

Abundance and Habitat Associations of Dusky-Footed Woodrats in Managed Redwood and Douglas-fir Forests¹

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Simpson Resource Company (formerly Simpson Timber) initiated studies on dusky-footed woodrats (*Neotoma fuscipes*) in 1992 on its approximate 450,000-acre ownership in Humboldt and Del Norte Counties, California. This land base is comprised of second and third growth forests primarily managed under an even-aged (clearcut harvest) silviculture technique. Interest in abundance and habitat associations of woodrats was driven by its importance as a primary prey item for the federally threatened northern spotted owl (*Strix occidentalis caurina*). Simpson's studies of spotted owls have shown that woodrats comprise approximately 45 percent frequency and 70 percent biomass of prey consumed by spotted owls.

Research projects on dusky-footed woodrats have consisted of two master's thesis projects at Humboldt State University and one "in-house" study. In the 1992 to 1993 master's study, we live-trapped woodrats on 1.2 ha grids located in 24 forested stands from four age classes of redwood (*Sequoia sempervirens*)/Douglas-fir (*Pseudotsuga menziesii*) forest. Age classes were: five to nine years, 10 to 20 years, 21 to 60 years, and 61 to 80 years. We live-trapped each stand for five nights with Tomahawk (model #201) traps. In the 1999 "in-house" study, we live-trapped woodrats in 15 redwood/Douglas-fir stands ranging from young regeneration nine to 15 years old to mature second growth forest 50 to 70 years old that had varying levels of commercial thinning harvest. Thinning existed on a continuum of basal area removed, but for the purposes of sampling we placed stands into light, medium and heavy thinning categories. Vegetation was measured in 0.04 ha circular plots within trapping grids. Akaike's Information Criterion (AIC) was used to identify the top models predicting woodrat occurrence. During 2000 and 2001, an HSU graduate student sampled 29 stands of Douglas-fir/tanoak (*Lithocarpus densiflorus*) forests for woodrats through the use of live-trapping techniques. Stands were stratified into four age classes: five to 20; 21 to 40; 41 to 60; 61 plus years. Two transects were randomly located within each stand and 25 Tomahawk live traps were placed at 15 m intervals along each transect. Trapping was conducted for five nights. Captured woodrats were marked and released. Vegetation was measured in 0.04 ha circular plots along trap lines. The top models for predicting woodrat occurrence were ranked according to AIC values. In addition, this study compared woodrat house centered vegetation plots and randomly chosen plots to investigate the influence of habitat variables on nest site (house) selection.

During 1992 to 1993 we found woodrats were most abundant in young stands

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from five to 20 years of age. Density estimates were ≥ 31 woodrats/ha in stands five to 20 years old and ≤ 2 woodrats/ha in stands 21 to 80 years old. In 1999, woodrats trapped in clearcut areas <15 years of age were found in similar abundance to clearcuts trapped in 1992 to 1993. Abundance in clearcuts was significantly greater than thinned stands ($\chi^2 = 12.54$, $P = 0.006$). In thinned stands, woodrats were associated with increasing understory cover, increasing amounts of redwood shrub cover, and decreasing amounts of Pacific rhododendron (*Rhododendron macrophyllum*) and salal (*Gaultheria shallon*) cover. Woodrats were negatively associated with conifer stems >45.7 cm dbh. A Poisson regression indicated that woodrats began responding to thinning when stand basal area approached a lower limit of 28 m²/ha. During 2000 to 2001, 207 different woodrats were captured among the four age classes of Douglas-fir forest. Woodrat abundance differed among the four age classes of Douglas-fir forest ($\chi^2 = 13.27$, $P = 0.004$) and woodrat abundance was negatively related to stand age ($r_s = -0.68$). The top model predicting woodrat abundance indicated a negative association with stand age, a positive association with shrub hardwood cover and a negative association with percent Douglas-fir in the shrub layer. The top model predicting woodrat house occurrence showed positive associations with ground cover of tanoak, percent tanoak in the shrub layer and density of understory tanoak.

All three studies indicate that in the redwood/Douglas-fir zone of Simpson's ownership, woodrats are in greatest abundance in young stands <20 years of age. Use of uneven-aged silviculture techniques such as commercial thinning or selection is not likely to enhance woodrat abundance because these practices generally encourage the proliferation of shade tolerant understory species that are not palatable forage for woodrats. Silviculture practices that promote a dense and diverse shrub layer of heliophilic species that are more palatable should promote woodrat abundance. However, woodrats also require suitable substrate in the form of redwood or tanoak stump sprouts, logs, and other down material for construction of their houses.

Because woodrats are the primary prey species of spotted owls (*Strix occidentalis caurina*) in northern California, forest management practices that influence woodrat abundance have implications to management of populations of threatened spotted owls. Thinning of mature stands is not likely to enhance the primary prey base for spotted owls in this region. The management strategies for threatened populations of spotted owls must take into consideration the habitat needs of the species itself and that of its primary prey.