Vegetation and Arthropod Responses to Brush Reduction by Grubbing and Stacking

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Brush Encroachment

- 93% of the Rio Grande plains and 34% of the coastal prairie have some brush encroachment

Potential Causes of Brush Encroachment

- High levels of grazing
- Spread of seed by livestock
- Change in fire frequency
- Climate change
- Elevated levels of CO^2
- Changes in grass competitive ability
- Combinations of these factors

Brush and Bobwhites

- Bobwhites need brush!
- Provides loafing cover
- Provides whistling posts
- Provides food
- Helps them survive heat and droughts
- Brush can compete with grasses and forbs
- Bobwhites appear to handle much higher brush densities than bobwhite hunters

Brush Management

- Mechanical, herbicide, and/or fire
- In 2003, it was the most common Environmental Quality Incentives Program
- $12 million funding in Texas that year

Grubbing and Stacking

- Grubbing is a mechanical brush management treatment
- Allows for selectively removing woody plants unlike some other methods (e.g., root-plowing or chaining)
- Stacking used as to pile downed brush
- Brush piles subsequently burned

Grubbing and Stacking

- Treated 50 m on each side of seismic strips
- Target mesquite and huisache while leaving mixed brush species intact
- Leave brush patches within a softball throw of more brush
- Goal was to create hunting lanes and improve bobwhite brooding, feeding and nesting habitat

Objectives

Test the hypothesis that grubbing and stacking:

- Decreases target brush, while leaving mixed brush (granjeno, brasil, lime prickly ash, etc.) largely intact

Objectives

Test the hypothesis that grubbing and stacking:

- Improves habitat for bobwhite brooding, feeding and nesting habitat

Study Area

- Santa Gertrudis Division of King Ranch, Inc.
- Near Kingsville, Texas in Kleberg County (27.30°N, 97.51°W).

Methods

- Established ten, 25-m permanent transects on treated and non-treated sites
- Estimated woody canopy using line intercept method
- Estimated cover of herbaceous vegetation, bare ground, and forb species richness using a quadrat
- Counted nesting clumps in circles with a radius of 2-m

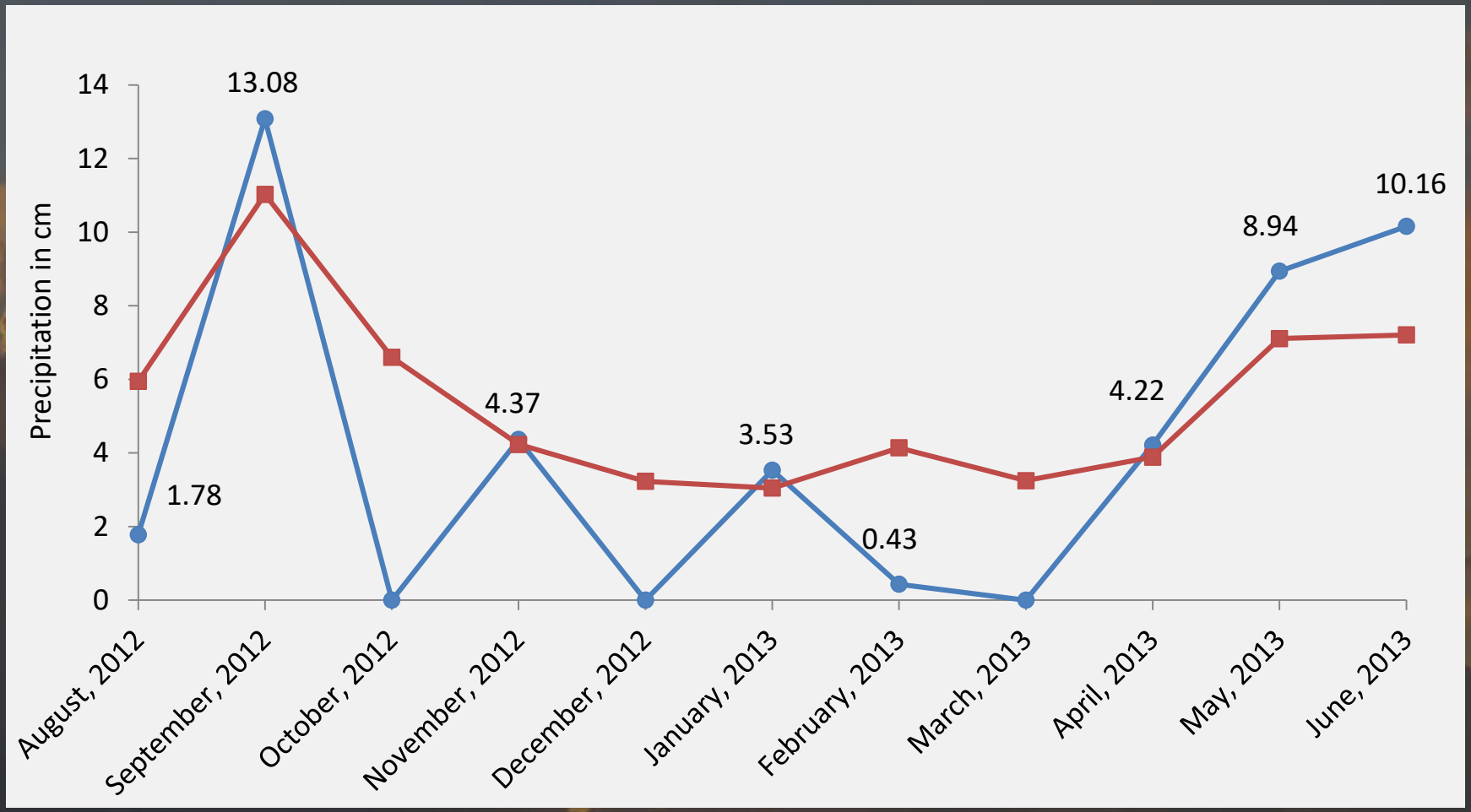
Methods

- Sampled arthropods using a sweep net and a D-Vac
- Separated, dried and weighed arthropods in the lab

Statistical Analysis

- Analyzed all data with Permanova+
- Used analysis of variance
- If pretreatment values were different we used analysis of covariance
- We selected an alpha of 0.10 as the significance level

Precipitation



Precipitation data obtained from King Ranch records, from Canelo Pens rain gauge.

Treated Transect 4

Pre-grubbing
7-25-2012

9-19-2012

Post-stacking
12-11-2012

1-7-2013

3-20-2013

7-8-2013

Treated Transect 5

Pre-grubbing
7-25-2012

9-19-2012

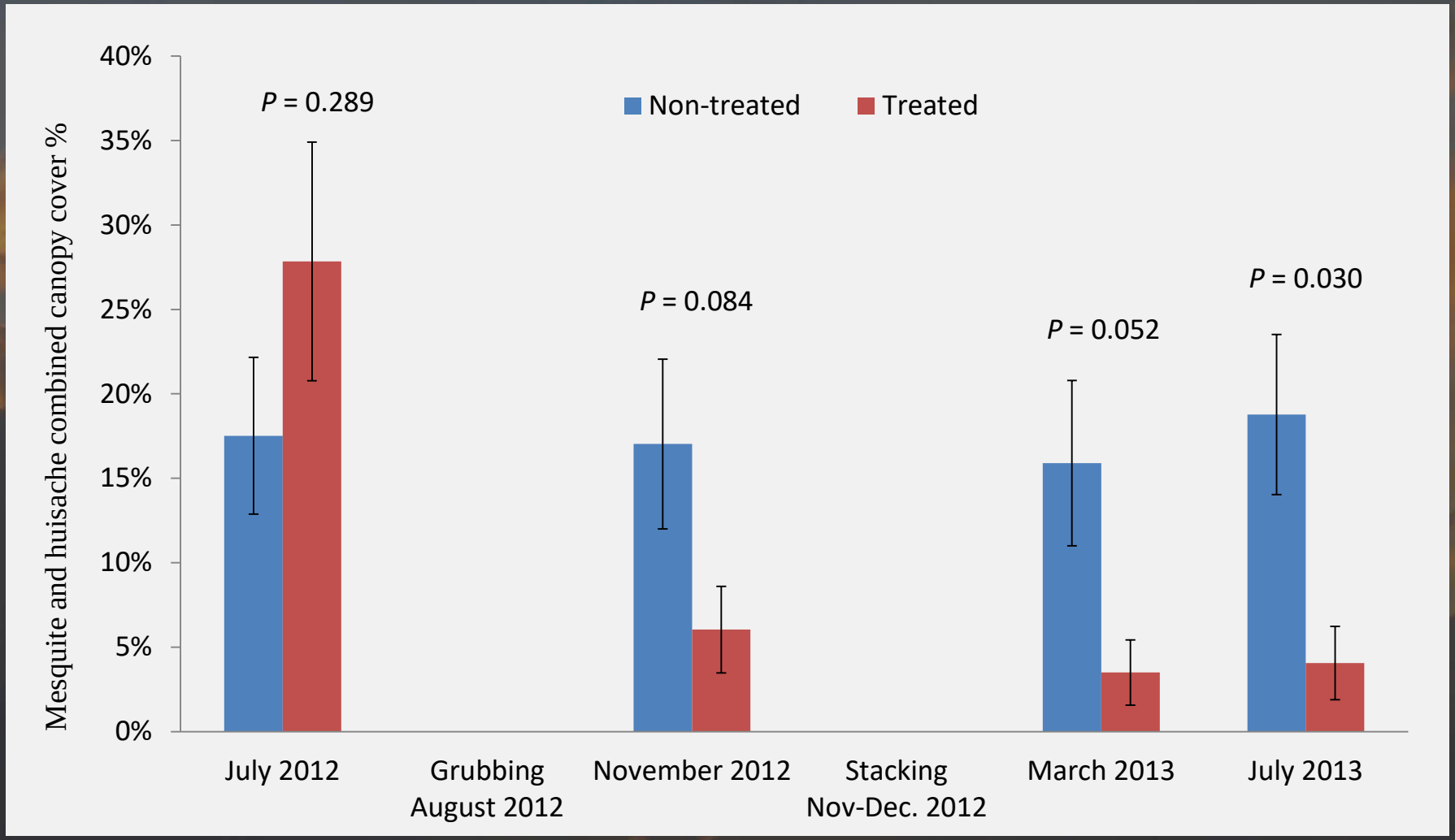
12-11-2012

Post-stacking
1-7-2013

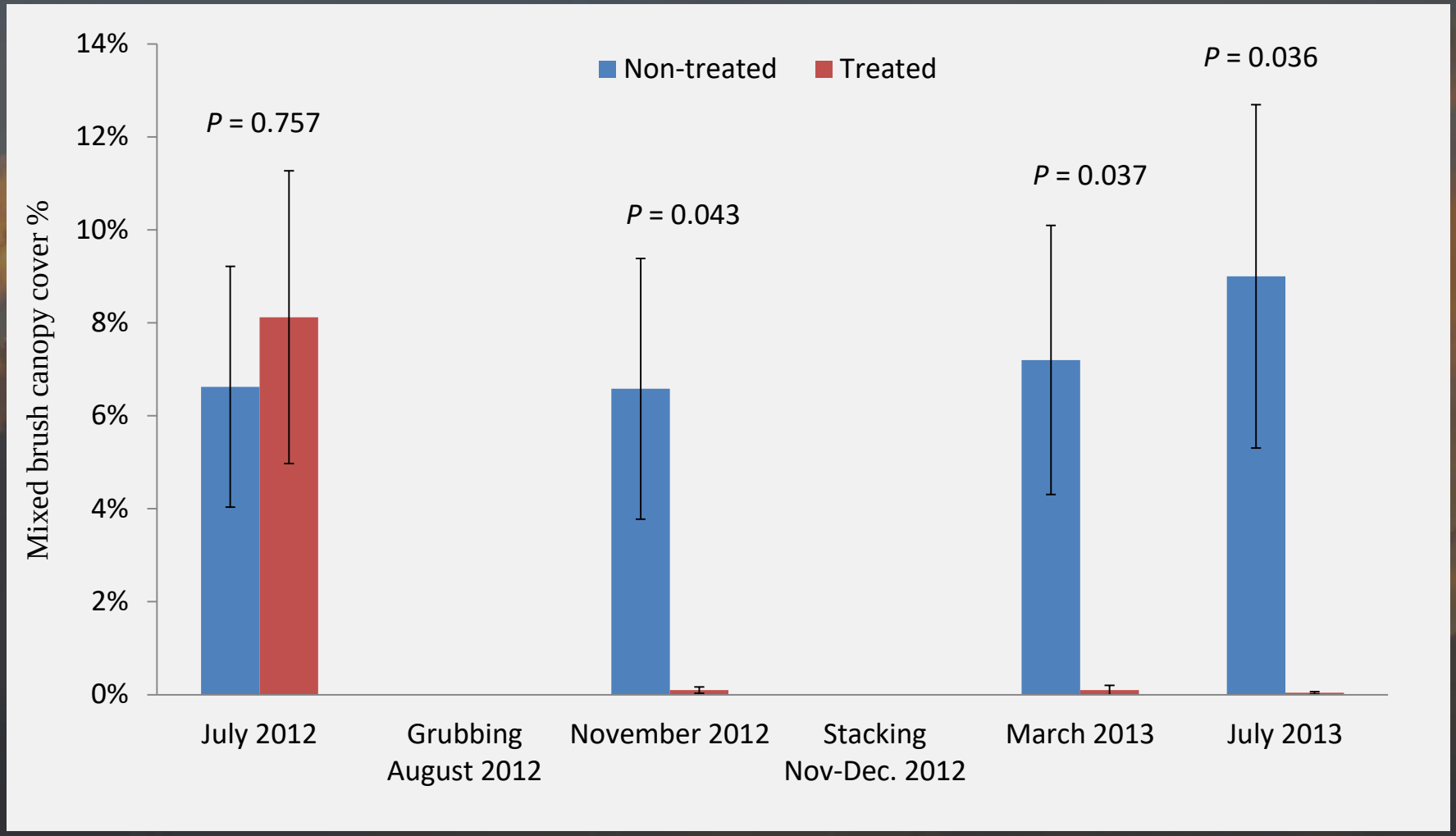
3-10-2013

7-8-2013

Mesquite and Huisache Combined Canopy Cover



Mixed Brush Canopy Cover



Summary of Vegetation Results

Response Variable	Grubbing Aug 2012	Stacking Nov 2012	Stacking March 2013	Stacking July 2013
Bare Ground	ND		+	ND
Forb Species Richness	ND		+	ND
Food Forbs Canopy	No treatment effect or Treatment x date interaction (P≥0.106)----------			
Food Grasses and/or Sedges Canopy	ND		ND	+
Nesting Clumps	No treatment effect or Treatment x date interaction (P≥0.245)----------			

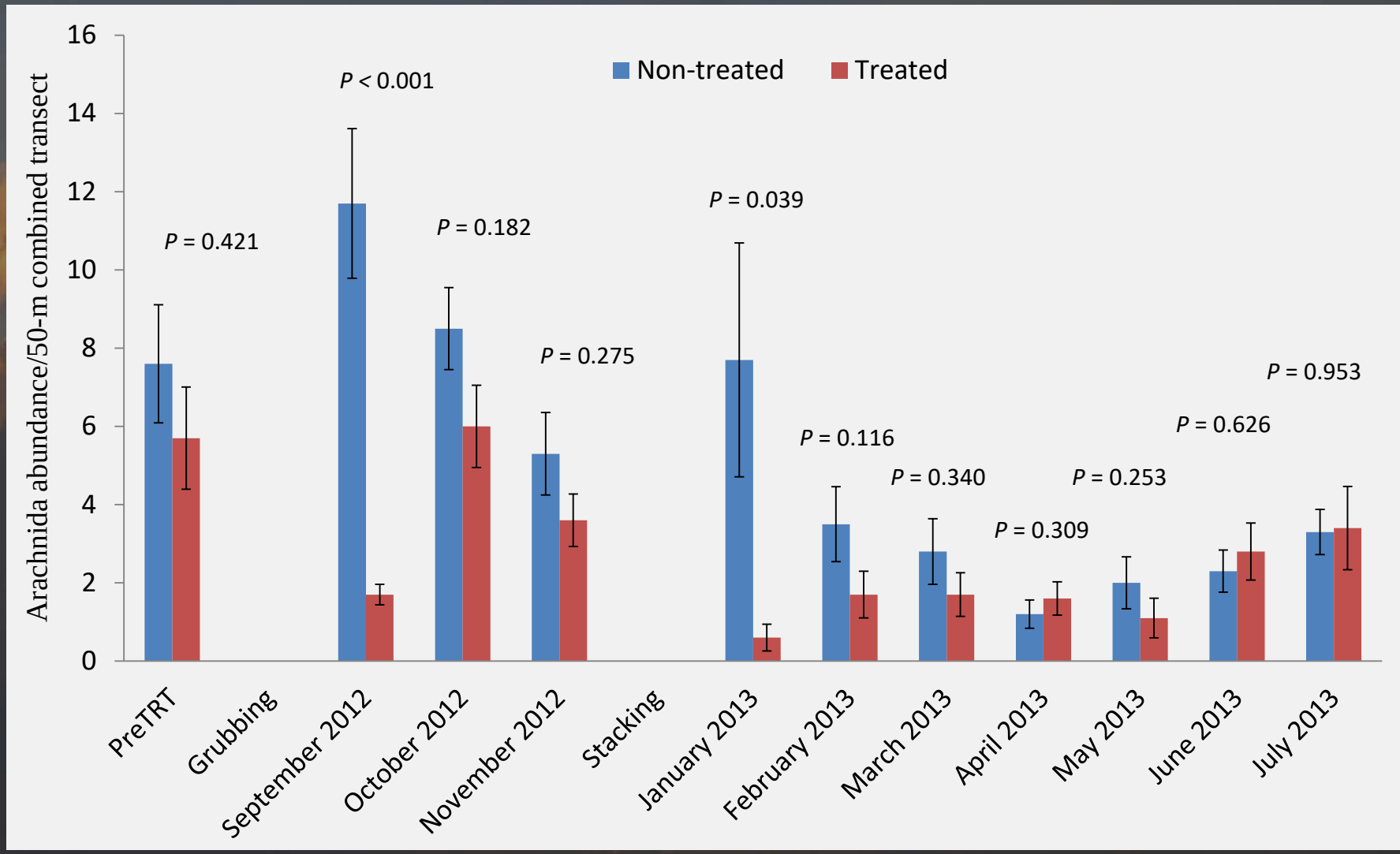
+ if grubbed and stacked site was greater than non-treated site (P≤0.100), and ND if there was no difference (P≥0.100).

Summary of Arthropod Results

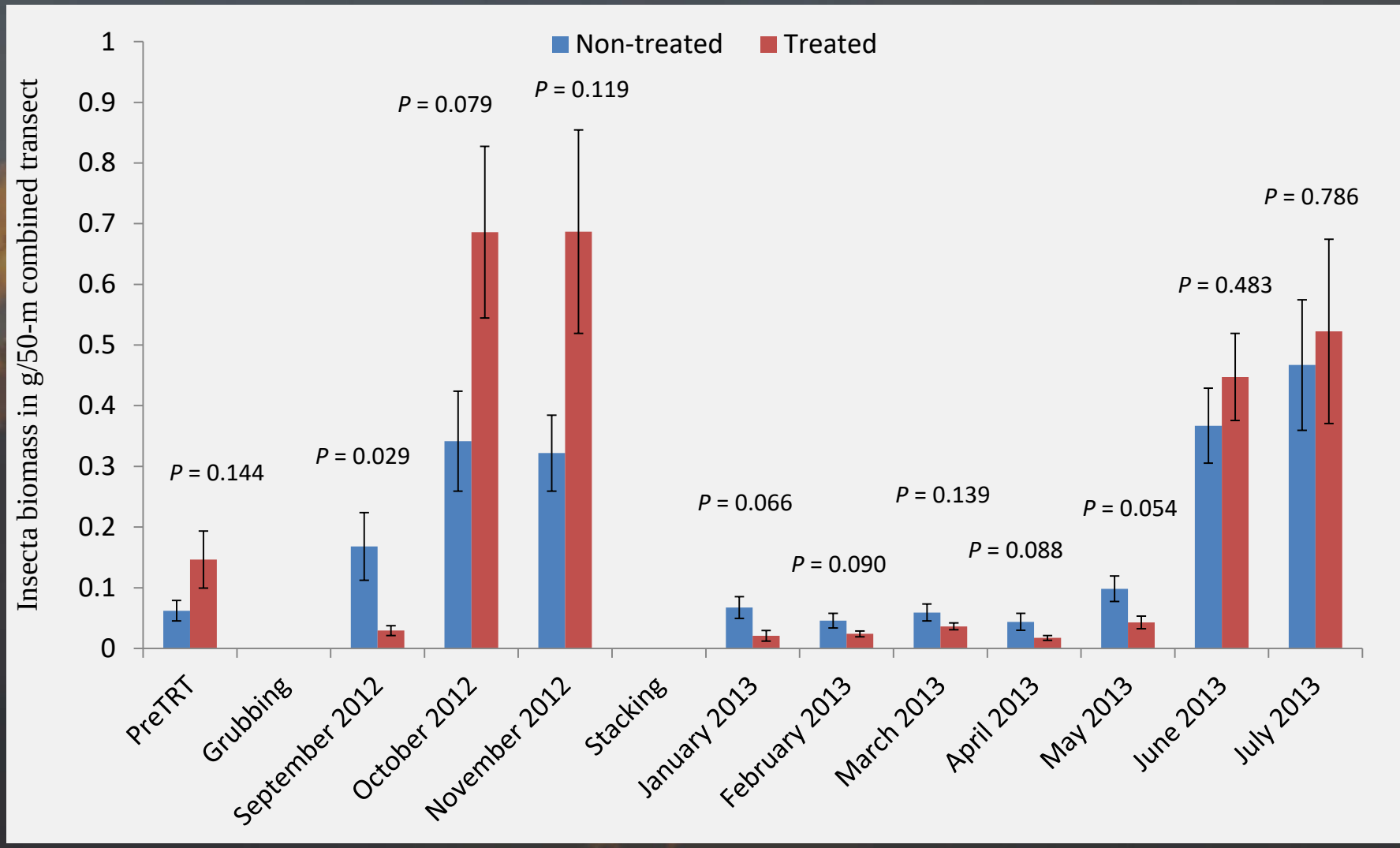
Response Variable	Grubbing	Sep 2012	Oct 2012	Nov 2012	Stacking	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013	Jul 2013
Arach. Abundance		-	ND	ND		-	ND	ND	ND	ND	ND	ND
Arach. Biomass		-	ND	ND		ND	ND	ND	ND	ND	+	+
Insecta Abundance		No treatment effect or Treatment x Date Interaction (P≥0.372)----------										
Insecta Biomass		-	+	ND		-	-	ND	-	-	ND	ND

+ if grubbed and stacked site was greater than non-treated site (P≤0.100), - if non-treated site was greater than grubbed and stacked site (P≤0.100), and ND if there was no difference (P>0.100).

Arachnida Abundance



Insecta Biomass



Discussion: Brush

- Treatments led to significant decreases in mixed brush cover
- Mesquite serves as a nursery plant for many species
- May be difficult to remove one without the other

Discussion: Herbaceous

- Increases in some variables
- Increase in bare ground in a month that treated and non-treated sites fell within optimum range
- Precipitation or lack thereof appeared to drown out differences over time

Discussion: Arthropod

- Positive effects were short lived
- Mechanical disturbance had negative effects
- Negative effects were also short lived

Discussion: Feeding, Brooding, and Nesting Habitat

- Grubbing and stacking did not appear to have an overall positive effect
- Any negative effects were short lived, even during a drought
- Responses in xeric environments are less predictable than mesic environments

Management Implications

- Management costs averaged $444.79/ha
- May be more cost effective to use a cheaper less selective brush management practice.
- Treatments may allow hunters to access areas that were previously unhuntable

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Questions?