

ENDANGERED MOUNT GRAHAM RED SQUIRREL (*TAMIASCIURUS HUDSONICUS GRAHAMENSIS*) USES NEST FOLLOWING LIGHTNING STRIKE

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ABSTRACT—Few studies have documented behavioral response of small mammals to fire. Here we report use of a nest by an adult Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*), an endangered subspecies endemic to the Pinaleno Mountains of southeastern Arizona, following a direct lightning strike to a tree. After 2 days, the squirrel nested in this tree and remained in the area for another 136 days. This is evidence that red squirrels may tolerate some degree of fire on the landscape.

RESUMEN—Pocos estudios han documentado el comportamiento de mamíferos pequeños en casos de incendio. Aquí reportamos el uso de un nido por un adulto de ardilla roja del monte Graham (*Tamiasciurus hudsonicus grahamensis*), una subespecie endémica amenazada de las Montañas Pinaleno en el sudeste de Arizona, después de la caída de un rayo en el árbol donde se encontraba el nido. Después de 2 días, la ardilla anidó en este árbol y permaneció en el área por otros 136 días. Esto es evidencia de que las ardillas rojas pueden tolerar incendios naturales hasta cierto punto.

Fire threatens survival of forest-dwelling mammals in North America, especially in the western United States, as increases in frequency and intensity of forest fires are predicted (Koprowski et al., 2006; Lehmkuhl et al., 2007). The threat is intensified for forest obligates such as tree squirrels that depend on trees for food, shelter, and protection from predators (Koprowski, 2005). In the short term, fire appears to have a negative impact on tree squirrels as thinned stands and subsequent reduction in canopy cover and available food are associated with high mortality and decreased density of squirrels (Podruzny et al., 1999; Fisher and Wilkinson, 2005; Koprowski, 2005; Koprowski et al., 2006; Herbers and Klenner, 2007). Observations of response of tree squirrels to direct impacts of fire are uncommon. Mortality in Mount Graham red squirrels (*Tamiasciurus hudsonicus grahamensis*) was high in burned areas, yet most surviving animals did not immediately abandon territories if some unburned habitat remained (Koprowski et al., 2006). Herein, we report the response of an endangered Mount Graham red

squirrel after a direct lightning strike to a tree containing a cavity nest of this taxon in the Pinaleno Mountains of southeastern Arizona.

As part of an ongoing study, Mount Graham red squirrels are marked with ear tags and fitted with radiocollars to examine use of space and to determine locations of nests (Koprowski et al., 2006). Following heavy thunderstorms on 25 August 2007, we noticed smoke rising from a small isolated fire within the territory of a radiocollared adult male red squirrel. A snag Engelmann spruce (*Picea engelmannii*), which contained a red squirrel nest, had been struck by lightning, and the upper bole and branches were in flames. The tree was 90-cm in diameter at breast height, 26.2-m tall, and 3 m from an occupied midden (central larderhoard). We first located a cavity nest 18.8 m up in this tree in September 2002 after which it was used 25 times by five squirrels. The aforementioned adult male resided at the midden for ≥ 395 days, but had not used this nest during 17 previous nocturnal radio-locations of the squirrel. The top one-third of the branches had fallen to the ground around the bole and also were burning.

Rain through the night reduced the fire to a smolder by 26 August, when firefighting personnel arrived to assess the fire. Firefighters observed the resident male squirrel near the nest tree and, thus, they only fragmented the smoldering branches lying on the ground, during which time the resident male approached the nest.

Red squirrels often use snags to cache food (Vahle and Patton, 1983); however, we did not observe this squirrel removing food from the snag. On the evening of 27 August, we located the signal from the resident squirrel at 1951 h and determined that he was in the nest tree, which was no longer smoldering after 2 days of rain. We could detect an obvious smell of smoke in the area and observed a dead deer mouse (*Peromyscus*) at the base of the tree, possibly killed by smoke inhalation. Between the evening of 27 August 2007 and 9 January 2008, the resident squirrel did not use this nest again over nine nocturnal radio-locations. The squirrel did maintain residence and established three new nests in proximity to the midden (range, 3.4–24.5 m away).

Fires at large spatial scales, such as stand-replacing crown fires, negatively impact tree squirrels by destruction of habitat and depletion of resources (Fisher and Wilkinson, 2005; Koprowski et al., 2006). Patchy, mixed-severity fires or ground fires were once common regimes in the southwestern United States (Brown and Smith, 2000), which left patches of habitat that allowed squirrels to persist in fire-affected areas. Following a fire, areas of patchy burn left some habitat and active middens of red squirrels unburned (Koprowski et al., 2006). Surviving squirrels did not abandon middens in partially burned areas. Our observations support this and indicate a behavioral plasticity in tree squirrels responding to fire and intensity of fire, likely evidence of a long history of evolution in fire-mediated landscapes.

We thank R. Smallwood, J. Garcia, and police K-9s Hunter and Lobo. Funding and in-kind support were

provided by Arizona Game and Fish Department, United States Department of Agriculture Forest Service, University of Arizona Office of the Vice President for Research, and Steward Observatory. Research was conducted under permit from the University of Arizona Institutional Animal Care and Use Committee, United States Department of Agriculture Forest Service, Arizona Game and Fish Department, and the United States Fish and Wildlife Service Endangered Species Office. Comments from two anonymous reviewers significantly improved this note.

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Submitted 30 January 2008. Accepted 10 May 2009.
Associate Editor was Celia López-González.