Native grass characteristics within xeroriparian communities of the Barry M. Goldwater Range-East, Arizona

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Introduction

Native grasses have been identified as an important conservation element in the Sonoran Desert, including the Barry M. Goldwater Range-East (BMGR-E), Arizona. These grasses and their surrounding xeroriparian plant communities are of particular interest due to their value as wildlife habitat.

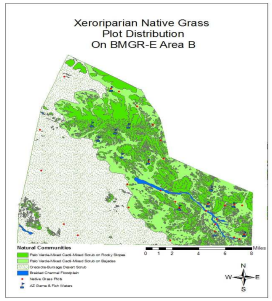
The Goldwater Range is home to several protected and endangered wildlife species, including the Sonoran pronghorn antelope (*Antilocapra americana*), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*), flat-tailed horned lizard (*Phrynosoma mcallii*), and lesser long-nosed bat (*Leptonycteris curasoae*). All of these animals share desert riparian communities as a part of their habitat. The presence of these species, as well as an abundance of unprotected wildlife, makes natural resource conservation a key concern for range managers.

In order to assess the overall ecological condition of the Goldwater Range, the plant communities present on the range must be thoroughly characterized. Native grasses are of particular interest, as they have long been considered an indicator of ecosystem health.

Objectives

- Are there differences in native grass species cover, density, and diversity between xeroriparian communities with different adjoining matrix communities?
- Are there differences in native grass species cover, density, and diversity within a xeroriparian community with distance from an active wildlife water development?
- Are there differences in native grass species cover, density, and diversity between xeroriparian communities that contain different amounts of non-native grass species richness and cover?

Study Area



Methods

Data Collection

In the field, 34 native grass plots were established within the *Valley Xeroriparian Scrub* and *Braided Channel Floodplain* natural xeroriparian communities. Plot centers were established in the approximate center of the wash bed and surrounding xeroriparian community. From the plot center, we measured out a circular plot radius of 25 meters in order to effectively capture the unique xeroriparian vegetation that borders the non-vegetated dry wash beds. We recorded information on the character of the substrate, the slope and aspect of the plot, and the presence of any disturbances or activities that might have impacted the soil or the living plants, including fire, flooding, and grazing.

For the entire plot area, we estimated the total percent of the plot's area covered by each identifiable grass species' canopy. All other vascular plants' canopy cover was estimated by life form groups: trees, shrub/vines, herbs/forbs/ferns, and cacti.

Within the plot area, we established five 1.5m x 1.5m grass density measurement quadrats. Figure 2 illustrates the plot layout and quadrat distributions for the native grass plots. Photo 1 shows an example of the native grass plots in the field.

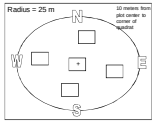


Figure 2: Diagram of xeroriparian native grass plot illustrating the layout of quadrats within the larger 25 meter radius plot

Photo 1: Field use of 1.5m x 1.5m quadrat

A complete tally of individual grass clumps was conducted for each species of native grass present within each quadrat. The percent of the area covered within each quadrat by any grass species present was also recorded. We tallied individual grass clumps for all species of grass (both native and exotic) within quadrats along the East cardinal line in each native grass plot.

Data Analysis

The grass density data was summarized by the number of individual clumps per square meter. Single-factor analysis of variance (ANOVA) tests were used to look for significant relationships between the nominal landscape variables (distance from water development, adjoining matrix community) and the native grass characteristics (cover, density, and diversity) and exotic grass cover.

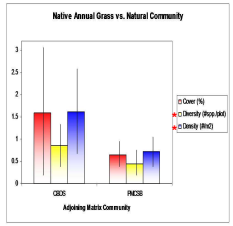
Photo 2: Plot with high cover of *Aristida spp.* located in CBDS matrix of Valley Xeroriparian Scrub community

Photo 3: Plot with *Aristida purpurpea* lining streambed in PMCSB matrix of Braided Channel Floodplain community

Photo 4: *Heteropogon contortus* located in center of plot in PMCSB matrix of Valley Xeroriparian Scrub community

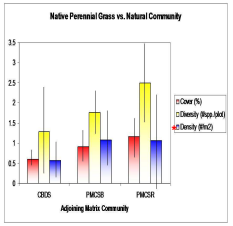
Photo 5: Site with high cover of *Pleuraphis rigida* in CBDS matrix of Valley Xeroriparian Scrub community

Results



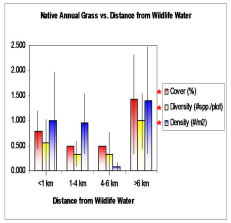
Native Annual Grass vs. Adjoining Matrix Community

Creosote-Bursage Desert Scrub (CBDS) has 2x greater cover, diversity, and density than Palo Verde-Mixed Cacti-Mixed Scrub (PMCSB) on Bajadas



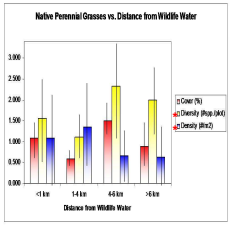
Native Perennial Grass vs. Adjoining Matrix Community

PMCSB has almost 2x greater cover, diversity, and density than CBDS



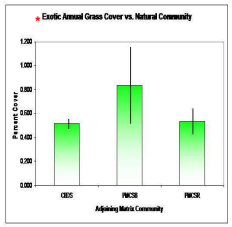
Native Annual Grass vs. Distance from Wildlife Water

Locations >6 km away from an active wildlife water development have the highest values for cover, diversity, and density



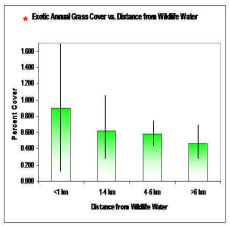
Native Perennial Grass vs. Distance from Wildlife Water

Cover and diversity increase as you move farther from a wildlife water, while density decreases



Exotic Annual Grass Cover vs. Adjoining Matrix Community

Exotic annual cover is about 60% higher in PMCSB than in CBDS



Exotic Annual Grass Cover vs. Distance from Wildlife Water

As distance to wildlife water increases, exotic annual cover decreases

* Indicates statistically significant relationship ($p < 0.05$) between grass characteristics and nominal landscape variables

Discussion

Adjoining Matrix Community

On the BMGR-E, native annual grasses show trends opposite from those demonstrated by native perennial grasses. Native annuals are dominant in valley bottom CBDS communities, whereas native perennials are dominant in upland PMCSB communities. This suggests that the two growth forms are adapted to different growth regimes, as the two communities occur in areas of differing elevation and substrate material. It is possible that the perennials have a greater abundance in PMCSB communities due to a need for moister and cooler conditions than are present in the CBDS communities.

Distance from Active Wildlife Water Development

Distance from a wildlife water development did not have the same pronounced effect on annual and perennial distribution as did the adjoining matrix community. Native annuals had their highest cover, diversity, and density in plots more than 6 km away from a wildlife water development, while native perennials did not show such a pronounced difference in distribution. This is likely due to the fact that the plots with the highest native annual values were located in the CBDS communities, while the wildlife waters are located far away in the PMCSB communities.

Exotic Grasses

Exotic annuals had greater abundance in the more mesic PMCSB communities, closer to the wildlife waters, than in the CBDS bottomlands. Their highest cover occurred in plots located less than 1km away from a wildlife water development (often located within 500m of water development), suggesting that the presence of disturbance in the area (either anthropogenic or natural use of the area by wildlife) has given rise to a greater abundance of exotic annual grasses. Only one exotic grass species was recorded on the BMGR-E: *Schismus barbatus* (Mediterranean grass), a cool-season C3 grass that grows in sandy, disturbed sites along roadsides and in dry riverbeds.

In conclusion, native and perennial grasses on the BMGR-E exhibited observable trends related to the nominal landscape variables we evaluated. These results indicate that the presence of active wildlife water developments on the BMGR-E has an effect on the presence and abundance of both native and exotic grass species. Results also show the preference of perennials and annuals for different types of habitat on the BMGR-E. Additional research is needed to establish cause and effect relationships for these findings.

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