chemically defended sapling biomass. This can be achieved by selecting animals that consume high amounts of juniper, by grazing during the appropriate seasons, or by using supplements. Additional approaches which have not been rigorously tested involve the use of specialized grazing systems such as low frequency grazing at high stocking densities and mixed grazing with small ruminants that exhibit contrasting feeding habits.

Objective

Our objective was to examine the combination of mixed grazing with sheep and goats and high stocking density (i.e. animal/grazable area/day) as potential grazing practices to increase the utilization of juniper by goats. Specific predictions were:

1) *Juniper utilization by goats will increase with mixed grazing at high stocking density* due to feeding niche separation between sheep and goats and restricted temporal allocation of forages.

2) *Intensity of herbaceous understory use should be highest with mixed grazing at low stocking density* due to less restrictive temporal allocation of forages which should favor selection of herbaceous forage by sheep.

Materials & Methods

- Design: Randomized Complete Blocks replicated by season (Summer & Spring)
- Treatments: factorial of 2 herbivores (GA: Goats Alone vs. GM: Goats Mixed with sheep) and 2 stocking densities (LD: low stocking density vs. HD: High stocking density).
- Herbivores: GA= 10 Boer-Spanish nannies (47.9 ± 1.1 kg; mean ± SE) or GM= 5 nannies + 4 Rambouillet ewes (69.2 ± 0.9 kg). GA and GM had same animal unit equivalents (1.1 AU)
- Stocking density: LD= grazing experimental pastures for 6 consecutive days or HD: daily rotation on 1/6 of the pastures (see figure 1 for details).
- Stocking rate (i.e. animals/area/time): set constant at 0.3 AU/ha/yr for the 4 treatments.
- Protocol: daily grazing for 11 hours, daily supplementation with 44% CP at 0.5 BW, hauled at night.
- Measurements: feeding activity, fecal juniper, herbaceous biomass before and after grazing, sapling utilization.

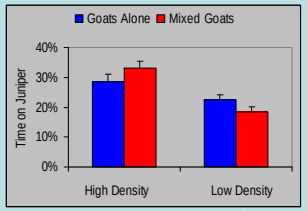
Figure 1. Diagram of grazing treatments for summer and spring seasons

Group of Spanish-Boer goats

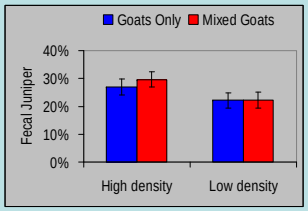
Mixed group of Spanish-Boer goats with Rambouillet ewes

Results

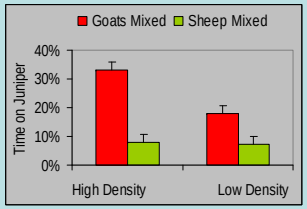
Utilization of Juniper



Herbivore*density P= 0.16; Density P=0.001; Herbivore P>0.05



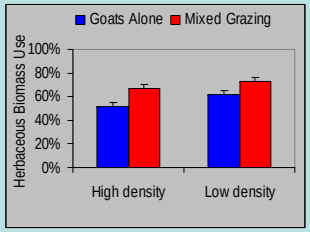
Herbivore*density P>0.05; density P< 0.05; Herbivore P>0.05



Statistical comparisons are not applicable

In the mixed group, the presence of ewes in open interspaces of nutritious grass may have forced goats to concentrate on juniper, especially under high density. Ewes always spent less time on juniper (Left graph)

Utilization of herbaceous vegetation



In the mixed grazing treatment, ewes were responsible for the more intensive use of herbaceous vegetation, especially under low density grazing (above).
Goats on the other hand, relaxed their use of herbaceous plants at the expense of higher juniper use (left)

Results

Table 1. Frequency of juniper saplings classified by defoliation level.

Defoliation Level	Mixed Grazing		Goats Alone	
	High Density	Low Density	High Density	Low Density
Heavy (>67%)	44%	40%	39%	39%
Moderate (34-66 %)	38%	31%	37%	34%
Low (< 33%)	18%	29%	24%	27%

Heavy (>67%)

Moderate (66-34%)

Low (<33%)

Plant variation in secondary compounds may explain this differential herbivory among juniper saplings

Pastures showed good recovery after a month of grazing (left). Branches of saplings with bark completely stripped (center and right) exhibit higher mortality

Conclusions

- Juniper utilization by goats was higher at high stocking density when goats grazed in combination with sheep. Diets of goats in the mixed high density treatment tended to include more juniper and less herbaceous vegetation than diets of goats in the other treatments. (Prediction 1, not rejected)
- The utilization of the herbaceous understory was highest with mixed grazing at low stocking density (Prediction 2, not rejected)
- Collectively, this study shows the potential of grazing systems to increase the utilization of juniper by goats and maximize their efficacy to control one-seed juniper saplings.

Acknowledgements

This study was funded by The Joe Skeen Institute for Rangeland Restoration, and contributions of The Corona Range and Livestock Research Center (CRLRC) and The San Angelo Agriculture Experiment Station. Special thanks are given to Carolina Fabbi for her assistance in the conduction of grazing trials. Authors also wish to thank Shad Cox, Michel Rubio, Dr. Tim Ross, Dr. Dawn Van Leuween, and Bob Wesley, for their collaboration in different aspects of the study.