



Nest Site Characteristics of Pueo (*Asio flammeus sandwichensis*) on O'ahu

Olivia Wang¹, Chad Wilhite¹, Marie-Sophie Garcia Heras¹, Wade Naguwa¹, Kicah Acoba¹, Julen Torrens-Baile^{1,2}, Kaleiheana-a-Pōhaku Stormcrow¹, Melissa R. Price¹

¹ Department of Natural Resources & Environmental Management, College of Tropical Agriculture & Human Resources, University of Hawai'i at Manoa, Honolulu, HI, 96822, USA, ² Departamento de Biología Ambiental, Universidad de Navarra, 31009 Pamplona, Spain

Contact: owang@hawaii.edu | www.pueoproject.com

Hawai'i Conservation Conference 2021 Abstract #54



Introduction

- The pueo, or Hawaiian Short-eared Owl (*Asio flammeus sandwichensis*), is a subspecies of the globally distributed Short-eared Owl and is the only endemic raptor species known to breed across all the main Hawaiian Islands.¹
- Across their range, Short-eared Owls nest on the ground in grasslands, marshes, and agricultural fields.^{2,3,4,5} These nests are threatened by human activities such as grass mowing, controlled burns, and agricultural use (i.e. crop harvesting, livestock trampling).^{6,7,8,9}
- To date, no comprehensive study of pueo nesting ecology has been completed. As a species of ecological and cultural importance, a better understanding of the habitat characteristics pueo use for nesting is necessary to inform conservation and land management, especially on O'ahu where they are state-listed as endangered.
- Objective: Describe the nest site characteristics of pueo on O'ahu**

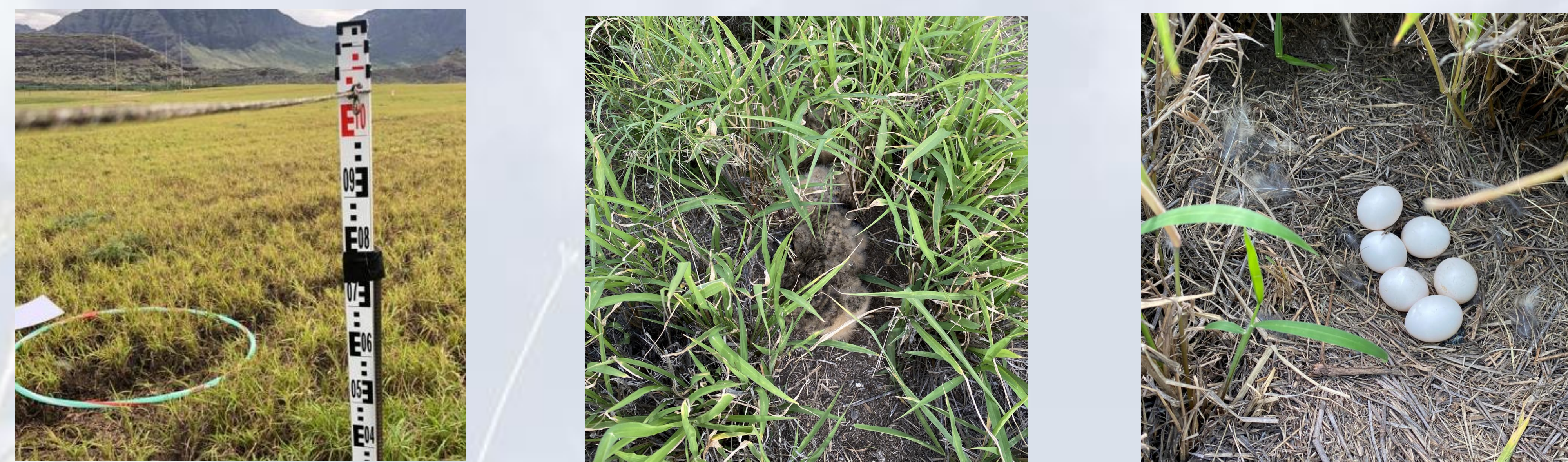


Figure 2: (From left to right) Robel pole used to take Visual Obstruction Readings (VOR), overhead view of a pueo nest with chicks, overhead view of a pueo nest with eggs.

Methods

Data Collection

- Search for pueo nests at two main study locations on O'ahu (Figure 1)
- Collect site characteristic data (Visual Obstruction Reading (VOR), percent vegetation cover, tallest vegetation height, and top 3 dominant plant species) at nest site and four random points within 100m of the nest site

Data Analysis

- Use a binary logistic regression model with use of the site for nesting (1 for pueo nests, 0 for random points) as the response variable and the site vegetation characteristics as predictor variables
- Use model selection to determine combination of vegetation characteristics that best predict use of a site for nesting by pueo

Preliminary Results

- From January 2020 – April 2021, we found eight pueo nests across our study locations. Seven nests were found in managed buffelgrass (*Cenchrus ciliaris*)–dominated grassland, and one nest was found in a wetland dominated by pickleweed (*Batis maritima*).
- The best model included mean low visual obstruction reading (VOR) and tallest vegetation height – as these metrics increase, so does the probability that a pueo selects that site for nesting (Figure 3a and b).
- Tallest vegetation height of all nests averaged 53.63 cm (± 1.65 , SE) while mean low VOR of all nests averaged 13.718 (± 0.99 , SE)
- Due to the low sample size, there is high model uncertainty. However, these initial results suggest that pueo are selecting for specific spots with denser, taller (>40cm) vegetation for nesting.

Management Implications & Future Work

- This is the first study investigating pueo nesting ecology and our results suggest that greater vegetation height and densities are important habitat characteristics for pueo nesting.
- Our findings from Hawai'i can be compared with other subspecies of Short-eared Owls to begin to understand intraspecific variation in life-history traits in this globally distributed species.
- Predicting where pueo prefer to nest will be especially useful for land-managers and agricultural producers to understand in order to minimize disturbance in likely pueo breeding areas.
- This study is an important step in predicting how pueo might respond to land-use changes across the Hawaiian Islands and in informing best management practices to maximize pueo occupancy and nesting success.
- Future work will include finding and monitoring more pueo nests and documenting key breeding parameters such as clutch size, nest success, and nest productivity to see how nest site characteristics affect pueo breeding parameters.

Study Areas



Figure 1: Location of the study areas - (Top) VLF Annex, Joint Base Pearl Harbor Hickam Lualualei (LLL) and the (Bottom) Nu'upia Ponds Wildlife Management Area, Marine Corps Base Hawaii (MCBH) - Kaneohe Bay on O'ahu, Hawai'i

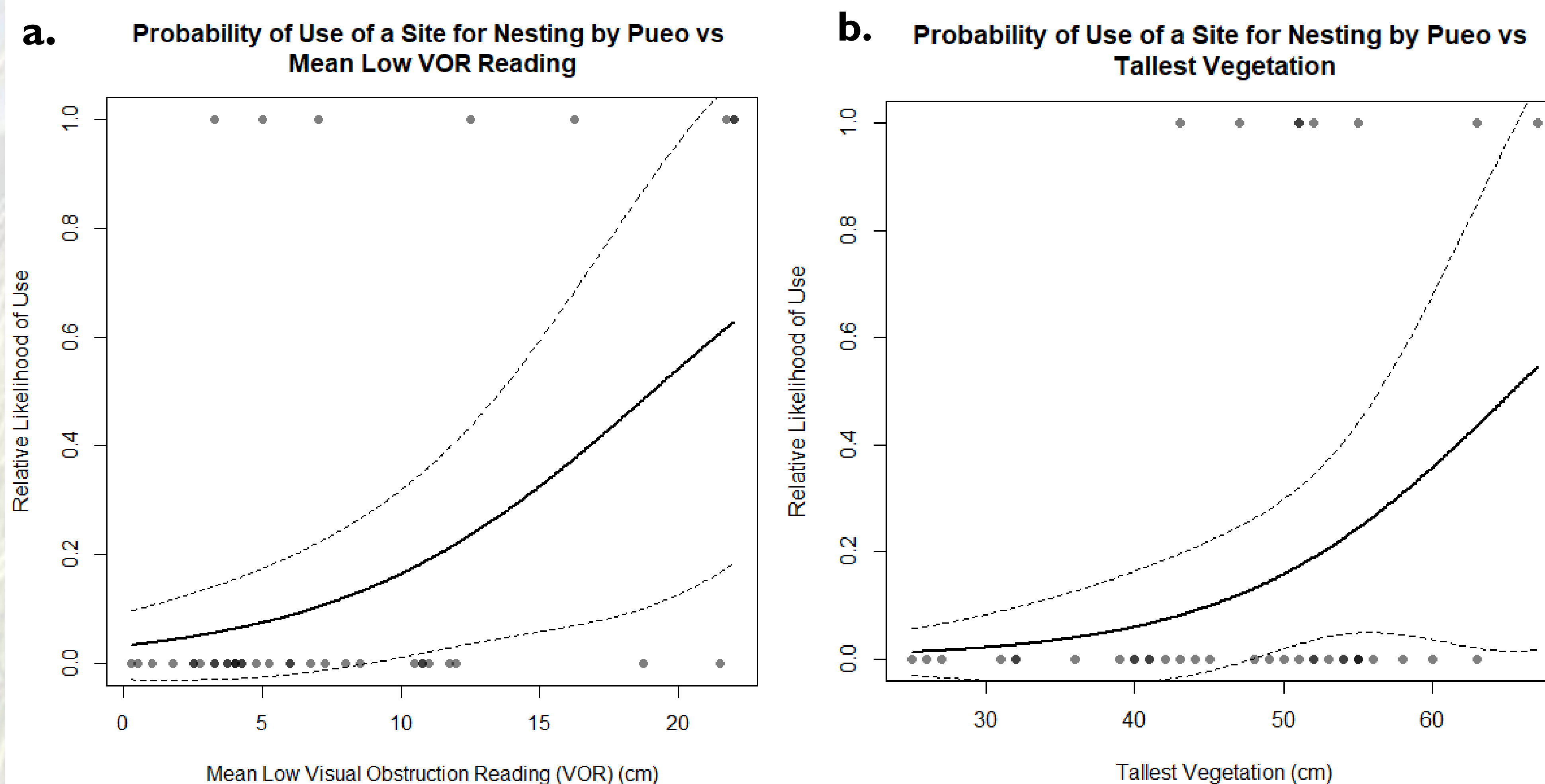
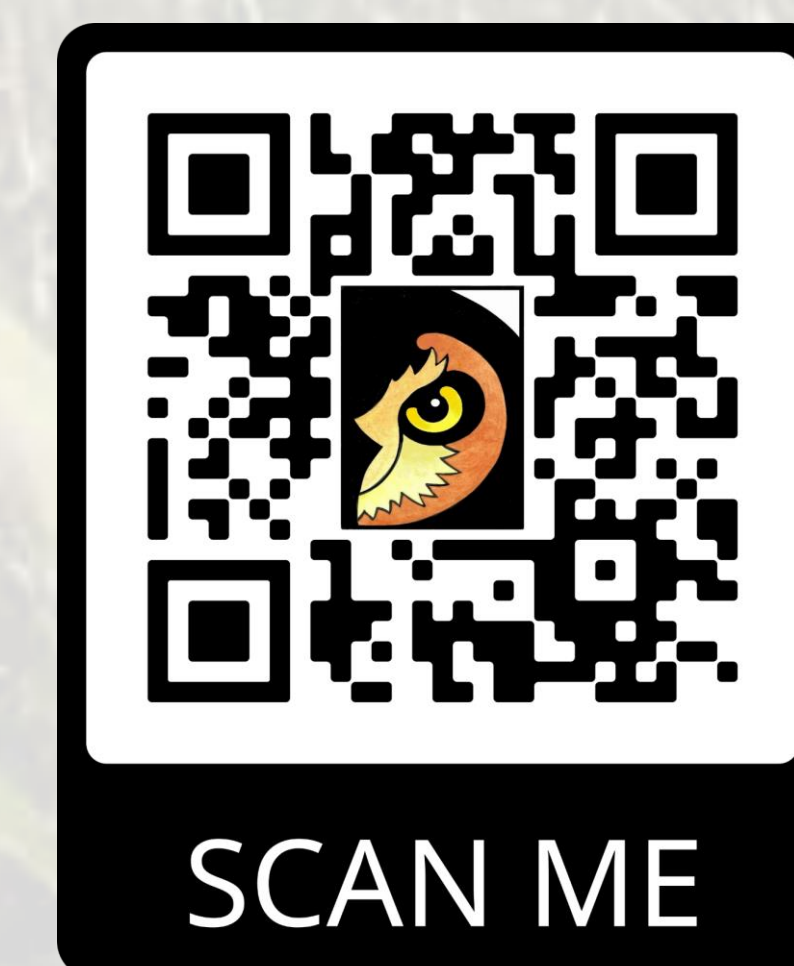


Figure 3a: Plot of the relative likelihood of use of a site for pueo nesting vs the mean low Visual Obstruction Reading (cm) at a given site. Gray dots are the mean low VOR at each site. Solid line indicates the predicted likelihood of use, dotted lines are the 95% confidence intervals.

Figure 3b: Plot of the relative likelihood of use of a site for pueo nesting vs tallest vegetation height (cm) at a given site. Gray dots are the tallest vegetation height at each site. Solid line indicates the predicted likelihood of use, dotted lines are the 95% confidence intervals.

References: ¹Hawai'i Department of Land and Natural Resources. (2005). *Pueo or Hawaiian Short-eared Owl*. Hawai'i's Comprehensive Wildlife Conservation Strategy. ²Clark, R.J. (1975). A Field Study of the Short-Eared Owl, *Asio flammeus* (Pontoppidan), in North America. *Wildlife Monographs*, 47, 3–67. ³Arroyo, B. E., DeCornulier, T., & Bretagnolle, V. (2000). Sex and Age Determination of Short-Eared Owl Nestlings. *The Condor*, 102(1), 216–219. ⁴Holt, D.W. (1992). Notes on Short-eared Owl, *Asio flammeus*, nest sites, reproduction, and territory sizes in coastal Massachusetts. *Canadian Field-Naturalist*, 106(3), 352–356. ⁵Keyes, K. L., Gahbauer, M.A., & Bird, D.M. (2016). Aspects of the Breeding Ecology of Short-eared Owls (*Asio flammeus*) on Amherst and Wolfe Islands, Eastern Ontario. *Journal of Raptor Research*, 50(1), 121–124. ⁶Arroyo, B. E., & Bretagnolle, V. (1999). Breeding Biology of the Short-eared Owl (*Asio flammeus*) in Agricultural Habitats of Southwestern France. *Journal of Raptor Research*, 33(4), 8. ⁷Fondell, T.F., & Ball, I.J. (2004). Density and success of bird nests relative to grazing on western Montana grasslands. *Biological Conservation*, 117(2), 203–213. ⁸Swengel, S.R., & Swengel, A.B. (2014). Short-eared Owl Abundance and Conservation Recommendations in Relation to Site and Vegetative Characteristics, with Notes on Northern Harriers. *The Passenger Pigeon*, 76(1), 19.

Contribute to our study! Scan the QR code to go to our website and find out how to submit your observations of pueo nests.



SCAN ME



Acknowledgements: Thank you to the Hawai'i Wildlife Ecology Lab members, especially the other Pueo Project members for their guidance and assistance in the lab and field. Thank you to the collaborators on this project, the U.S. Navy, Marine Corps Base Hawaii, Kaneohe Bay, and NAVFAC PAC, as well.