

Influence of Ungulate Herbivory on Post Fire Recovery of Shrubby Vegetation
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Kendra Robinson
Linda Scott
Nina Seevers

Abstract

The effects of mule deer browsing on the composition of a shrub community recovering from fire were investigated. A deer enclosure in North Beech Open Space, Boulder County, provided an ideal site for the study as a fire had occurred in the area in 1990. The results indicated that herbivory did have an effect on percent shrub cover, species richness, and percent similarity under post fire recovery conditions. There was a significant difference in species richness and a difference, although not statistically significant, in total percent shrub cover. Deer favor certain species over others, resulting in the absence of certain species outside of the deer enclosure. The browse choice of deer also influenced competition within the shrub community; species that are not selected thrive and may out compete other species.

Introduction

We examined the composition of shrub communities recovering from the Old Stage Road burn which occurred in 1990 in North Boulder. A 3300 square meter, 3 meter tall deer enclosure was built in North Beech Open Space one year after the fire, on a ridge between two hogbacks. This area provides a model of shrub recovery without the effects of deer browsing. We examined the shrub cover in the enclosure and in the surrounding area to determine the effects of wildlife browsing on shrub communities. We hypothesized that there would be a significant difference between the composition of shrub communities within the deer enclosure and outside of it. The question that we addressed was:

- What are the effects of mule deer browsing on percent shrub cover, species richness and percent similarity under post fire recovery conditions?

Having a healthy shrub community is vital for wildlife use. Fire suppression has previously been shown to decrease the production and alter the composition of shrub habitats (Cooper, 1960). Data also indicate that increased shrub biomass occurs in response to fires with recovery, in most cases, within a year following the burn (Andariese, 1982). As the deer enclosure was put in place a year after the fire, this study will examine the shrub community's long term post fire recovery.

The research site provided us with the opportunity to study the composition of shrub communities in areas that have been both browsed and non-browsed by wildlife, specifically mule deer. Pruning associated with limited animal browsing can be beneficial in encouraging more healthy, productive growth in shrubs. However, excessive browsing can have detrimental effects on ground cover. A previous study has shown that deer browsing on a restoration site (transplanted seedlings) yielded a 40% decrease in shrub and grass production (Austin, *et.al.* 1994). An extensive literature search showed that research pertaining to this subject is minimal, therefore our research will provide an avenue to further studies.

Methods

The line-intercept method was used in gathering data. A 30 meter transect line was laid in three random locations at each site, within the deer enclosure and just outside of the enclosure, in areas of similar aspect and slope. The site was an east facing slope with a gradient of 5-10 degrees. We identified species of shrubs and measured the distance of the line intercepted by each species. From these measurements percent cover, species richness, and percent similarity were calculated. A statistical analysis was done to determine if the two sites were significantly different.

Results

Total percent shrub cover in the deer enclosure was 25.75 while total percent shrub cover outside was 16.51 (see graph 1). A p-value of 0.160 showed that there was no significant difference between the two sites. Species richness within the deer enclosure was 8.67 and species richness outside was 5.33, (see graph 1). A significant difference

was found with a p-value of 0.011. The percent similarity between the two sites was found to be 80.70%.

The species found in both study areas were:

- Cichorium intybus*
- Tragopogon dubius*
- Adenolium lewissi*
- Artemisia ludoviciana*
- Grindelia squarrosa*
- Yucca glauca*
- Artemisia frigida*
- Cercocarpus montanus*

The species found only within the deer enclosure were:

- Neolepia campestris*
- Pterogonum alatum*
- Lonicera morrowi*
- Rhus trilobeta*

The following table shows how specific shrub species were affected by deer browsing:

Fig. 1 How shrub species appeared to be affected by deer browsing		
Positively Affected	Negatively Affected	Not Affected
<i>Cichorium intybus</i>	<i>Neolepia campestris</i>	<i>Adenolium lewissi</i>
<i>Tragopogon dubius</i>	<i>Pterogonum alatum</i>	<i>Artemisia ludoviciana</i>
	<i>Lonicera morrowi</i>	<i>Grindelia squarrosa</i>
	<i>Rhus trilobeta</i>	<i>Yucca glauca</i>
	<i>Artemisia frigida</i>	
	<i>Cercocarpus montanus</i>	

Discussion

In support of our original hypothesis, mule deer browsing has an affect on the composition of a shrub community recovering from a fire. There was a significant difference in species richness and a difference, although not statistically significant, in total percent shrub cover. Deer seem to favor certain species over others, which may be an explanation for the difference in the number of species at the two sites (See Graph 1).

This was shown by the species present in the enclosure and absent outside of the enclosure in our results.

Figure 1 shows two species that appear to be more successful outside of the deer enclosure. This could be accounted for by deer choosing certain species and reducing competition in the shrub community, thereby allowing the species that are not selected to thrive. Likewise, within the enclosure, species richness remains high as the deer have no access to these species. There were also several species that did not seem to be affected by herbivory.

An immediate result of fire is a decrease in competition among plant species. This may allow previously non-abundant species to grow in an area that recently burned. Local biologists feel that Boulder Open Space contains a unnaturally high number of deer which may negatively affect post fire recovery. This may account for species found inside of the enclosure that were not found outside of it.

As this study was conducted in late November, we experienced some difficulty in identifying some of the shrub species. Also, the season of the study may have hindered the gathering of a true representative sample of data, therefore the abundance of species may be different in the late fall than they are in the spring. Due to a small sample size, the error in the data set was high.

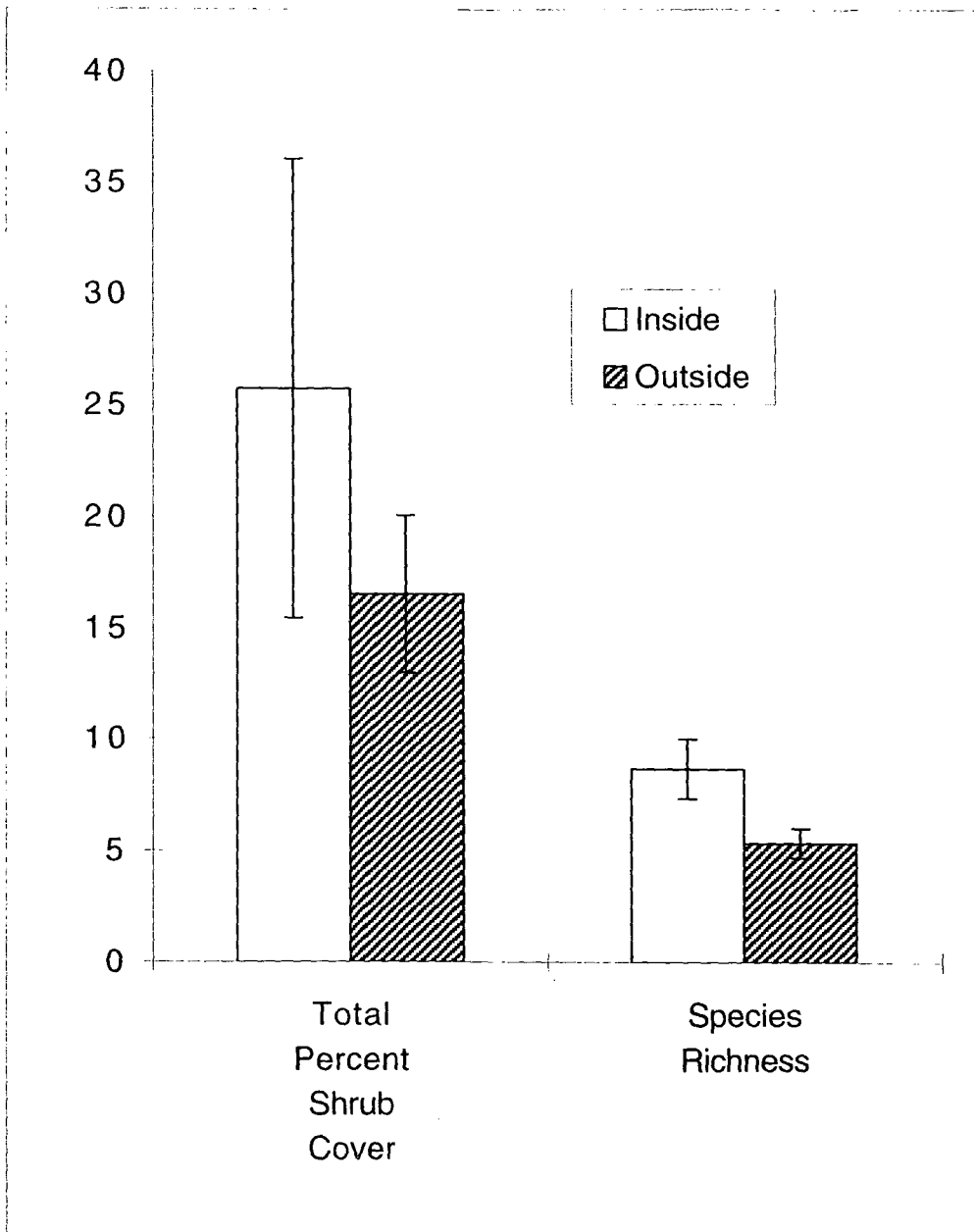
Future research that could be pursued would be to compare a deer enclosure in a non-burned site to a deer enclosure in a burned site. This would aid in better determining how both fire and browsing affect the composition of a shrub community. A long term study in this area could lead to a better understanding of how these communities recover from fire under the influence of herbivory. Additional studies are necessary to determine the density of the deer population in Boulder County, to see whether it is sustainable.

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Graph 1



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