Notes on the distribution of Bailey's eastern woodrat (Neotoma floridana baileyi) in Nebraska

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Three subspecies of the eastern woodrat (Neotoma floridana) occur in Nebraska. Neotoma floridana attwateri occurs in southeastern parts of the state (Fig. 1; Clausen 1998, Benedict et al. 2000), N. f. campestris occurs in south-central and southwestern Nebraska (Fig. 1; Kugler and Geluso 2009, Wills et al. 2011), and N. f. baileyi occurs in north-central Nebraska (Jones 1964, Birney 1973). The subspecies N. f. baileyi is an isolated, disjunct population that represents a glacial relict (Jones 1964). This population of eastern woodrats occurs only in cool canyons in the Niobrara River Valley and a few of its major tributaries in Cherry, Brown, Keya Paha, and Rock counties (Jones 1964, Birney 1973). In those counties woodrats inhabit houses constructed of sticks and other materials in rocky habitats along canyon walls, at bases of trees and logs in forested areas, and in abandoned buildings (Jones 1964, Birney 1973).

In recent decades, the distribution of eastern woodrats has expanded in southern Nebraska. Kugler and Geluso (2009) showed that N. f. campestris has expanded eastward along the Republican River into Harlan and Webster counties since the 1960s, and Clausen (1998) reported a northward advancement of N. f. attwateri into southeastern Nebraska from Kansas along the Big Blue River drainage. With recent advancements of those subspecies in the state, we examined whether the other subspecies, N. f. baileyi, also had expanded its range in north-central Nebraska and possibly into South Dakota. Previously, a single eastern woodrat was reported from South Dakota (Spring Creek, 18 mi. SE Rapid City; Goldman 1910), but Jones (1964) determined that this individual represented a bushy-tailed woodrat (Neotoma cinerea). Distributional limits for N. f. baileyi were last updated by Birney (1973).

In 2004, 2009, 2010, and 2011, we searched for diagnostic signs of woodrats (i.e., their houses constructed from sticks and other materials) in 4 counties in Nebraska (Boyd, Cherry, Keya Paha, and Rock cos.) and 1 county in South Dakota (Todd Co.). Most sites represented areas outside distributional boundaries reported by Birney (1973) and Jones (1964; Fig. 1). Prior to surveys, we contacted

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private landowners who owned wooded areas within and beyond the Niobrara River Valley. We searched for woodrat houses in dense trees and areas with shrubs, around abandoned buildings, and inside abandoned cars.

At most new sites with evidence of woodrats, we set traps to capture individuals to prepare as voucher specimens; vouchers were deposited in the collection at the University of Nebraska State Museum, University of Nebraska, Lincoln (see Appendix). We also queried museums and databases (see Appendix) for unpublished voucher specimens of *N. f. baileyi* (Mammal Networked Information System last queried on 26 January 2012). Prior to trapping, we obtained approval for research from the Institutional Animal Care and Use Committee at the University of Nebraska at Kearney as well as scientific collecting permits from the states of Nebraska and South Dakota. Common and scientific names of plants used herein are based on Kaul et al. (2006).

**Distribution**

We searched for *N. f. baileyi* at 8 locations in Nebraska and 2 in South Dakota (Fig. 1, Appendix), documented woodrats at 7 localities in Nebraska (localities 1, 4, 5, 8, 9, 13, and 14), and observed no evidence of them in South Dakota. Six other localities for *N. f. baileyi* (localities 2, 3, 6, 7, 10, and 11) were obtained from unpublished specimens housed in museums (Fig. 1, Appendix). We obtained distributional records for *N. f. baileyi* east, west, and north of known distribution limits in north-central Nebraska (Fig. 1).

To the east, we captured woodrats along the Keya Paha River in Boyd County (locality 1,
According to Frey (2009), the best method to conclude that extralimital records represent a range expansion is to demonstrate that the species was not present in the past, based on prior surveys. If historical sampling was inadequate,
then extralimital records are best considered range extensions (Frey 2009). We propose that another way to conclude that a record is a range expansion is to show that a species now occurs in habitats not present in the past. Based on those definitions and lack of past surveys in areas where woodrats occur today (see Birney 1973, Jones 1964), our eastern (Boyd County) and western (Cherry County) distributional records represent range extensions. Birney (1973) searched for woodrats as far east as eastern Boyd and Holt counties but did not present specific localities. Birney (1973) also searched for woodrats along the Keya Paha River in South Dakota but not specifically along the river in Nebraska. In Cherry County, Birney (1973) stated he did not search west of the record south of Cody on the Niobrara River and does not mention any surveys on the Snake River. It is possible, however, that our records represent expansions, but without knowledge of past surveys, we cannot justify that conclusion (Frey 2009). Distributional records of woodrats in wooded, isolated homesteads in prairies away from river valleys in north-central Nebraska, however, represent an expansion in distribution because such woodlots were not present prior to human settlement, regardless of the lack of prior surveys at these homesteads.

In conclusion, *N. f. baileyi* is the only endemic mammal in Nebraska, yet to date, relatively little information has been published on this taxon. Although the subspecies occurs in a limited area in the north-central part of the state, the population appears stable and possibly increasing with increasing wooded habitats reported in grasslands throughout the Great Plains (e.g., Briggs et al. 2002). Observations that woodrats construct houses in plum thickets and in isolated woodlots in the region demonstrate that the subspecies might occur in other treeless or isolated wooded habitats in north-central Nebraska. Additional research is warranted to document its current distribution, which might further elucidate mechanisms of dispersal, and determine whether the species has recently expanded in the Niobrara River Valley and surrounding areas.

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APPENDIX. Localities examined for Bailey’s eastern woodrats (*Neotoma floridana baileyi*) in Nebraska and South Dakota, and localities of previously unpublished voucher specimens from other researchers. Numbers preceding localities correspond to those locations in Fig. 1. Parentheses that follow localities include presence or absence of woodrats and museum numbers of our vouchers housed at the University of Nebraska State Museum, Lincoln (UNSM), as well as unpublished vouchers from other researchers housed at the University of Nebraska at Kearney (UNK); the Museum of Southwestern Biology, Albuquerque, New Mexico (MSB); Michigan State University Museum, East Lansing (MSU); and the Museum of Vertebrate Zoology, University of California, Berkeley (MVZ).

**NEBRASKA:**
- **Boyd County:** (1) 6.1 km S, 2.3 km W Naper, 42°54.325'N, 99°07.442'W (woodrats present; UNSM 30100).
- **Brown County:** (2) 4.75 mi S of Norden (MSU 17218) and (3) 16 mi N, 10 mi W Ainsworth, Niobrara Valley Preserve (UNK 3961 and 3978).
- **Cherry County:** (4) 7.8 mi S, 0.5 mi E Merriman, T33N, R37W, Sec. 28, NW1/4, SW1/4 (woodrats present; UNSM 29012); (5) 35.5 km S, 3.2 km W Cody, Snake River, 42°36.972'N, 101°16.915'W (woodrats present; UNSM 30101); (6) 1.1 mi N, 0.1 mi W Headquarters, Fort Niobrara National Wildlife Refuge (MSB 119407); (7) 2.6 mi N, 1.3 mi E Headquarters, Fort Niobrara National Wildlife Refuge (MSB 119413); and (8) 4.8 km N, 1.5 km E Sparks, 42°59.072'N, 100°14.085'W (woodrats present, UNSM 30098 and 30099).
- **Keya Paha County:** (9) 1.1 km N, 6.4 km E Sparks, 42°57.016'N, 100°10.592'W (woodrats present); (10) 2.5 mi S, 13 mi W Springview (UNK 3652); (11) 3 km S, 2 km W Springview (MVZ 181284); (12) Holt Creek Wildlife Management Area, 16.5 km N, 2.9 km E Springview, 42°57.818'N, 99°42.490'W (woodrats not present); and (13) 10.9 km S, 15.0 km E Springview, 42°43.595'N, 99°33.869'W (woodrats present).
- **Rock County:** (14) Fred Thomas State Wildlife Management Area, 15.7 km N, 4.3 km W Bassett, 42°43.261'N, 99°35.326'W (woodrats present).

**SOUTH DAKOTA:**
- **Todd County:** (15) 6.5 km N, 1.4 km E Sparks [Nebraska], 42°59.947'N, 100°14.366'W (woodrats not present) and (16) 6.5 km N, 2.3 km E Sparks [Nebraska], 42°59.981'N, 100°13.720'W (woodrats not present).