

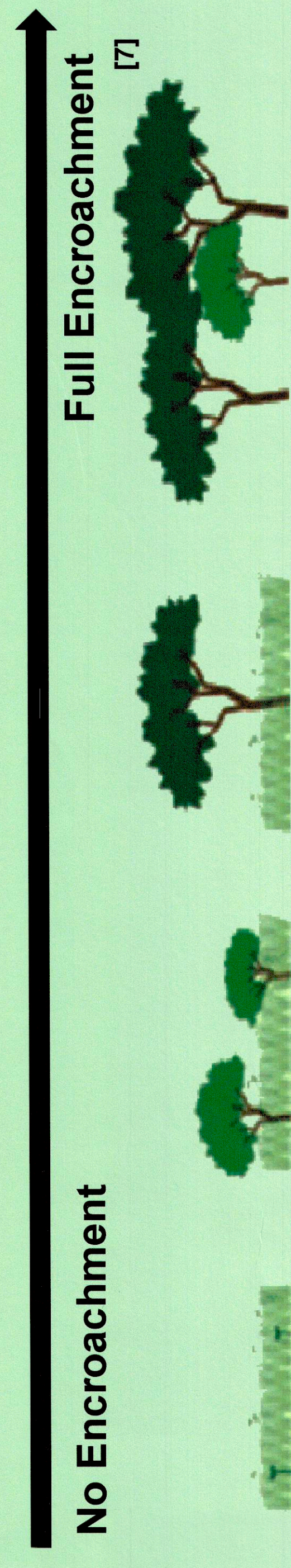
Pinus edulis & Juniperus monosperma encroachment: Impacts on shortgrass prairie ecosystems



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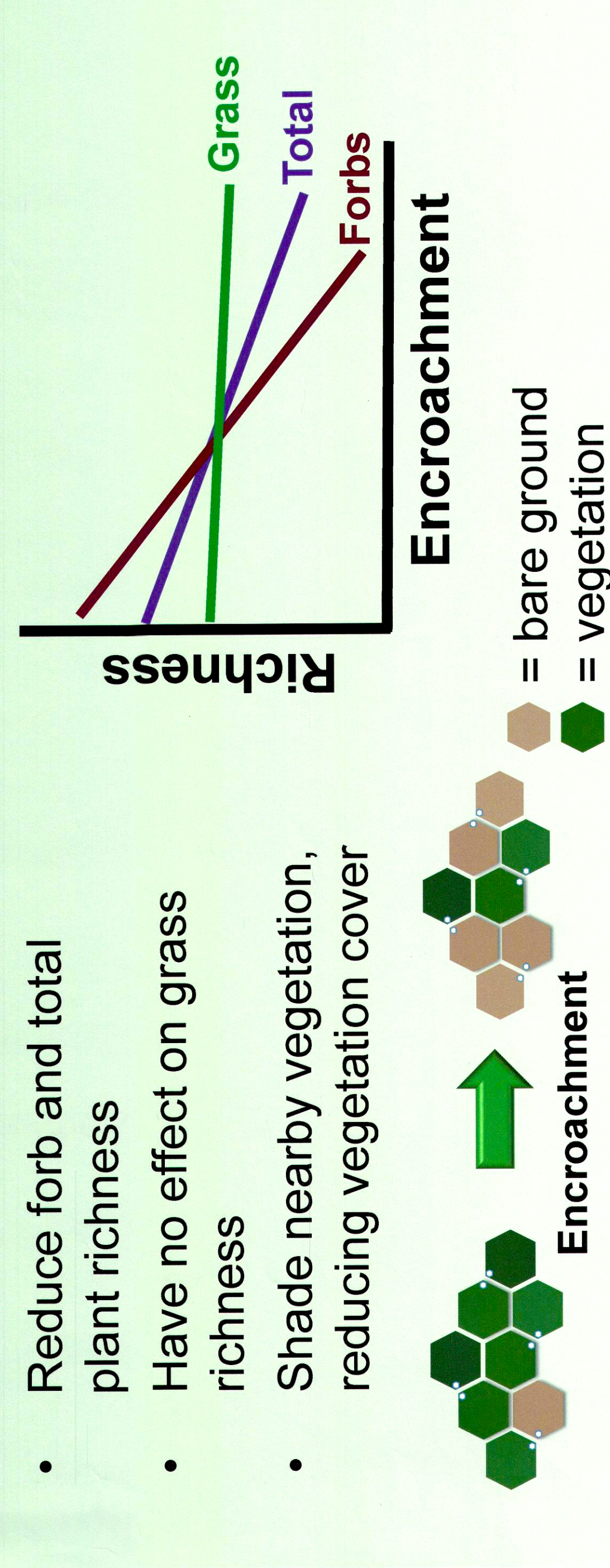
Introduction

- ### Shortgrass prairie ecosystems
- Support drought-tolerant vegetation, grazers, and at least 27 species of conservation concern^[1]
 - Threatened by fire suppression, conversion of habitat to cropland, and fragmentation^[2]
- ### Woody shrub encroachment
- Competes with native herbaceous vegetation for resources: light and water
 - Has been found to both increase^{[2][3]} and decrease^{[4][5]} herbaceous diversity



How does woody shrub encroachment influence plant diversity, vegetation cover and community structure?

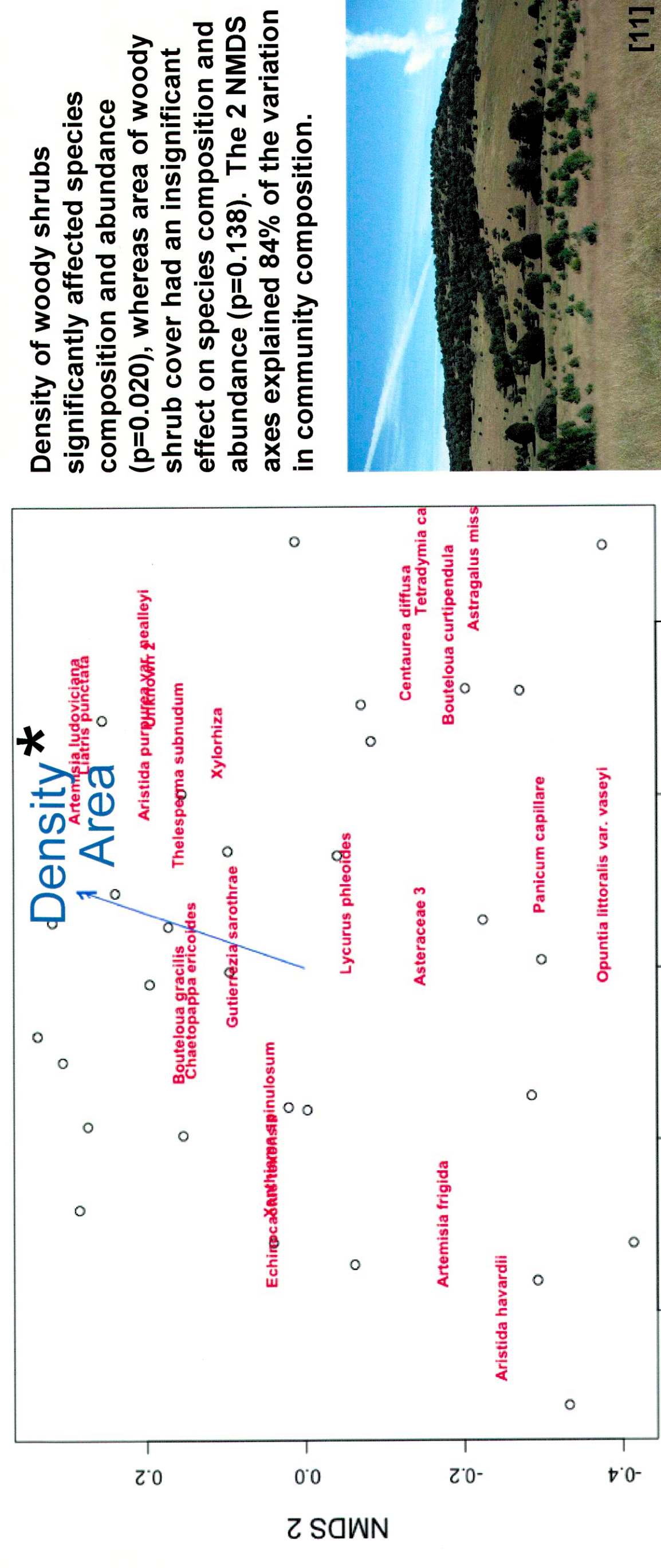
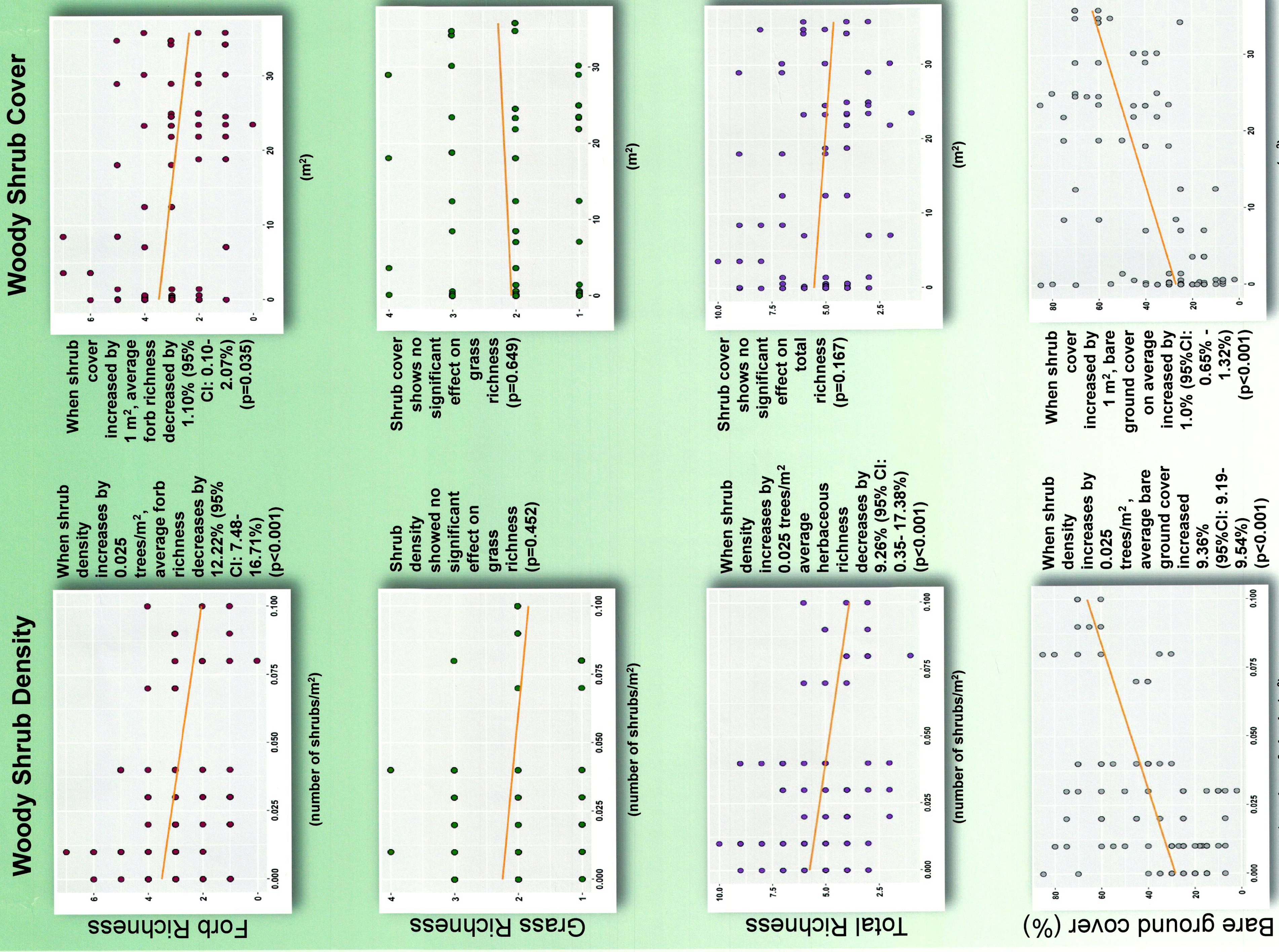
- Forb and woody shrub root structures are similar in depth, whereas grass roots are more shallow
- Thus, we expect woody shrub encroachment will:
 - Reduce forb and total plant richness
 - Have no effect on grass richness
 - Shade nearby vegetation, reducing vegetation cover



Methods

- Randomly sampled 100m² plots
 - Quantified woody shrub density and cover in each plot
 - Estimated % cover of grasses, forbs, and bare ground in three randomly placed quadrats
 - Modelled effects of shrub density and cover on grass, forb, and overall richness and bare ground using GLMs (R version 1.1.456)^[10]
 - Assessed effect of shrub density and cover on community structure using NMDS ordination (R version 1.1.456)^[10]
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Results



Discussion

- ### Key Findings:
- Woody shrub encroachment influences herbaceous diversity and cover
- ### Significance:
- Woody shrub density more strongly influenced plant diversity than woody shrub cover
- Numerous shrubs create extensive root systems that compete with plants for water, whereas canopy cover alters light availability
 - In arid New Mexico grasslands, plants are likely limited more by water than light, suggesting why woody shrub density had a stronger effect
 - Grasses are less susceptible to encroachment than forbs
 - Shrubs have deeper root structures which do not directly compete with shallow grass roots for water and nutrients
- Woody shrub prevalence reduces overall vegetation cover (increased bare ground)
- Since shrubs are much larger than herbaceous species, they shade the ground, blocking access to sunlight
 - Abundance of grassland vegetation affects food availability for grazers at Rio Mora NWR
- ### Effect on plant community:
- Grasses and species requiring full sun and wind were more commonly associated with un-encroached areas
- Forbs, drought-tolerant species, and species found in pinyon-juniper savannahs were more commonly associated with encroached areas
- white sagebrush, dotted blazing star, blue gramma, rose heath, and purple threeseawn
- ### Management recommendations:
- Shortgrass prairie conservation efforts should mitigate woody shrub encroachment, with an emphasis on maintaining forb diversity.
- Prescribed fires to mitigate encroachment^[13]
 - Encourage forb establishment through seeding^[13]

Acknowledgements

Denver Zoological Foundation: Provided staff, support, lodging and access to research area
 Rio Mora Staff: Erica Garroutte, Shantini Ramakrishnan & Luis Ramirez: Provided support and guidance in project design and implementation
 Kristofer Voss: Assisted in project design and statistical analysis
 Catherine Devitt and Ryan Lee: Collaborated in project development, data collection, and analysis

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