

**A NETTING SURVEY OF WATER AND CAVE AREAS USED BY BATS AT
CRATERS OF THE MOON NATIONAL MONUMENT, BUTTE COUNTY, IDAHO**

**RESEARCH CONTRACT
with the**

**NATIONAL PARK SERVICE
CRATERS OF THE MOON NATIONAL MONUMENT
P.O. BOX 29
ARCO, IDAHO 83213**

**Barry L. Keller
and
Richard T. Saathoff**

**Idaho Museum of Natural History
Idaho State University
Pocatello, Idaho 83209**

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SCOPE OF THE REPORT

This report summarizes museum collections, netting efforts, nursery use, and selected day roost use of lava-tube caves by bats at Craters of the Moon National Monument. Six sites were selected for netting as a result of the presence of water needed by bats for drinking. Sixteen additional caves were surveyed during the day to increase the number of sites reviewed, expanding upon last year's efforts to locate day roosting Corynorhinus townsendii. Caves previously containing nursery colonies of bats were revisited to determine if colonies were present at the same locations evaluated last year (Keller and Saathoff, 1995). Of the six sites initially selected to net, five were netted and all sites yielded bats. One nursery colony was located. Further study of Monument bats is recommended.

INTRODUCTION

In 1994, a study was initiated to locate Monument caves supporting populations of bats. Seven of 46 caves surveyed during daylight hours were found to contain populations of bats (Keller and Saathoff, 1995). Two nursery colonies of Townsend's big-eared bats were also located. During the summer of 1995, the objectives of the study were expanded to include a net-release assessment of the species present, especially in caves near or containing water.

The nomenclature of species expected or observed at Craters of the Moon, as proposed by Hall, (1981), Van Zyll de Jong (1984) and Jones, et al., (1992) including species names updated from the nomenclature in Hall (1981), requires minor modification in this report as a result of a suggested change for the genus of Townsend's big-eared bats proposed by Frost and Timm (1992) and Tumlison and Douglas (1992). Frost and Timm (1992) restore the traditional generic name of Townsend's big-eared bat from Plecotus to Corynorhinus, a standard accepted in this report. Additionally, since our initial study was completed, four new bat species have been proposed for addition to the U.S.D.I. Bureau of Land Management and the Idaho Department of Fish and Game Sensitive Species list while the C2 classification of species being considered for endangered status has been eliminated by the U.S. Fish and Wildlife Service. Protection may be provided to populations of Long-eared Myotis (Myotis evotis), Long-legged Myotis (M. volans), Yuma Myotis (M. yumanensis) and Fringed Myotis (M. thysanodes). Whereas the latter species is not probable at the National Monument, Long-legged and Yuma Myotis may be present. An insufficient number of bats have been netted on a long-term basis to determine the number of species currently present

on CMNM. Historically, bats netted at Craters have included four species, Small-footed Myotis, (Myotis ciliolabrum), Long-eared Myotis, (M. evotis), Little brown Myotis, (Myotis lucifugus), and Townsend's big-eared bat (Corynorhinus townsendii). Information on the voucher specimens collected between 01 July, 1927 and 01 August, 1969, as detailed in the Regis data base housed at the Idaho Museum of Natural History, indicates that approximately 387 bats have been collected in Idaho. At the time this report was written, the data base consisted of information supplied by 33 U.S. museums (Table 1). The number of Idaho bats prepared as specimens is limited, representing 2.8 percent of the 14,035 Idaho specimens of mammals on deposit in U.S. museums. The data base also included specimens in Idaho collections visited by Keller, Idaho bats included in the Idaho Fish and Game data base, and Idaho bats on deposit at the Conner Museum at Washington State University. At the date of this report, long-eared Myotis, likely the second most common bat at the Monument, require protection.

METHODS

Study Area

The study was completed during the period of 18 July to 09 August, 1995 at Craters of the Moon National Monument, Butte County, Idaho. The northern region of the Monument, north of Highway 20, was studied most intensively based upon the concentration of bats observed during the summer of 1994 from survey data of lava-tube cave use by bats (Keller and Saathoff, 1995). During field work in 1994, a QMC Model S200 bat detector (QMC Instruments Ltd, London England) equipped with a QMC/IL SM1 broadband microphone, was used to track bat activity by Saathoff, providing evidence of bats at Little Cottonwood Creek near the Martin Mine, a site sampled in 1995. The northern region of the Monument contains the greatest number of sites where water is available for bats to drink at the Monument. Two sites in the Caves area and the Big Sink area in the southern region of the Monument also were sampled.

Netting

Netting surveys detailing water use and night-roosting habits of Monument bats were completed from dusk to full darkness. Pools of water are known to expanded utilization of an area by bats, especially in arid climates. Due to the limited amount of water in the Monument only six sites were considered adequate for netting (Fig 1). Four are located in the north end of the Monument, two in caves and

Table 1. Museums collections assessed and placed in the REGIS data base by August 1995.

Name of Museum Contributing Data	Location
Albertson College Museum	Caldwell, ID
Berkeley Museum of Vertebrate Zoology	Berkeley, CA
Boise State University Museum	Boise, ID
Carnegie Museum of Natural History	Pittsburgh, PA
Conner Museum, Washington State Univ.	Pullman
Cornell University Museum	Ithaca, NY
Field Museum of Natural History	Chicago, IL
Idaho Museum of Natural History	Pocatello
Kansas Museum of Natural History	Lawrence
Oklahoma Museum of Natural History	Norman
Oklahoma State University Museum	Stillwater
Smithsonian Institution	Washington, D.C.
Texas A&M University Museum	College Station
Univ. Arizona Collection of Mammals	Tuscon
Univ. Idaho Museum of Natural History	Moscow
University of Colorado Museum	Boulder
University of Iowa Museum Natural Hist.	Iowa City
University of Michigan Museum Mus. Zool.	Ann Arbor
University of Montana Museum	Missoula
University of Nebraska State Museum	Lincoln
Utah Museum of Natural History	Salt Lake
Museums without Idaho Mammals on deposit:	
Angelo State University Museum	San Angelo, TX
Arizona State University	Tempe
California State University,	Sacramento
Colorado State University Museum	Fort Collins
Eastern New Mexico University	Portles
Indiana State Museum	Indianapolis
Sam Houston State University	Huntsville, TX
San Diego Natural History Museum	San Diego, CA
Santa Barbara Museum of Natural History	Santa Barbara, CA
Strecker Museum, Baylor University	Waco, TX
University of Nevada	Reno
University of Oregon Museum	Eugene

Figure 1. Locations of areas netted at Craters of the Moon National Monument during the summer, 1995.

two along streams. One stream could not be netted as a result of the lack of free standing pools and the high density of vegetation along stream banks. The Pioneer Mountains, which contained snow pack all summer during 1995, supplied the water in streams that were considered for netting.

Surveys were conducted with four shelf 2.6 m high, and 60 mm (110 d/2 ply 2, 3/8 inch) mesh black or sand-colored nylon mist nets of various lengths. Nets were supported with white plastic poles located in fixed positions in straight or "V" configurations. One to two nets were erected at each sample site. The main limitation of mist netting is that under certain conditions, **especially where vegetative cover is limited**, bats are able to detect and avoid the nets. This can result in low overall capture success and in some cases sampling bias where one species is better able than another to detect the nets. Consequently, it was not considered appropriate to net for fixed intervals or to collect and hold all individuals netted prior to closing the nets at the end of a sampling period. An Anabat II, equipped with a recorder was used to sample bats in the air column that might be missed. On the Monument, a number of individuals were seen skirting nets. Voucher specimens were prepared from only one site, where a bat could not be identified in the field, and are in curatorship at the Idaho Museum of Natural History, Pocatello.

Ultrasonic survey

The computer software package, ANABAT II, was used to generate sonographic plots from recorded calls (see Fenton and Bell, 1981). Although each species produces a unique call, identification of individual species and the certainty of this identification are contingent upon matching diagnostic frequencies of a sonogram with data generated from calls of known origin. Such data are scarce, and published sonographic data are of limited use because considerable variation in call characteristics exists across the geographic range of a species, producing what has been suggested as "dialects". Further, members of the genus *Myotis* possess calls that are very similar. Consequently, the data were of utility to determine if any bat species other than members of the genus *Myotis* were avoiding netting procedures.

Netting Sites Containing Water, Surveyed.

1. Site name: Little Cottonwood Creek by Martin Mine
 Site location: T2N R24E sec 22 W1/2
 Bats netted: *Myotis ciliolabrum*, *Myotis evotis*, *Myotis lucifugus*, and *Myotis* sp.

Comments: Good water source. Keller present during netting. Single specimens collected.

2. Site name: Creek at "Research Camp"

Site location: T2N R24E sec 27 NW1/4

Comments: Due to the lack of pools and high vegetation cover over the creek it was determined that this site would likely not yield specimens. Assessment by Keller.

3. Site name: New cave by the Northern AA flow

Site location: T2N R24E sec 35 NW1/4

Bats netted: Myotis ciliolabrum, Myotis evotis, and Myotis sp.

Comments: Good water source

*presumed to be Pond Cave
(Stefanic 2022)

4. Site name: Ice Lake and Antelope Caves

Site location: T2N R24E sec 34 SW1/4

Bats netted: Myotis ciliolabrum, Myotis evotis, and Corynorhinus townsendii

Comments: Narrow opening to Ice Lake, but possibly used as a water source

5. Site name: Moonshine Cave

Site location: T1N R24E sec 11 NE1/4

Bats netted: Myotis ciliolabrum

Comments: Pool appears to be too restrictive to be used as a water source

6. Site name: Boy Scout Cave

Site location: T1N R25E sec 6 NW1/4

Bats netted: Myotis ciliolabrum, Myotis evotis

Comments: Good water source. Corynorhinus townsendii was recorded on the Anabat.

Additional Daylight Cave Surveys

Sixteen caves were either surveyed for the first or second time during the summer. When caves were surveyed, caution was exercised because of the Hantavirus carried by rodents. We followed the procedure completed in 1994 when surveying caves (Keller and Saathoff, 1995), in spite of lack of a documented infection on the Monument because many of the caves contained nests or visually sighted Peromyscus maniculatus and Neotoma sp. populations, known primary reservoirs for Hantavirus. Because death almost always results from infections of humans by this virus (Center for Disease Control, 1993), and because the virus is known to occur in Idaho (Hjelle, et al. 1994) in areas immediately adjacent to Craters, caution was exercised in small caves as a result of assumed limited air-flow exchange, a condition permitting potential aerosol infection of individuals. When deemed appropriate, masks that filter out the dust particles

on which the virus could be carried, were worn in caves that had a dirt floor and/or those not well ventilated. Caves that could be surveyed, were traversed slowly by Saathoff on foot with the aid of a flashlight. When bats were located, individuals were visually examined for colored wing bands used in winter research by Wackenhut (1990), Bosworth (1994) and Doering (1996) during studies on the Idaho National Engineering Laboratory. Caves that contained free water pools were surveyed exceptionally carefully as a result of the need for water by bats in this desert area and as a result of the emphasis on water use by bats during this year of field effort. A summary of the 16 caves visited is presented below.

Cave Sites

1. Cave name: Antelope Cave
Cave location: T2N R24E sec 34 SW1/4
Comments: No bats
2. Cave name: Branch Cave
Cave location: T1N R24E sec 14 NE1/4
Comments: No bats
3. Cave name: Coyote Hole Blister Cave
Cave location: T2N R24E sec 35 NW1/4
Comments: No bats according to the Archeological team
4. Cave name: First Chance Cave
Cave location: T1N R25E sec 5 NE1/4
Comments: No bats
5. Cave name: Hidden Cave 1
Cave location: T1N R25E sec 5 W1/2
Comments: No bats
6. Cave name: Hidden Cave 2
Cave location: T1N R25E sec 5 W1/2
Comments: No bats
7. Cave name: Ice Lake Cave
Cave location: T2N R24E sec 34 SW1/4
Comments: No bats
8. Cave name: Moldy Trees Cave
Cave location: T1N R24E sec 14 SE1/4
Comments: No bats
9. Cave name: Moonshine Cave
Cave location: T1N R24E sec 11 NE1/4
Comments: No bats

10. Cave name: Needles Cave
Cave location: T1N R25E sec 5 NE1/4
Comments: No bats
11. Cave name: New cave by the Northern AA flow
Cave location: T2N R24E sec35 NW1/4
Comments: No bats
12. Cave name: Sandtrap Cave
Cave location: T2N R24E sec 34 SW1/4
Comments: Nursery Colony of Corynorhinus townsendii
13. Cave name: Screaming Jaws of Death Cave
Cave location: T2N R24E sec 34 SW1/4
Comments: No bats
14. Cave name: Shelter Cave
Cave location: T2N R24E sec 27 SE1/4
Comments: No bats according to the Archeological team
15. Cave name: Tree Mold Cave
Cave location: T1N R24E sec 14 SE1/4
Comments: No bats
16. Cave name: Two-Step Cave
Cave location: T2N R24E sec 34 SW1/4
Comments: No bats

RESULTS

A survey of U.S. museums indicated that four species of bats historically have been found at the Monument. Out of the six sites originally netted during the present study, five were netted at night, and all five were used by bats. Of the 16 caves surveyed during the day, one contained a nursery colony and 15 did not contain bats which were visible to Saathoff.

Survey of Specimens Held in Museums

Species of bats have been collected at the Monument by six different museums (Table 2). The localities where these bats were collected are Great Owl Cavern, Indian Tunnel, Paisley Waterhole, and a generic listing of Craters of the Moon. Myotis evotis was collected most frequently, followed by Myotis ciliolabrum, Corynorhinus townsendii, and Myotis lucifugus.

Netting Comments.

Netting site 1, which is on Little Cottonwood Creek by Martin Mine was netted on 18 July, 1995 by Keller and Saathoff. The area contains a spring which allows pools to form. Two nets were set, one tan 60ft net was placed across the spring to cover entire width of the pond. A second 40 ft black net was placed from the end of the first net, up hill on a diagonal. The sides of the hills and the adjacent trees appeared to be a flight corridor. Anabat recordings were not produced at this location. The bats netted at this site included: Myotis ciliolabrum, Myotis evotis, Myotis lucifugus, and Myotis sp. This site serves as a good water source for bats.

Netting site 2, located along the creek at the "Research Camp", was evaluated on 18 July, 1995. We decided that this site would be difficult to net as a result of the lack of pools and the high vegetation cover over the creek.

Netting site 3 was located at the new cave near the northern AA flow just north of Highway 20 in the North End Caves Area. This site was netted on 01 August, 1995 by Saathoff. This cave was discovered in 1995 by an archeological team working at the Monument. The discovery was fortunate because the cave contains a significant pool on the left side. A black 15ft net was used across the entrance to the cave sealing the whole entrance. The first bat was observed at 09:30pm. As a result discovering a large number of bats using this cave, the net was only left in place until 09:50pm. Bat species netted at this site, included: Myotis ciliolabrum, M. evotis, and Myotis sp. Our Anabat recorder was used in replace of the net after 09:50pm. It suggested that only Myotis sp. was present at the locality. This site appears to be an excellent location to initiate a study of natural history of bats at the Monument.

Netting site 4 was located at Ice Lake and Antelope caves in the North End Caves Area. Both caves were netted on 02 August, 1995 by Saathoff and Monument volunteers. One 30ft tan net was used to cover both entrances located in the breakdown pit. The net was set up in a "V" configuration leaving little room for bats to fly over the net. Antelope cave has three openings and does not contain a pool of water; the largest opening was netted. Corynorhinus townsendii were seen "light testing" the Antelope caves entrance from inside the cave prior to darkness. This suggests that some bats may be present in caves during the day that are not observed during daytime searches as a result of the difficulty in gaining access to the entire area within a cave system. Additionally, single daytime

searches may be compromised by bats that move among a variety of day roosts depending on the area traversed the previous evening during feeding. Ice Lake cave has a small opening and contains a very large pool of water. The following bats were netted at this locality: Myotis ciliolabrum, Myotis evotis, and Corynorhinus townsendii. An Anabat recorder made at this site showed both Myotis sp. and Corynorhinus townsendii present. Activity at this site was lower than at site 3, probably because the opening to Ice Lake cave is small.

Netting site 5, Moonshine cave, was located in the Big Sink Area. It was netted on 08 August, 1995 by Saathoff and Monument volunteers. A 15ft black net in a "V" configuration was used across the entrance including a segment leading away from the entrance. This cave contains a small pool of water in the rear that has limited access. Only one Myotis ciliolabrum was netted at this site. Anabat recordings showed only Myotis sp. This site does not appear to be an important water source for bats as it is not used extensively.

Netting site 6, Boy Scout cave, is located in the Caves Area. This cave receives high visitor use during the day. The cave has large sized pools that contain ice. A 15ft black net was used across the entrance with most of the entrance occluded by the net. This cave was netted by Saathoff and a Monument volunteer on 09 August, 1995. The majority of the bat activity was from 09:16pm to 09:45pm followed by limited activity until the net was taken down at 12:00am. Bats taken and released included Myotis ciliolabrum and Myotis evotis. Three Myotis evotis juveniles were also netted. Anabat recordings also indicated that Corynorhinus townsendii were present. This cave contains an excellent water source for bats. Because it contains two sensitive species, it should not be entered during evening hours as a result of the presence of juvenile M. evotis. The cave may serve as a nursery colony site for this species.

Nursery Colonies

Sandtrap cave, which is located in the North End Caves Area, contained a nursery colony of Corynorhinus townsendii consisting of approximately 35 bats. The cave is within 50 meters of Two-Step cave which contained a nursery colony of Corynorhinus townsendii in 1994, but not 1995. It appears that Corynorhinus townsendii nursery colonies will be found in the North End Caves Area yearly, but that they may move to different caves each year.

Needles cave in the Wilderness Area contained a nursery colony of Corynorhinus townsendii in 1994, but not in 1995.

The caves immediately around Needles cave were checked without success. The colony may have moved to another cave in the area that has not been discovered. The data suggest further search of the area for caves is warranted.

RECOMMENDATIONS

1. Caves known to contain nursery colonies **either historically or in a given year** should be placed off limits to human intrusion.
2. We still need to helicopter two bat specialists to caves not readily accessible by foot. If possible, these caves should be marked during the summer such that they can be located by air during the winter. They should be searched and netted during late June to mid July to locate potential nursery colonies. If possible, they should be searched again during the winter for hibernating bats. *Which Caves?*
3. Keller proposes to continue winter searches for hibernating bats during the next fiscal year of research. Limited searches in the North Caves area conducted during November 1995 (beyond contract reporting dates) failed to yield hibernating bats.
4. Doering (1996) has completed his M.S. thesis on winter hibernation in Townsend's big-eared bats at the INEL. If funding is continued, we will prepare a complete study plan for a long-term (10 year) analysis of bat population densities with special emphasis on nursery colonies by Keller. Bill Doering is interested in undertaking his doctoral research on the thermal ecology and water use of bats living on the Monument with special emphasis on populations of Corynorhinus townsendii. Both individuals will work together conducting these studies. Additional funds will be sought from outside sources to support this work. During the start-up phase, we solicit an increase in Challenge-Cost Share funding to \$5,000.00 per year.

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