



Do pinyon and juniper shrubs outcompete herbaceous vegetation?

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INTRODUCTION

Importance: With an open landscape and semiarid climate, short grass prairies support unique biodiversity, including bison, songbirds, and a variety of grass species.

Problem: Woody shrubs are encroaching on short grass prairie in Rio Mora National Wildlife Refuge (RMNWR).

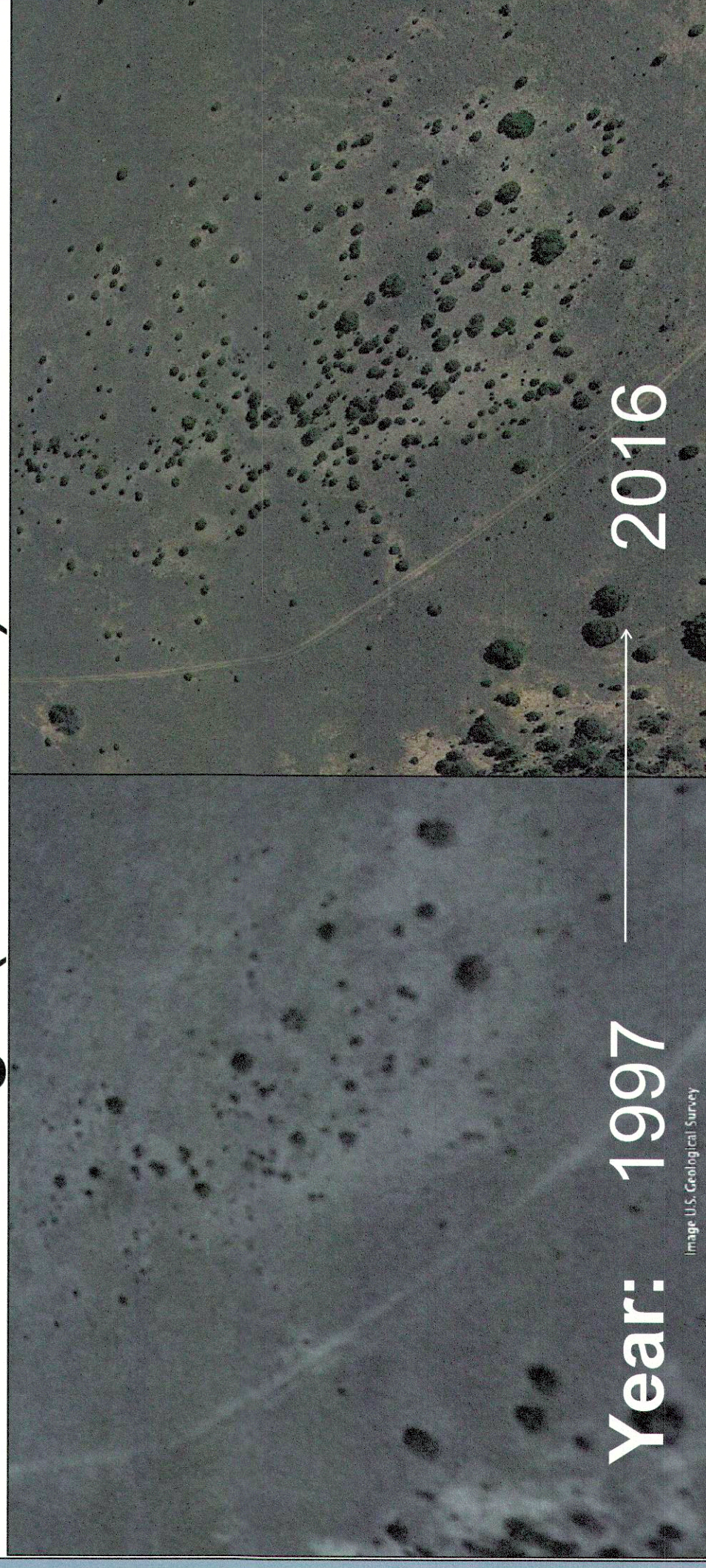


Figure 1. PJ encroachment in RMNWR north pasture between 1997 and 2016.

Question: Do pinyon (*Pinus edulis*) and juniper (*Juniperus spp.*) shrubs outcompete herbaceous vegetation for resources?

Hypothesis

Woody Shrubs

use more water, and create shade with their canopy.



Herbaceous Vegetation

Is left with fewer water resources, and less access to light.



PREDICTION

- ↑ pinyon or juniper (PJ) tree size & proximity to tree
- ↓ herbaceous cover and richness



METHODS

Study Site

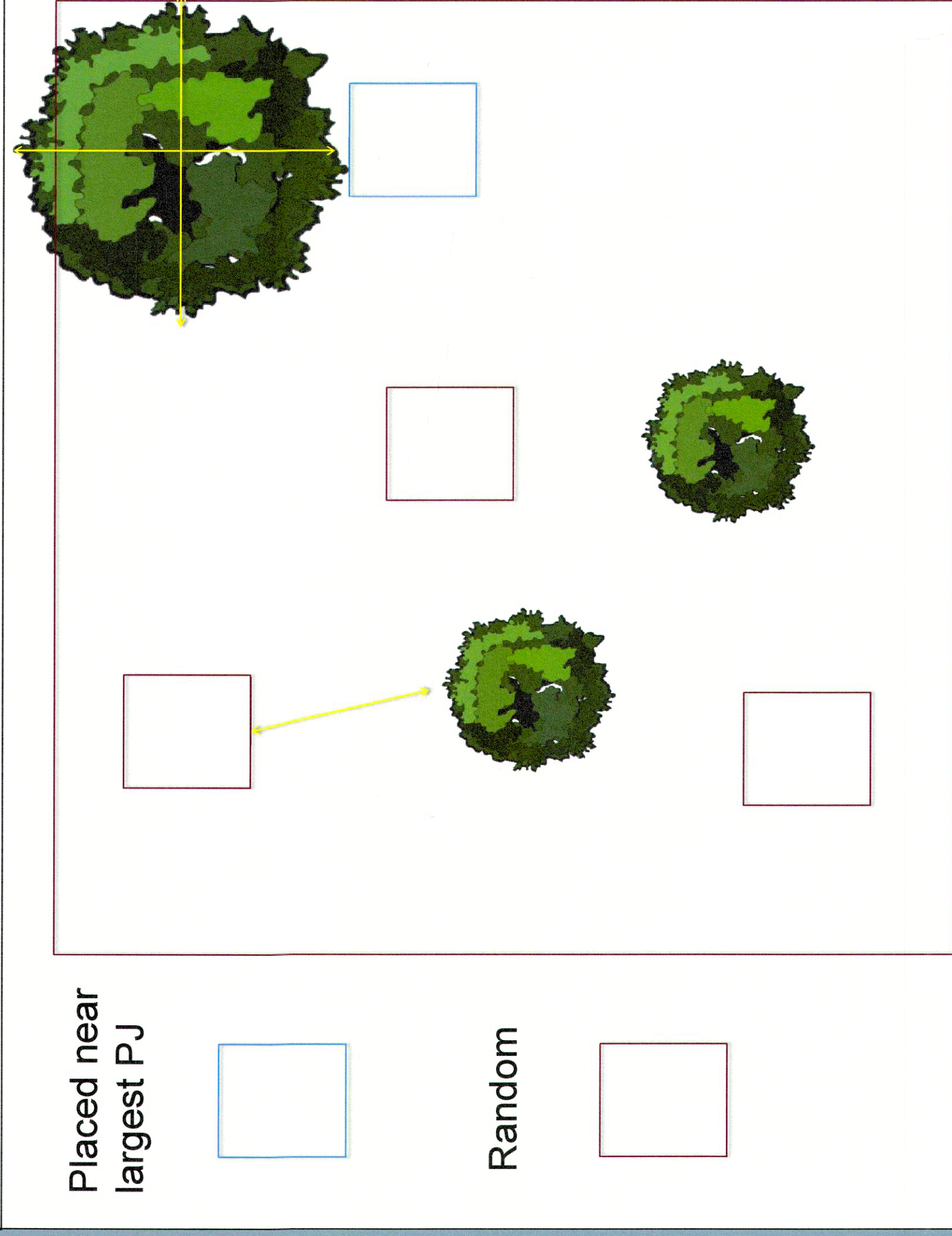


Figure 2. Red outline indicated study area in the north pasture.

- Rio Mora North Pasture
- Area: 300 x 40 m
- 30 Random plots
- 10 x 10 m plots

Data Collection

- Canopy area (πr^2) largest shrub in plot
- Measured vegetation cover in all four quadrats
- Distance of random quadrats to nearest shrub



Data Analysis

- All analysis was done in R studio version 3.3.2.
- An NMDS was used to evaluate community composition.
- A generalized linear model was used to evaluate the effects of canopy area.
- A mixed model was used with quadrats nested within plots to account for random effects.

RESULTS

Effects of PJ Canopy Area

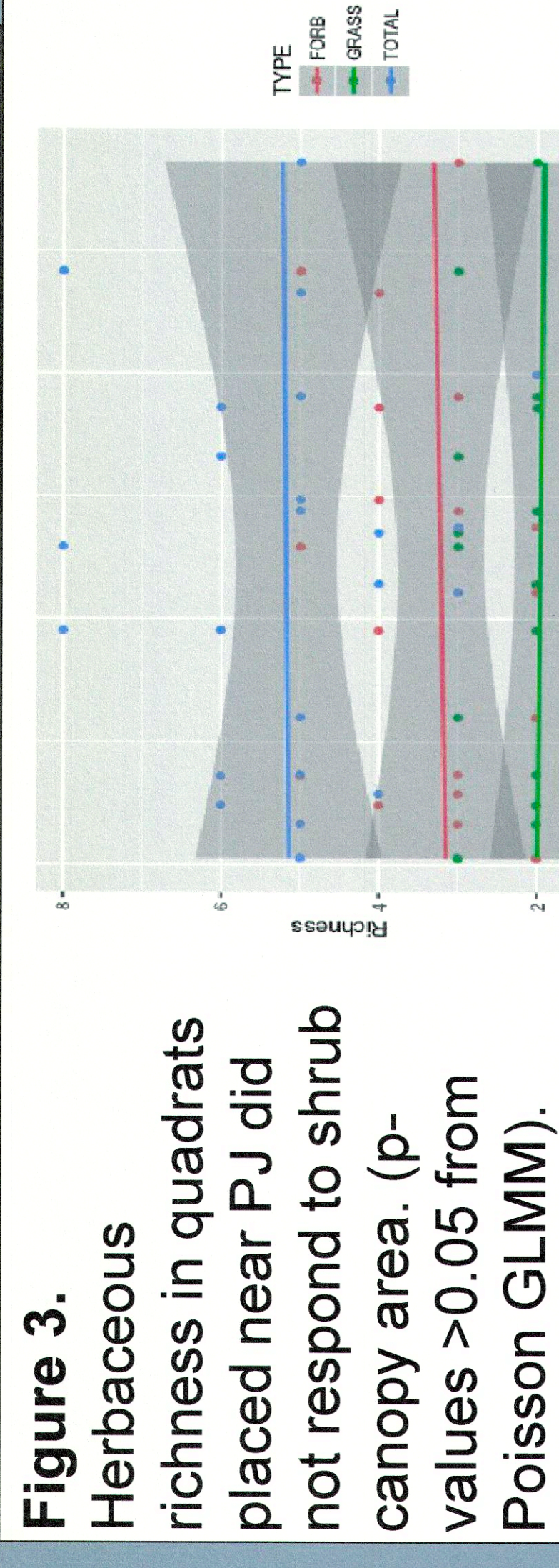


Figure 3. Herbaceous richness in quadrats placed near PJ did not respond to shrub canopy area. (p-values >0.05 from Poisson GLMM).

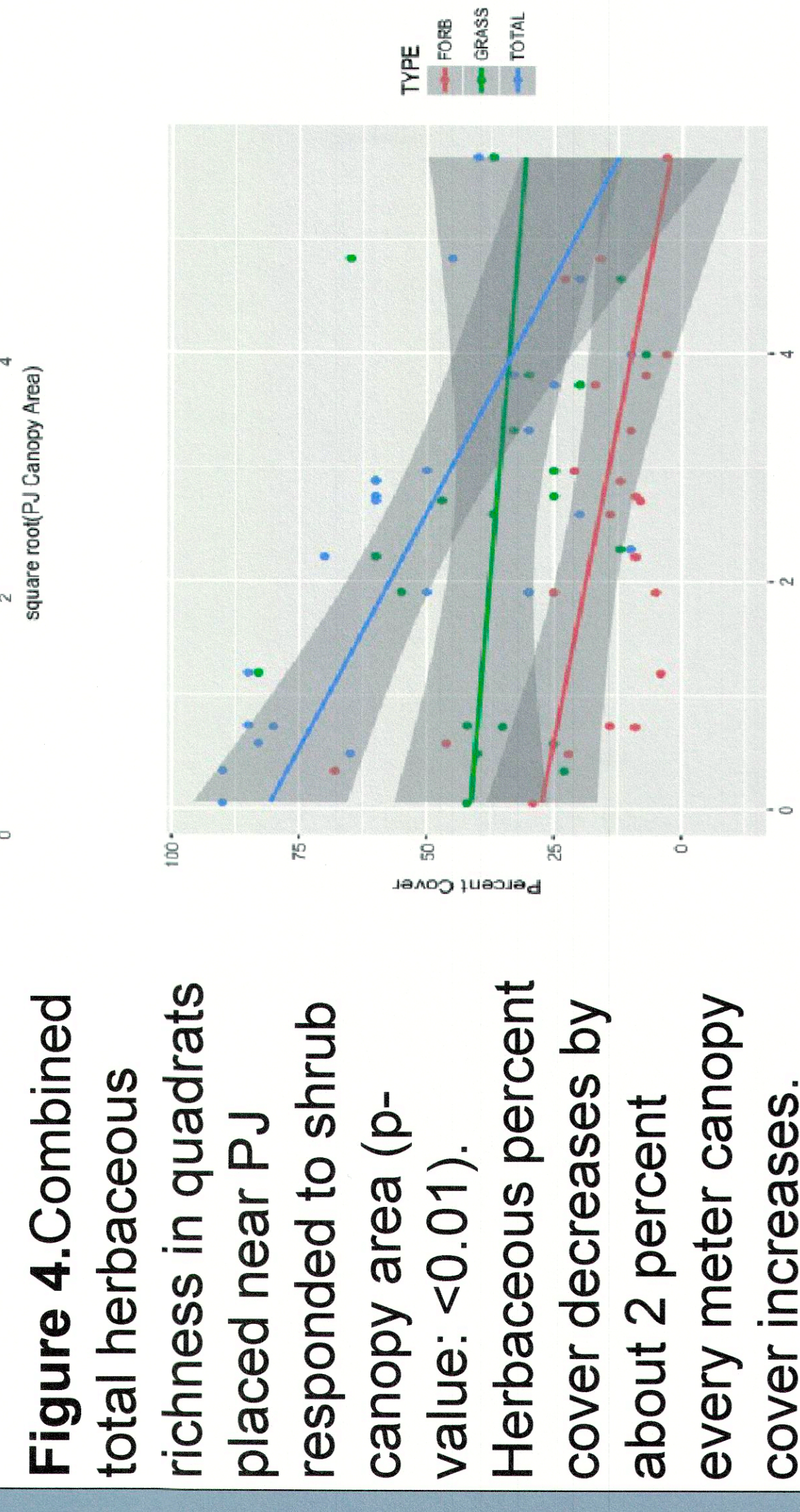


Figure 4. Combined total herbaceous richness in quadrats placed near PJ responded to shrub canopy area (p-value: <0.01). Herbaceous percent cover decreases by about 2 percent every meter canopy cover increases.

• NMDS showed no correlation between community composition and PJ size (p-value:0.97).

Effects of PJ Proximity

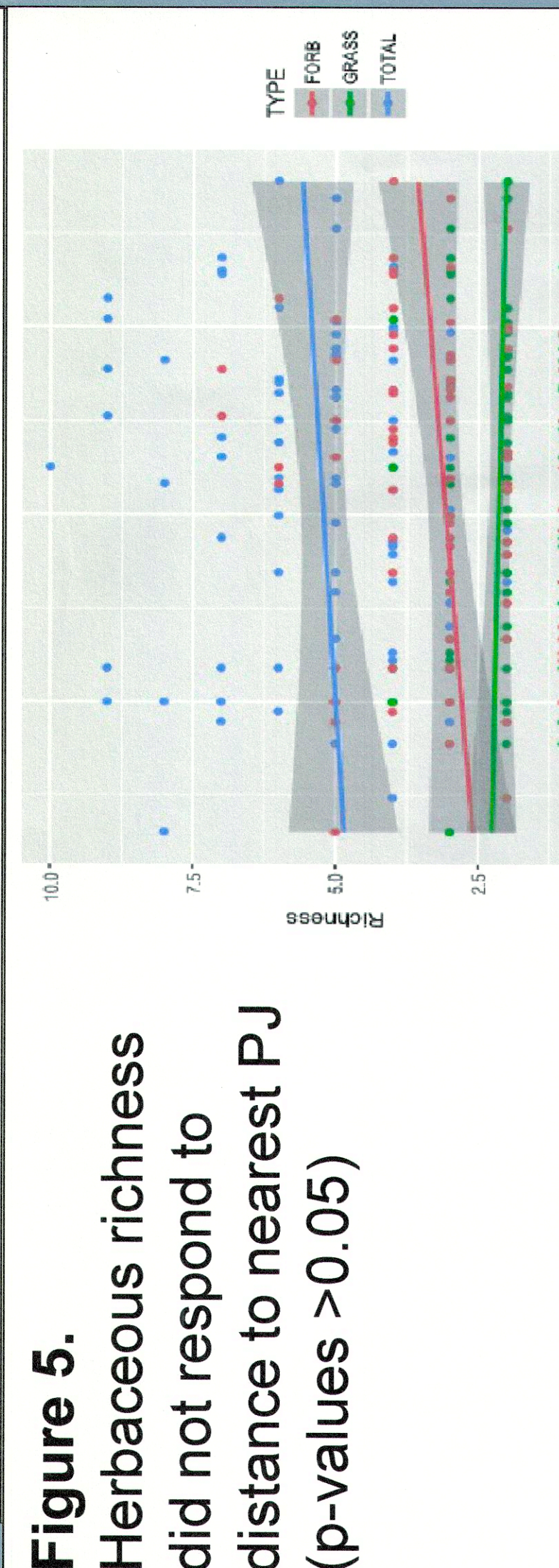


Figure 5. Herbaceous richness did not respond to distance to nearest PJ (p-values >0.05)

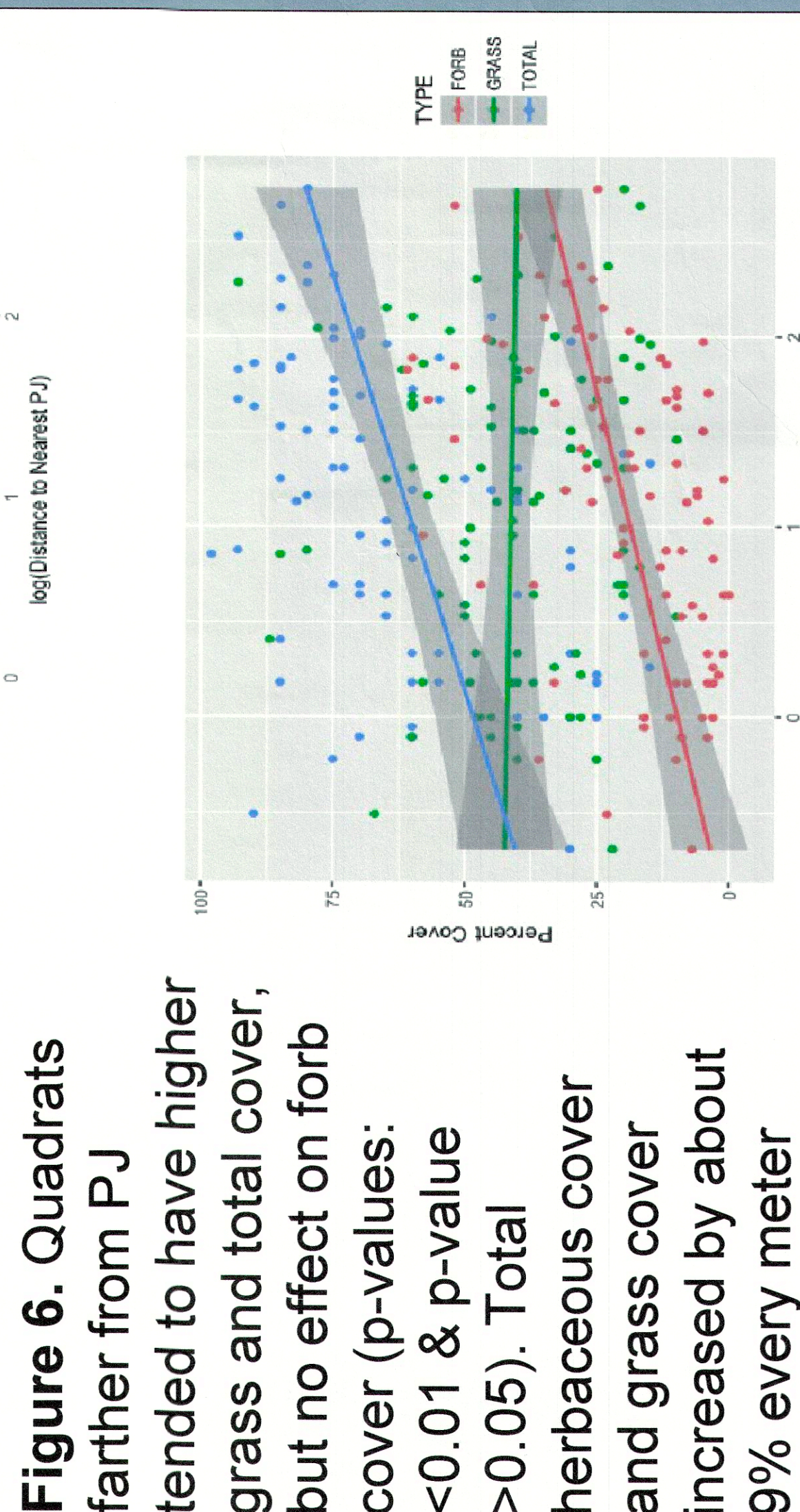


Figure 6. Quadrats farther from PJ tended to have higher grass and total cover, but no effect on forb cover (p-values: <0.01 & p-value >0.05). Total herbaceous cover and grass cover increased by about 9% every meter further from a PJ.

• NMDS showed no correlation between community composition and distance to nearest PJ (p-value: 0.13)

DISCUSSION

- Pinyon and juniper shrubs may be outcompeting herbaceous vegetation for resources, leading to a decrease in herbaceous cover in response to PJ size and proximity.
- In line with Van Auken (2000) & Primack (2002) we showed that grasslands are being negatively impacted by the PJ encroachment.
- Forbs were more greatly impacted by the PJ encroachment, which is in opposition to Van Auken (2000) who proposed that the larger shrubs got, the more they would compete with grasses.
- Follow up studies should look at the rate of PJ encroachment at Rio Mora National Wildlife Refuge.
- Future research should consider different types of management strategies that can be used in short grass prairies where PJ encroachment is occurring.

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