



Evaluating the effects of horizontal and vertical mulches for restoration of a degraded site in the Mojave Desert: First year findings

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Introduction

Anthropogenic disturbance and the invasion of exotic plant species are major drivers of ecosystem change in California's deserts. Restoration efforts can be particularly difficult in the desert due to the harsh, dry climate and slow recovery of native plants. Funding and time constraints can also hinder restoration of disturbed sites. Here, we compared horizontal and vertical mulches used to encourage the recovery of native annuals and attract native rodents to aid in soil decompaction. Mulching may increase soil moisture, provide shade, and provide safe sites for wind-dispersed seeds. **We hypothesized that vertical mulching would lead to increased plant cover and richness, that horizontal mulches would decrease invasive plant cover via shading, and that both mulches could provide shelter for native reptiles and mammals.**

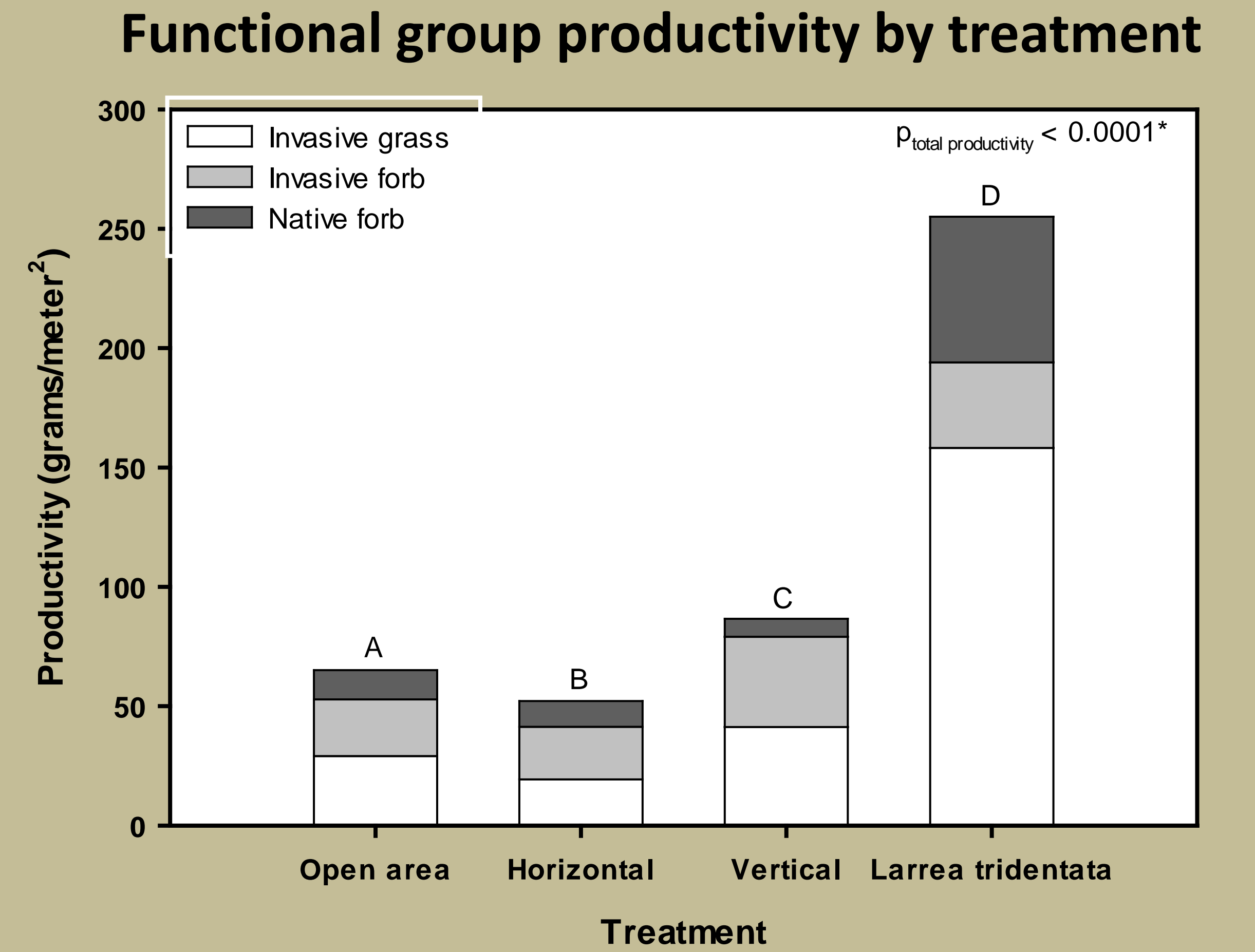
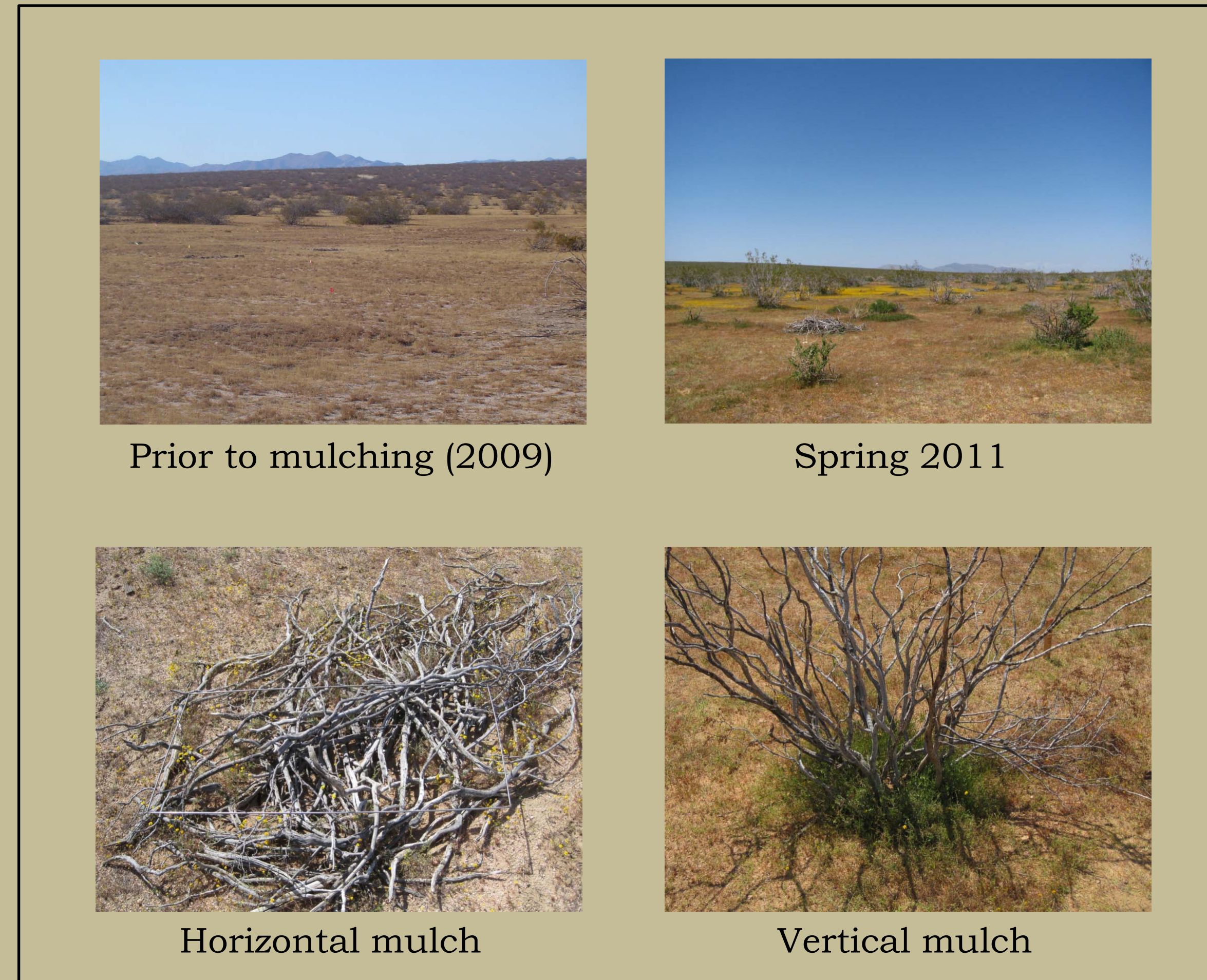
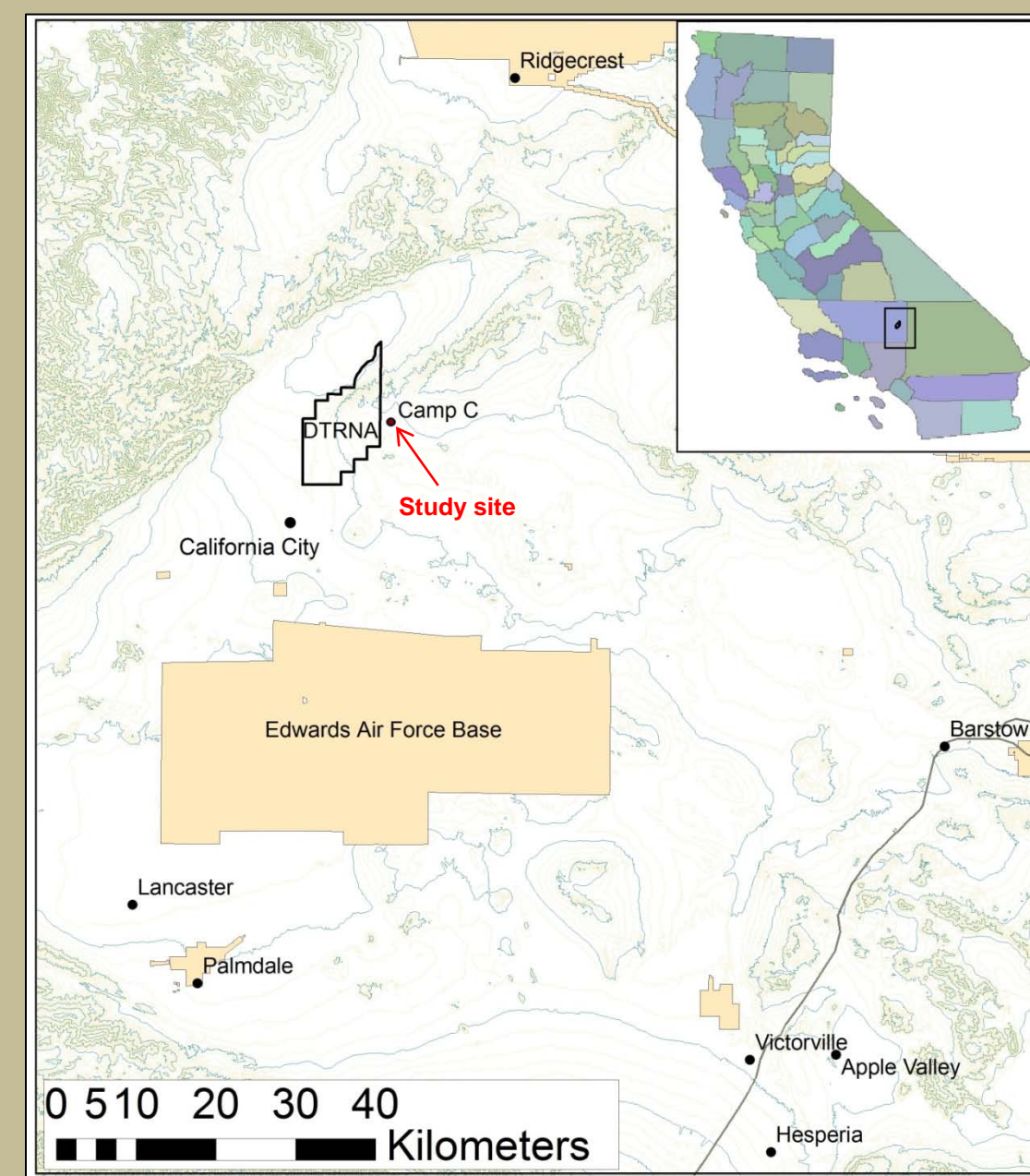
Methods

Field site: Camp-C, located 1.6 km east of the Desert Tortoise Research Natural Area, in the northwestern Mojave Desert was severely degraded by human use. Restoration activities began in 2007 and are ongoing.

Experimental design: Vertical (V) and horizontal (H) mulches were set up in the fall of 2010 over a 7.1 ha area. In spring 2011, 25 randomly selected V and H treatments were chosen for sampling, along with 25 random open areas (OA; interspace) and *Larrea tridentata* (LT) shrubs.

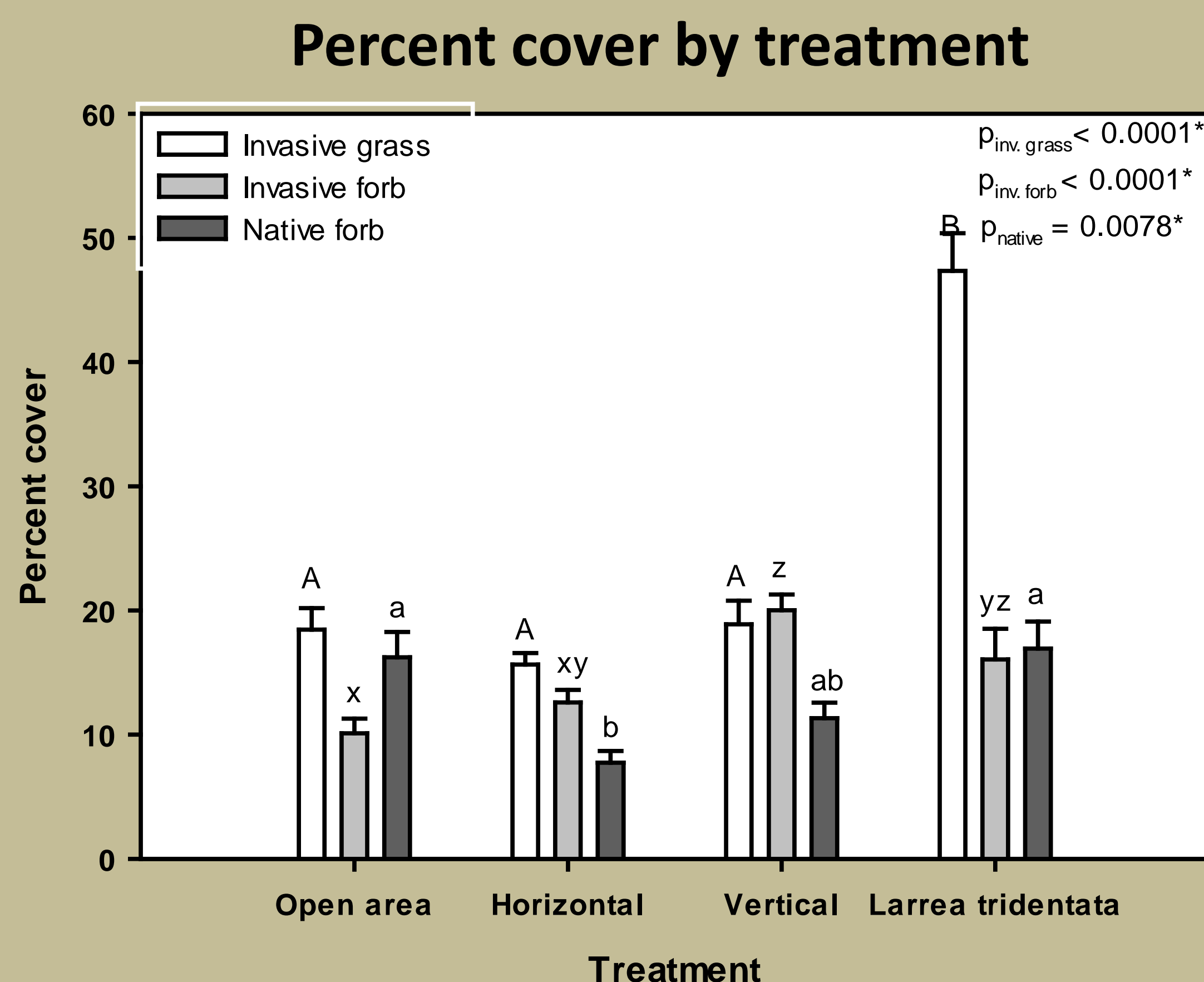
Sampling design: 1 x 0.5 meter plot frames were used to measure percent cover and species richness on the north and south sides of each plot. The number of rodent holes was also counted per plot. Biomass was clipped and annual plant productivity was calculated using biomass regressions.

Analysis: We used a Kruskal-Wallis Test for nonparametric data to determine whether measures among treatments differed. Tukey's HSD or Mann-Whitney tests were used to determine differences between treatments.



Results

- 5 invasive and 30 native plant species identified
- Percent cover of all functional groups differed by treatment, but invasives tended to dominate
- Native species richness was higher in V versus LT plots, but low overall (2.4 – 3.1 species/plot)
- V and H treatments did not attract rodent activity
- H plots were the least productive
- LT plots were over twice as productive as other plots



Discussion

First year findings: Five months after the mulches were established, we found few significant differences between H and V plots. V plots supported higher plant productivity, but this did not translate into higher cover or productivity of native species than H plots. Mulch treatments did not attract rodent activity, but may provide shelter for rodents, lizards, and juvenile desert tortoises in the future.

LT plots had the highest cover and productivity of any treatment type, largely due to the abundance of invasive annual grasses (4 *Bromus* species & *Schismus* spp.) in the understory. *Erodium cicutarium* was the only invasive forb identified within the study plots.

The mulches were created using existing plant material and, if successful, could offer managers an option for restoration that requires minimal labor and funding compared to other, more costly methods. Over time, these results may be used to inform restoration efforts in the northwestern Mojave and other desert sites.

Future directions: We plan to continue monitoring this project to measure changes in species cover and composition over time. We also plan to measure additional parameters such as soil nutrients, compaction, and moisture.

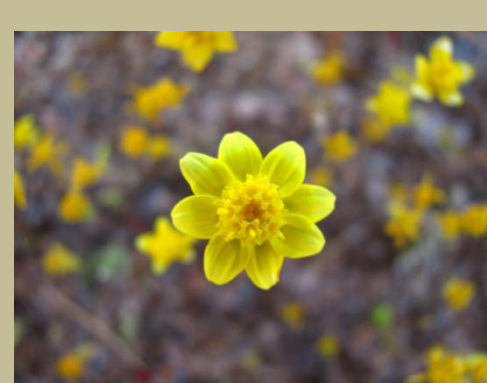
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Salvia carduacea



Phrynosoma platyrhinos



Lasthenia californica