ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMAFF11082
Data Sensitivity: No

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Microtus mexicanus navaho*
COMMON NAME: Navajo Mexican vole, Navajo Mountain Mexican vole, Navajo vole
SYNONYMS: *Microtus mogollonensis navaho* (Navajo vole)
FAMILY: Muridae

AUTHOR, PLACE OF PUBLICATION: S.B. Benson, Proc. Biol. Soc. Wash., 47: 49-50. 1934.

TYPE LOCALITY: Soldier Spring, 8800 feet, east slope of Navajo Mountain, San Juan County, Utah.

TYPE SPECIMEN: MVZ 58817 (Adult male). S.B. Benson #2155, 17 June 1933.

TAXONOMIC UNIQUENESS: Twelve subspecies in *Microtus mexicanus*, with four occurring in the United States in Arizona, Colorado, New Mexico, Texas and Utah. The Navajo Mexican vole (*M. mexicanus navaho*) is one of three subspecies occurring in Arizona, the others being *M. m. hualpaiensis* and *M. m. mogollonensis*.

Genetic work by several individuals, but recently by Dr. Jennifer Frey and Terry Yates (1993), puts *Microtus mexicanus navaho* into a different species, *M. mogollonensis*. They concluded that allozyme characteristics found in their study are similar to those of other studies involving *M. mexicanus*; allozyme and mitochondrial DNA data support morphologic and chromosomal data which indicates that populations from Mexico are specifically distinct from populations in the United States (to be regarded as *M. mogollonensis*); populations from the Grand Canyon, Mormon Lake, and San Francisco Mountain which have been regarded as *M. m. navaho*, form a clade with the populations from the Mogollon Rim, type for locality *M. m. mogollonensis*. This arrangement puts into question the validity of *M. m. navaho*. Without comparative genetic material from Navajo Mountain, this cannot be determined. Populations from the Hualapai Mountains, Music Mountains and Hualapai Indian Reservation form a closely related group distinct from other populations in Arizona. It is possible that all of these populations should be regarded as *M. m. hualpaiensis*. Populations from the Bradshaw Mountains and Mount Francis form a group distinct from other populations. Likewise, populations from Camp Wood, Chuska Mountains and White Mountains form groups distinct from all other populations. *M. m. hualpaiensis* is the most divergent subspecies but is more similar to *navaho* than to *mogollonensis*. Additional specimens and analysis are needed to answers these questions.

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DESCRIPTION: Small mouse-sized mammal with a short tail and long fur that nearly covers its small round ears. The pelage is cinnamon buff to light brown on the back, paler buff-brown on the sides, and grayish buff underneath. Tail is slightly bicolored, with dusky to light brown above and paler below. The mean body length measures 4-5 inches (10.16-12.7 cm), tail length of 1 inch (2.54 cm), and weight of around 28 g. Spicer et al (1984) reported weights of 30.5-33.8 grams. Unlike other Microtus species, this vole has 2 pairs of mammary glands; 1 pair pectoral and 1 inguinal. The 12 molar teeth (three on each side of each upper and lower jaw) are rootless, ever-growing, and flat-crowned, with alternating triangle enamel patterns. The skull is short and broad; zygomatic arches broadly flattened at union of jugals and zygomatic processes of maxillae. Upper incisors strongly recurved; incisive foramina broad and nearly parallel sided; auditory bullae large (Durrant 1952).

AIDS TO IDENTIFICATION: Distinguished from other subspecies in Arizona by its smaller overall size, shorter body, slightly shorter tail, and paler dorsum (Kime 1994). In addition, it has a shorter and narrower skull than *M. m. hualpaiensis*. It is about the same size as *M. m. mogollonensis*, but buffier with ventral surface white rather than buffy (Hoffmeister 1986). When compared to other *Microtus* species, the Mountain vole (*M. montanus*) has a whitish belly, the Longtail vole (*M. longicaudus*) has a tail 2 inches long or more, and the Boreal Redback vole (*Clethrionomys gapperi*) has a red back and grey sides.

ILLUSTRATIONS: Color photo (Kime, 1994:9)
Color photo (Whitaker, Jr. 1996: plate 122)

TOTAL RANGE: Northern Arizona including the Grand Canyon, and the Flagstaff and Williams areas, and from Navajo Mountain in both Arizona and Southern Utah. Also from the Defiance Plateau in Arizona.

RANGE WITHIN ARIZONA: Navajo Mountain (Navajo County) and Defiance Plateau (Apache County), and more recently from the south rim of the Grand Canyon, and the Flagstaff and Williams area (Coconino County).

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: This vole on Navajo Mountain appears to be disjunct, isolated ecologically and genetically from other populations of *Microtus*. They are relicts from Pleistocene times when their populations became isolated, when North American glaciers were retreating and the Southwest climate was becoming drier and warmer (Spicer 1987). Unlike most other small rodents, they are active day and night, year-round. They have two daily activity peaks, one at mid-day and the other in early evening. Activity may be affected or regulated, in part, by temperature. Their runways are 1.5 to 2 inches wide, extending from one burrow entrance to another, and to feeding sites (Kime 1994). Potential predators include a variety of mammalian, avian and reptilian species.

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REPRODUCTION: Little data exists on reproductive attributes for the Navajo Mountain Mexican vole, although they are thought to be similar to those of other *M. mexicanus* subspecies.

For the species: they have only four mammae, rather than the normal complement of eight for the genus, which limits the number of young produced. The average number of young ranges from 2-3 (2-5 in Whitaker, Jr. 1996), with peak pregnancy rates highest during the spring and summer, and lowest in the winter (Hilton 1992). Reproductive activities occur throughout most of year, but primarily May-October; about 30-40 days between litters (Whitaker, Jr. 1996). Its globular nest, constructed of dried grass and forbs, is placed in a dense clump of vegetation, under a log or rock, in a depression on the ground, or in a chamber in its burrow.

Populations and distribution of *Microtus* on Navajo Mountain and its other occupied habitat, may be influenced by fresh green vegetation which stimulates breeding. Thus during times of drought or habitat degradation, the lack or poor quality of fresh green vegetation could possibly result in a low level of successful reproduction. Obversely, increased fresh plant growth during periods of increased precipitation could contribute to the increase and expansion of vole populations (Spicer 1987).

Based on study results for the species, conducted in Flagstaff, Arizona, breeding was not seasonally restricted, but was restricted in correspondence with adverse environmental conditions such as subfreezing daytime temperatures or snow cover (Hilton 1992).

FOOD HABITS: Forage for grasses, forbs and other vegetation which are clipped and eaten right away or taken back to the burrow.

HABITAT: Occupies prostrate thickets of a variety of shrubs that provide dense cover, in areas of high litter and bare ground. Also dry, grassy areas, usually adjacent to ponderosa pine forests, but sometimes as low as juniper woodland or stands of sagebrush, or as high as spruce-fir (Kime 1994).

ELEVATION: 6,100 - 9,000 feet (1861 - 2745 m) on Navajo Mountain, and 3,800 - 9,700 ft (1160 - 2955 m) on the south rim of the Grand Canyon and on Agassiz Peak in the San Francisco Mountains respectively.

PLANT COMMUNITY: On Navajo Mountain, Benson (1935 in Spicer 1987) found voles in thickets of blackbrush *(Ceanothus*), snowberry (*Symphoricarpos*), manzanita (*Arctostaphylos*), and wild rose (*Rosa*) (Hoffmeister 1986, Spicer 1987). At the lowest elevations on Navajo Mountain and on surrounding plateaus, the vegetation is Great Basin Woodland (*Juniperus* and *Pinus*) interfingered with Great Basin Desertscrub (*Artemisia* and *Coleogyne*). At successively higher elevations are found Rocky Mountain Montane Forest (*Pinus*, *Pseudotsuga* and *Abies*) and Rocky Mountain Subalpine Conifer Forest (*Picea* and *Abies*). Patches of Aspen Forest (*Populus*) are also found scattered through the mountain

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(Biome designations follow Brown 1982, in Spicer 1987). Voles were found in sagebrush on the south rim of the Grand Canyon, and on the Black Mesa they occurred in sagebrush, rabbitbrush-saltbush (*Atriplex*)-sagebrush, and in thickets of tamarisk (*Tamarix* sp.) and greasewood (*Sarcobatus vermiculatus*)/desert olive (*Forestieria neomexicana*) (Spicer 1987). In the Inner Basin of the San Francisco Peaks, they occupied grassy areas amid spruce, fir, limber pine and aspen. North of Williams, voles were taken where junipers had been present but pushed over and new grass had appeared (BISON 2000).

POPULATION TRENDS: Not known. Although the data are not sufficient to indicate conclusively whether the current population is increasing, unchanging, or decreasing, they do suggest that vole abundance has decreased during the last 50 years. Furthermore, much of the habitat that seems suitable does not appear to be occupied, for reasons unknown (Spicer 1987). Biologists do not yet know whether the Navajo Mountain Mexican vole is a geographically isolated subspecies from other *Microtus*, mainly *M. mogollonensis*. Genetic work should clear up the taxonomy on this vole.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None (USDI, FWS 1996)
[C2 USDI, FWS 1985]

STATE STATUS: WSC (WSCA, AGFD in prep)
[Threatened, TNW, AGFD 1988]

OTHER STATUS: Forest Service Sensitive (USDA, FS Region 3 1999)
Group 4 (NNDFW, NESL 2000)

MANAGEMENT FACTORS: The greatest threat is loss or degradation of suitable habitat. According to Spicer (1987) livestock grazing on Navajo Mountain is a continuing threat to vole habitat. Grazing has been severe during the last 100 years or so. Periodic droughts and a shallow and erodible soil have also contributed to preventing the establishment of grasses or forbs, except occasionally in shrub patches.

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Intensive surveys are needed to document the range, habitat requirements, and life history of this subspecies in Arizona. Continue research involving genetic analyses of *M. mexicanus* subspecies to substantiate subspecific classifications and range boundaries of these subspecies within Arizona.

LAND MANAGEMENT/OWNERSHIP: BIA - Navajo Nation; NPS – Grand Canyon National Park; USFS – Coconino National Forest; Private.

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SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Game and Fish Department. 1988. Threatened Native Wildlife in Arizona. Arizona Game and Fish Department Publication. Phoenix, Arizona. P. 25.

Arizona Game and Fish Department. In prep. Wildlife of special concern in Arizona. Arizona Game and Fish Department Publication. Phoenix, Arizona. 32 pp.

Biota Information System of New Mexico (BISON). 2000. BISON Species Account 050837, Navajo Mogollon Vole (*Microtus mogollonensis navaho*). New Mexico Game & Fish, http://151.199.74.229/states/nmex_main/species/050837.htm. pp. 1-10.

Durrant, S.D. 1952. Mammals of Utah: taxonomy and distribution. Univ. of Kansas Pubs., Mus. of Nat. Hist. Lawrence, Kansas. Vol. 6, Pp. 375-376.

Frey, J.K., and C.T. LaRue. 1993. Notes on the distribution of the Mogollon Vole (*Microtus mogollonensis*) in New Mexico and Arizona. Reprint from The Southwest Naturalist. 38(2): 176-178.

Frey, J.K., and T.L. Yates. 1993. Hualapai Mexican Vole (*Microtus mexicanus hualpaiensis*), genetic analysis. Division of Mammals, Museum of Southwestern Bio., Univ. of New Mexico. Albuquerque, New Mexico. Pp. 1-26.

Hilton, B.L. 1992. Reproduction in the Mexican Vole, *Microtus mexicanus*. Jour. Mamm. 73(3): 586-590.

Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press. Tucson, Arizona. Pp. 443-444.

Kime, K.A. 1994. Nongame Field Notes: Navajo Mountain Mexican Vole. Wildlife Views. Arizona Game and Fish Department Publication. Phoenix, Arizona. P. 9.

NatureServe Explorer: An online encyclopedia of life [web application]. 2001. Version 1.6. Arlington, Virginia, USA: NatureServe. Available: http://www.natureserve.org/explorer. (Accessed: December 11, 2003).

Navajo Nation Fish and Wildlife Department. 2000. Endangered Species List for the Navajo Nation. Navajo Nation, Arizona. P. 3.

Spicer, R.B., et al. 1984. Contract Proposal: Status Survey of Navajo Mountain Mexican Vole (*Microtus mexicanus navaho* Benson, 1934). Ariz. Game and Fish Department. Phoenix, Arizona. Pp. 1-12.

Spicer, R.B. 1987. Status of the Navajo Mountain Mexican Vole (*Microtus mexicanus navaho* Benson) along the Arizona-Utah border. Arizona Game and Fish Department. Phoenix, Arizona. Pp. 1-38.

USDA, Forest Service Region 3. 1999. Regional Forester's Sensitive Species List.

USDI, Fish and Wildlife Service. 1985. Endangered and Threatened Wildlife and Plants; Review of Vertebrate Wildlife, Notice of Review. Federal Register 50(181): 37958-37967.

USDI, Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants: Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species, Notice of Review. Federal Register 61(40): 7596-7613.

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ADDITIONAL INFORMATION:

Revised: 2001-02-22 (SMS)
2003-12-30 (SMS)

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