Assessing Habitat Structure Preferences in the Coastal California Gnatcatcher

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Kellogg Honors College Capstone 2012

Introduction

•Study Subject: Coastal California Gnatcatcher (*Polioptila californica californica*), a federally threatened subspecies of the California Gnatcatcher, endemic to southern California and northern Baja California

•Problem: Populations are declining, primarily from loss of coastal sage scrub habitat due to human development

•Relevance: Braden et al. (1997) found that increased gnatcatcher fitness and survival was associated with specific vertical and horizontal habitat structure

•Study Objective: Assess the habitat structure preferences of Coastal California Gnatcatchers residing in the Voorhis Ecological Reserve on the Cal Poly Pomona campus and compare these preferences to those identified by Braden et al.

•Application: Conservation programs are more effective when the specific habitat requirements of the focal species are known

Materials and Methods

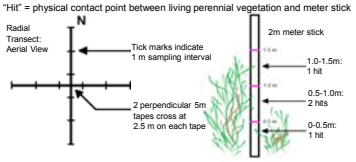
•Phase 1: Collect data on gnatcatcher activity in the Voorhis, based on calls and sightings, and input to ArcMap 10 (GIS) to identify areas that receive the most gnatcatcher activity

•Phase 2: Identify 4 sites with varying levels of gnatcatcher activity from which to collect vegetation data, based on “hits” (see diagram below)

•Phase 3: Analysis of data, utilizing number of hits below 0.5 m, total number of hits, coefficient of variation (CV) in hits, transect homogeneity, and homogeneity of hits among height classes in order to determine structural differences between sites

Vegetation Sampling Using a Radial Transect and “Hits”

“Hit” = physical contact point between living perennial vegetation and meter stick



General Results

•Site Descriptions:

➢Transect A: Mixed *Artemisia californica* and wild mustard

➢Transect B: Clumped *A. californica* and *Opuntia littoralis*, abundant open space in between

➢Transect C: Dense mix of *A. californica* and *O. littoralis*, few *Sarcostemma cynanchoides* and *Scrophularia californica*

➢Transect D: Tall, dense *A. californica*, some open space

•General Site Characteristics: In all structural parameters (except CV in hits), Transect Sites A and B and Transect Sites C and D were found to be statistically equivalent, and so were combined for analyses (see Table 1)

Discussion

•Summary: 4/5 analyses indicate that there is a significant difference between W/O CAGN and W/ CAGN sites in terms of habitat structure

•Significance: Coastal California Gnatcatchers in the Voorhis actively select certain microhabitats over others, even within preferred coastal sage scrub habitat

•Relevance: Gnatcatchers in the Voorhis select habitat in a manner consistent with the findings from Braden et al. and choose habitat that maximizes their fitness

•Importance to Cal Poly: The Voorhis Ecological Reserve is a coarse-grained habitat, where there are habitat “patches” of greater or lesser suitability for gnatcatchers

•Applications: To maintain habitat for California Gnatcatchers on campus and elsewhere, conservation plans must take into account that not all patches of similar habitat are suitable

•Implications: When choosing to develop or manipulate any coastal sage scrub, must assess microhabitats for gnatcatcher suitability and choose not to manipulate intact patches preferred by gnatcatchers

Results of Analyses

Table 1. General characteristics of W/O CAGN and W/ CAGN groups. W/ CAGN has a higher proportion of all 3 perennial vegetation types.

Group Category	Transect Sites	Gnatcatcher Activity	Proportion of Hits Out of Total Possible Hits		
			A. californica	O. littoralis	All Other Perennials
W/O CAGN	A + B	LOW	0.076	0.0347	0.000
W/ CAGN	C + D	HIGH	0.250	0.0556	0.021

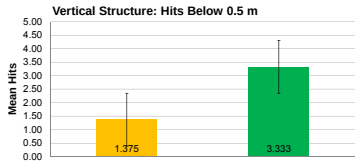


Figure 1. Number of Hits below 0.5m. Mean number of hits below 0.5m in W/O CAGN and W/CAGN sites are significantly different (p = 0.002). 2-Sample t-Test.

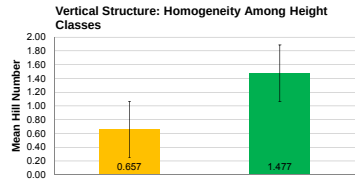


Figure 2. Homogeneity among height classes. Hill numbers calculated per sample as $1/\Sigma p_i^2$ where p_i is the proportion of hits in each height class. Mean Hill Number in W/O CAGN and W/CAGN sites are significantly different (p = 0.001). 2-Sample t-Test.

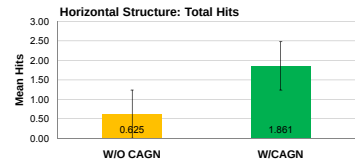


Figure 3. Number of Total Hits. Mean total hits in W/O CAGN and W/CAGN sites are significantly different (p = 0.000). 2-Sample t-Test.

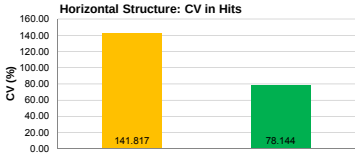


Figure 4. Coefficient of variation in hits. CVs in W/O CAGN and W/CAGN were NOT significantly different (F = 1.134, p = 0.766). Variance Ratio Test.

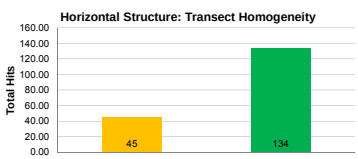
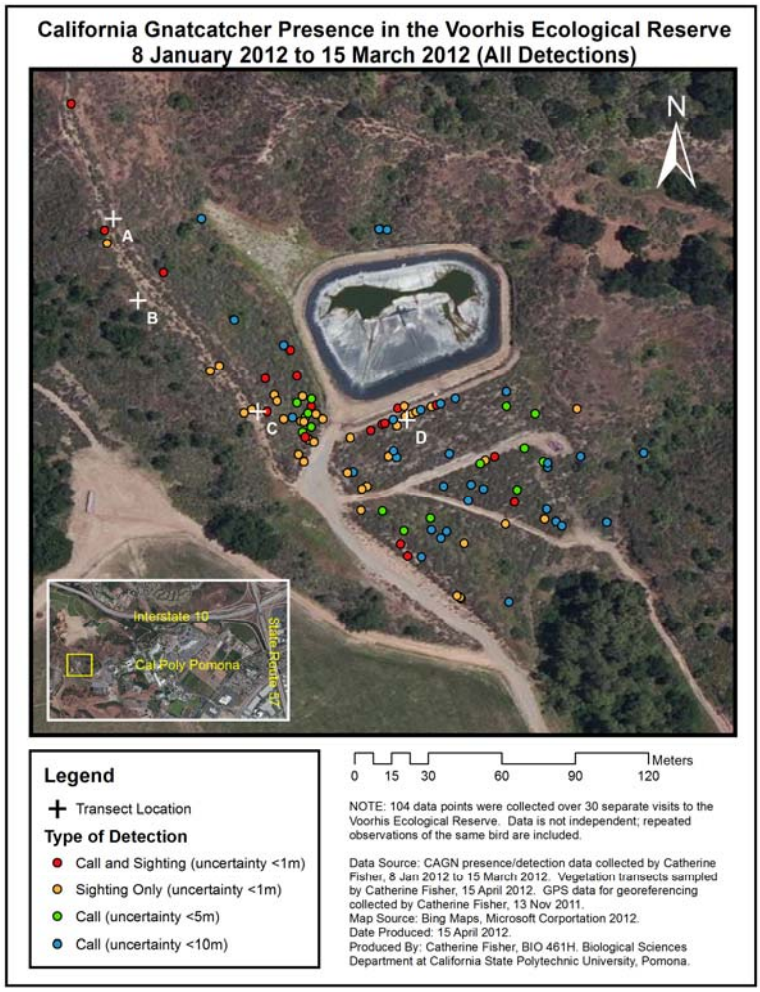


Figure 5. Transect Homogeneity (uses Total Hits). Total Hits in W/O CAGN and W/CAGN were significantly different (Yates' Corrected X^2 = 43.263, p = 0.000). Goodness of Fit Test.



Top, far left: Male California Gnatcatcher in breeding plumage. Image Source: http://nathistoc.bio.uci.edu/birds/passeriformes/Polioptila%20californica/index.htm

Top, left: Female California Gnatcatcher. Image Source: http://nathistoc.bio.uci.edu/birds/passeriformes/Polioptila%20californica/index.htm

Above, left and center: Vegetation sampling at Transect Site D in the Voorhis Ecological Reserve on 15 April 2012. Photographer: Eileen Berbeo

Above, right: Detail of leaves of California Sagebrush. Image Source: http://www.ecnca.org/plants/Artemisia_californica.htm

Acknowledgements: A heartfelt thanks to Dr. Moriarty for his constant support and assistance on this project from beginning to end, to Eileen Berbeo for her invaluable help with vegetation sampling, to Brice Colton for always making sure I returned safely from my forays into the field, and to my parents who are kind enough to fund my education and support my interest in all things wildlife-related.

References

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