ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM

Animal Abstract **Element Code:** AMAFF11081
Data Sensitivity: Yes

CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Microtus mexicanus hualpaiensis*
COMMON NAME: Hualapai Mexican vole
SYNONYMS: *Microtus mogollonensis hualpaiensis* (Hualapai vole)
FAMILY: Cricetidae

AUTHOR, PLACE OF PUBLICATION: Goldman, E. A. 1938. Three new races of *Microtus mexicanus*. Jour. Mammal. 19: 493.

TYPE LOCALITY: Hualapai Peak, 8400 ft., Hualapai Mountains, Mohave County, Arizona.

TYPE SPECIMEN: USNM 244108. E. A. Goldman #23554, 1923.

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

Genetic work by several individuals, but recently by Dr. Jennifer Frey and Terry Yates (1993), puts *Microtus mexicanus hualpaiensis* into a different species, *M. mogollonensis*. See "Additional Information" for the discussion of the continued use of *Microtus mexicanus hualpaiensis* by the Heritage Data Management System (HDMS). Frey and Yates 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 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. mogollonensis hualpaiensis*. Populations from the Grand Canyon 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*; Populations from the Bradshaw Mountains and Mount Francis formed a group distinct from other populations. Likewise, populations from Camp Wood, Chuska Mountains and White Mountains formed groups distinct from all other populations; Phenetically, *M. m. hualpaiensis* is the most

draft

divergent subspecies but is more similar to *navaho* than to *mogollonensis*. Additional specimens and analysis are needed to answers these questions.

Recent indepth genetic studies conducted by Dr. Tad Theimer (in press as of 2002) from Northern Arizona University, agrees with Dr. Frey's work and places this vole under the species *mogollonensis*, and restricts the species *mexicanus* to Mexico. Thus the taxonomy for *Microtus mogollonensis* contains three subspecies: *hualpaiensis*, *mogollonensis*, and *navaho*. His findings have been submitted to the U.S. Fish and Wildlife office in Phoenix, where it is hoped that the Service will consider both Dr. Theimer and Dr. Frey's work and delist the Hualapai vole.

DESCRIPTION: Small, cinnamon-brown, mouse-sized mammal with a short tail and long fur that nearly covers its small round ears. It appears thickset, blunt-nosed and short-legged. The pelage for the species is course and lax; upper parts cinnamon buff to dark cinnamon brown, with a mixture of black hairs resulting in grizzled-brownish color; sides paler; venter washed with grayish buff to cinnamon, sometimes whitish; tail slightly bicolored, dusky to dark brown above, paler below; incisive foramina short, wide, and truncate posteriorly. The mean total length ranges between 137.2 - 141 mm (5.35-5.5 in), tail 30.2 - 32 mm (1.2-1.25 in), and hind foot 19.6 - 22 mm (0.76-0.86 in); weight averages around 28 g. Two pair of mammary glands, 1 pair pectoral and 1 inguinal. The molar teeth (three on each side of each upper and lower jaw for a total of 12) are rootless, ever-growing and flat-crowned with enamel patterns of alternating triangles. Second upper molar with only 4 lakes posterior, palatal margin grooved or acutely notched; skull is short, wide, relatively angular and sculptured.

AIDS TO IDENTIFICATION: *M. mexicanus hualpaiensis* was described based on its paler color, longer premaxillae, broader incisors, shorter molar toothrow, shorter and broader skull, and longer hind feet as compared with *M. m. mogollonensis.* *M. m. hualpaiensis* has larger longer tail, body, and hind foot, and larger broader skull than *M. m. navaho* (AGFD 1985). The Mountain Vole (*M. montanus*) has a whitish belly, longer tail, 4 pairs of mammary glands rather than 2; Long Tail Vole (*M. longicaudus*) has longer tail (2 in or more), 4 pairs of mammary glands, dorsum with a middorsal reddish band, longer hind foot; Boreal Redback Vole (*Clethrionomys gapperi*) has red back and grey sides.

ILLUSTRATIONS: Color photo (Whitaker, Jr. 1996: plate 122)
Color photo (Kime 1995: p. 19)
B&W drawing (Schmidly and Martin 1977: p. 122)

TOTAL RANGE: Restricted to Arizona: From Mohave County (Hualapai and Music Mountains, Grand Wash Cliffs, Wabayuma Peak vicinity, and upper Blue Tank Wash drainage), Coconino County (Prospect Valley, Laguna Valley, Aubrey Cliffs, Round Mountain, and Trinity Mountain), Yavapai County (Santa Maria and Santa Prieta mountains, and Walnut Creek vicinity, north of Bald Mountain).

Draft

RANGE WITHIN ARIZONA: See **"Total Range."**

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: Unlike most other small rodents, voles are active day and night, year-round. They have two daily activity peaks, one at mid-day and the other in early evening (Kime 1995). Vole runways are 1.5 to 2 inches wide, extending from one burrow entrance to another, and to feeding sites. Presence of vole sign at trap locations in the Hualapais' during the 1991 survey, differed slightly depending on the amount of vegetation understory including grass cover, forbs, leaf litter, rocks, logs, and soil content. When moist soil and moderate grass cover prevailed, runways were very conspicuous. When heavy leaf litter was present, sizable portions of the runways were usually concealed, making them very difficult to locate (Kime et al 1992). Potential predators include a variety of mammalian, avian and reptilian species.

REPRODUCTION: Little data exists on reproductive attributes for the Hualapai Mexican vole (HMV), 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* in the Hualapais 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 et al 1985).

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: Grasses, forbs, and other plants.

HABITAT: Primarily associated with dry grass/forb habitats in Ponderosa Pine dominated forest. Studies conducted in 1991 by the Arizona Game and Fish Department (AGFD), suggests that this species uses dry, grassy areas on moderate to steep slopes with north aspects (Kime et al 1992). According to the Fish and Wildlife Service (1991), they are

draft

now found only in moist, grass/sedge habitats along permanent and semipermanent waters (such as springs and seeps), but may be capable of occupying drier areas when grass/forb habitats are available. More recent studies (Kime 1995) indicate their preferred habitat is grassy areas usually in or adjacent to spruce-fir, ponderosa pine, or Gambel's oak stands at higher elevations (above 6000 feet), and pinyon-juniper woodland or sagebrush at lower elevations (below 6000 feet). In the Hualapai Mountains, the aspect of all vole areas ranged from 290 to 114E, while slopes varied from 0 to 41 percent (Kime et al 1994).

ELEVATION: 939 m - 2560 m (3,080 - 8,400 feet).

PLANT COMMUNITY: Primarily associated with dry grass/forb habitats in Ponderosa Pine dominated forest. Dominant species at most of the recent collection sites (Kime et al 1994) in the Hualapai Mountains include ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*), common hoptree (*Ptelea angustifolia*), New Mexican locust (*Robinea neomexicana*), Quaking aspen (*Populus tremuloides*), mountain snowberry (*Symphoricarpos oreophilus*), columbine (*Aquilegia chrysantha*), Arizona black walnut (*Juglans major*), canyon grape (*Vitus arizonica*), fendlerbush (*Fendlera rupicola*), goldenrod (*Solidago* spp.), *Baccharis* spp., and a perennial mutton grass (*Poa* spp.).

POPULATION TRENDS: Unknown. A total of 54 voles had been trapped between 1991-1993, more than double the amount that had been caught the previous 60 years. Specimens taken in the Music Mountains, 50 miles north of the Hualapais', and from Prospect Valley may also belong to the Hualapai subspecies, which would indicate that they are more widespread than previously thought. Biologists don't know yet whether the Hualapai Mexican vole is a geographically isolated subspecies from other *Microtus*, mainly *Microtus mogollonensis* (Kime 1995). Recent genetic work should clear up the taxonomy on this vole.

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: LE (USDI, FWS 1987), without critical habitat
[C1 USDI, FWS 1985]
[C2 USDI, FWS 1982]

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

OTHER STATUS: No NESL Group Status (NNDFW, NESL 2008)
[Group 4 (NNDFW, NESL 2000)]

MANAGEMENT FACTORS: Grazing and recreation use and development are the primary threats to the vole and its habitat (USDI, FWS 1991).

PROTECTIVE MEASURES TAKEN: Recovery Plan approved August 19, 1991 (USDI, FWS 1991). Maintain Hualapai Mountain Park as a Natural Recreation Area.

draft

SUGGESTED PROJECTS: 1) Include measurement of soil and temperature, vegetation sampling, and determination of fire history in future studies, since precise habitat requirements for this vole are not yet fully understood. Also, the long-term monitoring of known vole sites will clarify the role of succession in habitat suitability. 2) Continue research involving genetic analyses of *M. mexicanus* spp. to substantiate subspecific classifications and range boundaries of these subspecies within Arizona. Until these questions are answered, the range of *M. m. hualpaiensis* is uncertain. 3) Implement a monitoring effort using passive integrated transponder tags on voles from selected habitat sites in the Hualapai Mountains to determine vole densities and dispersal. Baseline population estimates will be needed to evaluate the viability of these populations, if genetic analyses prove Hualapai Mexican voles are indeed geographically isolated from any other subspecies. 4) Survey other mountain ranges for potential vole habitat, collect specimens from selected areas for genetic analyses of subspecific classification, and continue monitoring vole sites in the Hualapai Mountains (Kime et al 1994).

Actions needed per U.S. Fish and Wildlife 1991 Recovery Plan are: 1) Monitor existing populations, 2) Protect and manage occupied habitat, 3) Identify, locate, protect, and manage potential habitats, 4) Develop active and passive habitat restoration techniques, and 5) Develop cooperative management agreements with non-federal landowners.

LAND MANAGEMENT/OWNERSHIP: BIA - Hualapai Reservation; BLM – Kingman Field Office; USFS – Prescott National Forest; State Land Department; Mojave County – Hualapai Mountain County Park; Private.

SOURCES OF FURTHER INFORMATION

REFERENCES:

Arizona Game and Fish Department. 1988. Threatened Native Wildlife in Arizona. AZ Game and Fish Department Publication. Phoenix, Arizona. 32 pp.

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

Author unknown. 1986. Distributions and Habitats of Voles in Southeastern Colorado and Northeastern New Mexico. The Southwest Naturalist. Vol. 31 No. 2.

Burt, W.H., and R.P. Grossenheider. 1976. Peterson Field Guides: A field guide to the Mammals, North America north of Mexico. Third Edition. Houghton Mifflin Co., Boston. P. 188.

Cockrum, E.L. 1960. The recent mammals of Arizona: their taxonomy and distribution. The University of Arizona Press. Tucson, Arizona. Pp. 209-210.

Frey, J.K., and T.L. Yates. 1992. Hualapai Mexican Vole (*Microtus mexicanus hualpaiensis*), genetic analysis. Preliminary report to Arizona Game and Fish Department. University of New Mexico, Albuquerque. Pp. 1-7.

draft

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

Frey, J.K., and T.L. Yates. 1993. Hualapai Mexican Vole (*Microtus mexicanus hualpaiensis*), Genetic Analysis. Final Report. University of New Mexico. Albuquerque, New Mexico. Pp. 1-26.

Hall, E.R. 1981. The Mammals of North America. Vol. 2, Second Edition. John Wiley & Sons. New York, New York. P. 814.

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. 441-443.

Kime, K., W.E. Van Pelt, and D.W. Belitsky. 1992. Status of the Hualapai Mexican Vole in Northwestern Arizona. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program. Phoenix, Arizona. Pp. 1-13.

Kime, K., W.E. Van Pelt, and D.W. Belitsky. 1994. A Status Review of the Hualapai Mexican Vole in Northwestern Arizona. Arizona Game and Fish Department, Nongame and Endangered Wildlife Program. Phoenix, Arizona. Tech. Rep. 42, pp. 1-23.

Kime, K.A. 1995. Life on the runway, Arizona's Mexican Voles. Wildlife Views. Arizona Game and Fish Department Publication. Phoenix, Arizona. Pp. 19-20.

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. pp. 3.

Navajo Nation Fish and Wildlife Department. 2008. Navajo Endangered Species List.

Schmidly, D.J., and C.O. Martin. 1977. The Mammals of Trans-Pecos Texas: including Big Bend National Park and Guadalupe Mountains National Park. Texas A & M University Press. College Station, Texas. P. 122.

Spicer, R.B., R.L. Glinski and J.C. deVos. 1985 (revised 1986). Status of the Hualapai Vole (*Microtus mexicanus hualpaiensis* Goldman). Arizona Game and Fish Department. Phoenix, Arizona. Pp. 1-49.

USDI, Fish and Wildlife Service. 1982. Federal Register 47 FR 58454-58460.

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. 1987. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Hualapai Vole. Final Rule. Federal Register 52(190): 36776-36780.

USDI, Fish and Wildlife Service, Region 2, Ecological Services Field Office. 1991 (with 1992 addendum). Endangered and Threatened Species of Arizona. Ecol. Serv. Field Office, USFWS, Phoenix.

USDI, Fish and Wildlife Service, Region 2. 1991. Recover Plan for the Hualapai Mexican Vole (*Microtus mexicanus hualpaiensis*). Albuquerque, NM. pp. 1-28.

Whitaker, Jr., J.O. 1996. National Audubon Society Field Guide to North American Mammals. Alfred A. Knopf. New York, New York. P. 634.

draft

MAJOR KNOWLEDGEABLE INDIVIDUALS:

William E. Van Pelt - Arizona Game and Fish Department, Phoenix, Arizona.
Dr. Jennifer K. Frey - University of New Mexico, Albuquerque.
Dr. Tad Theimer – Northern Arizona University, Flagstaff, Arizona.

ADDITIONAL INFORMATION:

According to Tamarin (1985) and Kime et al (1994), habitat factors that appear most important in influencing local distribution of *Microtus* are: vegetation type, moisture conditions, and amount of cover. Due to the fluctuation of these habitat factors, site occupancy may be seasonal. This observation is based off of studies conducted in 1991 (Kime et al 1994).

Because the Hualapai Mexican Vole was considered very rare (only 15 known specimens collected in the Hualapais from 1923 to 1984), and occupied small patches of suitable habitat that had been threatened by livestock grazing, human recreation, and other activities, it was listed by the USFWS as endangered on October 1, 1987. This action raised the level of concern for the subspecies substantially (Kime et al 1992). Since then, extensive surveys have been conducted by the AZ Game and Fish Department (early to mid 1990's), along with genetic analysis conducted by Dr. Jennifer Frey out of the University of New Mexico, that places this subspecies in *Microtus mogollonensis*. The Heritage Data Management System (HDMS) of the AGFD continues to track this vole as *M. mexicanus hualpaiensis*, based on the continued use of this taxonomy by the U.S. Fish and Wildlife Service, and the listing of this vole as Endangered, under the Endangered Species Act.

Revised: 2001-01-30 (SMS)
2003-12-30 (SMS)

To the user of this abstract: you may use the entire abstract or any part of it. We do request, however, that if you make use of this abstract in plans, reports, publications, etc. that you credit the Arizona Game and Fish Department. Please use the following citation:

Arizona Game and Fish Department. 20XX **(= year of last revision as indicated at end of abstract)**. X...X **(= taxon of animal or plant)**. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. X pp.

draft