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Dispersal and settlement in an endangered forest obligate: influence of behavior and forest structure

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Natal dispersal and settlement are critical processes structuring populations both demographically and genetically. The dispersal process (emigration, exploration, and immigration) has tremendous fitness consequences in terms of individual survival and reproductive success and may be influenced by individual behavioral differences and habitat structure. Coniferous forest structure is often altered by disturbance events like deforestation, insect infestation and fire - as is the case for many coniferous forests in the western United States – and such alterations may impact dispersal movements and settlement. The Mt. Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) is an endangered, endemic forest obligate constrained to a single mountaintop in southeastern Arizona. A long-term monitoring project has examined demography, space use, and habitat associations of Mt. Graham red squirrels since 1989. Much information on adult space use and survival has been obtained, however little exists on juvenile survival, behavioral differences, dispersal distance, settlement decisions, or habitat affinities. We combine methods for quantifying behavioral differences with a novel remote

sensing application to examine effects of both behavior and habitat on individual dispersal and settlement decisions.

Methods: In 2010, we initiated a radio telemetry study to track juvenile red squirrel movements, habitat affinities, and survival. We assessed individual behavior differences using mirror-image stimulation trials. We measured forest structure of natal and settlement centers and home ranges using plot-level measurements as well as three-dimensional LiDAR (light detection and ranging)-derived metrics such as canopy closure, stand height, basal area, and structural stage. We examined effects of behavior on probability of dispersal, dispersal distance, and overwinter survival. We compared forest structure at the natal center and home range and compared these metrics to settlement centers and home ranges.

We calculated dispersal distances for 37 individuals and long-term survival estimates for 15 individuals. Natal dispersal appears to be male-biased with males dispersing an average of 1016.3 m (n = 19, range 0 – 4,787m) and females dispersing an average of 320 m (n = 18, range 0 – 2,521m). Behavioral data suggest individual differences exist among squirrels remaining philopatric and those dispersing; forest structure comparisons indicate differences between natal and settlement areas.