

**ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM**

Animal Abstract

Element Code: AMAFB08011

Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Tamiasciurus hudsonicus grahamensis* (Allen, 1894)

COMMON NAME: Mount Graham Red Squirrel; Mount Graham Chickaree; Mount Graham Spruce Squirrel

SYNONYMS: *Sciurus hudsonicus grahamensis* Allen, 1894

FAMILY: Sciuridae

AUTHOR, PLACE OF PUBLICATION: *Sciurus hudsonicus grahamensis* J.A. Allen, 1894. Bull. Amer. Mus. Nat. Hist. 6:347-350. Species level: [*Sciurus vulgaris*] *hudsonicus* Erxleben, 1777:416. Type locality "mouth of Severn River, Hudson Bay, Ontario." Based on "Hudson Bay Squirrel" of Pennant (Cited in Howell, 1936). *Tamiasciurus hudsonicus* Pollock, 1923:213, first use of current name combination.

TYPE LOCALITY: Graham Mountain, Graham County, Arizona.

TYPE SPECIMEN: Am. Mus. Nat. Hist. #9013/7308. Adult female collected August 18, 1894 by W.W. Price and B.C. Condit.

TAXONOMIC UNIQUENESS: *Tamiasciurus hudsonicus* is 1 of 3 species in genus, all found in North America; also the only species of this genus that occurs in Arizona. *T.h. grahamensis* is endemic subspecies of Arizona and 1 of 24 subspecies in *T. hudsonicus*. The other subspecies of *T. hudsonicus* that occurs in Arizona is the non-endemic *mogollonensis*. (Wilson and Reeder, 2005).

DESCRIPTION: A small diurnal tree squirrel easily recognized by its reddish dorsum and white venter. The dorsum and venter colors are usually demarcated by dark lateral lines, especially in the summer. The reddish or ferruginous brown dorsum color often with yellowish or reddish-yellowish interspersed. Total length is 28.0-35.0 cm (11.02-13.78 in), length of tail 9.5-15.0 cm (3.74-5.91 in), and weights from 140-250 g (4.94-8.82 oz). Red squirrels have large eyes and a bushy tail, often smaller and flatter than other tree squirrels. The dark colored tail is shorter than the body. White stripe present above and below the eye; ears without a pronounced tuft of hair; skull rounded in dorsal profile. No sexual dimorphism between adults has been determined.

AIDS TO IDENTIFICATION: *T. h. grahamensis* is generally slightly smaller, and has a shorter body, hind foot, and skull than *T. h. mogollonensis*, the only other red squirrel in Arizona. The skull of *mogollonensis* is also narrower than that of *grahamensis*. Color is not a

reliable distinguishing characteristic. Its explosive ratchet-like "chr-r-r-r" call is unique to the species, and serves to identify it even when it is not seen.

ILLUSTRATIONS:

Color photo (O'Brien 1990)

Color photo (Young in <http://medusa.as.arizona.edu/graham/envir.html>)

Color photo (Cancalosi 1994)

Color photo of species (Whitaker 1996)

Color photo of species (James Anderson, in Wilson and Ruff, 1999: p. 460)

TOTAL RANGE: Pinaleno Mountains, Graham County, Southeastern Arizona, above 8,700 feet elevation.

RANGE WITHIN ARIZONA: See "Total Range."

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Red squirrels across their range in North America are known to be very vocal and highly territorial. In Arizona, *T. h. grahamensis* is more secretive and much quieter than the other red squirrel (*T. h. mogollonensis*) found here. Red squirrels are diurnal with a bimodal activity pattern, generally exhibiting the most activity about 2 hours after sunrise and before sunset. This pattern is observed during the spring, summer and fall months; unimodal pattern is observed in the winter. Bad weather may reduce their activity, but they are unlikely to remain in the nest for more than a day. They exhibit two annual molts, spring and fall. Have two distinctive calls, the characteristic bark and chatter (rattle) call. The chatter is a territorial call and is the first line of defense, especially in defending their food supply. The bark call is a sign of aggression, used against intruders, including humans.

This species is known to build and utilize two possibly three types of nests. They use cavities in trees for nests, but also construct exposed spherical 'ball' nests from twigs, grass, and lichen in dense foliage (may be a nest of loosely held twigs and leaves in the branches of a tree in good weather). They may even use underground nests in burrows at times. It is not known if this subspecies uses all three kinds of nests or not.

Examining active "middens" found under preferred trees is used as a tool to estimate population size. These middens are utilized during winter months, can be kept active for years, and are aggressively defended. They are typically used by successive generations. The squirrel creates these middens when they strip scales from spruce-fir cones to get at the seeds. The scales fall to the ground around the feeding site and accumulate in mounds averaging ten inches or more deep and five to ten feet across. Red squirrels bury cones and other foodstuffs in these piles where moisture and coolness are maintained by layers of insulation. An unopened cone buried in a midden will mature slowly allowing seeds to be consumed later than if they were not buried.

REPRODUCTION: When ready to breed, a female abandons her territorial behavior and allows males to enter her territory without opposition for a single day. After initiating a 'mating chase' and breeding with 1-2 males, females are no longer receptive and return to their territorial ways. One to two litters of 2 to 5 young (up to 7 in some areas) are produced every year. In the southwest, red squirrels may produce two litters per year. Generally, they have one litter per year. After a gestation period from 35-40 days, young are born helpless. In the nest, they are nursed and cared for by the mother for 6-8 weeks. The mother provides nothing other than milk and protection from other squirrels. Young red squirrels are weaned at 7-11 weeks, and begin establishing their own territories at 9-12 weeks. Juvenile mortality (likely linked to over-wintering) is high at 67%, and most squirrels do not live past 2-3 years of age.

FOOD HABITS: Pine seeds are a big component of their diet, which they also store in caches of unhusked cones. They may eat a variety of other seeds, acorns, mushrooms, fungi, buds and fruit. Sometimes, the fungi are also stored in the middens.

HABITAT: Primarily occurs in higher conifer forests of high humidity, and a closed canopy. These factors produce a suitable microhabitat needed for middens. Their habitat covers about 6460 hectares at upper elevations of the Pinaleno Mountains, characterized by a series of rolling areas surrounded by steep edges and narrow canyons, especially along the northern and eastern edges. The Mt. Graham red squirrel is very selective when choosing an area, not only for midden placement, but also for general activities.

ELEVATION: 8,700 - 10,200 feet (2,654 - 3,111 m). At one time, they were found as low as 6,000 ft (1,830 m) on north facing slopes. According to AGFD, HDMS unpublished records (accessed 2003) they are found from 7,360-10,235 ft (2,243-3,120m).

PLANT COMMUNITY: Spruce-fir and mixed conifer communities.

POPULATION TRENDS: Perhaps they were more common in former times. At one time, they were thought to be extinct until Dave Brown (AGFD) and others found them in 1980. Dr. Donald Hoffmeister believed that the introduction of Abert's Squirrel played a significant role in their population decline, due to competition (AGFD 1996).

Past red squirrel midden surveys, suggested populations varying from approximately 100 to almost 400 animals. Red squirrel surveys are conducted by visiting a random number of known middens, which are areas where red squirrels store or cache their cones. From 1991-1997, Mount Graham red squirrels had a population of around 350 individuals. A 1998 survey by the US Forest Service estimated the population at 462 squirrels, an increase of 25% from the previous survey (USFS Biological Assessment, accessed 2003). The 1999 fall survey results were 528 squirrels, while the fall 2000 survey showed a decline in the number of squirrels to 474 (Arizona Game and Fish Department 2001). Between 2001 and 2009, the number has fallen to somewhere around 250 individuals; 263 (plus or minus 11) squirrels estimated in 2008, and 250 (plus or minus 11) estimated in 2009. The fall 2010 estimate by the Arizona Game & Fish Department and U.S. Forest Service shows 214 individuals. A

combination of drought, poor cone crops, fires, and insect tree infestation may have caused reductions to the population.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1987)
Critical Habitat established (USDI, FWS 1990)

STATE STATUS: 1A (AGFD SWAP 2012)
[WSC, AGFD, WSCA in prep]
[State Endangered AGFD, TNW 1988]

OTHER STATUS: Not FS Sensitive (USDA, FS Region 3, 2007)
[Forest Service Sensitive (USDA, FS Region 3, 1988)].

MANAGEMENT FACTORS: Threats include low numbers, limited distribution, intense summer fires, possible competition for habitat with the introduced Abert's squirrel, and the development of astronomical observatories and related facilities and roads. Alterations of closed canopy forests, such as logging and insect infestations, could affect the microenvironment critical for maintenance of middens. On a management level, the Coronado National Forest is planting trees in areas impacted by severe fires, and the U.S. Forest Service is supporting squirrel research being conducted by the University of Arizona. Additionally, the landscape-level Pinaleño Ecosystem Restoration Project will improve long-term health of squirrel habitat. (In <http://azgfd.net/artman/publish>, 3/1/2011).

PROTECTIVE MEASURES TAKEN: Critical Habitat was designated under the authority of the Endangered Species Act: Hawk Peak-Mount Graham Area, Heliograph Peak Area, and Webb Peak Area. Major constituent element is dense stands of mature spruce-fir forest.

SUGGESTED PROJECTS: Continued intensive monitoring of current population, forest management goals to manage hot wildfires and insect tree infestation, determine if any affect of competition exists with Abert's squirrels, continue with feasibility study to determine whether to proceed with Breeding Pilot Program at The Phoenix Zoo's Conservation Center.

LAND MANAGEMENT/OWNERSHIP: USFS Coronado National Forest.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

Per Steele (1998), "*Tamiasciurus* is derived from the Greek words *Tamias*, meaning animal who caches food, *Skia*, meaning shadow, and *oura*, meaning tail (Gurnell, 1987)." Steele (1998) also refers to the species *T. hudsonicus* as Pine Squirrel instead of Red Squirrel, distinguishing this species from the European Red Squirrel (*Sciurus vulgaris*), which is often referred to as red squirrel in the literature.

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