

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

Animal Abstract

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CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Sorex palustris*

COMMON NAME: American Water Shrew, Water Shrew, Northern Water Shrew

SYNONYMS: *Sorex acadicus* (Allen, 1915) [not Gilpin, 1867]

FAMILY: Soricidae

AUTHOR, PLACE OF PUBLICATION: *S. palustris* Richardson, 1828. Zool. J., 3:517.

TYPE LOCALITY: Canada, "marshy places, from Hudson's Bay to the Rocky Mountains."; not specified.

TYPE SPECIMEN: J. G. Cooper (s.n.), 1953.

TAXONOMIC UNIQUENESS: *Sorex palustris* is 1 of 24 North American species of water shrew in the Genus *Sorex*, and 1 of 5 in Arizona. Beneski and Stenson, 1987 (in Wilson and Reeder, 2005) recognize 9 subspecies. *Sorex palustris navigator* is the only subspecies that occurs in Arizona. According to Wilson and Reeder (2005), *S. palustris* was "Formerly placed in genus *Neosorex* Baird; now in *Sorex*, subgenus *Otisorex*, *S. vagrans* complex (Demboski and Cook, 2001; Fumagalli et al., 1999). Reviewed by Beneski and Stinson (1987, Mammalian Species No. 296), who recognized 9 subspecies. They did not include *alaskanus* as suggested by Junge and Hoffmann (1981:28) and Hall (1981:43); George (1988) and Carraway (1995) also treated *alaskanus* as distinct."

DESCRIPTION: A large, semiaquatic, long-tailed shrew; males average slightly heavier and longer than females. Total length is 13-17 cm (5.12-6.69 in); length of tail 5.7-8.9 cm (2.24-3.50 in); length of hind foot 1.8-2.2 cm (0.71-0.87 in); weight ranges from 8-18 g (0.28-0.63 oz). The dense pelage is black or black frosted with gray, and white tinged with gray or brown ventrally. Tail is distinctly bi-colored (dark above, light below), more rarely concolor. Their front and hind feet have a fringe of stiff hairs (fibrillae) located on the outer and inner margins of the feet and toes. The large hind feet provide the main thrust for swimming. The chin is usually lighter in color than other parts of the body. The head has bead-like eyes, inconspicuous ears, a pointed snout not greatly down-turned, and 32 simple teeth, mostly with sharp single-cusps. Sexually active males (February-September) have prominent dermal glands on each side between fore and hind legs. The skull is large and each side of the upper jaw has five unicuspid teeth; each premolar bears a distinctive, medially directed, pigmented ridge. The anterior part of the rostrum is comparatively short and not curved ventrally. No

post-mandibular foramen is present. (Beneski, Jr. and Stinson, 1987; Wilson and Reeder, 2005).

AIDS TO IDENTIFICATION: *Sorex palustris* differs from *S. monticolus*, *S. merriami*, *S. arizonae*, *S. nanus*, and from *Notiosorex crawfordi* in longer head and body, tail and hind feet; fringe of stiff hairs on hind feet; color blackish or slate gray rather than some shade or mixture of brown; and longer skull. It also differs further from *S. merriami* and *S. arizonae* in no post-mandibular foramen, and from *Notiosorex crawfordi* in five rather than three upper unicuspid (Hoffmeister 1986).

ILLUSTRATIONS:

Color photo (Whitaker, Jr., 1996: plate 8)

Color drawing (Burt and Grossenheider, 1980: plate 1)

Color photos (<http://members.vienna.at/shrew/fotos-palustr-ornatus.html>)

Black and White photo (S.R. Antell, in Beneski and Stinson, 1987: fig. 1)

Color drawing (in Smithsonian North American Mammals, <http://www.mnh.si.edu/mna>)

Color photo (Roger W. Barbour, in Smithsonian North American Mammals, <http://www.mnh.si.edu/mna>)

TOTAL RANGE: Boreal and montane areas of North America below the tree line from Alaska to the Sierra Nevada, Rocky and Appalachian mountains.

RANGE WITHIN ARIZONA: White Mountains, Apache County. This population is disjunct by approximately 200 miles from the nearest population in southern Utah, and 300 miles from the population in northern New Mexico.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: The water shrew is always associated with water. Per Beneski, Jr. and Stinson (1987) “they are capable of sustaining forced dives of 31.1 to 47.7 seconds, along with reducing their metabolic demands, thereby allowing them to dive year-round in cold mountain streams. Remaining underwater is difficult because during a dive a water shrew is surrounded by a silvery layer of air that causes it to surface and float like a cork whenever it stops paddling. The fringe of hairs on the hind foot, increases the foot’s surface area, trapping air bubbles, which allows this shrew to actually run on the water’s surface. Water shrews molt in fall and spring; winter pelage is somewhat paler than summer pelage. Flank glands, composed of enlarged sweat and sebaceous glands, are present in all shrews. In coping with their environment, water shrews seem to use their environment, and seem to use their sensory abilities synergistically; however, the relative acuity and functional significance of individual senses are not well understood. The vibrissae and sensitive muzzle of water shrews seem to aid in detection of prey (especially when diving), and the vibrissae also may serve as lateral feelers in confined areas. The hearing ability seems acute to distances of 3 meters, particularly for high-pitched sounds.”

Water shrews are very active, foraging day and night year-round to fuel their high metabolic rate and prodigious appetite. They need to consume approximately their weight in food every day (Conway 1952, Sorenson 1962 *in* NatureServe 2001). In the wild, they seem unable to store significant body fat and can die of starvation within a few hours. When a surplus of food is available it is often hoarded, with the particular gatherer sometimes defecating on it to keep other shrews away. There are two major activity periods, from sunset to 4 hours after sunset, and just before sunrise. They enter a relatively deep slumber for an hour or two at time, several times each day. Nests constructed of sticks, leaves and moss (or other soft material), are found in tunnels and in or under hollow logs within 10 feet of water. Mean diameter of nests is 8 cm. Captive water shrews neither defended individual nests nor nested in social groups. They were generally solitary and most intraspecific behavior was antagonistic (Sorenson 1962, *in* Beneski, Jr. and Stinson 1987). Much of the water shrew's food, including small fish, is captured while swimming or diving, which makes them vulnerable to predatory fish, garter and water snakes, marsh birds, hawks, and owls. They lead short and intense lives, with an average lifespan measured in months (Belitsky 1992). Average lifespan is around 18 months.

REPRODUCTION: In water shrews, ovulation is not spontaneous, but induced by copulation, as reported in other shrews. They may begin breeding as early as January and continue through August. Adult females produce two or three litters per breeding season. The gestation period is not known, but for most shrews is approximately 21 days (ranges from 17-28 days). Estimated duration of gestation and lactation in the water shrew does not exceed 10 weeks (Conway 1952, *in* Beneski, Jr. and Stinson 1987). Gestation ranges from 17-28 days. Females have six mammae, two pair abdominal and one pair inguinal. Embryo counts range from 3 to 10, with 6 being the most common. The young, born blind and naked, are weaned within 2 to 4 weeks and are reproductively active within a few months of birth. Water shrews mature earlier and with greater individual variation than reported for other *Sorex* species, although most females do not reproduce until after their first winter. Females born early in the year may reproduce later the same year.

FOOD HABITS: Water shrews usually prey on insects and other invertebrates such as worms and snails, but may take small vertebrates when available, including fish, fish eggs, amphibians, and carrion. They also eat fungi and green vegetation. Water shrews are capable of reducing their metabolic demands, thus allowing them to dive year-round in cold mountain streams for food; also even diving under ice (Beneski and Stinson, 1987).

HABITAT: *Sorex palustris* is a common inhabitant of boreal and montane riparian habitats. In much of the southern portion of the range such as Arizona, populations are isolated on montane islands, separated from other populations by semi-arid, inhospitable habitat. When found, they are invariably encountered near streams or other water bodies with heavy vegetative cover and plentiful logs, rocks, crevices, or other sources of shelter that offer high humidity and overhead protection. Found in shallow tunnels and runways through grasses, sedges, reeds, and willow and alder thickets. Occasionally, *S. palustris* is caught near slow-moving streams, dry ephemeral creek beds, and small springs. A study conducted by Clark

(1973) indicated that water shrews were most common in habitats of approximately 75% ground cover (Clark 1973, *in* Markow and Hocutt 1994).

ELEVATION: 8,200 - 9,630 ft. (2500-2935 m) in Arizona.

PLANT COMMUNITY: Montane riparian communities.

POPULATION TRENDS: Not well known, but because of their limited range in Arizona and narrow requirement for riparian habitats, they are rarely encountered and are of concern. According to NatureServe (2010), "Large range in the boreal and montane regions in North America; secure, if not abundant, throughout the northern part of the range; in the south, habitat has been fragmented since the retreat of the last glaciers, making isolated populations vulnerable to extirpation; some subspecies are rare enough to be of concern."

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS: None
STATE STATUS: 1B (AGFD SWAP 2012)
[WSC, WSCA, AGFD in prep]
[Endangered, TNW AGFD 1988]
OTHER STATUS: Forest Service Sensitive (USDA, FS Region
3 2007, 2013)

MANAGEMENT FACTORS: Recreational and livestock use of riparian (streamside) and lacustrine (lakeside) habitats may have caused a decline of the water shrew in Arizona. However, limited information on habitat and population status precludes specific delineation of management needs (Belitsky 1992). Suitable management consists primarily of maintaining their requirements, which includes high quality water, preferably mountain streams, and abundant cover such as rocks, logs, or overhanging stream banks (NatureServe 2001, 2010).

PROTECTIVE MEASURES TAKEN:

SUGGESTED PROJECTS: Research is needed to determine the minimum population size needed to maintain genetic viability in a fragmented habitat. In addition, Smith (1993) summarized that successful management of the population will require 1) further assessment of the range and habitat requirements of the subspecies in Arizona, 2) efforts to maintain existing subpopulations and habitat, and 3) possible restoration of suitable habitat to increase the population's range and density, and to facilitate dispersal.

LAND MANAGEMENT/OWNERSHIP: USFS – Apache-Sitgreaves National Forest; Private.

SOURCES OF FURTHER INFORMATION**REFERENCES:**

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MAJOR KNOWLEDGEABLE INDIVIDUALS:

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ADDITIONAL INFORMATION:

The generic name *Sorex* is from the Latin *soric* meaning “shrew mouse” and the specific name *palustris* is from Latin and means “dwelling in marshes.”

If the main dispersal corridors for water shrews in Arizona are the streams that they inhabit, habitat alteration above river forks could isolate multiple subpopulations, thereby cutting off dispersal corridors and drastically increasing the chances of extinction for this population as a whole (Markow and Hocutt 1994).

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