

Eastern Woodrat

Neotoma floridana

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DESCRIPTION

Taxonomy and Basic Description

The eastern woodrat was first described by Ord in 1818. Woodrats build extensive stick nests in which they larder bright, shiny objects, hence the nickname “packrats.” The Eastern woodrat (*Neotoma floridana*), the only woodrat species in South Carolina, has gray-brown or rusty brown fur on the back with darker hairs down the center of the back, a white belly and whitish paws. The white extends to the underside of the jaw. The well-furred tail is nearly as long as the body. It has short hairs and is bi-colored (dark on top and light underneath). Woodrats have long whiskers and large, unfurred ears. They are easily distinguished from black (*Rattus rattus*) or Norway rats (*Rattus norvegicus*) because woodrats have relatively large eyes, four white feet, well-furred tails and rather blunt snouts. Both black and Norway rats, introduced invasive species, have scaly tails and pointy snouts (Webster et al. 1985).



Males are slightly larger than females (Wiley 1980). Specimen weights from South Carolina at the Campbell Museum of Natural History range from 119.5 to 306.4 grams (4.1 to 10.7 ounces) for males and 104 to 268.8 grams (3.6 to 9.4 ounces) for females. The average weight of woodrats captured at mountain sites in South Carolina during winter were 264 grams (9.2 ounces) in males and 207.5 grams (7.3 ounces) in females (Bunch and Dye 1999c).

The woodrats in South Carolina were formerly recognized as two distinct subspecies. The mountain or Appalachian population was referred to as the southern Appalachian eastern woodrat (*Neotoma floridana haematoreia*). Coastal populations were assigned *Neotoma floridana floridana* (Hall and Kelson 1959; Wiley 1980). They are now considered to be the same subspecies, *Neotoma floridana haematoreia*, based on molecular genetic comparisons (Hayes and Harrison 1992; Ray 2000).

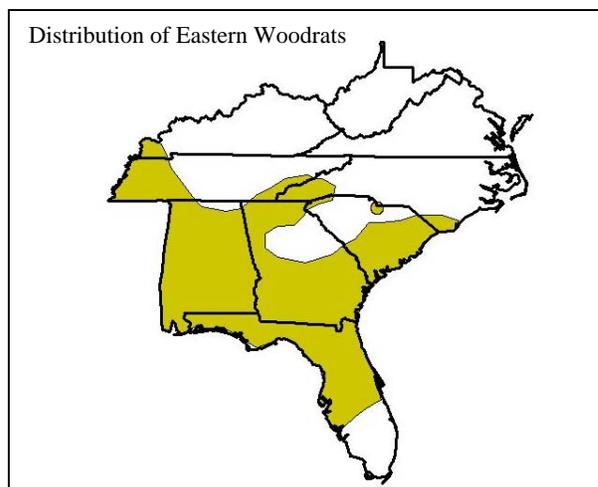
Farther to the north and west, ranges of both the eastern woodrat and the less common Allegheny woodrat (*Neotoma magister*) overlap. Allegheny woodrats were once recognized as subspecies of *Neotoma floridana* but are now recognized as a discrete species (Hayes and Harrison 1992; Hayes and Richmond 1993; Ray 2000; Edwards and Bradley 2001). The differences between the two species are subtle. Woodrats in the mountains tend to have longer whiskers than their coastal counterparts (Ray 2000) and their tails are more distinctly bi-colored and hairier. In this regard, eastern woodrats from the southern Appalachians more closely resemble Allegheny woodrats; those from the coastal plain of North and South Carolina more closely resemble eastern woodrats from Florida.

Status

In South Carolina, the species is apparently secure (S3/S4). Currently, coastal and mountain populations are not ranked separately in South Carolina. North Carolina ranks coastal populations of eastern woodrats as critically imperiled and mountain populations as rare or uncommon. Georgia and Florida rank *N. floridana* as secure, and the global rank is secure (G5) (NatureServe 2004). Eastern woodrats are on the IUCN Red List in the “lower risk, least concern” category (Yensen and Kirkland, Jr. 1998).

POPULATION SIZE AND DISTRIBUTION

Woodrats range along the coast from Pender County in southeastern North Carolina (Webster et al. 1985), southward along the entire coastal plain and into the sandhills of South Carolina. The distribution broadens westward into piedmont habitat as it continues southward into Georgia. The mountain populations of eastern woodrats are restricted to the southwestern mountains of North Carolina and northwestern South Carolina, ranging west and southward in Georgia.



A record of an eastern woodrat from York County, South Carolina (Dowda et al. 1981) in the upper piedmont suggests that the distribution in the midlands and upper piedmont of South and North Carolina is not well understood.

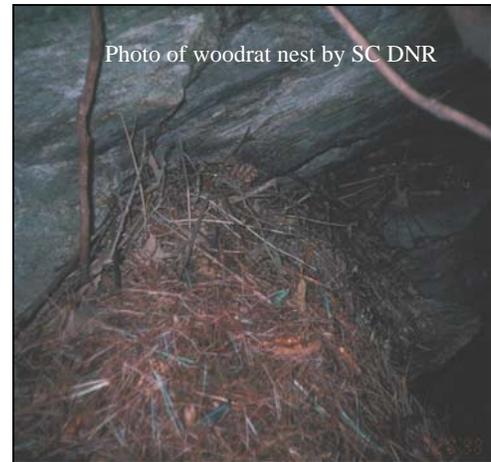
HABITAT AND NATURAL COMMUNITY REQUIREMENTS

Woodrats use a wide variety of habitats in South Carolina. In the southern Appalachian ecoregion, they can be found in dry or mesic deciduous or mixed deciduous forests including coves, bottomlands and swamps. They also occur in pine-heath communities and early successional stands such as old fields and clear cuts. Woodrats will use harvested woodlands prepared mechanically if piles of woody debris are present, but do not use sites that have been treated with herbicides within the previous five years (O’Connell and Miller 1994). They are often found in, but are not limited to, rock outcrops, boulder fields and cliffs.

In the coastal plain, woodrats use floodplain and swamp forests, wet scrub thickets, logged areas, dry and mesic deciduous forests and hardwood pine forests. At the Naval Weapons Station near Charleston, woodrats were captured in natural pine regeneration areas that were approximately 12 years old; these areas were affected by Hurricane Hugo and contained abundant coarse woody debris. Woodrats were also captured in mature hardwood pine forest habitat and mixed stand edge with an adjoining field at the Naval Weapons Station (Louie et al. 2001). At coastal North Carolina sites, Webster et al. (1987) reported an apparent association of woodrat prevalence in deciduous forest with dense dwarf palmetto (*Sabal minor*) cover and circum-neutral soils.

Woodrats are opportunistic; they forage on a variety of items including berries, stems, buds, leaves, seeds, fruit, bark, fungi, insects, acorns and other nuts (McMurry et al. 1993; Monty and Feldhamer 2002; Schwartz and Schwartz 1981; Wiley 1980). Hard mast, such as acorns, may be an important food source in winter.

Two obvious items can be found to indicate the presence of woodrats: large bulky nests and latrines. Nests for woodrats are built inside a large house constructed of sticks, leaves, branches, and scavenged litter such as vinyl flagging, bottle caps and Mylar balloon remnants. The bulky houses are continually maintained. Several nests can be found in one large house or den structure. Often these structures are in or under rock outcroppings, large cavity trees, large slash piles or in abandoned buildings. Latrines are often found on rock ledge sites where large piles of droppings accumulate.



CHALLENGES

Coastal populations of eastern woodrats in South Carolina are impacted by habitat loss and isolation due to development. Although some habitat for this species is protected on public lands, barriers of intense development isolate many preserved sites, particularly in the coastal plain. Much of the suitable habitat found in the midlands needs additional protection and many suitable areas found in the inner and outer coastal plain are not protected at all.

Predation (Monty and Feldhamer 2002) and factors that increase predator density or woodrat detection by predators also represent challenges to this species. Additionally, placement of recreational trails near suitable bolder or rock outcrop nest sites may adversely affect eastern woodrats by resulting in increased access to and, therefore, increased predation of nests.

Raccoons and their associated parasite, the raccoon roundworm (*Baylisascaris procyonis*) may also pose a threat to eastern woodrats (Monty and Feldhamer 2002). Although this parasite is not common in the south, the potential exists for parasite transmission to woodrats. Once transmission occurs, raccoon roundworm larvae migrate to the brain and death can occur. Such mortality has been documented in the rare Allegheny woodrat (*Neotoma magister*). As raccoon populations increase, an observable decrease in the woodrat population has been noted; transference of the roundworm is believed the cause (NatureServe 2004). Raccoons are a cosmopolitan species that often coexist and benefit from human activity, readily foraging in garbage, gardens, agriculture fields, aquaculture areas, koi ponds, pet food and bird feeders. Anything that causes an increase of raccoons within woodrat habitat can therefore increase the likelihood of raccoon parasite transfers to woodrats.

The exotic gypsy moth (*Lymantria dispar*) may pose a threat to populations of woodrats. Gypsy moth caterpillars prefer oak trees, but will defoliate most hardwoods when present in large numbers. This defoliation reduces mast production; repeated defoliations lead to tree mortality (McManus et al. 1992; Pearson 2002). Gypsy moths were first reported in South Carolina in

1998 (Pete Bischoff personal communication 2005). To date, no significant outbreaks of gypsy moth caterpillars have occurred in this state; however, should such an outbreak occur, it could result in significant impacts to woodrat food sources.

Sudden Oak Death (SOD) results from an introduced fungus (*Phytophthora ramorum*) that recently arrived in South Carolina via nursery stock. The impacts of this fungus on our forests could be devastating as it attacks a many species of shrubs and trees (O'Brien et al. 2002). Specific impacts to the many types of oak trees (*Quercus* spp.) in the southeast are not yet known. If the blight is not contained, serious losses of oak trees can be expected. Red, northern pin and black oaks have been shown to be susceptible to the fungus in experimental exposures (Tooley and Kyde 2003). The warm, humid climate in the southeast is conducive to the spread of the fungus. Unfortunately, SOD is believed to be distributed by air borne spores; such distribution makes it very difficult to control this fungus. This threat is not unique to South Carolina; infected nursery stock has been shipped to several southeastern states. Fortunately, to date, it has not been detected in our South Carolina forests. Woodrats use acorns, as do many other species of wildlife. Losing a significant proportion of our mature oaks could create a forage bottleneck that could decimate woodrat populations.

Currently, very few people are aware of woodrats or packrats in South Carolina, except for the perception that they are a nuisance species. This perception contributes to the assumption that this species is responsible for nuisance rat infestations. However, this species is generally not found living in areas populated by humans. Lack of knowledge of the eastern woodrat and its relevance in the ecosystem can represent a challenge for protection of this species.

CONSERVATION ACCOMPLISHMENTS

Extensive holdings in various public ownerships and nonprofit conservation organizations or conservation easements have protected over 162,000 acres of land in the mountains of South Carolina. Most, if not all of the tracts, have woodrats (Bunch et al. 1999 a,b,c). Some habitat preservation exists in the midlands and lower coastal plain on sites such as the Congaree National Monument and the Silver Bluff Audubon sanctuary. Significant tracts, such as the SCDNR's system of Heritage Preserves, the Francis Marion National Forest, the multi-partnered ACE basin project and the various National Wildlife Refuges also protect some coastal populations.

CONSERVATION RECOMMENDATIONS

- Conserve woodrat habitat linkages between sites that are already under protection through acquisition and/or conservation easement and encourage stewardship by private landowners.
- Encourage landowners and foresters to avoid use of herbicides as a site preparation technique in areas with woodrats.
- Survey the upper piedmont region in York County and surrounding counties to determine the distribution of woodrats in that region.
- Determine if trails by-passing outcrops and boulder fields lead to increased predation of woodrats.

- Acquire eastern woodrat density estimates for each ecoregion and designate selected sites for long-term monitoring in each of the following geographical area: southern Appalachians, inner and outer coastal plain, and piedmont.
- Educate the public about the relevance of the eastern woodrat in the ecosystem. Such education could occur at a demonstration site that illustrates important habitat and species in the mountain region of South Carolina.
- Continue to monitor the spread of raccoon roundworm, gypsy moths and SOD in South Carolina and develop an action plan in the event these threats adversely affect wildlife species within this state.

MEASUREMENTS OF SUCCESS

Surveys and density estimates in the southern region should provide some population estimations that will be used to more accurately rank the species and prioritize future management needs.

LITERATURE CITED

- Bunch, M. and A. Dye. 1999a. Appalachian woodrat distributional surveys. Unpublished final report for the U.S. Fish and Wildlife Services. South Carolina Department of Natural Resources. Columbia, South Carolina. 8 pp.
- Bunch, M.S. and A. Dye. 1999b. Monitoring and status surveys of rare species in the Jocassee Gorges area. Unpublished E-1-21 final report for U.S. Fish and Wildlife Service. South Carolina Department of Natural Resources. Columbia, South Carolina. 39 pp.
- Bunch, M.S. and A.S. Dye. 1999c. Bat, woodrat, and New England Cottontail survey and technical guidance. Unpublished W-91-1-W-91-3 final report for U.S. Fish and Wildlife Service. South Carolina Department of Natural Resources. Columbia, South Carolina. 60 pp.
- Dowda, H., A.F. DiSalvo and S. Redden. 1981. Naturally acquired rabies in an eastern wood rat (*Neotoma floridana*). *J. Clinical Microbiology*. 13:238-239.
- Edwards, C.W. and R.D. Bradley. 2001. Molecular phylogenetics of the *Neotoma floridana* species group. *J. Mammalogy*. 82:791-798.
- Hall, E.R. and K.R. Kelson. 1959. *The Mammals of North America*. The Ronald Press Company. New York, New York. 549 pp.
- Hayes, J.P. and R.G. Harrison. 1992. Variation in mitochondrial DNA and the biogeographic history of two woodrats (*Neotoma*) of the eastern United States. *Systemic Biology*. 41:331-344.
- Hayes, J.P. and M.E. Richmond. 1993. Clinical variation and the morphology of woodrats (*Neotoma*) of the eastern United States. *J. Mammalogy*. 74:204-216.

- Louie, B., M. Bunch and J.R. Harrison. 2001. Mammal survey and other biological assistance at NWS Charleston, SC. Unpublished final report for Naval Facilities Engineering Command. South Carolina Department of Natural Resources. Columbia, South Carolina. 26 pp.
- McManus, M., N. Schneeberger, R. Reardon and G. Mason. 1992. Gypsy Moth. Forest Insect & Disease Leaflet 162, U.S. Department of Agriculture Forest Service. 11 pp.
- McMurry, S.T., R.L. Lochmiller, J.F. Boggs, D.M. Leslie, Jr. and D.M. Engle. 1993. Opportunistic foraging of eastern woodrats (*Neotoma floridana*) in manipulated habitats. *Am. Midland Nat.* 130:325-337.
- Monty, A.M. and G.A. Feldhamer. 2002. Conservation Assessment for the Eastern Woodrat, (*Neotoma floridana*) and the Allegheny Woodrat (*Neotoma magister*). USDA Forest Service, Eastern Region. 36 pp.
- NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.0. NatureServe, Arlington, VA. <http://www.natureserve.org/explorer>.
- O'Brien, J.G., M. E. Mielke, S. Oak and B. Boltzan. 2002. Sudden Oak Death. Pest Alert, U.S. Department of Agriculture Forest Service. NA-PR-02-02. 4 pp.
- O'Connell, W.E. and K.V. Miller. 1994. Site preparation influences on vegetative composition and avian and small mammal communities in the South Carolina upper coastal plain. *Proceedings of Annual Conference of Southeastern Fish and Wildlife Agencies.* 48:321-330.
- Pearson, A. 2002. Gypsy moths & Bt: a double scourge. *Chicago Wilderness Magazine*.
Published at chicagowildernessmag.org/issues/summer2002/gypsymothes.html.
- Ray, D.K. 2000. Phylogenetics and evolution of woodrats (Genus *Neotoma*) in the southern Appalachian Mountains. MS Thesis. University of North Carolina at Wilmington. Wilmington, North Carolina. 68 pp.
- Schwartz, C.W. and E.R. Schwartz. 1981. *The Wild Mammals of Missouri*, revised edition. University of Missouri Press and Missouri Department of Conservation. Columbia, Missouri. 356 pp.
- Tooley, P.W. and K.L. Kyde. 2003. Susceptibility of some eastern oak species to Sudden Oak Death caused by *Phytophthora ramorum*. Poster paper available as pdf document at <http://www.aphis.usda.gov/ppq/ispmp/pramorun>.
- Webster, W.D., J.F. Parnell and W.C. Biggs, Jr. 1985. *Mammals of the Carolinas, Virginia, and Maryland*. The University of North Carolina Press. Chapel Hill, North Carolina. 255 pp.

Webster, W.D., W.W. Golder, A. Neville and J.F. Gouveia. 1987. The distributional status of the eastern woodrat, *Neotoma floridana floridana*, in North Carolina. Journal of the Elisha Mitchell Scientific Society. 103:111-112.

Wiley, R.W. 1980. *Neotoma floridana*. Mammalian Species. 139:1-7.

Yensen, E. and G.L. Kirkland, Jr., 1998. *Neotoma floridana* (Ord 1818). In: North American Rodents. Status Survey and Conservation Action Plan. D.J Hafner, E. Yensen and G.L. Kirkland, Jr. (editors). IUCN?SSC Rodent Specialist Group. IUCN, Cambridge, UK. 171 pp.