

Woodrat Nest Survey at Hillside Natural Area:
A Call to Action

Friends of Five Creeks Interns

Karin Budi
Paulina Lara
Quetzalli Ruiz

December 3, 2024

Table of Contents

Table of Contents	2
Introduction	3
Species Role and Description	3
Research Methods	4
Results and Discussion	7
Conclusion	13
Works Cited	14

Introduction

Conducting a survey on woodrat nests, with almost no advanced knowledge of these small furry mammals, opened our eyes to the important contributions these rodents have to their surrounding habitat. The San Francisco dusky-footed woodrat project by Friends of Five Creeks focused on the 100-acre El Cerrito Hillside Natural Area (HNA), located in California. Our survey was conducted in 2024 in response to recent land-clearing activities in El Cerrito Hills, which highlight a broader trend of land management practices that do not prioritize the preservation of local ecosystems and their threat to biodiversity. The ongoing habitat destruction in the area underscores the need for more sustainable land management practices that protect the vital roles species like the woodrat play in maintaining ecological balance.

Among the species impacted by the clearings are the San Francisco Dusky-footed woodrats (*Neotoma fuscipes annectens*). Woodrats serve as an important food source for their predators. In addition, their nests provide crucial shelter for various small species, while facilitating seed dispersal. Therefore, the primary goal of this survey is to provide data about the status of this species to the California Department of Fish and Wildlife (CDFW) database to ensure woodrats are protected to the extent possible.

Species Role and Description

The dusky-footed woodrat is a small rodent ranging from 335–468 mm, typically weighing between 186.7 g and 311.8 g. It is easily distinguished by its grayish-brown fur and white underbelly, and blackish-dusky colored hind feet (Caraway and Verts 1991). They are more closely related to deer mice than to other rats. Woodrats' unique behaviors include the building of large, multi-room stick nests on the ground and in trees, and a tendency to collect and hoard various objects, leading to their nickname "trade rats." They are also known for resourcefulness and adaptability: They 'trade' objects they find for new ones, selectively incorporating new items into their nests, and discarding old ones (Donat 1933). They are sociable: multiple generations may share a nest, and nests are often built close together, usually by family members. During our surveys, we observed that their nests were often situated near each other.

These large nests, which they build from sticks, leaves, and other found materials, also play a critical role in local biodiversity – making the species one of nature's engineers. Their nests, constructed from sticks, leaves, and other natural materials, often provide shelter for a variety of other species, contributing to local biodiversity. Woodrats prefer densely shaded areas, especially near water. Woodrats bring seeds and other plant materials back to their nests, storing them for food or using them as bedding or lining. This inadvertently promotes plant growth, distribution, and variety. Woodrats also are an important food source for a variety of predators, including owls, the red-shouldered and other hawks, eagles, coyotes, bobcats, and large snakes including gopher snakes.

Research Methods

We recorded nest locations using cell phone photos with GPS location, in addition to using Google Earth for elevation. We measured nest diameter and height with a 30-meter surveyor's tape. For

the canopy cover, we used a convex mirror to observe and record the coverage percentage. We determined the slope and aspect using a compass and measuring apps. The type and density of surrounding vegetation and trace evidence of animals, such as bitten leaves or nesting materials were observed manually within a 1-meter radius around each nest. The project consisted of 12 expeditions, going well off established trails, between August 23rd and November 15th, 2024. Some areas were skipped due to steepness or dense poison oak. We also did only cursory checks of large, open grassy areas where nests would be easily seen. The map below shows the areas and nests surveyed.

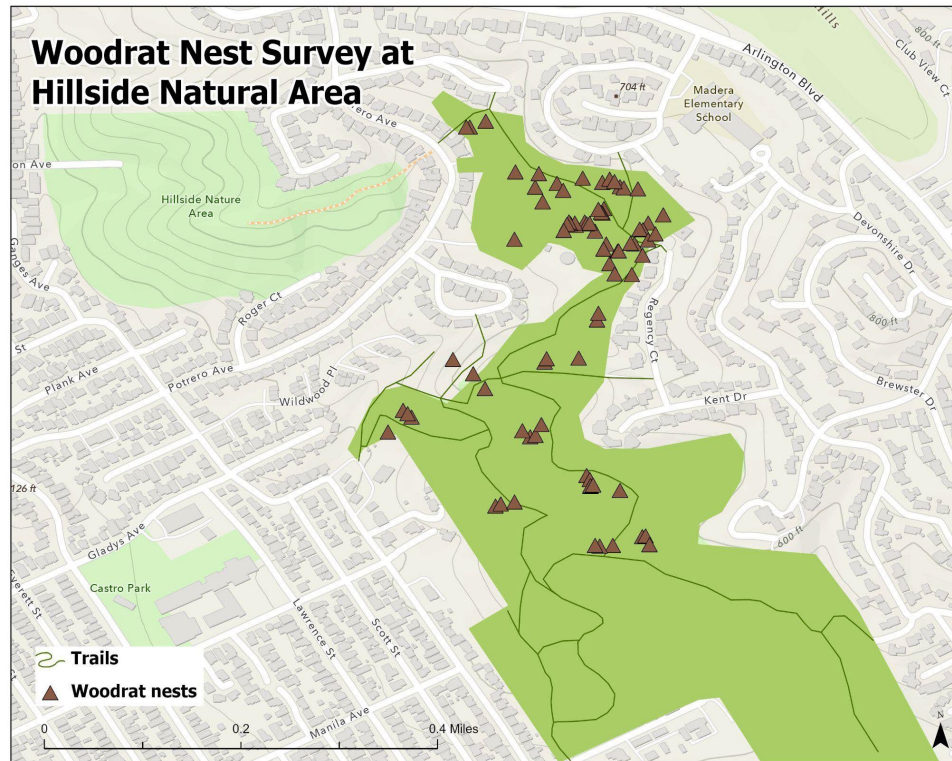


Figure 1. Map of Survey, Hillside Natural Area, El Cerrito, CA.

Results and Discussion

We found a total of 78 nests in the area. Due to the difficulty of surveying the whole HNA, we expect that there are more. Woodrats commonly use coast live oak (*Quercus agrifolia*), poison oak (*Toxicodendron diversilobum*), and coyote bush (*Baccharis pilularis*) as common nest materials. Such shrubs and trees may also help protect their nests from invaders. We observed that crowded, shrubby habitats were the most common areas for woodrat nest building. We did not observe many nests in open, mowed areas. Those we saw were abandoned and in poor condition. Woodrats seemed to prefer closed, isolated regions with moderate to high shrubbery and trees around their nests. The woodrats also seemed to prefer areas with a good amount of shade, the average percentage of cover being 60%. About 45% of the nests were found in the Madera Open Space area, where there was an abundance of French broom, poison oak, coyote bush, and coast live oak. We believe that the large concentration of nests may be attributed to the recent clearing of ground cover in a large adjacent area we discovered during one of our excursions in the Madera Open Space. Another observation we made was the slope preferences for woodrat nest building, with the mean slope being 20.1° and the maximum being 40°. This data indicates that the woodrats tend to favor moderate slopes for their nests, with a tendency to avoid both very flat and very steep terrains.



Figures 2 (a) and (b). **Woodrat Nests, Hillside Natural Area, El Cerrito, CA.**

The nests measured an average of 1.62 meters in diameter and 0.73 meters in height, with the largest recorded at 3.58 meters long and 1.72 meters high. Nest shapes varied from conical to domed or tent-like, with many appearing to still be under construction. Seven nests were confirmed to be occupied based on woodrat sightings, while others, though apparently empty, appeared in good condition to potentially shelter other species. Four tree nests were documented: three in coast live oak trees and one in an olive tree (*Olea europaea*). These tree nests, which were located near ground nests and larger than a basketball, suggest that they were not squirrel nests. The presence of decoy nests added complexity to our survey. Since woodrats commonly build extra or decoy nests, perhaps for escape or to confuse predators, it's difficult to infer actual populations. A European holly (*Ilex aquifolium*) sapling was discovered growing in the middle of a woodrat nest. The absence of nearby holly trees suggests that the woodrats might have transported seeds from elsewhere, showing that they do disperse seeds and help regenerate the forest.

Our statistical analysis shows that their nests were larger where there is cheesewood (*Pittosporum undulatum*, common in moist shady areas), indicating a positive correlation with the tree ($p = 0.0191$), compared to coast oak ($p = 0.0930$) or poison oak ($p = 0.0572$). Although our results indicated that canopy cover did not influence nest size ($p = 0.8865$), we found that it did influence the placement of 23 of the nests (with 91-100% shade), compared to only 6 nests built in 0-10% canopy cover. As mentioned before, woodrats prefer moist shady areas. Cheesewood is strongly correlated with watercourses, which may indicate a possible relationship between nests and water access.

Conclusion

The Dusky-footed woodrat is a vital component of its ecosystem. This industrious creature plays a crucial role in:

- **Seed dispersal:** Woodrats collect and store seeds, aiding in the spread of plant species. This action supports vegetative growth and plant diversity.
- **Food for predators:** They are a key food source for a range of predators, including hawks, owls, and other carnivores. The health of the woodrat populations can help maintain important predator populations in the HNA.
- **Habitat creation:** The nests woodrats build from sticks, leaves, and other materials provide shelter for a variety of smaller creatures, including salamanders, snakes, lizards, mice, beetles (Chen 2023), and even skunks and rabbits (English 1923), contributing to a rich microhabitat.

The new Environmental Impact Report (EIR) for the HNA envisions extensive brush clearing, which would be harmful to woodrats' nests considering they favored closed, secluded areas with moderate to dense shrubbery and trees around their nests. We are concerned that the draft plan for removing large trees and creating a 100-foot "shaded fuel break" with minimal understory does not sufficiently protect these animals, which rely on oak trees and shrubs for protection, nesting material, and food. The plan recognizes they are a keystone species on which others rely.

Our observations show that woodrat nests contribute to seed dispersal, as seen in the variety of plant species found in each nest, with coast oak being particularly favored for nest building. This highlights the woodrat's role in local ecology, especially in plant dispersal and growth. Therefore, the results underscore the need for proper land management, as clearing habitats could harm woodrat populations and disrupt their ecological functions, particularly by reducing key plants like coast oak. Thoughtful conservation is crucial for supporting both woodrats and the broader ecosystem. The intelligence and resilience of woodrats, evident in their complex nests, make them and their ecosystems worth protecting. To ensure their survival, we must implement conservation strategies, including habitat restoration, public education, and ongoing research. By working together, we can support the long-term health of these fascinating creatures and their habitats.

Acknowledgments

We would like to thank Susan Schwartz, president of Friends of Five Creeks, for her guidance and supervision throughout this project. We would also like to thank fellow intern, Lily Hessel for her contribution in helping us track down nests. We are also grateful to Audrey Liese of Friends of Hillside Natural Area for her support and for leading us to key areas of abundant woodrat nests. Finally, we thank the City of El Cerrito for granting us the opportunity and support to conduct this important survey within their natural spaces.

Appendix

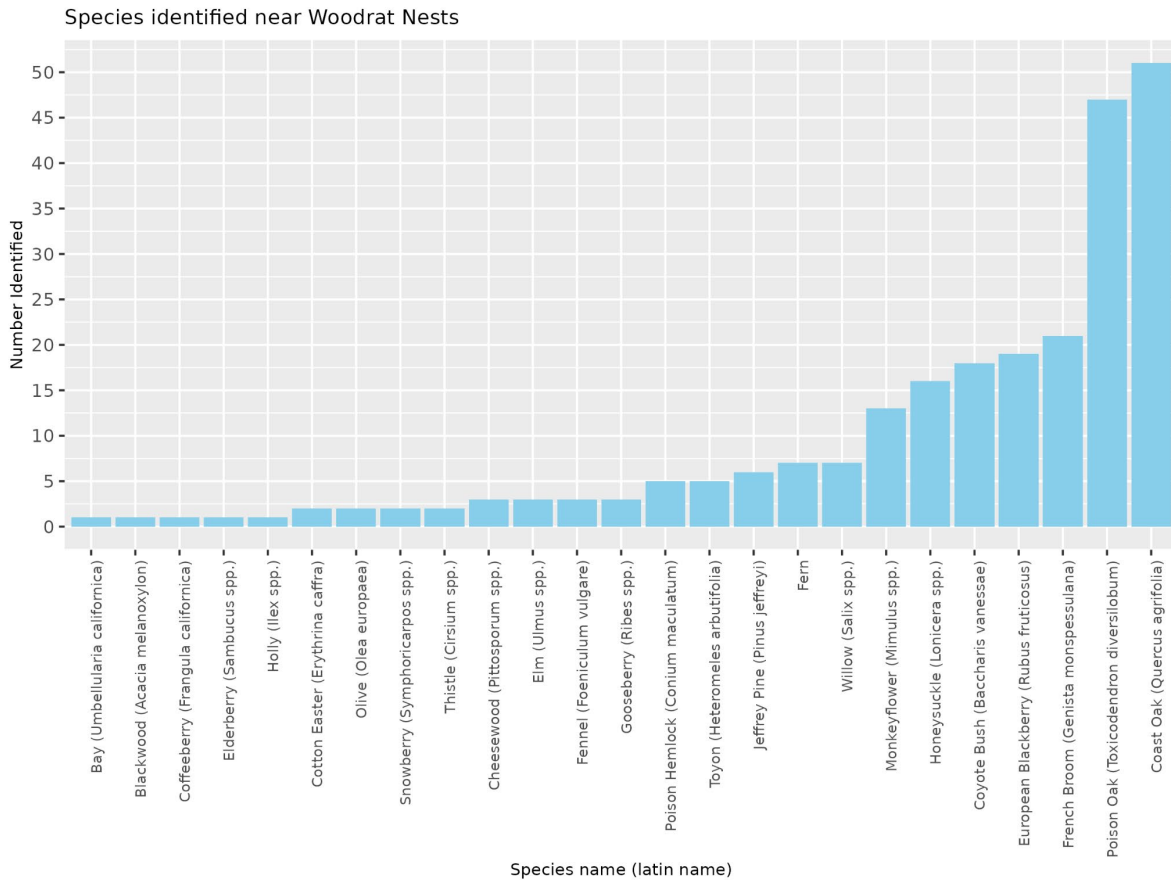


Figure 3. of **Vegetation Species identified on or near Woodrat Nests.** The top 7 vegetation species identified on or within 1m of the surveyed woodrat nests. The most frequently observed species were Coast Oak (*Quercus agrifolia*) with 51 identified, Poison Oak (*Toxicodendron diversilobum*) with 47 identified, French Broom (*Genista monspessulana*) with 21 identified, European Blackberry (*Rubus fruticosus*) with 19 identified, Coyote Bush (*Baccharis pilularis*) with 18 identified, Honeysuckle (*Lonicera spp.*) with 16 identified, and Monkeyflower (*Mimulus spp.*) with 13 identified.

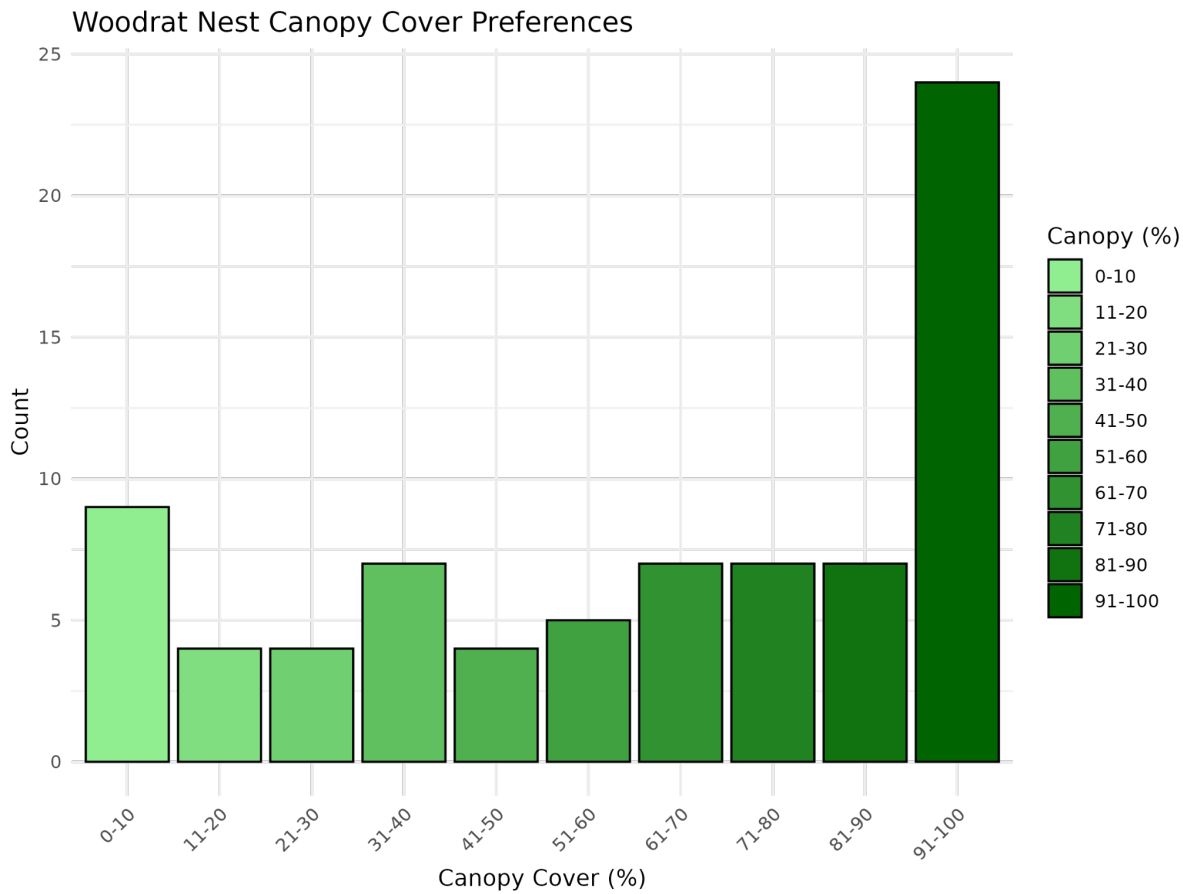


Figure 4.

Canopy Cover Range Distribution. The distribution of canopy cover percentages across the surveyed area, categorized into 10% increments. The 91-100% range is the most frequent, with 23 occurrences, indicating that areas with dense canopies are common in the surveyed locations. The 71-80% and 81-90% ranges also had relatively high frequencies (6 and 7 occurrences, respectively), suggesting that moderate canopy cover is prevalent. In contrast, lower canopy cover ranges (0-10%, 11-20%, etc.) were much less frequent, with only a few observations in each of those ranges.

Works Cited

Atsatt, Peter R., and Trudy Ingram. 1983. "Adaptation to Oak and Other Fibrous, Phenolic-Rich Foliage by a Small Mammal, *Neotoma Fuscipes*." *Oecologia* 60 (1): 135–42.

<https://doi.org/10.1007/BF00379333>.

Banks-Leite, Cristina et al., "Countering the effects of habitat loss, fragmentation, and degradation through habitat restoration.", *One Earth*, Volume 3, Issue 6, 2020, Pages 672-676, ISSN 2590-3322,

<https://doi.org/10.1016/j.oneear.2020.11.016>

Carraway, L. N., and B. J. Verts. 1991. "Neotoma Fuscipes." *Mammalian Species*, no. 386, 1–10.

<https://doi.org/10.2307/3504130>.

Chen, Rui. "San Francisco Dusky-Footed Woodrat." UC Santa Cruz Campus Natural Reserve, 2023.

<https://ucscampusreserve.ucsc.edu/media1/sf-d-f-woodrat>.

English, Pennoyer F. "The Dusky-Footed Wood Rat (*Neotoma Fuscipes*)." *Journal of Mammalogy* 4, no. 1 (February 1923): 1–9. <https://doi.org/10.2307/1373521>.

"Dusky-Footed Woodrat." Friends of Edgewood, October 1, 2022. <https://friendsofedgewood.org/dusky-footed-woodrat>

"El Cerrito Hillside Natural Area." iNaturalist, January 25, 2012. <https://www.inaturalist.org/places/el-cerrito-hillside-natural-area#/places/el-cerrito-hillside-natural-area>.

"Hillside Natural Area." The City of El Cerrito, 2023. <https://el-cerrito.org/812/Hillside-Natural-Area-Fundraising>.

Matocq, Marjorie D. 2002. "Phylogeographical Structure and Regional History of the Dusky-Footed Woodrat, *Neotoma Fuscipes*." *Molecular Ecology* 11 (2): 229–42. <https://doi.org/10.1046/j.0962-1083.2001.01430.x>.

Weiskopf, Sarah R. et al., "Climate change effects on biodiversity, ecosystems, ecosystem services, and natural resource management in the United States.", *Science of The Total Environment*, Volume 733, 2020, 137782, ISSN 0048-9697, <https://doi.org/10.1016/j.scitotenv.2020.137782>