



Factors Influencing the Distribution of the Hawaiian Short-eared Owl

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INTRODUCTION

- Raptors provide critical ecosystem services as the top-down regulators of the systems they occupy.¹⁰ Only one native raptor, the Hawaiian Short-eared Owl, or Pueo (*Asio flammeus sandwichensis*), provides these services on all the main Hawaiian Islands.⁷
- The Pueo is more generalist in diet and habitat-use compared to its mainland counterparts (Figure 3).^{4,5,6} Considered an ancestral guardian and once abundant on the islands, the Pueo is currently state-listed as endangered on O'ahu, with little information regarding the overall health of the population.⁹
- A limiting factor for raptor populations, especially owls, is prey availability.¹ Models of predator-prey relationships assume foraging behavior is directly related to prey density. However, habitat characteristics may impact the effort required to detect and capture prey.^{2,3}
- The objective of this research is to examine differences in vegetation characteristics and prey biomass across various habitat types on Maui and determine the relationship between these variables and Pueo presence.



Figure 3. Common prey items and habitats used by Pueo in Hawai'i.

METHODS

- Random site selection: stratified by elevation (Fig. 1).
- Survey prey species: audio/visual avian survey, insect sweep net, and Sherman rodent traps using capture-mark-recapture method (Fig. 2).
- Collect habitat characteristics: ground cover, canopy cover, and vegetation height at every point.
- One-way ANOVA to determine the relationship between prey biomass and vegetation characteristics.
- Pearson's t-test to determine the relationship between Pueo presence, (a) vegetation characteristics, and (b) prey biomass.

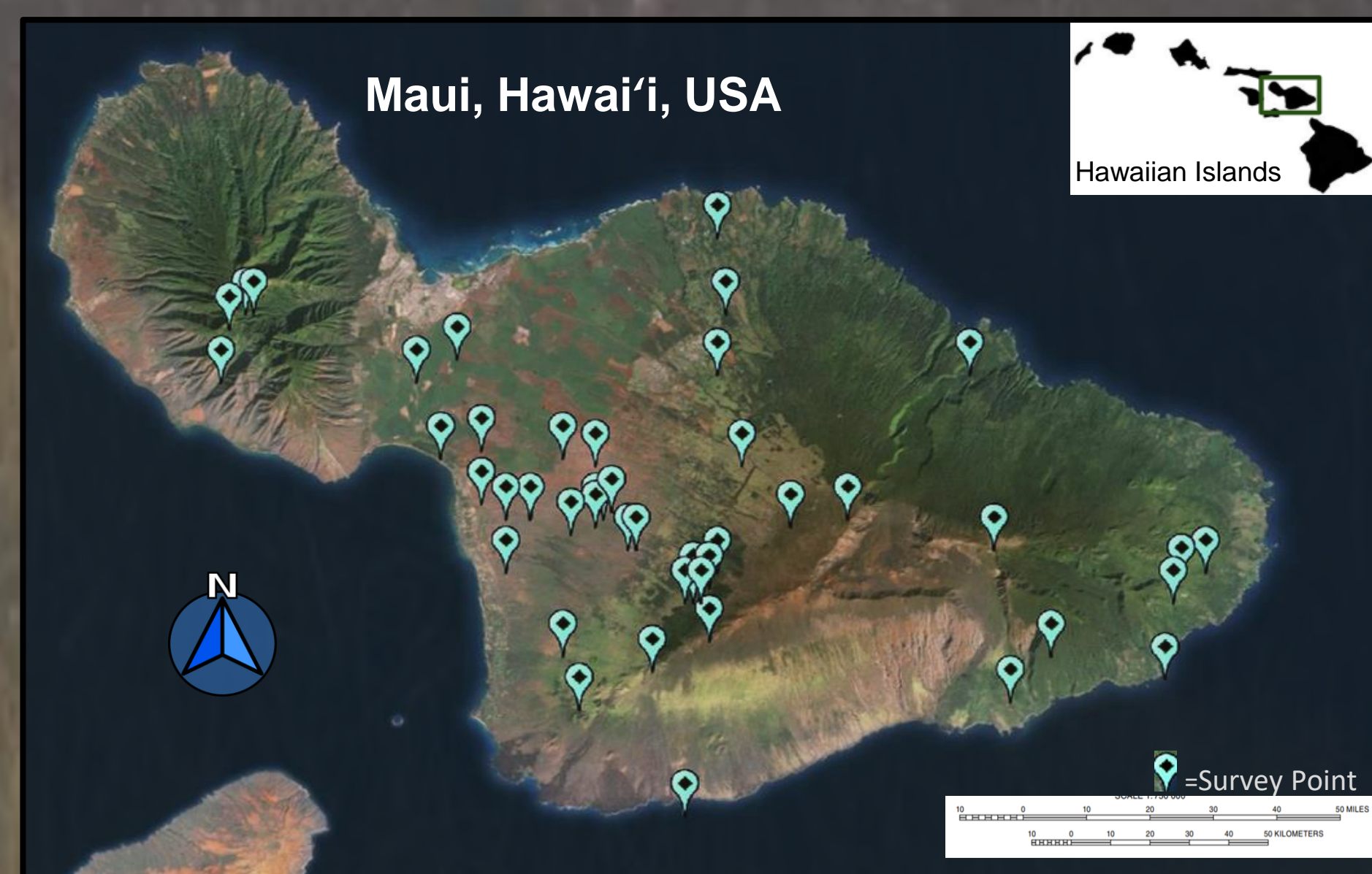


Figure 1. Survey locations, Maui island, HI.



Figure 2. Audio/visual avian survey; insect sweep net; Sherman rodent traps using capture-mark-recapture method.

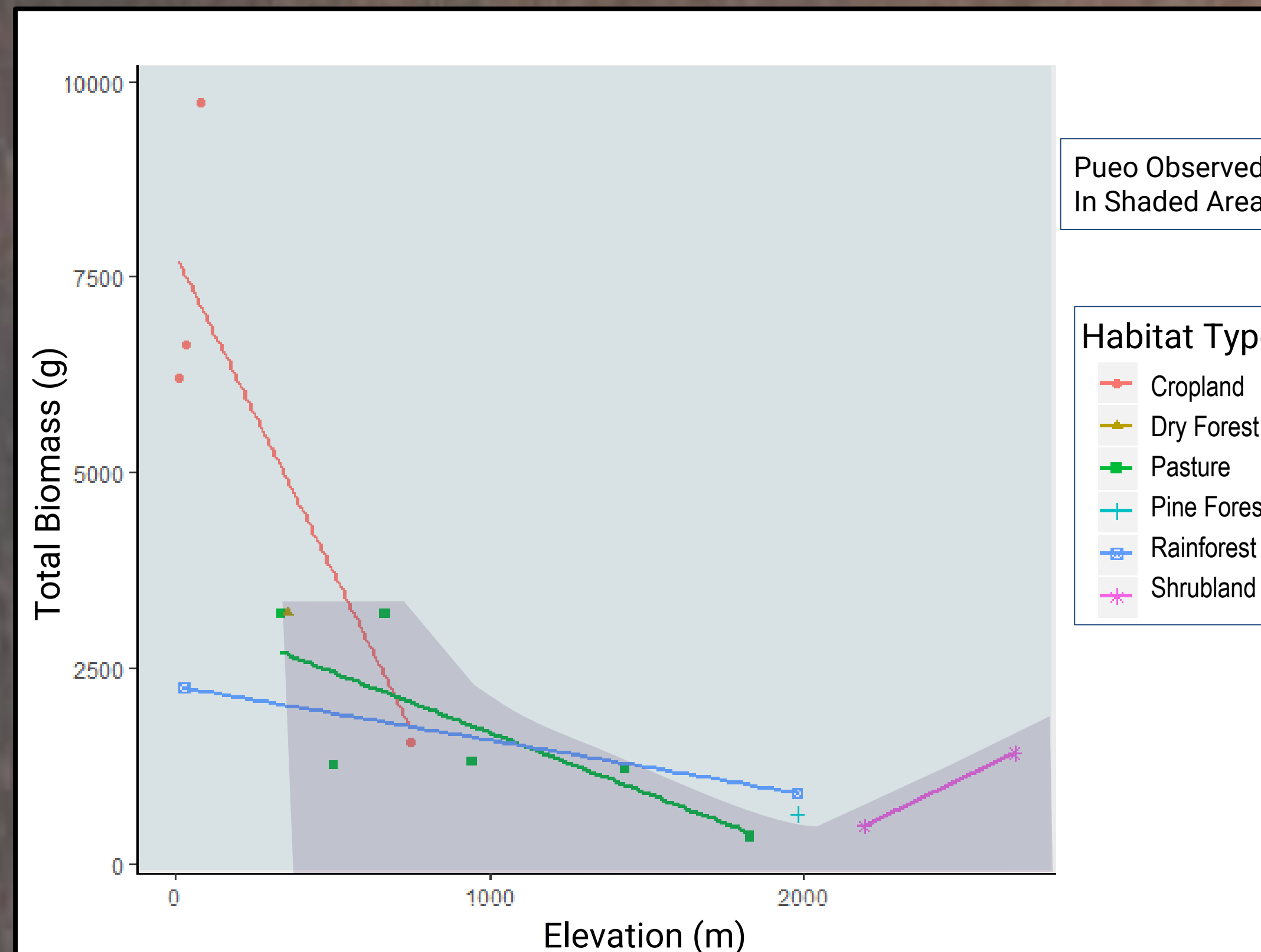


Figure 4. Total prey biomass and elevation in relation to habitat type (N=16).

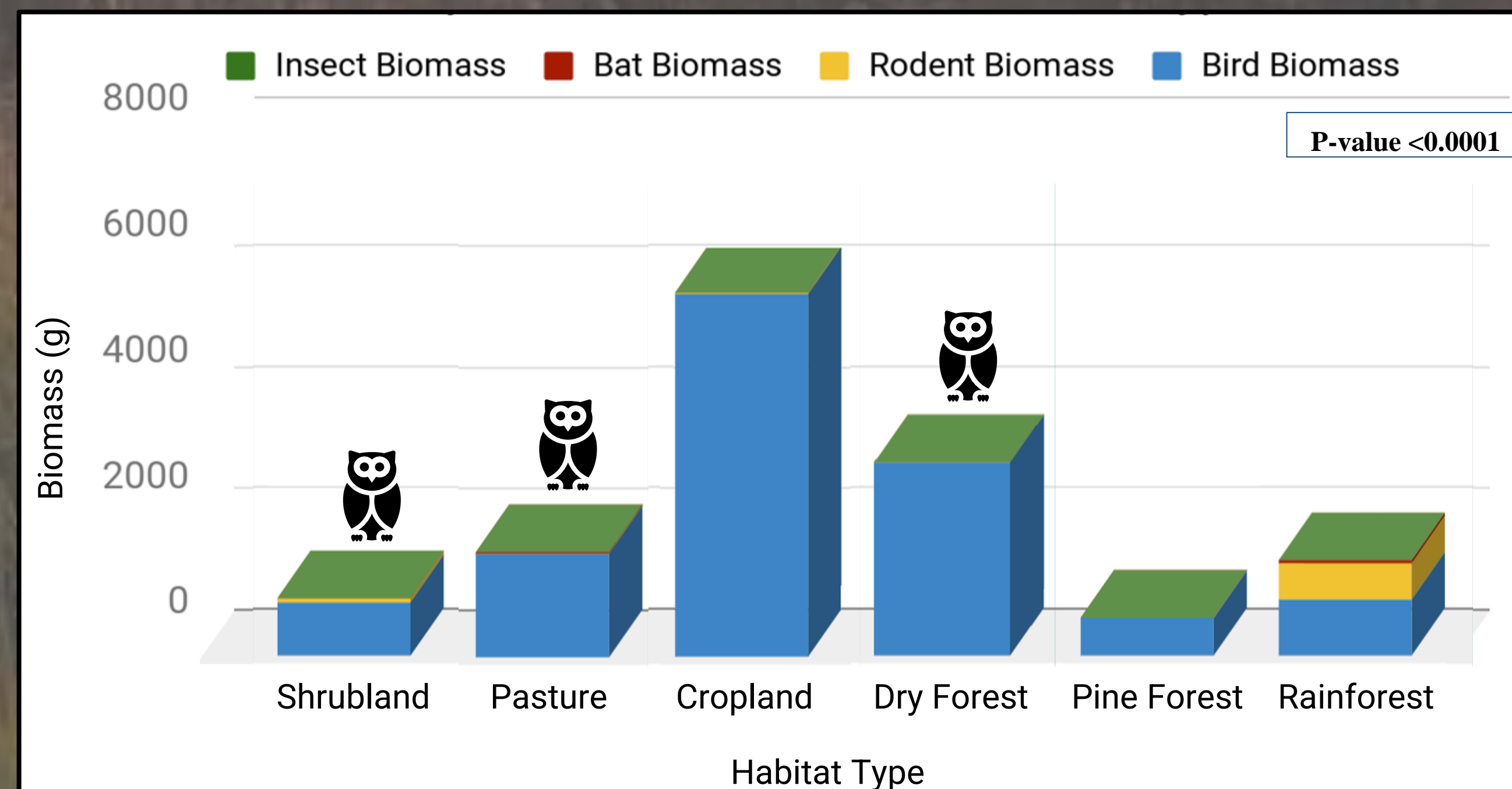
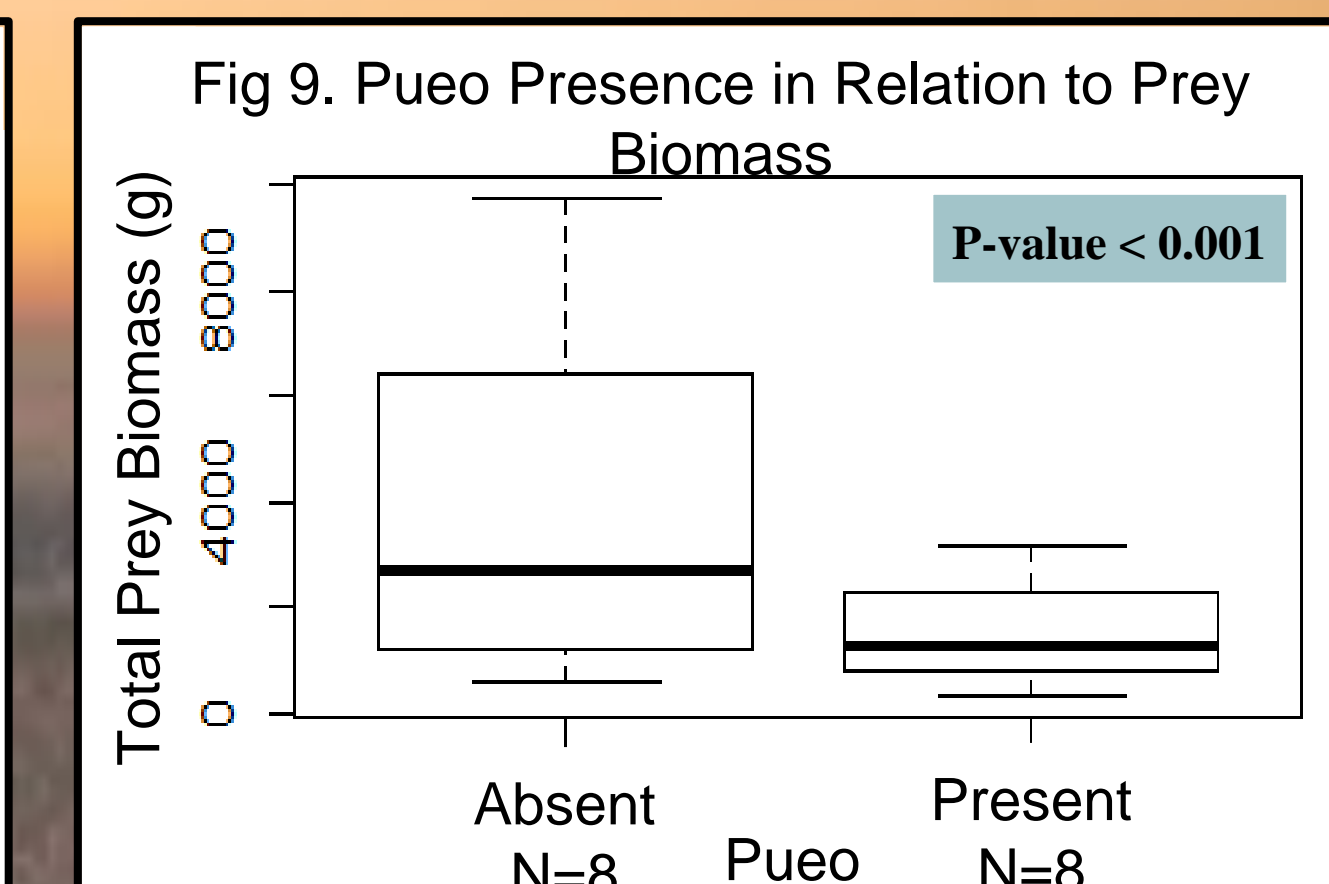
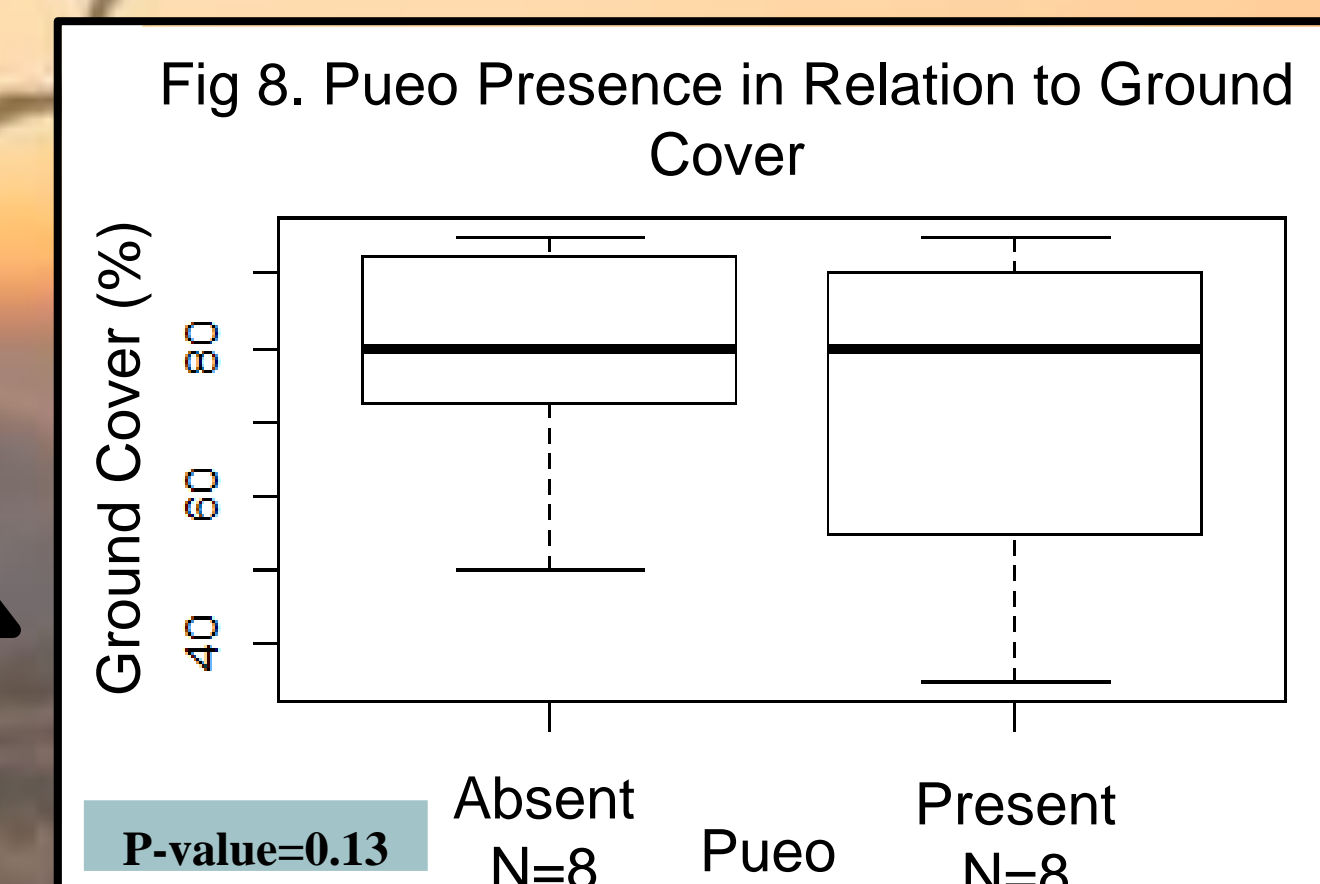
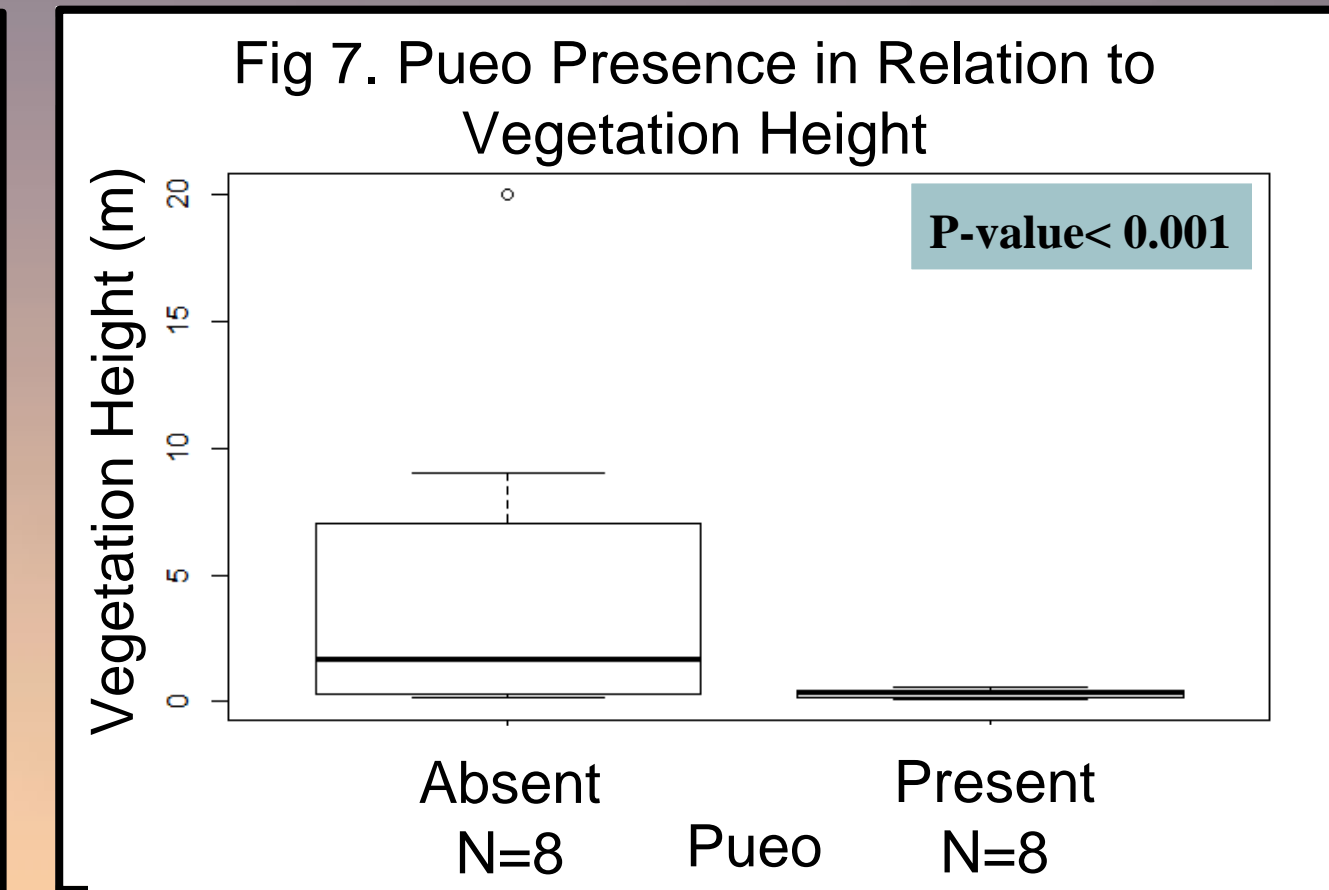
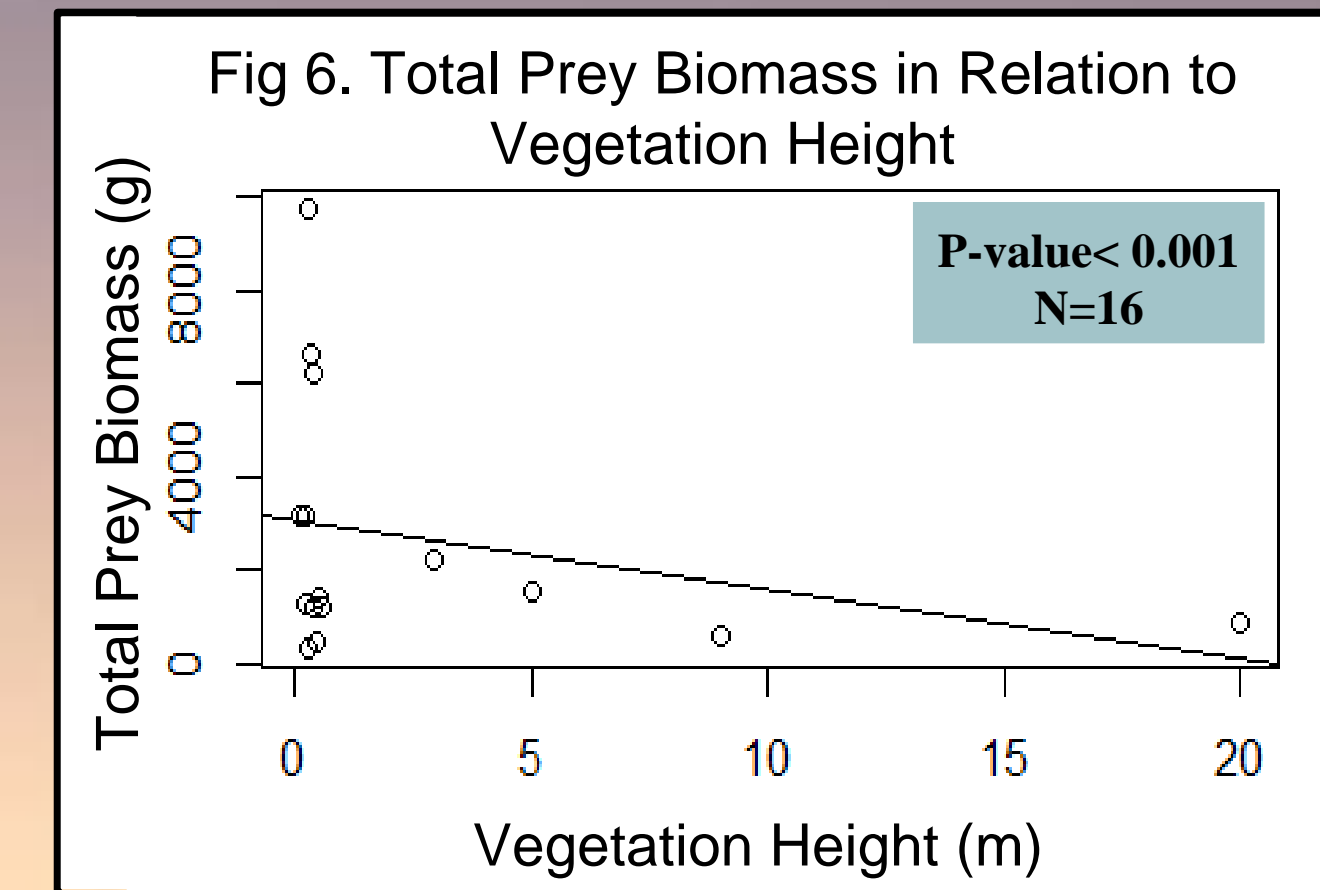


Figure 5. Average prey biomass per habitat type (ordered from lowest to highest vegetation height; N=16).



PRELIMINARY RESULTS

- Prey biomass was significantly different among habitat types ($P < 0.0001$), elevation ($P < 0.00001$), vegetation height ($P < 0.001$), and canopy cover ($P < 0.001$). Prey biomass was not significantly different in relation to ground cover ($P = 0.110$), (Fig. 4, 5, and 6).
- Vegetation height was shorter for surveys where Pueo were detected (mean \pm SD = 32.00 ± 0.17 cm) than for surveys where Pueo were not detected (mean \pm SD = 4.8 ± 6.9 m; $P < 0.001$; Fig. 7).
- Ground cover was not statistically significant between surveys where Pueo were detected (mean \pm SD = $72.5 \pm 22\%$) versus not detected (mean \pm SD = $79 \pm 15\%$; $P = 0.13$; Fig. 8).
- Prey biomass was lower for surveys where Pueo were detected (mean \pm SD = 1550.5 ± 1090.9 g) than for surveys where Pueo were not detected (mean \pm SD = 3887.15 ± 3280.17 g; $P < 0.001$; Fig. 9).
- Barn Owls (*Tyto alba*) were observed more frequently at lower elevations (mean \pm SD = 486 ± 649 m; $P = 0.13$, $N = 2$), while Pueo were observed at higher elevation sites (mean \pm SD = 1326 ± 847 m; $P = 0.16$, $N = 8$).

CONCLUSIONS & NEXT STEPS

- Pueo were observed in shrubland, pasture, and dry forest habitats which contained low vegetation height and medium ground cover. These habitats also contained low prey biomass; thus, habitat structure may influence Pueo presence more than prey biomass.
- Pueo were not observed during surveys in August ($N = 4$), which was the hottest and driest month of the year, suggesting that temperature and rainfall may influence Pueo presence, whether directly or indirectly by prey availability.

Next Steps

- Examine Pueo presence in relation to (a) individual prey types, (b) season, (c) weather, (d) temperature, and (e) Barn Owl presence.
- Examine individual prey types in relation to (a) habitat characteristics, (b) season, and (c) rainfall.
- Develop models to predict Pueo occupancy

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