

Bat surveys and habitat use in western South Dakota

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**Report to
South Dakota Department of Game, Fish and Parks**

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Introduction and Methods

This report details bat survey work conducted within western South Dakota during the period June through December 1998. Funding was provided by the South Dakota Department of Game, Fish and Parks.

Much of the work conducted during the summer of 1999 was a continuation of work begun in 1998 conducting surveys in varying habitat types surrounding the Black Hills. Locations throughout western SD were selected based upon known habitat preferences of bat species as well as interviews with local residents, wildlife biologists, and land managers. Another criterion used to select survey sites was based upon the location's displaying habitat characteristics unique to the immediate area.

In addition to summer surveys, known winter hibernacula were surveyed (abandoned mines and natural caves).

Survey methods consisted of mist netting at foraging areas, trapping at night roosts (mist nets and harp trap), visual surveys of day roosts, monitoring through use of ultrasonic echolocation detector (*BATBOX III*, Stag Electronics, United Kingdom)¹, and survey of hibernacula.

A listing of survey sites and legal descriptions can be found on page 24.

BANDING

It is well documented that natural caves and abandoned mines provide wintering habitat for eight of SD's year-round resident bat species. For SD bats outside the Black Hills region, wintering habits are largely unknown. In an effort to address this point, limited banding was begun during the summer of 1999.

¹All detector surveys were conducted using a minimum of two detectors (one set to receive calls of lower frequency with the other set for higher frequency). This method eliminates the need of constant manual tuning to scan frequency ranges.

Bat bands used in this project were manufactured by Lambournes, Ltd. (United Kingdom). The bands (2.9mm alloy) are similar to the bands used previously in the Black Hills between 1992 and 1995, with the exception of being color-coded (anodized). The western region of the state was divided into two regions (north and south) with the division being a line through Rapid City. Bats banded in the northern region of the state (outside the Black Hills) were banded using a blue band. Bats banded in the southern region of the state (outside the Black Hills) were banded using a red band. All bands are labeled "SDGFP" with a unique 5-digit number. No bats within the Black Hills will be banded using a color-coded band. This will permit discrimination during hibernacula surveys when band information is frequently inaccessible.

Limited banding was begun in mid-August. Species selected for inclusion in this project were those known to be year-round residents and whose wintering habits are poorly understood or have demonstrated seasonal movement between regions in other study areas. Migratory species (*Lasiomycteris noctivagans*, *Lasiurus borealis*, *Lasiurus cinereus*) were not included owing to their southward migration during winter months. *Corynorhinus townsendii* and *Myotis ciliolabrum* were not included given their relatively limited distribution outside the Black Hills and more sedentary habits.

All bats were banded following capture at foraging sites and occurred late enough in the season to prevent stress to pregnant females. Individual banding candidates were selected based upon three criteria: To be banded: 1) body weight must exceed mean body weight for species (adjusted for sex) based upon weights recorded in South Dakota (See Tigner 1997); 2) Forearm to be banded could not display any anomalies (swellings, injuries, etc.); males were banded on left forearm exclusively, females banded on right forearm exclusively¹; 3) No other physical defects or injuries were apparent including tears or punctures to flight membranes.

Hibernacula surveys conducted through the end of December have not yielded any bats with color-coded bands. Only a limited number of these bands have been applied to date. Additional banding is planned for the summer of 2000.

¹ This rule began with banding conducted in 1992 and its continued use has permitted determination of sex in hibernating populations when bats cannot be disturbed. It can also be a determining factor when only a portion of the band's number can be read.

SURVEYS OF FORAGING LOCATIONS

One area selected for survey and banding was riparian habitat found to the north of the Black Hills region on the prairie of Butte and Harding Counties. Limited detector surveys were conducted in this area during 1998 with distinct differences noted between habitat types (Tigner 1998). A variety of sites in this region were netted and surveyed via ultrasonic echolocation detector (*BATBOX III*, Stag Electronics, United Kingdom).

MOREAU RIVER (SOUTH FORK)

Permission was obtained to survey on the property of Gene Johnson (T14N R5E Sec. 31) along the Moreau River's South Fork. Four locations were selected for netting surveys. Three were located west of Hwy. 85 while the fourth location was beneath and adjacent to the state highway 85 bridge which crosses the Moreau.

Weather conditions for three of the netting survey nights were ideal, warm with little to no winds. The fourth night had late afternoon thundershowers that cleared prior to sunset but resulted in cooler temperatures and a slight NW breeze. Two additional nights were surveyed via ultrasonic detector at the bridge location following heavy thundershowers.

The bridge survey yielded the only captures of the four nights of netting surveys. Bat activity at the bridge was limited to later hours with no activity being recorded prior to 22:30. Most of the activity occurred between 23:30 and 24:00. The single exception was an adult male *Eptesicus fuscus* that was netted shortly after sunset almost certainly following emergence from a cliff swallow's nest located beneath the bridge. Direction of flight, proximity of nests to the mist net, and absence of any previous echolocation activity all support the conclusion of the bat's day roosting within the nest. This species has been observed emerging and entering these nests along the Cheyenne River (Tigner 1998). Upon release, this bat flew along the river's course towards the northwest.

A second observation of a bat utilizing a cliff swallow nest was made following the capture of an adult male *Myotis lucifugus* that was netted flying low over the pool immediately beneath the bridge. This capture occurred at 23:50. Processing of captured bats was conducted at a workstation set high on the north bank beneath the bridge. (This vantage point afforded an elevated view of all nets as well as the underside of the bridge where most of the bat activity was recorded.) Upon release, the *M. lucifugus* flew a short spiral up toward the center of the bridge and was observed flying into a cliff swallow nest. It was not observed emerging although this could have easily been missed.

Air temperature beneath the bridge was discernibly warmer than air temperature outside the bridge's protection although no temperatures were taken. Materials of the underside of the bridge were warm to the touch throughout the course of the survey.

As noted, most of the activity occurred late in the evening and was comprised of short intermittent foraging flights from points that could not be identified. The bridge is apparently used as a night roost as well as a foraging location. No echolocation activity was recorded after 24:00 (survey end times: 01:00, 00:45; and 00:30).

At the bridge location, during three nights of surveys, approximately 20 passes were recorded by at least three species of bats. Two species noted above and confirmed by capture were *E. fuscus* and *M. lucifugus*. A third *Myotis spp.* was heard via the detector on two survey nights but could not be positively identified. *E. fuscus* was the most commonly heard species. No records were noted during the course of any of the surveys along the Moreau for *L. noctivagans*, *L. borealis*, or *L. cinereus*.

Three nights of surveying (west of the bridge at Hwy. 85) along the river yielded similar activity levels but no captures. All bats appeared to be following the course of the river but easily avoided net placements. As at the bridge location, *E. fuscus* was the most common bat heard.

STOCK PONDS - HWY 85 - HARDING/BUTTE COUNTIES

Detector surveys were conducted on two evenings for comparison with surveys conducted on 9/6/98 at stock ponds located adjacent to Hwy. 85 between Buffalo and Belle Fourche (See Tigner 1998).

The same survey format was followed except for the exclusion of Indian Creek and Belle Fourche River locations. Surveys were conducted for approximately 30 minutes at eight stock ponds (all within 100 meters of Hwy. 85). As before, two detectors were used in order to monitor high and low frequencies simultaneously. Weather conditions were favorable for foraging activity.

To determine possible seasonal variation, the first survey was conducted earlier in the season (7/24/99) than in 1998. No bat activity was recorded at any of the stock ponds.

The second survey was conducted on 9/4/99. As with previous surveys, no bat activity was recorded during the survey.

MALLULA STATE GAME PRODUCTION AREA

This area is located northwest of Buffalo, SD, approximately 25 km east of the Little Missouri River. Containing small wooded draws, the survey site was characterized by gently rolling prairie containing a large stock pond within a sheltered drainage. This location was surveyed on two evenings 8/28/99 and 9/5/99. Both evenings were calm and warm with plentiful flying insects noted on both evenings. The first survey yielded no bat activity. No echolocation calls were monitored.

Nets were struck at 24:00. The second evening's survey (detectors only) recorded a single pass to the west of what was probably an *E. fuscus* although brevity of the call prevented confirmation. At approximately 22:30, this location was abandoned and survey was continued along the Little Missouri River near Camp Crook, SD. This area was active with frequent passes and foraging activity. Flight paths followed the river and did not appear to favor a specific direction. All bats were flying above the canopy. *Eptesicus fuscus*, *Myotis lucifugus*, and at least one other *Myotis* species were identified via detector. A single *Lasiorycteris noctivagans* was also recorded foraging flying in a southerly direction. Activity ended approximately 0030. Additional survey locations south of Camp Crook along the river were briefly monitored randomly until 0130. No other activity was noted.

BEAR BUTTE CREEK

Given the close proximity of this riparian area to the maternity/nursery roosts located in buildings at the Ft. Meade facility (<1km), this area has been assumed an important foraging location. Additionally, *Myotis* species have been observed, upon emergence from a maternity/nursery roost located in Building 51 at Fort Meade, to fly in the direction of this area.

Having previously determined emergence time from the closest Ft. Meade roost, a location along the creek adjacent to a small meadow was selected for a netting survey. This point was also adjacent to the tree line extending around the periphery of the western edge of the Ft. Meade property. Survey was conducted 6/22/99.

Approximately five minutes after emergence time from the roost in Building 51, bats began arriving at the survey location. Between 21:25 and 22:00, 83 passes of *Myotis lucifugus* were recorded at this site. Bats were flying above canopy and following the creek in an easterly direction. Activity abruptly ended after 22:00 with no other records being recorded.

The only other species heard at this location was *Lasiorycteris noctivagans* (two passes recorded at 21:15 and 21:20). No *E. fuscus* were recorded at this location, which was somewhat surprising given the large numbers of this species found in roosts at Ft. Meade.

Winds picked up and temperatures cooled noticeably at approximately 22:30. Given the absence of any bat activity after 22:00, nets were struck at 23:15.

ALKALI CREEK HORSE CROSSING (BLM)

Located near the Ft. Meade facility, this survey location is a crossing of Alkali Creek. Characterized by diversity of habitat, this location is adjacent to rock cliffs, prairie grassland, ponderosa pine forest and large oak along the creek drainage.

First surveyed in 1998, this location and nearby Frog Pond (see below) have yielded captures of ten of the eleven species of bats found in western South Dakota. (*Myotis evotis* has not been recorded at this location.) This location has yielded high capture rates of lactating females and juveniles of the tree-roosting species (*Lasiorycteris noctivagans* and *Lasiurus cinereus*). In addition, *Lasiurus borealis* has also been captured at this location.

This location was monitored twice during the summer of 1999. The first survey was on 8/18/99. As was the case in 1998, the survey included captures of juvenile *L. noctivagans* and *L. cinereus*. Survey results are located on page 33.

The second survey was conducted on 9/22/99. This survey was characterized by less overall activity (possibly owing to cooler temperatures) but also by the absence of any of the tree-roosting species. No captures and no echolocation calls were heard for any of these three species. It is likely a southward migration of those bats summering in this area had already begun. Survey results are located on page 33.

FROG POND (BLM)

Located approximately 1.5km from Ft. Meade, this small pond surrounded largely by oak yields similar captures to Alkali Creek crossing described above. Size and depth of the pond have prevented effective netting of this location. Only a detector survey was conducted at this site during 1999. Species identified on 8/16 were *Eptesicus fuscus*, *Lasiorycteris noctivagans*, *Lasiurus cinereus*, *Myotis ciliolabrum*, and *Myotis lucifugus*.

All five species were identified foraging at this location. Survey was ended at 22:50 owing to onset of rain showers.

ELLIOT PROPERTY - RAPID CREEK

This parcel of property is bisected by Rapid Creek and is located at the edge of the eastern boundary of the city limits of Rapid City. In addition to the creek, the property is crossed by old irrigation ditches that contain water diverted at higher flows from Rapid Creek. Property is atypical in that it is largely surrounded by cleared and developed land. Containing large cottonwoods, Russian olive, thick uncut brush and tall grasses, insect activity was plentiful. The owner's home is located on the property approx. 5km from Rapid Creek. *E. fuscus* is known to use the apex of the roof beneath the eaves at both ends of the building as a night roost.

Surveyed on 7/8/99, only limited activity was recorded. Three species were identified during the survey: *Eptesicus fuscus*, *Lasiorycteris noctivagans*, and *Lasiurus cinereus*. A single *Myotis* species was also heard (two passes) but could not be identified.

E. fuscus was the most common species heard, with only intermittent passes recorded throughout the course of the evening. Two passes of *L. noctivagans* were recorded at 21:45 and a single pass of *L. cinereus* at 22:05. When direction could be determined, most of the flight was traveling in an easterly direction. Only *E. fuscus* was heard foraging and all bats were flying well above the canopy of the trees. Two additional passes of *L. cinereus* were recorded at 23:05 and 23:15 (both flying in an easterly direction). The wind came up at 23:30 after which no further activity was recorded. Nets were struck at 24:00 with no captures for the evening.

HOUK PROPERTY

Located east of Rapid City off Hwy. 44, this property is bisected by Rapid Creek and is surrounded by grassland. Located around three bends in the creek are a mixture of large cottonwood, Russian olive, willow, ash, and elm. This riparian area comprises approximately 2 acres. This property is approximately 2km east of survey site: Elliott Property.

Surveyed during the summer of 1998, four species were identified at this location (Tigner 1998). These were: *Eptesicus fuscus*, *Lasiurus cinereus*, *Lasiurus cinereus*, and a single *Myotis* species which was not captured and could not be positively identified.

Given the low level of activity found at the nearby Elliott property, a detector survey was conducted at this location for comparison purposes. Both of these locations are similar in size and habitats.

A detector survey was conducted on 7/11/99. Activity level was very low with only three individual passes recorded of *Eptesicus fuscus* throughout the course of the evening. The last pass was recorded at 22:30 and survey was discontinued at 23:30.

Low levels of bat activity at both of these locations may be a result of seasonal variation. Surveys conducted at this location in 1998 were generally later in the year (survey dates: 7/14, 8/4, 8/16, 9/1, 9/4). Studies that focus upon how bats use specific waterways/riparian areas may resolve these apparent differences in activity levels and species distribution.

ELK CREEK – HALVERSON PROPERTY

This location was east of the bridge crossing Elk Creek on Empire Place Road. Large cottonwoods line the creek at this point with numerous snags and dense vegetation. Approximately 1 km from this location, a local resident had reported bats roosting in a barn during the previous summer. Mosquitoes and moths appeared plentiful throughout the course of the night with conditions calm and warm. Survey was conducted on 8/17/99.

First bat was heard at 20:30 (*E. fuscus*) and had likely been day roosting in a nearby cottonwood. Three individual passes were heard at 21:00 (*E. fuscus*). All bats were flying above the canopy from west to east.

No foraging activity was heard during the course of the entire evening. Three species were confirmed: *Eptesicus fuscus* (8 passes), *Lasiurus cinereus* (single record), and an unidentified *Myotis* species (three passes). Only individual bats were heard and all were flying from west to east along the course of the creek. All were flying well above the canopy of the cottonwoods. Top of the highest mist net was approximately 8m in height with all bats flying well above this level.

This was a very slow evening averaging only a single pass approximately every 15 minutes. The last pass was recorded at 22:35. Nets were struck at 24:00 with no other activity heard through 00:45.

LOG TROUGH PONDS (USFS)

These spring-fed ponds are located near the junction of FS Roads 287 and 288, south of Jewel Cave National Monument and have served as survey locations numerous times for bat studies conducted since 1992.

Surveyed on 7/20/99 as part of a USFS training workshop only two species were netted: *Myotis lucifugus* and *Lasionycteris noctivagans*. Limited activity was likely attributable to mid-evening thundershowers which ended the survey. See page 34 for survey results.

The deteriorated condition of these ponds as a result of cattle grazing in this area and recommendations for restoration and protection has been described (Tigner 1998). To date, no actions to protect this important foraging resource have been implemented. Limited surface water, coupled with the species and habitat diversity of this vicinity, warrant the protection of this resource.

ERSKINE POND

This ephemeral pond, located near Erskine Cave, was surveyed on 6/23/99 and 7/21/99. This location was first surveyed on 8/23/98 and was found to yield high capture numbers of *Lasionycteris noctivagans* and *Lasiurus cinereus* (Tigner 1998). Additionally, this is one of the few sites in the Black Hills where *Lasiurus borealis* has been captured. For purposes of comparison with dates of the 1998 survey, earlier survey dates were selected during 1999.

The first survey was conducted on 6/23/99. All eight of the *L. noctivagans* captured were pregnant females. No males or juveniles were captured. Two lactating *L. cinereus* were also captured on this evening.

The second survey (7/21/99) was conducted simultaneously with a survey of Erskine Cave. Coinciding with a training workshop organized by the Black Hills National Forest, this location was netted by biologists from the USFS and BLM. The data collected during this survey appears on pages 29-30 courtesy of Brad Phillips, biologist with the Black Hills National Forest.

A total of 23 *L. noctivagans* were captured during this survey. Most of these were juveniles or reproductive females. Additionally, a juvenile *L. cinereus* was also captured during this survey.

Given the level of activity at nearby Erskine Cave (predominantly *Myotis* species), it is worth noting only two individual bats of this genus (*M. lucifugus* and *M. ciliolabrum*) were captured at this pond. There are no other known water sources in this vicinity. Other foraging locations that yield higher capture rates of *Lasionycteris* and *Lasiurus* have not shown this marked segregation.

NORBECK POND - BADLANDS NATIONAL PARK

This location is an ephemeral pond located immediately at the base of the ridge approximately .5 km east of Norbeck Pass. This site was netted on 8/20/99. Nearly all surface water was gone at the time of the survey. A single small pool surrounded by the sticky mud of the Badlands was still present under the surrounding cottonwood trees. Four mist nets were set at this location.

Of the nine species recorded in the park (Bogan et al 1994), eight species were netted during the course of this single evening's survey¹. These included: *Corynorhinus townsendii* (n=4), *Eptesicus fuscus* (n=21), *Lasionycteris noctivagans* (n=1), *Myotis ciliolabrum* (n=17), *Myotis lucifugus* (n=4), *Myotis septentrionalis* (n=5), *Myotis thysanodes* (n=4), and *Myotis volans* (n=1). There were numerous escapes of both *Eptesicus* and *Myotis* species owing to the high numbers of simultaneous captures.

Reproductive females and juveniles for all species except *Myotis septentrionalis* and *Lasionycteris noctivagans* were captured during the survey. The single capture of *Lasionycteris noctivagans* escaped the net prior to examination. The nearest known maternity roost for *M. septentrionalis* was identified in a building in the town of Wall, SD (Tigner 1997).

Early capture times, coupled with mineral deposits characteristic of Badlands features found on captured bats, indicate roosting in close proximity to this survey site. Numerous cracks and cavities within the ridge immediately adjacent to the survey site are common. See pages 27-28 for a complete list of list of captures.

ROOSTING LOCATIONS

CASCADE CREEK ROOST BUILDING

Following discovery of a maternity roost of *Corynorhinus townsendii* in an abandoned building on this preserve in 1996 (Cryan 1997), and subsequent surveys of bats conducted in this area (Luce 1998; Tigner 1998), the Nature Conservancy's Black Hills Program developed a strategy designed to protect existing resources.

Following recommendations developed by Luce (1998), the abandoned building, which had housed the *C. townsendii* roost, was stabilized to prevent further deterioration.

One collapsed section of the building was removed. This debris served as passage for a feral cat to

¹ Of the nine known species, only *Lasiurus cinereus* was not captured during this survey.

gain access to the upper floor of the building in which the roost had been located. New roofing was installed on the front section of the building and all doors and windows were sealed to prevent predator access or unauthorized entry to the building's interior. Holes in the flooring were also sealed to prevent access of predators from underneath the wood frame building. A portion of the main chimney was removed owing to deterioration of the brick and the resulting hole in the roof was sealed. The bat access point into the roost area, a second floor window, was left unaltered to minimize changes to the roost.

Surveys of this site in 1998 yielded only a single specimen of *C. townsendii* (Luce 1998).

Following completion of work on the roost in spring of 1999, monthly surveys were conducted to determine bat usage.

Throughout the course of the summer, surveys found only the single *C. townsendii* roosting in the building. Scattered droppings within the roosting area indicated some use as a night roost although no evidence of collective roosting was observed.

Monitoring of the site will continue in 2000.

FT. MEADE VETERANS ADMINISTRATION BUILDINGS

See Tigner 1998 for a recent history of this location.

Building 51: The attic of this building has been used by at least three species of bats as a maternity/nursery roost. A management plan has been put in place that excludes the bats from all but one portion of the attic and was in place prior to the arrival of the bats in the spring of 1999.

The attic of the building was cleared of all bat droppings and old insulation and a walkway was constructed throughout the entire attic. Prior to installing new insulation, all openings to walls and ceilings of quarters below were sealed using expanding foam. In addition to sealing all openings from within the attic, utilizing a bucket truck, all openings on the exterior of the building were caulked or sealed with expanding foam. The single exception to this closure was the main entry point that bats had used to gain entry to the attic. This roosting area was sealed from the remainder of the attic using plastic sheeting that was attached to rafters and extended down completely to the newly installed walkway. In addition to sealing off this portion of the attic, large tarpaulins were spread over the surface of the insulation throughout the entire roosting area. Plastic sheeting was placed on top of the tarpaulins beneath the apex of the roof and against the brick-end wall to facilitate dropping removal. Rough-sawn timber was used to create crevices for roosting and was attached to the apex of the roof throughout the length of the roost area.

Both *Myotis lucifugus* and *Myotis volans* returned and used the attic as a maternity/nursery roost

during the breeding season of 1999. On the afternoon of 6/10/99 (weather was cool with light rain), a quick visual check of the roost indicated approximately 500 bats (conservative estimate).

A persistent group of *Myotis septentrionalis* (approx. 12) comprised of both adult females and volant juveniles was found within the attic but outside the roosting area on several occasions during the course of the summer. They were captured by hand and returned to the roost area each time they were found. Numbers of this group gradually diminished over the course of the summer. It is likely this group rejoined the larger roost of this species that was identified in Building 65 on the facility (see below).

The final pair of *M. septentrionalis* discovered outside the roost area were captured by hand and banded. This was done in an attempt to determine whether the same bats were returning to the area outside the roost. Additionally, a pair of *M. lucifugus* was also captured (and banded) outside the enclosed roosting area. Both pair consisted of an adult female and volant juvenile pup.

Banding records and biometrics are on page 35.

In addition to the described changes to the roost, a large maternity roost box was placed immediately behind this building. Roosting box is approximately 1 m long by 1.5 m high by 45cm in width. Box was mounted atop a wooden telephone-type pole. Bottom of the box is approximately 7m from the ground. No use of this box was observed during the course of the summer.

Building 65: The attic of this building has been used as a maternity/nursery roost for *Eptesicus fuscus*, *Myotis thysanodes pahasapensis*, and *Myotis evotis* (Tigner 1997). This building also served as maternity/nursery roost for *Myotis septentrionalis* during the summer of 1999. A survey was conducted on 7/15/99. A roost of *Eptesicus* was found in several clusters throughout the attic. The largest of the clusters was approximately thirty bats. Total for the attic was approximately fifty bats.

Only two *Myotis thysanodes* were found during this survey. These were roosting separately.

The third species identified during this survey was *Myotis septentrionalis*. This roost was located adjacent to a central brick chimney below the floor of the attic, within a wall of the apartment below. A conservative count for this species during the survey is fifty bats. This makes this the largest roost for this species yet identified in South Dakota. There is no previous record of this species using this building as a maternity roost. This species had been identified at Bldg. 51 previously (Tigner 1997). Movement to this location may have been in response to roost management activities at Bldg. 51 (see above).

No bat-related complaints have been received from this building's occupants and no roost management activities have been undertaken at this location.

Immediately adjacent to this building a second roosting box was erected (dimensions/mounting are the same as described in the segment discussing Bldg. 51. There was no observed use of this roost box during the course of the summer.

Chapel: *E. fuscus* is the only species identified using this building. Exclusion from the attic above the sanctuary using barriers of plastic sheeting continues to be successful. A small number of bats (<5) were seen roosting around two chimneys in wings adjacent to the sanctuary. No evidence of large collective roosting was observed in this building during the summer of 1999.

BAD LUCK CAVE

Gated by the USFS to protect hibernating bats, this location serves as hibernaculum to the second largest¹ number of *Corynorhinus townsendii* in South Dakota. Additionally, *Myotis ciliolabrum* and *Eptesicus fuscus* use the cave as a hibernaculum.

This cave was last surveyed on 2/17/98 when approximately 240 *C. townsendii*, 8 *M. ciliolabrum*, and 4 *E. fuscus* were identified (Brad Phillips, USFS Biologist, personal communication). The current survey was conducted on 12/9/99. Approximately 300 *C. townsendii*, 18 *M. ciliolabrum*, and 12 *E. fuscus* were identified. Most of the *C. townsendii* were roosting individually or in small clusters. Largest cluster observed consisted of 18 bats. One cluster consisted of four *C. townsendii* and a single *E. fuscus* roosting together.

E. fuscus and *M. ciliolabrum* were found in crevices and hibernating on the surface of the rock. No clusters of *E. fuscus* or *M. ciliolabrum* were observed.

The population increase in *C. townsendii* may simply reflect a successful breeding season although the mild weather conditions may have played a role in hibernacula selection. The cave is characterized by a sinkhole type entrance and serves as a cold air trap. Temperatures at this cave are typically colder than other nearby caves of similar size. The USFS has begun a monitoring program of conditions within the cave.

WHITEWOOD CAVE

This cave was surveyed on 8/27/99 utilizing a harp trap. Heavy rains began shortly after sunset and bat activity was minimal. All bats recorded were entering the cave. A record of captures appears on page 34.

A winter survey was conducted at this cave on 12/28/99. Level of human disturbance continues to increase at this important roost location. Evidence of recent human disturbance at the cave was apparent with the construction of two new fire rings within the cave. Firewood had also been

¹ Jewel Cave National Monument is the largest known hibernaculum

dragged into the cave. The smell of smoke from at least four separate fire sites within the cave was still detectable at the time of survey. Levels of disturbance have increased since monitoring of this location began. Campfires within the cave's interior are becoming commonplace.

Disturbance has been documented at this cave during the nursery season as well as during hibernation (Tigner 1997).

Records of two banded bats were recorded during this survey. The first was a male¹ *Eptesicus fuscus* observed hibernating in a cluster located in a crevice on the ceiling of the cave. Height was approximately three meters from the floor of the cave. Owing to the height, no other information from the band was observable. There have been four males of this species banded previously at this location (1 banded in 1993, 2 banded in 1994, 1 banded in 1995). However, given the range of this species, it is entirely possible this individual was banded at another location altogether.

The second band record was a male *Corynorhinus townsendii* (Band: USFS 0303) banded at this location on 6/3/93 as a probable juvenile. This bat was roosting alone with tightly folded ears hanging from the ceiling at a height of approximately 1.5 meters. There have been no other records of this individual prior to this observation.

Efforts are continuing to develop a long-term management plan that would restrict casual access to this location.

ERSKINE CAVE

Monitored for bat usage since July of 1992, all eight hypogean species found in South Dakota utilize this cave as a night roost. It has been used by four species as a day roost during the summer (*Corynorhinus townsendii*, *Eptesicus fuscus*, *Myotis lucifugus*, *Myotis volans*). It has served as a hibernation site for five species (*Corynorhinus townsendii*, *Eptesicus fuscus*, *Myotis ciliolabrum*, *Myotis thysanodes*, and an unidentified *Myotis* species [either *M. lucifugus* or *M. volans*]). There is no evidence of this site being used as a maternity/nursery roost by any species.

Vandalism and high levels of disturbance continue to characterize this location. Campfires are the most common form of disturbance. Summer and winter surveys were conducted during 1999.

¹ Recent banding of bats in the Black Hills has strictly observed banding males only on the left forearm and females on the right. As such, sex can be determined during hibernation if band numbers are not visible.

A summer survey was conducted on 7/21/99 utilizing a harp trap to capture bats. All bats captured were entering the cave with the exception of one adult male *Myotis septentrionalis* which had been day-roosting in the cave and was captured exiting. Five species were captured during the survey. These included: *Eptesicus fuscus*, *Myotis ciliolabrum*, *Myotis lucifugus*, *Myotis septentrionalis*, and *Myotis volans*.

With the exception of three non-reproductive adult females (one each of *Myotis ciliolabrum*, *Myotis lucifugus*, and *Myotis septentrionalis*) all other captures were male. A single juvenile male *Myotis septentrionalis* was also captured. This was the only juvenile captured during the course of the evening.

Survey results are on page 31.

A winter survey was conducted at this cave on 12/10/99. Three species were identified hibernating: *Corynorhinus townsendii*, *Eptesicus fuscus*, and *Myotis ciliolabrum*. All bats were hibernating in the same room of the cave (room to right upon entry). All bats were roosting on the surface of the rock, with none identified in crevices.

Seven *C. townsendii* were found roosting individually throughout the room to the right upon entry. One found near the opening into the room was completely covered with condensation, which is unusual for this species. Hibernacula selected by this species are typically characterized by low humidity.

Four *Eptesicus fuscus* were observed during this survey. One was an adult male banded at this location as a juvenile on 7/31/92 (Band: USFS 0013).

Three *M. ciliolabrum* were identified during this survey.

While a buffer around the immediate vicinity was left during a recent timber sale in this area, the cave has had no other management controls implemented. As has been noted previously, bat activity at this location has declined since monitoring was begun. High levels of disturbance continue to characterize this location. Without controlling access to this site, long-term prognosis of this cave as bat habitat is poor.

As has been noted previously (Tigner 1998), the number and diversity of species, which have been documented using this location, attests to its broad suitability as a site worthy of protection. A closure during winter months is recommended and should be accompanied by a well-publicized campaign to educate area residents on the necessity of such protection.

DAVENPORT CAVE

Located in the northern Hills on the Black Hills National Forest, this cave has been monitored for bat usage since 1992. For a recent history of this location, see Tigner 1997 and 1998. Vandalism continues to be a problem in maintaining the integrity of the gate installed to restrict unauthorized access. (Oscar Martinez, USFS Biologist, personal communication).

Summer and winter surveys were conducted at this site during 1999.

A survey utilizing a harp trap to capture bats was conducted on 8/24/99. Five species were identified using the cave: *Eptesicus fuscus*, *Myotis ciliolabrum*, *Myotis evotis*, *Myotis septentrionalis*, and *Myotis volans*.

Of these five species, only *M. septentrionalis* (5 adult males) and *M. volans* (one non-reproductive adult female) were utilizing the cave as a day-roost. All others were captured entering the cave.

Juveniles of three species were captured- *E. fuscus*, *M. ciliolabrum*, and *M. septentrionalis*.

Two *Myotis evotis* were captured (both adult males).

One recapture of a banded *M. septentrionalis* (adult male) was also recorded during this survey. Banded at this location on 9/9/92 (Band: USFS 0231) of indeterminate age, weight at initial capture was 9gm. No other records for this bat have been recorded.

Survey results are on page 32.

A winter survey was conducted on 12/08/99. Results of the survey yielded three species hibernating in the cave: *Eptesicus fuscus* (n=4), *Corynorhinus townsendii* (n=3), *Myotis ciliolabrum* (n=1).

RUNKLE CAVE

This small cave located on USFS property was surveyed on 12/1/99. A group of ten *Corynorhinus townsendii* was found in the room to the right upon entry. All records of this species have been in this location within the cave. All were roosting individually.

One of the *C. townsendii* (band: USFS 0236) was an adult female banded as a juvenile at this location on 9/16/92. This bat has also been observed hibernating in this cave on two other occasions: 4/8/93 (Tigner unpublished data) and on 11/24/97 (Oscar Martinez, USFS Biologist, personal communication).

Based upon this cave's close proximity to a public road and recent sale and development of nearby private property (construction of private homes has begun), this location should be protected by a gate to restrict access during winter months.

SAFE INVESTMENT MINE

This mine located on USFS property serves as a hibernation site to five species of bats. Gated to prevent unauthorized entry with a bat-friendly gate (on two separate portals), numbers of bats have begun to increase following initial declines resulting from problems of vandalism (intentional killing of bats, construction of campfires, spray-painting walls, discharging fireworks). Gate has remained vandalism free for the past four years. A survey conducted in January of 1999 found two hibernating *Myotis septentrionalis*, a species not previously identified during winter surveys at this location.

A winter survey was again conducted on 12/9/99. Results of this survey also yielded two *M. septentrionalis* roosting in crevices. In addition to these bats, there were four *Eptesicus fuscus*, seven *Corynorhinus townsendii*, and three *Myotis ciliolabrum*.

MYSTIC ROAD MINE

This mine, characterized by an unstable portal, has been monitored since 1992 (Tigner 1998). During the interim between winter surveys of 1998 and 1999, the portal collapsed entirely sealing the mine. Ownership of the private property on which the mine is located is to be finalized by spring of 2000. After this has been determined, it is hoped restoration and surrounding stabilization can be undertaken. Its consistent yield of species diversity, coupled with its size, represents a significant loss of habitat. This location held the record for the greatest number of *Myotis ciliolabrum* ever identified in the Hills (Tigner 1998). Other species utilizing this mine as night roost or hibernaculum were *Corynorhinus townsendii*, *Eptesicus fuscus*, *Myotis septentrionalis*, *Myotis thysanodes pahasapensis*, and *Myotis volans* (Tigner 1997). Given its remote location, it is not known when the collapse of the mine occurred.

The loss of this mine typifies the uncertain future of such locations and the diminishing number of available hibernation sites within the Black Hills. (See also Edelweiss Mine)

EDELWEISS MINE

Last surveyed in 1995, this abandoned adit was identified as a hibernation site for three species: *Myotis ciliolabrum*, *Myotis septentrionalis*, and another *Myotis* species (either *M. lucifugus* or *M. volans*).

Portal of this mine was surrounded by extremely unstable rock although the mine's interior was solid. Survey attempt on 12/10/99 found the portal filled completely with debris, which had

collapsed from above the portal. Closure gave some appearance of having been intentional owing to the piling of some of the rock.

Although not believed to have provided habitat for great numbers of bats, it was one of only a handful of sites known to provide suitable wintering conditions for *M. septentrionalis*. It also serves to demonstrate the temporary contribution such sites make to providing essential habitat for South Dakota's bat population. See also Mystic Road Mine description.

IGLOO CAVE

This small cave, located on Black Hills National Forest, is an active night roost during the summer months for six species of bats (*Corynorhinus townsendii*, *Eptesicus fuscus*, *Myotis ciliolabrum*, *Myotis lucifugus*, *Myotis septentrionalis*, and *Myotis thysanodes pahasapensis*). Remote location and natural camouflage of the opening have kept levels of disturbance at this cave at a minimum.

The last winter survey conducted at this location was in 1995. Both a mid- and late winter survey was conducted. The first of these was 1/25/95 and recorded only 12 *Corynorhinus townsendii* (including one banded male, unable to read band). This site was resurveyed on 3/30/95 when 16 *C. townsendii* (including one banded female, unable to read band) and two *Myotis ciliolabrum* were recorded.

Corynorhinus banding history at this location: Six adult males were banded night roosting at this cave in 1994. No female *Corynorhinus* have been banded at this location.

This cave was surveyed on 12/9/99. Survey identified 17 *C. townsendii* (including one banded male, band could not be read), 1 *Eptesicus fuscus*, and six *M. ciliolabrum* (one of which was flying upon our initial entry into the cave).

BEARTRAP CAVE

Located near Igloo Cave, this location is slightly larger than Igloo and has shown more evidence of human disturbance. Although it has a well-camouflaged entrance, it is a well-known cave in this area.

This cave was last surveyed during the winter of 1995. Two surveys were conducted (mid-winter and late winter). The first of these surveys was on 1/25/95 when one *Eptesicus fuscus*, two *Myotis ciliolabrum*, and ten *Myotis* species (either *M. lucifugus* or *M. volans*) were recorded.

The second survey of 1995 was on 3/30/95. Recorded at this survey were: two *E. fuscus* and six *Myotis* species (either *M. lucifugus* or *M. volans*). No *M. ciliolabrum* were recorded.

Survey in 1999 was on 12/9. Identified during this survey were two *Corynorhinus townsendii*, two

Myotis ciliolabrum, and six *Myotis* species (either *M. lucifugus* or *M. volans*). Both *C. townsendii* were located in the first (drop-down) room of the cave, which is cooler than the remainder of the cave.

ICE CAVE

Past surveys have indicated this site to serve primarily as a night roost. Species identified night roosting at this location: *Corynorhinus townsendii*, *Eptesicus fuscus*, *Myotis ciliolabrum*, and *Myotis septentrionalis*. As indicated by its name, this cave is characterized during winter by a large column of ice, which is located in the middle of the cave, extending from ceiling to floor.

Previous winter surveys (1994 and 1995) at this location have found only small numbers of *Myotis ciliolabrum* and *Eptesicus fuscus*.

This location was surveyed on 12/9/99 and recorded three species: *Corynorhinus townsendii* (n=2), *Eptesicus fuscus* (n=1); *Myotis ciliolabrum* (n=6). Attesting to the mild winter, there was no ice found within the cave. The *M. ciliolabrum* were roosting in a cluster within the dome on the ceiling that is typically filled with ice that forms the column.

GORDON'S CAVE

This location is a small, single room cave that serves primarily as a night roost during the active season. Species identified night roosting at this location: *Corynorhinus townsendii*, *Eptesicus fuscus*, *Myotis ciliolabrum*, *Myotis lucifugus*, *Myotis septentrionalis*, *Myotis thysanodes pahasapensis*, and *Myotis volans*.

The access point into this cave is approximately 7m in length allowing greater air exchange with the outside. As a result, temperatures are often well below freezing during the winter months. There have been no prior records of bats hibernating in this cave.

Survey was conducted on 12/10/99. Two species were identified: *C. townsendii* (n=4) and *M. ciliolabrum* (n=2). Presence of these bats likely reflects the mild winter conditions experienced to the date of the survey.

DISCUSSION

Hibernacula

Diminishing quality and availability of suitable hibernacula continues to pose the greatest threat to the eight hypogean species of bats found in South Dakota. Failure to control access into hibernacula during sensitive times of the year will see continued degradation of existing sites. Installations of bat-gates have proven to be an acceptable management tool for all species utilizing underground roosting sites in the Black Hills (Tigner 1997). With pressure increasing on remaining hibernacula, this approach must be applied on a broader scale, becoming an integral part of habitat management for these species.

The role of abandoned mines in South Dakota in supporting regional bat populations remains largely unexamined. Many of the mines currently known to be used by bats are providing only short-term respite from the loss of other natural underground roosting locations. Natural degradation, coupled with safety and liability concerns, will result in an acceleration of habitat loss for these species. The loss of two such locations is documented within this report.

Unseasonably mild weather characterized the end of 1999. Mild temperatures permitted foraging by bats well into the month of November. Mild weather has also delayed the winter abandonment of roosts in buildings across South Dakota. At least five *E. fuscus* roosts located in buildings in western South Dakota were known to contain bats in December. While this species is known to be robust, and wintering in buildings in South Dakota not unprecedented, the number of roosts still containing bats appears to be higher than previously recorded. This is also apparently true of roosts in eastern South Dakota. Two maternity roosts in Mitchell, SD, located in wood-frame homes, were known to be occupied by *E. fuscus* in December of 1999. In one of these locations, two adult females were captured by hand and banded. Banding information appears on page 35.

Other signs of mild weather conditions were observations of bats hibernating in locations that have not been known to serve this function during previous winter surveys. Two such examples were Gordon's Cave and Ice Cave on the Black Hills National Forest. In addition, several shorter mine adits (3-5m) have been found to contain individual *C. townsendii* where previous records of roosting had been limited to active times of the year.

Summer Surveys

Netting surveys conducted in more open habitat typically result in lower capture rates. This is particularly true of smaller, more acrobatic flyers. As such, netting surveys conducted within riparian areas of prairie habitat have yielded only limited information. Attempts to locate roosts in or near these areas have proven difficult. Two large roosts were identified in the northwest corner of the state only after seasonal abandonment had occurred. These will be surveyed in the summer of 2000 and will include selective banding. Interviews with local residents and land managers will continue in an attempt to identify roosts and foraging locations for future surveys.

As previously noted, no bats banded outside the Black Hills have been identified in hibernacula within the Hills. Given the limited number of bands applied, coupled with the mild weather conditions, this is not a surprising result. Additional banding outside the Hills is planned for 2000. Continued observance of uniformity within banding schemes (i.e., employing the sex-specific forearm banding [males=left FA; females= right FA]) will serve to contribute to the success of future data collection. As such, it is recommended, all future banding projects incorporate past protocols into their design.

Monitoring differing habitat types associated with surface water and vegetation yielded a variety of results. Similar habitats frequently yielded very different results. Whether these differences are attributable to seasonal variations, proximity to roosting habitat, foraging requirements, species or sexual segregation, or a myriad of other factors is unknown.

Systematic surveys conducted along established riparian areas throughout the course of the active time of year could provide information related to dispersal of species, identifying important foraging locations, migratory patterns, and species/habitat associations. Continued monitoring of creeks and rivers, coupled with roost identification in areas outside the Black Hills will serve to provide much needed information concerning elements related to land management and bat habitat requirements.

SURVEY LOCATIONS AND LEGAL DESCRIPTIONS¹

| | |
|--|------------------------------|
| Alkali Creek Horse Crossing (BLM)..... | T5N R5E NE of the SW Sec. 24 |
| Frog Pond (BLM) | T5N R5E SE of the NE Sec. 14 |
| Bear Butte Creek..... | T5N R5E SE of the NE Sec. 11 |
| Erskine Pond (USFS)..... | T3N R6E Sec. 32 |
| Elliott property..... | T1N R8E Sec. 8 |
| Houk property..... | T1N R8E Sec. 15 |
| Norbeck Pond (Badlands N.P.)..... | T3S R18E SE of Sec. 19 |
| Log Trough Ponds (USFS)..... | T4S R2E NW of the NW Sec. 12 |
| Erskine Cave..... | T3N R6E Sec. 32 |
| Davenport Cave..... | T5N R5E Sec. 28 |
| Edelweiss Mine..... | T1N R5E Sec. 17 |
| Mystic Road Mine..... | T2N R4E Sec. 33 |
| Whitewood Cave..... | T6N R4E Sec. 6 |
| Ft. Meade, SD..... | T5N R5E Sec. 11/12 |
| Igloo Cave..... | T2S R2E Sec. 16 |
| Beartrap Cave..... | T2S R2E Sec. 17 |
| Ice Cave..... | T2S R2E Sec. 17 |
| Gordon's Cave..... | T4N R5E Sec. 12 |

¹Roost legal descriptions are given only to the section to help protect these locations from disturbance. Specific locations are on file with the SDGF&P in Pierre, SD

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NORBECK POND - BADLANDS NATIONAL PARK - 8/20/99

| BAND | SPECIES | SEX | FA | WT | AGE | NOTES |
|------|----------------------------------|-----|----|------|-----|-------------------------------|
| N/B | <i>Corynorhinus townsendii</i> | F | 43 | 12 | J | 2150 capture |
| N/B | <i>Corynorhinus townsendii</i> | F | 44 | 9.5 | J | |
| N/B | <i>Corynorhinus townsendii</i> | | | | | Escaped net |
| N/B | <i>Corynorhinus townsendii</i> | | | | | Escaped net |
| 4501 | <i>Eptesicus fuscus</i> | M | 46 | 21.5 | J | 2020 capture |
| N/B | <i>Eptesicus fuscus</i> | F | 47 | 26.5 | J | |
| 4506 | <i>Eptesicus fuscus</i> | M | 45 | 14.5 | J | |
| N/B | <i>Eptesicus fuscus</i> | F | 47 | 21.5 | J | |
| 4507 | <i>Eptesicus fuscus</i> | M | 48 | 17.5 | J | |
| 4508 | <i>Eptesicus fuscus</i> | M | 48 | 20.5 | A | |
| 4510 | <i>Eptesicus fuscus</i> | M | 47 | 21 | ? | Probable juvenile |
| 4511 | <i>Eptesicus fuscus</i> | M | 47 | 21 | A | |
| 4512 | <i>Eptesicus fuscus</i> | F | 48 | 21.5 | A | Non-reproductive |
| N/B | <i>Eptesicus fuscus</i> | M | | | | Released, no biometrics taken |
| N/B | <i>Eptesicus fuscus</i> | M | 47 | 17.5 | A | |
| 4513 | <i>Eptesicus fuscus</i> | M | 48 | 18.5 | J | |
| 4514 | <i>Eptesicus fuscus</i> | M | 46 | 20.5 | A | |
| N/B | <i>Eptesicus fuscus</i> | | | | | Escaped net |
| N/B | <i>Eptesicus fuscus</i> | | | | | Escaped net |
| N/B | <i>Eptesicus fuscus</i> | | | | | Escaped net |
| 4515 | <i>Eptesicus fuscus</i> | M | 44 | 16 | J | |
| 4516 | <i>Eptesicus fuscus</i> | M | 49 | 16.5 | J | 2400 capture |
| 4517 | <i>Eptesicus fuscus</i> | M | 45 | 18.5 | A | 2400 capture |
| N/B | <i>Eptesicus fuscus</i> | M | 44 | 22 | A | |
| 4518 | <i>Eptesicus fuscus</i> | M | 44 | 19.5 | A | 2430 capture |
| N/B | <i>Lasionycteris noctivagans</i> | | | | | Escaped high net, 0030 |
| N/B | <i>Myotis ciliolabrum</i> | F | 32 | 6.5 | A | Post-lactating |
| N/B | <i>Myotis ciliolabrum</i> | M | 30 | 5 | ? | Probable juvenile |
| N/B | <i>Myotis ciliolabrum</i> | F | 31 | 5.5 | J | |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 5 | ? | |
| N/B | <i>Myotis ciliolabrum</i> | F | 32 | 5 | A | |
| N/B | <i>Myotis ciliolabrum</i> | M | 32 | 5 | ? | |
| N/B | <i>Myotis ciliolabrum</i> | F | 32 | 5 | A | Post-lactating |
| N/B | <i>Myotis ciliolabrum</i> | F | 31 | 4.5 | A | Post-lactating |

NORBECK POND BADLANDS N.P. CONTINUED

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|-------------------------------|-----|----|---------|-----|-------------------------------------|
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 4.5 | J | |
| N/B | <i>Myotis eiliolabrum</i> | F | 31 | 4.5 | J | |
| N/B | <i>Myotis ciliolabrum</i> | F | 33 | 6 | A | Lactating |
| N/B | <i>Myotis ciliolabrum</i> | F | 33 | | A | Weight not taken |
| N/B | <i>Myotis ciliolabrum</i> | F | 32 | 5.5 | A | Post-lactating |
| N/B | <i>Myotis ciliolabrum</i> | M | 30 | 4.5 | J | |
| N/B | <i>Myotis ciliolabrum</i> | F | | | A | Forearm and weight not taken |
| N/B | <i>Myotis ciliolabrum</i> | | | | | Escaped |
| N/B | <i>Myotis ciliolabrum</i> | F | 33 | 6 | A | Non-reproductive |
| 4503 | <i>Myotis lucifugus</i> | M | 37 | 7.5 | J | Very dark pelage |
| N/B | <i>Myotis lucifugus</i> | F | 39 | | A | Non-reproductive; no weight taken |
| N/B | <i>Myotis lucifugus</i> | M | 37 | 8 | A | |
| N/B | <i>Myotis lucifugus</i> | M | 36 | 8 | J | |
| 4502 | <i>Myotis septentrionalis</i> | M | 38 | 8 | A | |
| N/B | <i>Myotis septentrionalis</i> | M | 39 | 7 | A | Swelling on left forearm |
| 4509 | <i>Myotis septentrionalis</i> | M | 37 | 8 | A | |
| N/B | <i>Myotis septentrionalis</i> | M | 36 | 7 | A | 2305 capture |
| N/B | <i>Myotis septentrionalis</i> | M | 40 | 8.5 | A | |
| N/B | MYOSPP (minimum of 5) | | | | | Escaped nets |
| N/B | <i>Myotis thysanodes</i> | F | 43 | 11 | A | Lactating |
| N/B | <i>Myotis thysanodes</i> | F | 43 | 8.5 | J | Very light fringe |
| N/B | <i>Myotis thysanodes</i> | F | 43 | 9.5 | A | Post-lactating |
| N/B | <i>Myotis thysanodes</i> | F | 41 | 8 | ? | Non-reproductive; probable juvenile |
| 4505 | <i>Myotis volans</i> | M | 38 | 7.5 | J | |

ERSKINE POND

6/23/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|----------------------------------|-----|----|---------|-----|---------------------------------------|
| N/B | <i>Lasionycteris noctivagans</i> | F | 42 | 14.5 | A | Pregnant; 22:10 capture |
| N/B | <i>Lasionycteris noctivagans</i> | F | 42 | 15 | A | Pregnant; 22:12 capture |
| N/B | <i>Lasionycteris noctivagans</i> | F | 43 | 16 | A | Pregnant; 22:55 capture |
| N/B | <i>Lasionycteris noctivagans</i> | F | 43 | 15 | A | Pregnant; 22:56 capture |
| N/B | <i>Lasionycteris noctivagans</i> | F | 42 | 14.5 | A | Pregnant; 22:57 capture |
| N/B | <i>Lasionycteris noctivagans</i> | F | | | A | Pregnant; released |
| N/B | <i>Lasionycteris noctivagans</i> | F | | | A | Pregnant; released |
| N/B | <i>Lasionycteris noctivagans</i> | F | | | A | Pregnant; released |
| N/B | <i>Eptesicus fuscus</i> | M | 45 | 20.5 | A | Slight wear to canines; 23:09 capture |
| N/B | <i>Lasiurus cinereus</i> | F | 53 | 35 | A | Lactating; parous |
| N/B | <i>Lasiurus cinereus</i> | F | 56 | 33.5 | A | Lactating; parous |

7/21/99 (USFS Training Session; No weights were taken during survey; n/r= not recorded)

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|----------------------------------|-----|------|---------|-----|-------------------------|
| N/B | <i>Eptesicus fuscus</i> | F | n/r | | A | 19:48; reproductive |
| N/B | <i>Eptesicus fuscus</i> | F | n/r | | A | 19:31; reproductive |
| N/B | <i>Eptesicus fuscus</i> | M | 45 | | | 19:32; age not recorded |
| N/B | <i>Eptesicus fuscus</i> | M | 47 | | A | 19:34 |
| N/B | <i>Eptesicus fuscus</i> | F | 47 | | A | 01:10 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 40.8 | | A | 19:35 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 40.5 | | J | 19:38 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 40.5 | | J | 19:40 |
| N/B | <i>Lasionycteris noctivagans</i> | F | n/r | | A | 19:45; reproductive |
| N/B | <i>Lasionycteris noctivagans</i> | F | n/r | | A | 19:20 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 41 | | A | 19:25 |
| N/B | <i>Lasionycteris noctivagans</i> | F | 40 | | A | 19:30; reproductive |
| N/B | <i>Lasionycteris noctivagans</i> | F | 41.5 | | A | 19:30; reproductive |
| N/B | <i>Lasionycteris noctivagans</i> | F | 41 | | J | 19:46 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 40 | | | 21:54; age not recorded |
| N/B | <i>Lasionycteris noctivagans</i> | M | 43 | | J | 21:56 |
| N/B | <i>Lasionycteris noctivagans</i> | F | 42 | | J | 22:20 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 40 | | J | 22:20 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 39.5 | | J | 22:22 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 41.5 | | J | 00:30 |

ERSKINE POND 7/21/99 CONTINUED

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|----------------------------------|-----|------|------------|-----|-------------------------|
| N/B | <i>Lasionycteris noctivagans</i> | M | 43 | | J | 00:47 |
| N/B | <i>Lasionycteris noctivagans</i> | F | n/r | | A | 23:13 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 40 | | J | 23:45 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 40.5 | | J | 00:05 |
| N/B | <i>Lasionycteris noctivagans</i> | F | n/r | | | 23:45; age not recorded |
| N/B | <i>Lasionycteris noctivagans</i> | M | 41 | | J | 00:15 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 41 | | J | 00:15 |
| N/B | <i>Lasionycteris noctivagans</i> | M | 40 | | J | 00:37 |
| N/B | <i>Lasiurus cinereus</i> | M | 55.5 | | J | 23:00 |
| N/B | <i>Lasiurus cinereus</i> | M | 51 | | | 19:50; age not recorded |
| N/B | <i>Lasiurus cinereus</i> | M | 55 | | A | 19:15 |
| N/B | <i>Lasiurus cinereus</i> | M | n/r | | | 19:45; age not recorded |
| N/B | <i>Lasiurus cinereus</i> | M | n/r | | | 19:50; age not recorded |
| N/B | <i>Myotis ciliolabrum</i> | F | 31 | | A | 23:39 |
| N/B | <i>Myotis lucifugus</i> | M | 38.5 | | A | 00:47 |

ERSKINE CAVE

7/21/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|-------------------------------|-----|----|---------|-----|-----------------------------------|
| N/B | <i>Eptesicus fuscus</i> | M | 46 | 17.5 | A | Entering; 23:50 |
| N/B | <i>Eptesicus fuscus</i> | M | 42 | 16 | A | Entering; 23:55 |
| N/B | <i>Myotis ciliolabrum</i> | F | 31 | 5.5 | A | Entering; 00:15; non-reproductive |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 5 | A | Entering 21:48 |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 5 | A | Entering; Molting (stomach bare) |
| N/B | <i>Myotis ciliolabrum</i> | M | 32 | 5.5 | A | Entering; 00:20 |
| N/B | <i>Myotis ciliolabrum</i> | M | 30 | 5.5 | A | Entering; 23:15 |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 5 | A | Entering; 23:30 |
| N/B | <i>Myotis lucifugus</i> | M | 38 | 7.5 | A | Entering 21:00 |
| N/B | <i>Myotis lucifugus</i> | M | 39 | 8 | A | Entering 21:30 |
| N/B | <i>Myotis lucifugus</i> | M | 40 | 8.5 | A | Unknown direction; 22:40 |
| N/B | <i>Myotis lucifugus</i> | F | 39 | 7 | A | Entering 21:05; non-reproductive |
| N/B | <i>Myotis septentrionalis</i> | M | 37 | 7.5 | A | Entering; 22:25 |
| N/B | <i>Myotis septentrionalis</i> | M | 35 | 6.5 | J | Entering; 22:35 |
| N/B | <i>Myotis septentrionalis</i> | F | 36 | 6 | A | Entering; 23:15; non-reproductive |
| N/B | <i>Myotis septentrionalis</i> | M | 37 | 7.5 | A | Exiting (day-roosting) 21:40 |
| N/B | <i>Myotis septentrionalis</i> | M | 37 | 8.5 | A | Entering; 00:20 |
| N/B | <i>Myotis septentrionalis</i> | M | 35 | 7 | A | Entering; 23:30 |
| N/B | <i>Myotis septentrionalis</i> | M | 38 | 8 | A | Entering; 00:15 |
| N/B | <i>Myotis septentrionalis</i> | M | 37 | 8.5 | A | Entering; 00:25 |
| N/B | <i>Myotis septentrionalis</i> | M | 38 | 8 | A | Entering; 00:30 |
| N/B | <i>Myotis septentrionalis</i> | M | 38 | 8 | A | Entering 21:25 |
| N/B | <i>Myotis septentrionalis</i> | M | 38 | 8.5 | A | Entering; 01:15 |
| N/B | <i>Myotis volans</i> | M | 39 | 7.5 | A | Entering; 00:55 |

DAVENPORT CAVE

8/24/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|-------------------------------|-----|----|---------|-----|--|
| N/B | <i>Eptesicus fuscus</i> | F | 47 | 17.5 | J | Entering; others heard (<5) |
| N/B | <i>Myotis ciliolabrum</i> | F | 32 | 5 | A | Entering; non-reproductive |
| N/B | <i>Myotis ciliolabrum</i> | M | 30 | 5 | A | Entering |
| N/B | <i>Myotis ciliolabrum</i> | M | 30 | 4.5 | A | Entering |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 5 | J | Entering; small punctures in wing membranes |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 4.5 | J | Entering |
| N/B | <i>Myotis ciliolabrum</i> | F | 32 | 5 | A | Entering; post-lactating |
| N/B | <i>Myotis ciliolabrum</i> | F | 32 | 5 | A | Entering; post-lactating |
| N/B | <i>Myotis ciliolabrum</i> | F | 34 | 6 | A | Entering; post-lactating |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 5 | J | Entering |
| N/B | <i>Myotis ciliolabrum</i> | F | 30 | 5 | J | Entering |
| N/B | <i>Myotis evotis</i> | M | 39 | 7 | A | Entering; no fringe |
| N/B | <i>Myotis evotis</i> | M | 40 | 8 | A | Entering; very slight fringe along uropatagium |
| N/B | <i>Myotis septentrionalis</i> | M | 38 | 7.5 | A | Entering |
| N/B | <i>Myotis septentrionalis</i> | M | 36 | 7.5 | | Entering; age not recorded |
| N/B | <i>Myotis septentrionalis</i> | F | 37 | 7.5 | A | Exiting (day-roosting) |
| N/B | <i>Myotis septentrionalis</i> | M | 37 | 7.5 | A | Exiting (day-roosting) |
| N/B | <i>Myotis septentrionalis</i> | M | 34 | 6 | A | Exiting (day-roosting) |
| 0231 | <i>Myotis septentrionalis</i> | M | 38 | 8 | A | Exiting (day-roosting) |
| N/B | <i>Myotis septentrionalis</i> | M | 37 | 8 | A | Exiting (day-roosting) |
| N/B | <i>Myotis septentrionalis</i> | F | 36 | 6 | ? | Entering; non-reproductive |
| N/B | <i>Myotis septentrionalis</i> | M | 33 | 6 | ? | Entering; FA measure correct |
| N/B | <i>Myotis septentrionalis</i> | M | 37 | 7 | ? | Entering |
| N/B | <i>Myotis septentrionalis</i> | M | 34 | 6.5 | A | Entering |
| N/B | <i>Myotis septentrionalis</i> | M | 35 | 6 | J | Entering |
| N/B | <i>Myotis septentrionalis</i> | M | 34 | 5.5 | J | Entering |
| N/B | <i>Myotis septentrionalis</i> | M | 36 | 8.5 | A | Entering |
| N/B | <i>Myotis septentrionalis</i> | M | 37 | 9 | A | Entering |
| N/B | <i>Myotis volans</i> | F | 36 | 7.5 | A | Exiting (day-roosting); non-reproductive |
| N/B | <i>Myotis volans</i> | M | 38 | 7.5 | | Entering; age not recorded |
| N/B | <i>Myotis volans</i> | F | 36 | 7.5 | A | Entering; post-lactating |

ALKALI CREEK HORSE CROSSING (BLM)

8/18/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|----------------------------------|-----|----|---------|-----|------------------------------|
| N/B | <i>Corynorhinus townsendii</i> | | | | | 20:35; seen flying under net |
| N/B | <i>Eptesicus fuscus</i> | M | 45 | 13.5 | J | |
| N/B | <i>Eptesicus fuscus</i> | F | 46 | 19 | A | |
| N/B | <i>Eptesicus fuscus</i> | F | 50 | 24 | A | |
| N/B | <i>Eptesicus fuscus</i> | F | 48 | 22 | J | |
| N/B | <i>Eptesicus fuscus</i> | F | 49 | 29 | A | |
| N/B | <i>Eptesicus fuscus</i> | F | 48 | 22.5 | A | |
| N/B | <i>Eptesicus fuscus</i> | M | 45 | 17.5 | J | |
| N/B | <i>Eptesicus fuscus</i> | F | 47 | 23.5 | A | |
| N/B | <i>Eptesicus fuscus</i> | F | 46 | 25.5 | J | |
| N/B | <i>Eptesicus fuscus</i> | M | 45 | 20 | J | |
| N/B | <i>Eptesicus fuscus</i> | M | 45 | 12.5 | J | |
| N/B | <i>Eptesicus fuscus</i> | M | 44 | 24.5 | A | |
| N/B | <i>Eptesicus fuscus</i> | F | 45 | 17 | J | |
| N/B | <i>Lasiorycteris noctivagans</i> | M | 42 | 11 | J | |
| N/B | <i>Lasiorycteris noctivagans</i> | M | 40 | 12 | J | |
| N/B | <i>Lasiorycteris noctivagans</i> | M | 40 | 11.5 | J | |
| N/B | <i>Lasurus cinereus</i> | | | | | Escaped net |
| N/B | <i>Lasurus cinereus</i> | | | | | Escaped net |
| N/B | <i>Lasurus cinereus</i> | M | 51 | 21 | J | |
| N/B | <i>Lasurus cinereus</i> | M | 55 | 22.5 | J | |
| N/B | MYOSPP | | | | | Escaped net |

9/22/99

| | | | | | | |
|-----|---------------------------|---|----|------|---|------------------|
| N/B | <i>Myotis ciliolabrum</i> | | | | | Escaped net |
| N/B | <i>Myotis ciliolabrum</i> | M | 32 | 7 | A | |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 7.5 | A | |
| N/B | <i>Eptesicus fuscus</i> | F | 46 | 25 | A | Non-reproductive |
| N/B | <i>Eptesicus fuscus</i> | M | 47 | 20.5 | A | |
| N/B | <i>Eptesicus fuscus</i> | M | 45 | 19 | A | |
| N/B | <i>Eptesicus fuscus</i> | M | 44 | 26.5 | A | |
| N/B | <i>Myotis lucifugus</i> | M | 37 | 9.5 | A | |
| N/B | <i>Myotis lucifugus</i> | M | 38 | 9 | A | |
| N/B | MYOSPP | | | | | Escaped net |
| N/B | MYOSPP | | | | | Escaped net |

WHITEWOOD CAVE 8/27/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|---------------------------|-----|----|---------|-----|-------------------------------|
| N/B | <i>Myotis ciliolabrum</i> | F | 33 | 5 | A | Entering cave; post-lactating |
| N/B | <i>Myotis ciliolabrum</i> | F | 33 | 4.5 | J | Entering cave; 2015 capture |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 5 | J | Entering; 2105 capture |
| N/B | <i>Myotis ciliolabrum</i> | M | 31 | 5 | A | Entering; 2110 capture |
| N/B | <i>Myotis ciliolabrum</i> | | | | | Escaped; entering |
| N/B | <i>Eptesicus fuscus</i> | F | 43 | 16.5 | J | Entering; 2120 capture |

LOG TROUGH PONDS 7/20/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|----------------------------------|-----|----|---------|-----|--------------|
| N/B | <i>Lasionycteris noctivagans</i> | M | 40 | 10 | A | 2110 capture |
| N/B | <i>Lasionycteris noctivagans</i> | M | 41 | 10.5 | A | 2120 capture |
| N/B | <i>Lasionycteris noctivagans</i> | M | 42 | 11 | A | 2135 capture |
| N/B | <i>Myotis lucifugus</i> | M | 39 | 7.5 | A | 2100 capture |
| N/B | <i>Myotis lucifugus</i> | M | 38 | 8 | A | 2140 capture |
| N/B | <i>Myotis lucifugus</i> | M | 39 | 7.5 | A | 2150 capture |

MOREAU RIVER SOUTH FORK 8/25/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|-------------------------|-----|----|---------|-----|---|
| 5003 | <i>Eptesicus fuscus</i> | M | 45 | 18 | A | Emerged just after sunset from cliff swallow nest |
| 5004 | <i>Myotis lucifugus</i> | M | 38 | 8 | A | 20:50 capture; low net over water; night roosting in cliff swallow nest |
| 5005 | <i>Eptesicus fuscus</i> | M | 44 | 19 | A | 23:30 capture; netted immediately adjacent to bridge |
| N/B | MYOSPP. | | | | | Heard via detector; no captures |

FT MEADE - BUILDING 51 8/18/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|-------------------------------|-----|----|---------|-----|---------------------------------------|
| 0984 | <i>Myotis lucifugus</i> | F | 39 | 7.5 | J | Hand-captured; roosting with 0982 |
| 0982 | <i>Myotis lucifugus</i> | F | 39 | 8 | A | Hand-captured; post-lactating; w/0984 |
| 0981 | <i>Myotis septentrionalis</i> | F | 39 | 9.5 | A | Hand-captured; post-lactating; w/0988 |
| 0988 | <i>Myotis septentrionalis</i> | F | 37 | 7 | J | Hand-captured; roosting with 0981 |

Private Home, West Seventh Street, Mitchell, SD 12/12/99

| BAND | SPECIES | SEX | FA | WT (gm) | AGE | NOTES |
|------|-------------------------|-----|----|---------|-----|-----------------------------------|
| 5001 | <i>Eptesicus fuscus</i> | F | 47 | 19.5 | A | Hand-captured in basement of home |
| 5002 | <i>Eptesicus fuscus</i> | F | 47 | 20 | A | Hand-captured in basement of home |

