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BAT SURVEY ALONG THE MISSOURI RIVER IN CENTRAL SOUTH DAKOTA—Bats are efficient predators of night-flying insects (Whitaker 1993), particularly in urban, agricultural, and forested areas in South Dakota (Kiesow 2004). In South Dakota, 6 bat species are considered rare and presently monitored by the South Dakota Natural Heritage Program (SDNHP; South Dakota Natural Heritage Program 2002). Because bats serve a vital ecosystem function there is an increased need to conserve bats and their habitats. Hence, the objectives of this project were to determine bat species richness along the Missouri River in central South Dakota.

We conducted surveys of bats using mist-nets and acoustic detection from early May to early October 2003–2005. We sampled survey sites ~7 nights each year starting 45 minutes before sunset to 4–5 hours after sunset (total of 80 mist-net hours) during optimal survey conditions (light wind [0–8 kph], no precipitation, and warm temperatures [16–27° C]). According to Swier (2003), only 1.5% of eastern South Dakota was considered wooded, which included shelterbelts, riparian areas, forests, and shrublands. Our target area for sampling, according to objectives set forth by the South Dakota Bat Management Plan, was to survey riparian areas along the Missouri River in central South Dakota. Most riparian areas and forests occur on state and federal lands, thus we randomly selected survey sites along the Missouri River in central South Dakota based on presence of relatively intact habitat consisting of (living and dead) cottonwood (*Populus deltoides*) trees in riparian areas. Our survey sites occurred on state lands, including Farm Island Nature Area, La Framboise Nature Area, and Oahe Downstream Recreation Area near Pierre, South Dakota (Fig. 1). (Farm Island Nature Area was selected based on past surveying efforts by Swier [2003].)

We captured bats using 4 mist-nets of 2 different sizes (i.e., 6 m and 12 m long) stretched between two 4.5 m poles. We recorded sex, reproductive status, forearm length, age (juvenile or adult, based on presence of the epiphyseal plate in the second digit), and body weight for each newly captured bat. Also, we cut a small section of hair from the rump to detect recaptured animals; recaptured individuals were immediately released unless individuals had a band. We recorded band number, reproductive status, forearm length, and body weight for all banded individuals that we recaptured. We analyzed mist-net data by examining frequency distributions, boxplots, and quantile plots by site using the statistical software program, JMP-IN™ 4.0 (SAS Institute, Cary, North Carolina, USA).

We collected bat calls using an unattended bat detector (D-980 Pettersson Elektronik, Uppsala, Sweden) placed 4 m above ground. We recorded bat calls for the duration of mist-net sampling directly onto a laptop computer. We analyzed all bat calls using full spectrum acoustic analysis of frequencies, bandwidths, call intervals, heels, slopes, and duration using a bat analysis software program (SonoBat™,

Sonobat, Arcata, CA, USA). We compared reference calls from bats collected in this region to calls collected during this study using sonograms (i.e., time-frequency displays).

We captured 30 individuals via mist-nets and documented 7 species of bats (mist nets [$n = 5$] and acoustic sampling [$n = 7$]), including northern myotis (*Myotis septentrionalis*; mist-net [$n = 14$], acoustic [$n = 24$]), little brown myotis (*M. lucifugus*; mist-net [$n = 12$], acoustic [$n = 30$]), hoary bat (*Lasiurus cinereus*; mist-net [$n = 1$], acoustic [$n = 10$]), silver-haired bat (*Lasionycteris noctivagans*; mist-net [$n = 0$], acoustic [$n = 23$]), big brown bat (*Eptesicus fuscus*; mist-net [$n = 1$], acoustic [$n = 46$]), red bat (*L. borealis*; mist-net [$n = 2$], acoustic [$n = 10$]), and western small-footed myotis (*M. cilolabrum*; mist-net [$n = 0$], acoustic [$n = 4$]). Northern myotis ($n = 14$; 43% male, 50% female, and 7% unknown) and little brown myotis ($n = 12$; 42% male, 42% female, and 16% unknown) were the most commonly (84% of captured bats) captured species via mist-net sampling. We captured pregnant females using mist-nets during June, and subsequently noted lactation from June to July (earliest 29 June) and first occurrence of volant young in mid-September (earliest 17 Sept.).

On 9 September 2004 at Farm Island Nature Area, we recaptured a northern myotis that was originally captured and banded by Swier (2003) on 25 July 2002 at Farm Island Nature Area. The bat weighed 9.3 g, and we estimated the age as 3 years old. Swier (2003) identified this bat as a post-lactating female adult that weighed 7.7 g.

Similar to previous surveys by Swier (2003), Lane et al. (2003), and Bales (2007), we documented the same seven species along the Missouri River of which two, northern myotis and silver-haired bat, are considered rare and presently monitored by the SDNHP. Little is known about the ecology of northern myotis in South Dakota (Jones and Genoways 1967); however, they are likely restricted to ponderosa pine (*Pinus ponderosa*) forests in the Black Hills and cottonwood forests along the Missouri River (Kiesow 2004). Silver-haired bats use large dead or dying ponderosa pines as roosting sites in the Black Hills (Mattson et al. 1996). Little is known about the silver-haired bats in South Dakota outside of the Black Hills, but, in general, silver-haired bats inhabit both coniferous and deciduous forests and riparian areas along waterways (Kiesow 2004). It is likely that northern myotis and silver-haired bats are using wooded areas along the Missouri River for roost sites and migration routes. However, riparian areas with living and dead trees of all age classes are relatively sparse in the plains region of South Dakota, largely due to existing land practices. During this study, we documented the likely importance of riparian corridors to bats in the plains region and believe the Missouri River may serve as a migration corridor for many bat species. Thus, protecting riparian areas may be necessary for conservation of bats in South Dakota.

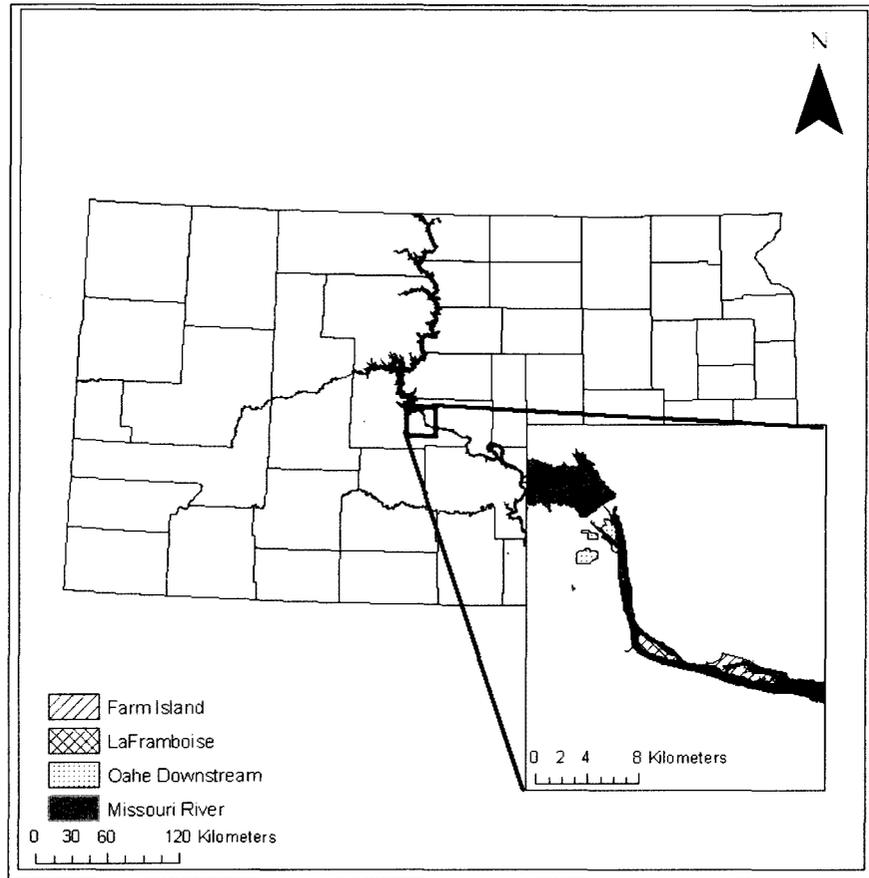


Figure 1. Sample sites (Oahe Downstream Recreation Area, LaFramboise Nature Area, and Farm Island Nature Area) along Missouri River in central South Dakota, 2003–2005.

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