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Road effects on movements and midden occupancy of red squirrels

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Roads are conspicuous and pervasive features of landscapes and represent one of the most significant anthropogenic impacts on natural areas and wildlife. Roads and traffic can cause mortality, impede and alter movements of animals and influence population density. Red squirrels are territorial and rely on cone scale piles known as middens to store food for winter survival. They are an ideal taxon to assess effects of roads on movements and space use because of their territoriality and ease of radio-tracking. The Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) is an endangered subspecies of red squirrel endemic to and isolated in the high elevations of the Pinaleño Mountains, Arizona. To investigate road effects on movements, we obtained telemetry data from March 2007 to February 2011. We selected squirrels that occupied middens within 100 m of roads and estimated seasonal home ranges every 3 month. We analyzed the spatial relationship of individual seasonal home ranges to roads and examined distance from squirrels to roads. We compare results to squirrels that occupied middens within 100 m of closed canopy forest interior. We found squirrels do not avoid approaching roads, but their home ranges are restricted to one side of roads. Average distance from squirrels to roads does not differ from forest interiors; however, fewer home ranges overlap roads than overlap forest interiors.

Midden occupancy was not influenced by distance to roads. Movement of animals through gaps such as roads to colonize habitat patches is critical to maintain genetic variability and population persistence, particularly in habitat fragments. Our results suggest that there is a potential barrier effect of roads on Mt. Graham red squirrels. A better understanding of the factors that influence road and traffic effects on animal movements will assist in designing effective mitigation.