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Evaluating the Effects of Grazed and Ungrazed Habitat on Raptor Abundance



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Introduction

Within Humboldt County, Red-tailed Hawks (*Buteo jamaicensis*) and Northern Harriers (*Circus hudsonius*) are two common raptor species that exploit both ungrazed and grazed habitats. However, the proportion of habitat each species utilizes for hunting and foraging has not been identified. Comparing the abundance of prey availability and raptor densities, as well as, habitat structures within ungrazed and grazed habitats may provide insight into the effects of pasturelands on raptor foraging behavior. Raptors are highly mobile predators and often take advantage of multiple heterogeneous habitats. Previous studies have identified that habitat selection by Red-tailed Hawks and Northern Harriers is not always directly correlated with prey biomass (Preston 1990). However, habitat structures such as perch availability are documented to affect Red-tailed Hawk distribution .

The object of this study is to compare the effects of ungrazed and grazed habitats on the density and abundance of Red-tailed Hawks and Northern Harriers. This will identify how different habitats can affect raptor distribution and habitat selection. This will be achieved by documenting the number of Red-tailed Hawks and Northern Harriers within a given habitat.



Figure 1. Example of a rodent burrow at one of the ungrazed site locations.

METHODS

In order to identify how ungrazed and grazed habitats affect raptor abundance, three metrics were collected. Firstly, raptor abundance was identified through 10-minute interval point counts at four pre-determined sites. The point counts occurred at various times throughout the day between sunrise and sunset from mid-February to mid-April. Besides raptor abundance, rodent abundance was also documented. This was achieved by performing a 30 x 2 meter belt transect at each point count location and counting the number of burrows seen (Figure 1). Finally, the occurrence of perched raptors versus flying raptors, as well as, the quantity of perches per site were counted.

After the data was collected, A t-test was conducted to determine the significance of Red-tailed Hawk and Northern Harrier usage of ungrazed and grazed habitats. A chi-squared test was utilized to identify the proportion of use between anthropogenic and natural perch availability. Thirdly, a linear regression test was done to discern if rodent abundance is correlated to raptor abundance.

Acknowledgements

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Grazed



Ungrazed

Photo credits: Loren Clark.

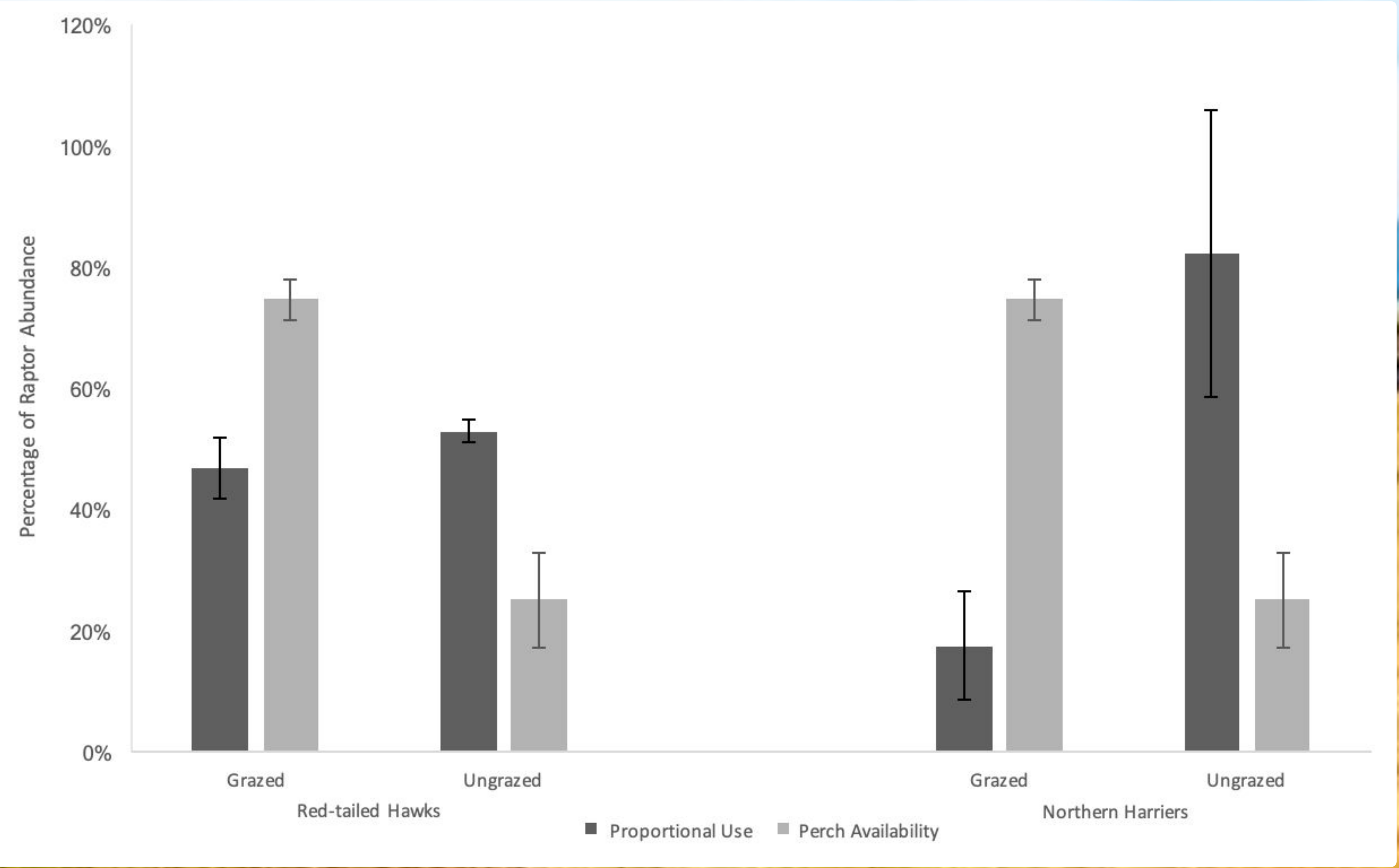


Figure 2. Percentage of Red-tailed Hawk and Northern Harrier abundance within grazed and ungrazed habitats as compared to perch availability within each habitat type.

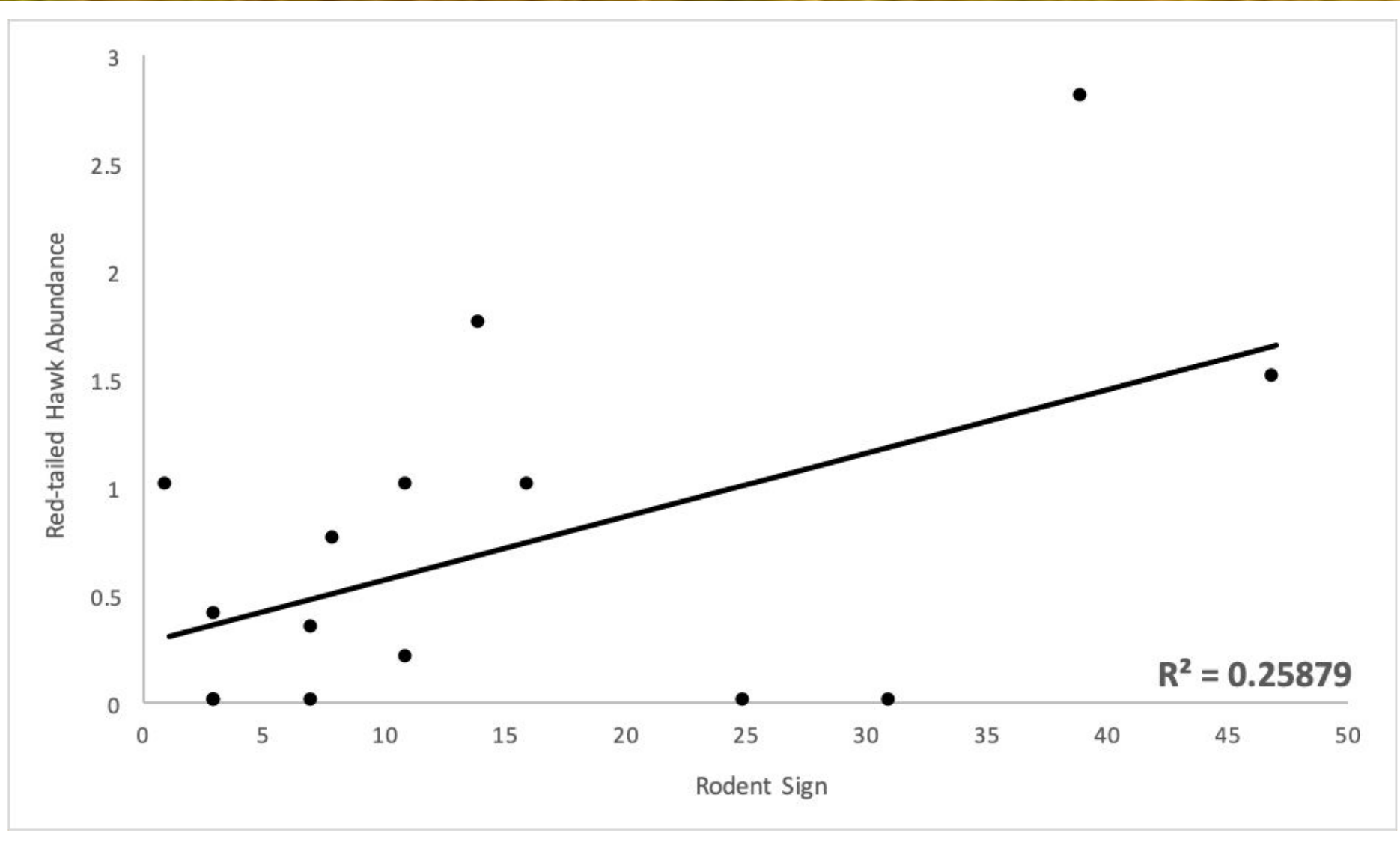


Figure 3. Red-tailed Hawk abundance as a function of rodent sign (p = .053).

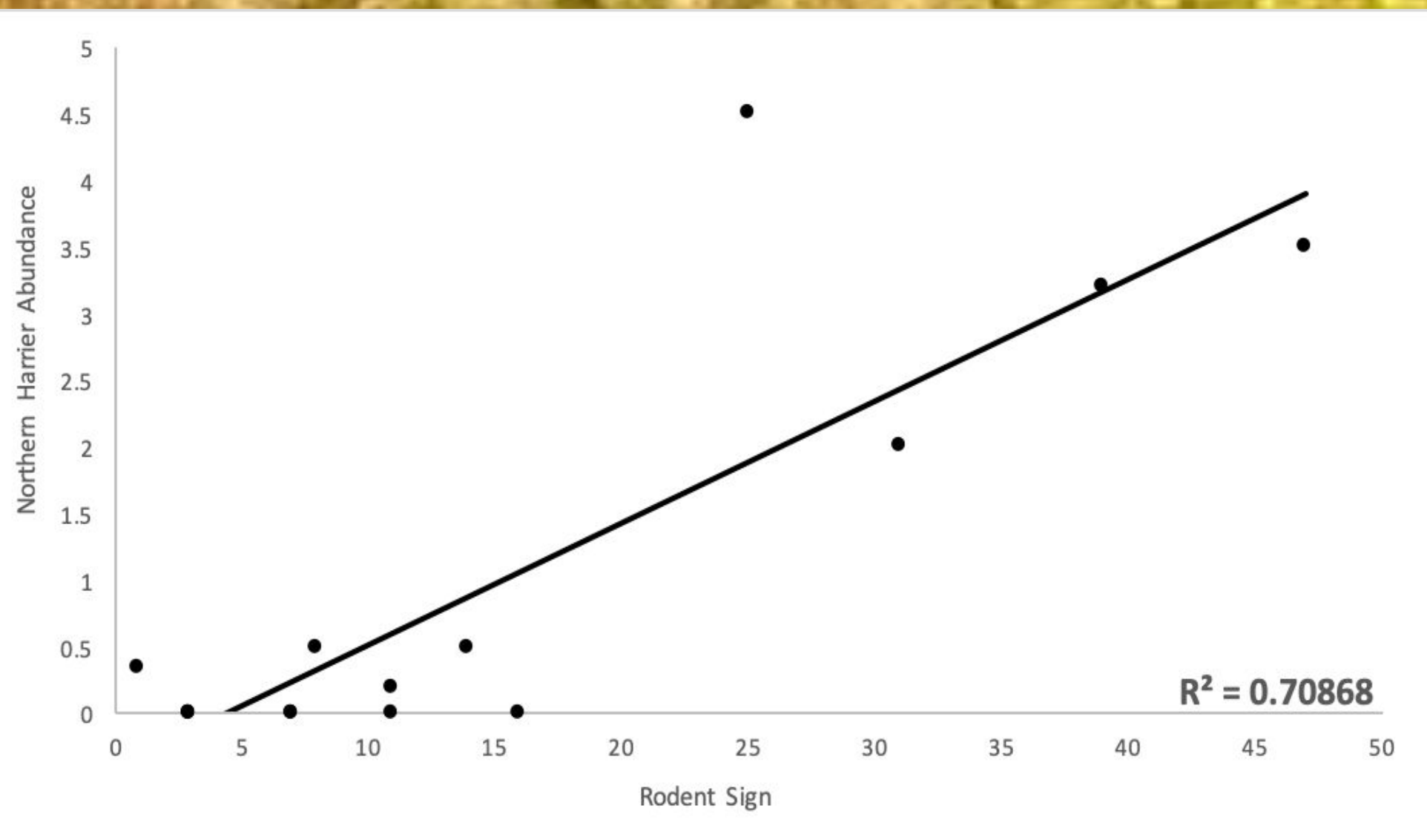


Figure 4. Northern Harrier abundance as a function of rodent sign (p < .001).

RESULTS

- Overall**
 - 67 sites were visited over 7 weeks.
 - 32 to ungrazed habitats and 35 to grazed habitats.
 - 56 Red-tailed Hawks and 71 Northern Harriers were observed throughout the course of the study.
- Abundance**
 - An unequal variance t-test identified that Northern Harriers had a greater abundance at ungrazed sites as compared to grazed sites (t = 6.43, df = 34, p < .001), where as, Red-tailed Hawks did not (Table 1; t = 1.02, df = 57, p = .053).
- Perches**
 - Both species selected for habitats that were significantly different than the perch availability in each habitat (Figure 2; $\chi^2=77.26$, p < .001).
 - 24% of Northern Harriers observed were perching, as compared to 88% of Red-tailed Hawks.
- Rodent Sign**
 - Red-tailed Hawk abundance did reflect an association with rodent sign, but it was not significant (Figure 3; $R^2 = .26$, p = .053).
 - Northern Harrier abundance was closely distributed with the quantity of rodent sign (Figure 4; $R^2 = .71$, p < .001).

Species	df	T-Critical	T-Stat	p	Ungrazed \bar{x}	Grazed \bar{x}
Red-tailed Hawk	57	1.67	1.02	p=.053	0.97	0.71
Northern Harrier	34	1.69	6.43	p < .001	2.03	0.17
Pooled	89	1.66	5.19	p < .001	1.5	0.44

Table 1. T-Test results of raptor abundance in grazed and ungrazed habitats, as well as, the average number of raptors at ungrazed and grazed sites.

DISCUSSION

Northern Harrier and Red-tailed Hawk distribution and abundance varied between the two species. Northern Harrier abundance was significantly higher at ungrazed sites, as compared to grazed, and closely tied with rodent abundance. However, Red-tailed Hawks were fairly commensurate in their distribution between ungrazed and grazed habitats, and while there was a correlation with rodent abundance, it was not significant (p=.053).

More research is needed to evaluate why Red-tailed Hawks were not strongly preferential in the habitats they selected for. A few possible explanations could involve the territoriality of Red-tailed Hawks and intraspecific competition being a limiting factor in hawk abundance at a given site (Rothfels and Lein 2011 Feb 14). Another possible explanation may be that the type of perches had more of an affect on Red-tailed Hawk site selection than the quantity of perches (Knight and Kawashima 1993). While grazed habitats often had a higher quantity of perches, the quality may have been less suitable for Red-tailed Hawks. A third possibility could be that Red-tailed Hawks are choosing to predate largely on non-burrowing rodent species, and their abundance at a site is still closely related to the abundance of their prey species (Fitch et al. 1946). Lastly, increasing the sample size and conducting more point counts at each site, may show a stronger relationship between Red-tailed Hawks and rodent abundance.

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