
Delaware Water Gap National Recreation Area

Fall Bat Investigations at Cold Air Cave and Mt. Minsi Talus



August 23-November 1, 2005
Bat Conservation and Management, Inc.
Carlisle, Pennsylvania

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Delaware Water Gap National Recreation Area
Bushkill, PA

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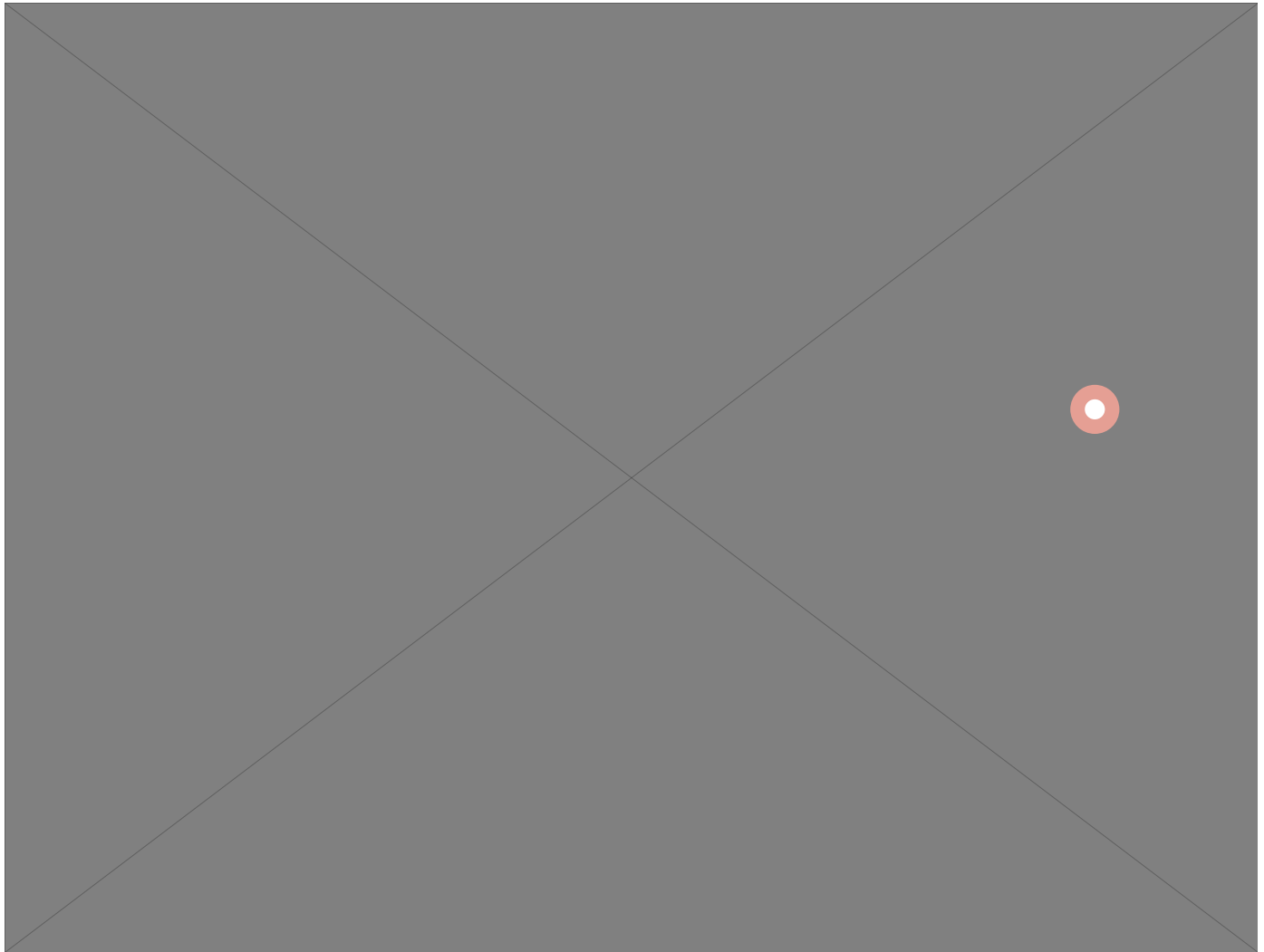
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*Cover:
Cold Air Cave and a 6' x 7' harp trap at the base of Mt. Minsi Talus*

General Sampling Location



Cold Air Cave, Delaware Water Gap National Recreation Area

Figure 1

Abstract

Cold Air Cave is a small opening located in bedrock below a steep escarpment on the eastern slopes of Mt. Minsi at elevation 330 (100 meters). To assess the use and importance of Cold Air Cave and associated talus as a hibernaculum, Bat Conservation and Management, Inc. used a combination of harp trap and mist net trapping techniques to survey the cave entrance, and acoustic monitoring to survey a small portion of open talus. One hundred fifty-four bats of three (3) species were captured in the harp traps and mist nets during the entire nine-night project (Table 1); including sixty-one (61) little brown myotis (*Myotis lucifugus*), twenty-three (23) northern long-eared myotis (*Myotis septentrionalis*), forty-six (46) eastern pipistrelles (*Pipistrellus subflavus*) and two (2) bats of the *Myotis* species which escaped before being completely identified. Three species, the big brown bat (*Eptesicus fuscus*), the Eastern red bat (*Lasiurus borealis*), and the Hoary bat (*Lasiurus cinereus*), were not physically captured at all throughout the project but were recorded electronically.

Keywords: bat, trap, acoustic, fall, survey

Introduction

Objective

To assess the use and importance of Cold Air Cave and associated talus as a hibernaculum, Bat Conservation and Management, Inc. used a combination of harp trap and mist net trapping techniques to survey the cave entrance, and acoustic monitoring to survey a small portion of open talus.

Study Area

The Delaware Water Gap is a geologic formation on the border of New Jersey and Pennsylvania, where the Delaware River traverses the last large ridge of the Appalachian Mountains enroute to the Atlantic Ocean. The Worthington State Forest is to the immediate northeast on the New Jersey side of the border. U.S. Interstate 80 also passes through the gap.

The Delaware Water Gap is the site of the Delaware Water Gap National Recreation Area, which is used primarily for recreational purposes, such as rafting, canoeing, and hiking. The park encompasses 40 miles of the Delaware River and 67,000 acres of its valley in Pennsylvania and New Jersey.

The ridge of the Appalachians that the Delaware crosses is called the Blue Mountains in Pennsylvania and the Kittatinny Mountains in New Jersey. The New Jersey mountain is Mt. Tammany, the Pennsylvania mountain is Mt. Minsi. The summit of Mt. Minsi is at 1,461 feet (445 meters) elevation. Large exposures of Ordovician (Martinsburg) and Silurian (Shawangunk) rocks are exposed on both sides

of the gap. A heavy apron of talus are derived from the Shawangunk cliffs and extends almost to river level at 225 feet (68 meters) elevation.

Cold Air Cave is located 1.8 miles (2.9 kilometers) southeast of Delaware Water Gap along Route 611. The topography consists of steep river gorge along the meandering river valley at an elevation of approximately 330 feet (100 meters). This site is dominated by a 10 acre talus slope directly above, which is surrounded by an extensive deciduous forest. Cold Air Cave is 150 feet (45 meters) from Route 611, a relatively busy two-lane highway along the west side of the Delaware River.

Cold Air Cave is a small opening located in bedrock below a steep escarpment on the eastern slopes of Mt. Minsi at elevation 330 (100 meters). About ten acres of open talus cover the bedrock immediately above the cave entrance. The talus is surrounded by mixed forest. The cave opening is approximately 6' (1.8 meters) wide x 6' (1.8' meters) high but quickly diminishes in size after only 30' (9 meters). Cold air emanates from the opening, suggesting extensive fissures physically impossible for humans to enter but where bats could overwinter or day roost during certain times of the year. Cold air Cave is a tectonic cave, consisting of crevices initially formed during the mountain building episode of Kittatinny Mountain and later modified by slumping as the Delaware River down cut past the rock layers. Deep indices formed by the layer of sandstone talus forms a cold air "sponge" trap that accounts for the well known cool breeze associated with the site on warm days.

Methods and Results

In June 2005 Bat Conservation and Management, Inc. (BCM) of Carlisle, Pennsylvania was contracted by National Park Service of Bushkill, Pennsylvania to conduct field surveys of woodland bat species specifically at Cold Air Cave and the Mt. Minsi Talus in Monroe County, Pennsylvania. Sampling was conducted between August 23 and November 1, 2005 and consisted of a single trap site sampled 9 times over approximately two months in the fall season. The site contained up to two harp traps and one mist net location (Table 1). In addition to mist net sampling, an acoustic detector was deployed at each site and recorded bat echolocation calls that were later analyzed and sorted to species when possible. The total inventory effort at this site met exceeded the recommendations outlined by the Pennsylvania Game Commission (PGC) Protocol for Assessing Abandoned Mines/Caves (Appendix B).

The site was sampled using traditional harp trap and mist net trapping techniques. Harp traps were constructed by BCM, Inc. (Figures 2 and 3). Harp trapping involves hanging 3'x3.5' or 6'x7' frames threaded with two vertical layers of monofilament line in the entrances of hibernacula. Bats attempting to pass through the trap are captured either by colliding directly with the lines or by entering the space between the layers. Once captured, they flutter into a bag where they are held until they are removed for identification. This

method of sampling is less stressful and safer for the animals than being tangled during mist net sampling.

Mist nets were manufactured by Avinet, Inc. of Dryden, NY (38mm mesh - nylon, reduced bag, 50/2, 38mm mesh, 2.6m high, 4 shelves). Nets can be set at different heights according to specific site conditions. "Single-high" nets are simple 2.6-meter high nets between two poles. "Double-high" nets are slightly more complicated with two 2.6 meter high nets stacked between two poles. "Triple-high" nets consist of three 2.6 meter high nets stacked between two poles. Double high nets were chosen to be most appropriate for this site. The net lengths were also dictated by the physical characteristics of the site and were 6 meters long. Nets were placed over the trail between Cold Air Cave and the parking area along Route 611 (Figure 4). Nets blocked the majority of the travel-way in this area.

A net-night was defined as any configuration of mist net length and height between 2 poles set up for 1 night. Net-night level of effort totaled 13 net-nights over the 9 nights (Table 1); including eight (8) 6'x7' harp traps, three (3) 3'x4' harp traps, and two (2) double-high net sets. The recommended level of effort for one site as described by the PGC Protocol for Assessing Abandoned Mines/Caves is two net-nights (Appendix B).

Table 1: Net Night Level of Effort

Trap type	8/22	8/23	9/12	9/14	9/25	9/27	10/30	10/31	11/1	Totals
6'x7' Harp	1	1	1	1	1	2	0	0	1	8
3'x4' Harp	0	0	0	0	0	0	1	1	1	3
Double High	0	1	1	0	0	0	0	0	0	2
Totals	1	2	2	1	1	2	1	1	2	13

One net night is any size or stack of nets stretched between 2 poles.

Data collected at each trapping area included detailed net setup diagrams, weather conditions during sampling, and general habitat information. Data recorded on bats included species, sex, age, reproductive status, weight, and net of capture information. Age classification was determined by degree of ossification of the epiphyseal plates of the finger bones. The reproductive condition of females was noted by abdominal palpitation and inspection of mammary glands. The reproductive condition of female bats can be used to determine which species have maternity colonies in the general vicinity of the capture site during summer months. This information is not particularly useful in this project because of the migratory nature of these animals.

Bat captures for this project are summarized in Tables 2 and 3. A total of 154 bats of three (3) species were captured; including sixty-one (61) little brown myotis (*Myotis lucifugus*), twenty-three (23) northern long-eared myotis (*Myotis septentrionalis*), forty-six (46) eastern pipistrelles (*Pipistrellus subflavus*) and two (2) bats of the *Myotis* species which escaped before being completely identified.



Figure 2. 6'x7' harp trap on August 23.



Figure 3. 6'x7' and 3'x4' harp trap on November 1.



Figure 4. 6'x7' harp trap and double-high mist net on August 23.

Table 2: Capture Summary

Name		Night	Total Species	Total Captures
Cold Air Cave		8/23	3	56
Cold Air Cave		8/24	3	25
Cold Air Cave		9/12	3	39
Cold Air Cave		9/14	3	10
Cold Air Cave		9/25	3	12
Cold Air Cave		9/27	2	8
Cold Air Cave		10/30	2	3
Cold Air Cave		10/31	0	0
Cold Air Cave		11/1	1	1
				154

Table 3: Mist Net Site Totals

Species		8/22	8/23	9/12	9/14	9/25	9/27	10/30	10/31	11/1	Totals		
											M	F	Unk
<i>Myotis lucifugus</i>	M	32	7	19	4	5	1	1	0	1	70		
	F	3	3	4	1	0	2	0	0	0	13		
<i>Myotis septentrionalis</i>	M	5	3	4	1	2	0	2	0	0	17		
	F	0	0	3	1	2	0	0	0	0	6		
<i>Pipistrellus subflavus</i>	M	10	7	3	1	1	3	0	0	0	25		
	F	6	3	6	2	2	2	0	0	0	21		
Unknown		0	2	0	0	0	0	0	0	0	2		
Totals		56	25	39	10	12	8	3	0	1	112	40	2
		154									154		

"Unknown" bats are those which escaped before complete identification was possible.

Acoustic Survey

BCM incorporated a modern acoustic “bat detector” to compliment the traditional mist net capture techniques during this project. The device was set up on each night of the project to record high-frequency echolocation calls of free flying bats, which later were reviewed and sorted to species when possible.

A bat detector microphone is sensitive to sound beyond the range of human hearing. The circuitry within the detector converts the input into signals audible to the human ear and broadcasts it over a small speaker. Like birds, reptiles, and amphibians, humans hear best at frequencies below five kilohertz (kHz); most of our conversations are conducted below three kHz. A bat detector permits the recording of sounds in the 10 kHz to 200 kHz range, including those of other mammals and many insects. One D240x ultrasonic detector (Pettersson Elektronik® AB, Sweden) was used to record bat calls each night. The D240x device uses a time expansion method to analyze ultrasound. The time expansion method is similar to making a tape recording of a sound and then playing it back at a lower speed, however digital techniques are used to store the signal instead of a high-speed tape recorder. Even though this is not a real-time conversion method,

it offers a number of important advantages. Since the signal is stretched out in time, it is possible to hear details of the sound not audible with other methods (e.g., a technician can actually hear frequency differences within one short pulse or between different pulses). Time expansion is also the only technique that preserves all amplitude and harmonic characteristics of the original signal, making time expanded signals ideal for sound analysis in the laboratory.

Upon detecting ultrasound, the D240x devices were set to stop recording and immediately play back the captured sound 10x slower than real time, which takes just under 20 seconds. The detector’s sound output was recorded into a portable digital recorder, an iRiver model iFP-795, and later downloaded to computers running SonoBat bat call analysis software (SonoBat®, Arcata, California). The D240x devices were set to record 1.7-second call sequences that contained up to 10 calls in a sequence. A bat lingering near the detector may generate more than one call sequence file depending on speed, proximity, direction, and amplitude. While file totals do not necessarily represent individual numbers of bats, the file totals can give a rough comparison of bat activity between nights sampled in this project.

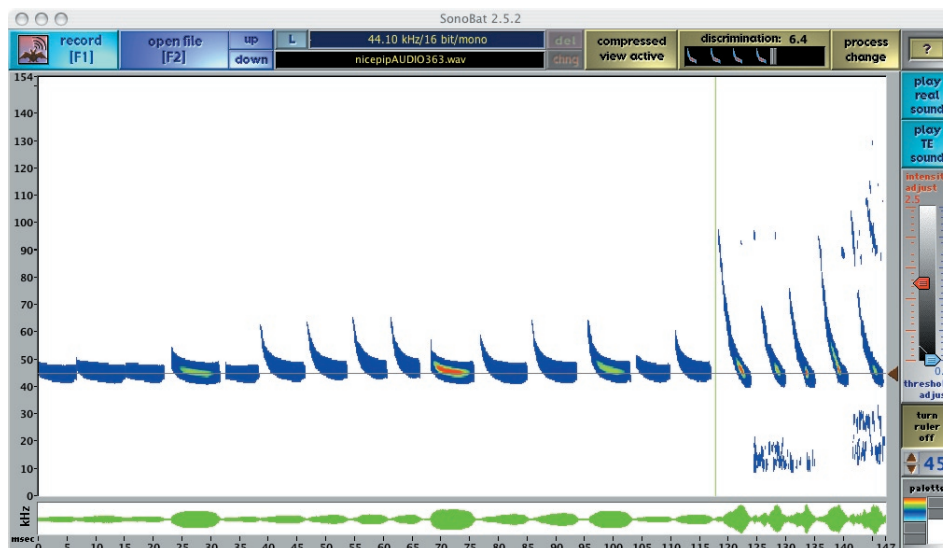


Figure 5. Example of SonoBat comparison of *Pipistrellus subflavus* (left of divider) and *Lasiurus borealis* (right of divider).

Atmospheric absorption reduces the operational range of echolocation in air and appears to limit its effectiveness to a maximum of about 15.2-meters (50 feet). Only the few bat species that emit very low frequency echolocation calls are able to reach even this distance. Laboratory studies with big brown bats (covering frequencies of 60-30 kHz) have shown that these animals are quite “near-sighted,” first detecting a 2.0-centimeter (0.75 inch) sphere at approximately 4.9-meters (16 feet) (Kick 1982). As a result, bat detectors only record bat calls that are close to the sampling station. Nevertheless it is generally assumed that bat detectors will detect some bat species that would not be captured in even the most elaborate mist net set (O’Farrell 1999).

Files that were generated by the acoustic system were manually identified and sorted for preliminary species identification based in known call characteristics. The unknown calls were individually compared with a library of known reference samples. These reference samples were recorded throughout the summer and fall of 2004 and 2005 with the identical equipment used for the monitoring survey. This reference library contains multiple recordings of all bat species commonly found in the Northeast, including rare and endangered species. The library is supplemented by additional reference calls of hoary bats and eastern red bats from Dr. Joseph M. Szewczak, Humboldt State University, Arcata CA. Call analysis, especially of calls recorded in

Table 4: Capture and Acoustic File Totals

Species	8/23 6.5 hours		8/24 6 hours		9/12 6 hours		9/14 4 hours		9/25 5 hours	
	Net	Acoustic	Net	Acoustic	Net	Acoustic	Net	Acoustic	Net	Acoustic
<i>Eptesicus fuscus</i>	0	9	0	13	0	69	0	5	0	0
<i>Lasiurus borealis</i>	0	2	0	5	0	2	0	0	0	0
<i>Lasiurus cinereus</i>	0	1	0	3	0	0	0	0	0	0
<i>Myotis lucifugus</i>	35	32	10	82	23	70	5	5	5	0
<i>Myotis septentrionalis</i>	5	11	3	3	7	3	2	0	4	0
<i>Pipistrellus subflavus</i>	16	17	10	29	9	5	3	2	3	2
Total:	56	72	23	135	39	149	10	12	12	2

Acoustic file counts do not represent individual numbers of bats.

Table 5: Capture and Acoustic File Totals

Species	9/27 4 hours		10/30 8 hours		10/31 6 hours		11/1 12 hours	
	Net	Acoustic	Net	Acoustic	Net	Acoustic	Net	Acoustic
<i>Eptesicus fuscus</i>	0	1	0	0	0	0	0	3
<i>Lasiurus borealis</i>	0	0	0	0	0	0	0	3
<i>Lasiurus cinereus</i>	0	0	0	0	0	0	0	0
<i>Myotis lucifugus</i>	3	1	1	0	0	0	1	0
<i>Myotis septentrionalis</i>	0	0	2	2	0	0	0	1
<i>Pipistrellus subflavus</i>	5	0	0	0	0	0	0	0
Total:	8	2	3	2	0	0	1	7

Acoustic file counts do not represent individual numbers of bats.

Two recorders were used on 10/30 and 11/1.

a passive manner, is not an exact science due to the animals' abilities to vary their echolocation calls and the subjective nature of identification, and not all call sequences recorded can be unequivocally identified to species.

Bat detectors were generally activated immediately following trap setup each night. During the first night of the project the detector was initially placed 50 feet (15 meters) in front of the cave entrance but was overwhelmed by high insect activity. At 9:30 PM it was moved to the talus slope 50 feet (15 meters) above and west of the cave entrance. For the second night (8/24), the recorder was placed in the parking area along Route 611 and elevated in order to sample free flying bats in the area. On the third sample night (9/12) the detector was again placed on the talus slope 50' west of the cave. Intermittent rain showers limited the use of the recorder on 9/14 and it was placed on the edge of the Route 611 parking area. For 9/25 and 9/27 a recorder was placed on the talus slope above

the cave. On the seventh trap night (10/30) two detectors were used to monitor the talus slope and the cave entrance simultaneously. On 10/31 a single detector was placed on a ledge directly overlooking the approach to the harp trap in order to better gauge activity at the cave entrance. Finally on the last night of sampling, again two detectors monitored the talus and cave entrance simultaneously.

Acoustic recorders collectively sampled approximately 57.5 hours during the project. Three hundred eighty-one (381) files were generated that could be analyzed to species with a high degree of confidence. Little brown bats were most often recorded and generated 190 files (50%). Big brown bats were second most commonly recorded and accounted for 99 files (26%). Eastern pipistrelles were identified in 55 files (14%) and Northern long-eared bats were represented in 20 files (5%). Eastern red bats, and Hoary bats combined accounted for 17 files or 4% of the total.

Discussion

Bat captures for this project are summarized in Tables 2 and 3. A total of 154 bats of three (3) species were captured; including sixty-one (61) little brown myotis, twenty-three (23) northern long-eared myotis (*Myotis septentrionalis*), forty-six (46) Eastern pipistrelles (*Pipistrellus subflavus*) and two (2) unknown *Myotis* species that escaped before being identified. Tables 4 and 5 includes all the acoustic captures that were identifiable to species.

Maternity colonies begin to disband in late summer and early fall. At this time, males and females of hibernating species begin to swarm together. Large groups of these bats will swarm in and out of cave entrances throughout the night, often roosting in the caves during the day. This swarming behavior brings adults together for mating, and may also teach young bats the location of the hibernation caves. Autumn also prompts the silver-haired, red, and hoary bats to begin their migration to warmer climates.

Since some number of little brown, northern longear, and eastern pipistrelle bats were captured at the cave entrance into the last week of September, it may be assumed that at least small numbers of these species may be overwintering there.

This project spanned the entire fall swarming season from late August through November 1 in order to detect the widest variety of species. A significant portion of the captures and recordings were made in August and the first half of September. The gender ratio is heavily in favor of male little brown and Northern long-ear, suggesting that the Mt. Minsi talus and/or Cold Air Cave may be a favorable summer day roost for these bachelors in the late summer. Previous work identified male Eastern small-footed bat (*Myotis leibii*) at Cold Air Cave in late July (Chenger 2004), but this species was neither sampled or recorded during this project, suggesting summer use for this species as well.

The acoustic survey complimented the traditional mist net survey and established the presence of bat species which otherwise would have been under-represented. Three species, the big brown bat (*Eptesicus fuscus*), the Eastern red bat (*Lasiurus borealis*), and the Hoary bat (*Lasiurus cinereus*) were not physically captured at all throughout the project but was recorded acoustically. Without the acoustic monitoring, capture data alone would leave some bats under-represented. Interestingly, big brown bats accounted for 26% of the files recorded but were never captured in the trap system. This species will produce louder echolocation calls than many others which may have led to *Eptesicus* being recorded more often. However, a distinct spike of *Eptesicus* recordings occurred on 9/12 which suggests some may have been in transit.

The bat fauna in the vicinity of Cold Air Cave includes common northeastern species. Though no endangered Indiana bats (*Myotis sodalis*) were encountered during this survey, their absence from the area cannot be absolutely confirmed.

Numerous studies of bat roosting and foraging behaviors suggest that management for a diversity of day roosts (in buildings, artificial roosts, tree hollows and cavities), commensurate with encouraging habitat diversity (especially native vegetational diversity; ensuring both age-class and species diversity), and protection of aquatic diversity and quality will support a diversity of bat species (Thomas 1992, Barclay and Brigham 1998, and Krusic 1986.), especially in areas where bats can find critical cold-temperature (but not freezing) over-wintering sites within their migratory limits. And, because bats are primary consumers of numerous night-flying insects, including many crop and forest pests, maintaining healthy bat populations in an area contributes greatly to general environmental health (USDA, NRCS et. al 2002).

Future habitat management plans for Cold Air Cave that take bat roosting and foraging needs into account will benefit numerous bat species that are threatened throughout the region by land conversion, water quality degradation, and roost disturbance or destruction. Although Cold Air Cave is well known, the proximity to busy Route 611 prevents a large amount of vandalism on summer evenings when bats may be vulnerable

while swarming. There is no traversable passage so a traditional cave gate is unnecessary to protect from winter intrusions. Perhaps the most significant impact on bat activity at Cold air Cave would come from the direct result of a hypothetical expansion of Route 611 in the distant future, at which time a re-evaluation for summer and winter use by threatened and endangered species would be necessary.

References

U.S.D.A Natural Resources Conservation Service, Wildlife Habitat Management Institute, and Bat Conservation International, Inc. 2002. Bats and Integrated Pest Management. 4 pages.

U.S. Fish and Wildlife Service. 1999. Agency Draft Indian Bat (*Myotis sodalis*) Revised Recovery Plan. Fort Snelling, Minnesota. 53 pages.

Barclay, R.M.R. and R.M Brigham. 1998. Hide and seek: In search of forest bats. *Bats* 16(1): 3-7.

Chenger, J. 2004. Line 1278 Replacement Project Woodland Bat Survey. Bat Conservation and Management, Inc., Carlisle, Pennsylvania

Jones, C., W.J. McShea, M.J. Conroy, and T.H. Kunz. 1996. Capturing Mammals. In: D.E. Wilson (et. al, Ed) *Measuring and Monitoring Biological Diversity, Standard Methods for Mammals*. Smithsonian Institution Press, Washington. 409 pages.

Kick, S. 1982. Target detection by the echolocating bat, *Eptesicus fuscus*. *Journal of Comparative Physiology* 145: 432-435.

Krusic, R. A., M. Yamasaki, C. D. Nefus, and P.J. Pekins. 1996. Bat habitat use in White Mountain National Forest. *Journal of Wildlife Management*, vol. 60, pp. 625-631.

O'Farrell, M.J. and W.L. Gannon. 1999. A comparison of acoustic versus capture technique for the inventory of bats. *Journal of Mammalogy*. 80: 24-30.

Thomas, D.W. 1992. Bats and old growth forests: Are both vanishing. *Bats* 6(2): 2-6.

Thompson, C.E., 1982. *Myotis sodalis*, *Mammalian Species*, 163: 1-5.

Appendix A: Regional Bat Species

Big Brown Bat

Eptesicus fuscus

No federal listing

Weight: 14 - 21 grams (0.5 - 0.7 ounce)

Wingspan: 32 - 40 centimeters (13 - 16 inches)

Distribution: From southern Canada through southern North America into South America, including many islands in the Caribbean.

These bats are closely associated with humans and are familiar to more people in the United States than any other species of bat. Most summer roosts are in attics, barns, bridges, or other man-made structures, where colonies of a few to several hundred individuals gather to form maternity colonies. They move into caves, mines, and other underground structures to hibernate only during the coldest weather. Where most of these bats winter remains unknown. It emerges at dusk and flies a steady, nearly straight course at a height of 6 - 10 meters (20 - 33 feet) in route to foraging areas. Its large size and steady flight make it readily recognizable. Apparently, some individuals use the same feeding ground each night, for a bat can sometimes be seen following an identical feeding pattern on different nights. After feeding, the bat flies to a night roost to rest; favored night roosts include garages, breezeways, and porches of houses. These bats consume beetles, ants,

flies, mosquitoes, mayflies, stoneflies, and other insects. Mating occurs in autumn and winter, females store sperm, and fertilization takes place in spring. In the eastern United States, big brown bats usually bear twins in early June. In the western United States, usually only one baby is born each year. It is common throughout most of its range.



Figure 6: Big Brown Bat

Eastern Pipistrelle Bat

Pipistrellus subflavus

Weight: 6 - 8 grams (0.2 - 0.3 ounce)

Wingspan: 21 - 26 centimeters (8 - 10 inches) Distribution: eastern Canada, most of the eastern United States, southward through eastern Mexico to Central America

Caves, mines, and rock crevices are used as hibernation sites in winter, and occasionally as night roosts in summer. These bats rarely occur in buildings, and apparently most roost in trees in summer. This species inhabits more caves in eastern North America than any other species of bats, usually hanging singly in warmer parts of the cave. An individual may occupy a precise spot in a cave on consecutive winters; it usually has several spots in which it hangs, shifting from one to another during the winter. This bat emerges from its daytime retreat early in the evening. It is a weak flier and so small that it may be mistaken for a large moth. Eastern pipistrelle bats usually are solitary, although occasionally in late summer four or five will appear about a single tree. The flight is erratic, and the foraging area is small. It often forages over waterways and forest edges and eats moths, beetles, mosquitoes, true bugs, ants, and other insects. Mating occurs in autumn, sperm

is stored during winter, and fertilization takes place in spring. These bats usually bear twins in late spring or early summer. Babies are born hairless and pink with eyes closed, and they are capable of making clicking sounds that may aid their mothers in locating them. They grow rapidly and can fly within a month. This species is common throughout its range.



Figure 7: Eastern Pipistrelle

Eastern Red Bat

Lasiurus borealis

No federal listing

Weight: 9 - 15 grams (0.3 - 0.5 ounce)

Wingspan: 28 - 33 centimeters (11 - 13 inches),

Distribution: Southern Canada, the eastern United States (except the Florida Peninsula), and northeastern Mexico.

Eastern red bats spend daylight hours hanging in foliage of trees. They usually hang by one foot, giving them the appearance of dead leaves. Although these bats seldom enter caves for any distance, they often swarm about cave entrances in autumn. In colder parts of their range, they may migrate south in winter or hibernate in hollow trees or leaf litter. These bats are almost completely furred, except for the ears and parts of the wings, and they can respond to subfreezing temperatures by increasing their metabolism. Predators include several kinds of birds, especially blue jays. Eastern red bats emerge early in the evening and often fly on warm winter afternoons. They forage regularly over the same territory on successive nights. They commonly feed beneath street lights. Eastern red bats consume moths, crickets, flies, mosquitoes, true bugs, beetles, cicadas, and other insects. Eastern red bats mate in flight during August and September, sperm is stored over winter, and females give birth to one to four babies

(average is 3.2) during late spring or early summer. Pups are born hairless, with the eyes closed, and they cling to the fur of their mother with their teeth, thumbs, and feet. It is common throughout most of its range, except for the New England states where it seems to be more infrequent.



Figure 8: Eastern Red Bat

Hoary Bat

Lasiurus cinereus

No federal listing

Weight: 25 - 30 grams (0.9 - 1.1 ounces)

Wingspan: 34 - 41 centimeters (13 - 16 inches)

Distribution: Southern Canada through most of South America, including Hawaii, Iceland, Bermuda, and the Dominican Republic.

Hoary bats are one of America's largest and most handsome bats. With their long, dense, white-tipped fur, they have a frosted, or hoary, appearance. They spend their summer days concealed in the foliage of trees where they choose a leafy site well covered above but open from underneath, generally 3-5 meters (10-17 feet) above the ground usually on the edge of a clearing. Hoary bats don't emerge to feed until after dark, but during migration, they may be seen soon after sundown. They sometimes make round trips of up to 24 miles on the first foraging flight of the night, then make several shorter trips, returning to the day roost about an hour before sunrise. Because they rarely enter houses and spend the daylight hours well concealed, humans rarely have an opportunity to see these bats. Northern populations make long seasonal migrations to and from warmer winter habitats. The sexes apparently are segregated throughout most of the summer range; males are uncommon in the eastern United States at this time. Hoary bats may fly during late afternoon on warm days in winter. Their swift and direct flight pattern and large size

make them readily identifiable on the wing in most parts of the range. Moths, true bugs, mosquitoes, and other insects may be captured as food. Hoary bats bear two pups in mid-May, June or early July. The young cling to the mother through the day, but are left clinging to a twig or leaf while she forages at night. Although widespread throughout North America, hoary bats are not often captured. The Hawaiian subspecies, *L. c. semotus* (Hawaiian hoary bat) is considered endangered.



Figure 9: Hoary Bat

Indiana Bat

Myotis sodalis

Federally endangered

Weight: 6 - 9 grams (0.2 - 0.3 ounce)

Wingspan: 24 - 28 centimeters (9 - 11 inches)

Distribution: Appalachian Mountains from northern New York to the cave region of Tennessee, Alabama, and Georgia.

Includes mid western states west of the Appalachians to Iowa, Missouri, and Arkansas.

The Indiana bat was one of the first bat species in the United States to be recognized as endangered by the U.S. Fish and Wildlife Service Endangered Species Act. This listing was largely due to declines recorded at winter hibernation sites in caves, which until very recently, were the only known roosts for this species. The Indiana bat's distribution includes cave regions and, during summer, areas relatively near cave regions in the eastern United States. Indiana bats usually hibernate in large dense clusters of up to several thousand individuals in sections of the hibernation cave or mine where temperatures average 3° - 6°C (38° - 43°F) and with relative humidities of 66-95%. They hibernate from October to April, depending on climactic conditions. Females depart hibernation sites before males and arrive at summer maternity roosts in mid-April and mid-May. Human disturbance and alteration of hibernation caves, loss of summer roosting and foraging habitat due to deforestation, and pesticide poisoning have all contributed to the decline of the Indiana myotis. Despite protection at overwintering sites, Indiana bat populations continue to decrease in several portions of their range, indicating disturbance or loss of summer habitat. Because these bats are roosting mainly under exfoliating bark, their summer roosts are short-lived. A continually emerging mosaic of multi-aged trees needs to become available from year to year which can serve as roost sites. Moreover, like many cavity or crevice dwelling bats, Indiana myotis switch roosts often throughout the summer maternity season. Maternity colonies appear to have at least one "primary roost" that is used by the majority of the colony. Over a dozen different "alternate roosts" may be used by portions of the colony intermittently. One reason for this roost switching may be due to differing thermoregulatory needs at different stages of the reproductive process for individuals or as a result of environmental deviations from normal climatic patterns. Bats may also switch roosts due to increased parasite loads or unstable food resources brought on by drought or unusually heavy rains.

One pup is born in June and is raised under loose tree bark, and more recently in certain buildings, usually near wooded stream side habitat. The summer roost of adult males often is near maternity roosts, but where most spend the day is unknown. Others remain near the hibernation site and a few males are found in caves during the summer.

Between early August and mid-September, Indiana bats arrive near their hibernation sites and engage in swarming and mating activity. Swarming at cave entrances continues unto mid or late October. During this time, fat reserves are built up for hibernation. When pregnant, females eat soft bodied insects; they eat moths when lactating, and moths, beetles, and hard-bodied insects after lactation. Foraging areas are typically within five miles of the summer roost. Males also eat a variety of insects. Life spans of nearly 14 years have been documented. The present total population of this species is fewer than 360,000 with more than 85% hibernating at only nine locations in Missouri, Indiana, and Kentucky making them extremely vulnerable to destruction.



Figure 10. Indiana Bat



Figure 11. Indiana Bat

Little Brown Bat

Myotis lucifugus

No federal listing

Weight: 7 - 14 grams (0.3 - 0.5 ounce)

Wingspan: 22 - 27 centimeters (9 - 11 inches)

Distribution: Widely from central Alaska to central Mexico.

The little brown bat usually hibernates in caves and mines. During summer, it often inhabits buildings, usually 100° F attics, where females form nursery colonies of hundreds or even thousands of individuals. Where most males spend the summer is unknown, but they likely are solitary and scattered in a variety of roost types. Colonies usually are close to a lake or stream. This species seems to prefer to forage over water but also forages among trees in rather open areas. When foraging, it may repeat a set hunting pattern around houses or trees within a few miles of its roost. It eats insects, including gnats, crane flies, beetles, wasps, and moths. Insects usually are captured with a wing tip, immediately transferred into a scoop formed by the forwardly curled tail and interfemoral membrane, and then grasped with the teeth. Mating occurs in autumn but also may occur during the hibernation period. One baby is born in May, June, or early July. When the mother is at

rest during the day, she keeps the baby beneath a wing. Life span may be more than 20 years. This species is one of the most common bats throughout much of the northern United States and Canada but is scarce or only locally common in the southern part of its range. A subspecies found in the southwestern United States, *M. l. occultus* (Arizona bat), is considered to be of special concern.



Figure 12. Little Brown Bat

Northern Long-eared Bat

Myotis septentrionalis

No federal listing

Weight: 6 - 9 grams (0.2 - 0.3 ounce)

Wingspan: 23 - 27 centimeters (9 - 11 inches)

Distribution: Includes southern Canada and the central and eastern United States southward to northern Florida.

Northern long-eared bats hibernate in parts of caves and mines that are relatively cool and moist, where the air is still. Hibernation may begin as early as August and may last for 8 - 9 months in northern latitudes. In summer, they roost by day in a variety of shelters, including buildings and under tree bark, shutters, bat houses, and bridges. At night they commonly use caves as night roosts. Recent trapping and internal surveys suggest they may use caves as stopover points during migration more so than actual hibernation. Northern long-eared bats seem much more solitary in their habits than other members of genus *Myotis*, and they generally are found singly or in small groups containing up to 100 individuals. Although they frequently hang in the open, they seem to prefer tight crevices and holes. Sometimes only the nose and ears are visible, but they can be distinguished from most other species of *Myotis* by their long ears. These bats forage mainly on forested hillsides and ridges rather than in stream side and floodplain forests. They consume a variety of small night-flying insects. Presumably most mating occurs in autumn

prior to hibernation. Apparently small nursery colonies are formed in June and July where pregnant females give birth to one baby. Mothers may be able to retrieve their young that fall from roost sites. Life span may be more than 18 years. This species is common over much of its range, but does not occur in large concentrations.



Figure 13. Northern Long-eared bat.

Silver-haired Bat

Lasionycteris noctivagans

No federal listing

Weight: 8 - 11 grams (0.3 - 0.4 ounces)

Wingspan: 27 - 32 centimeters (11 - 13 inches)

Distribution: From southern Alaska and Canada through most of the United States and northern Mexico.

Silver-haired bats are among the most common bats in forested areas of America, most closely associated with coniferous or mixed coniferous and deciduous forest types, especially in areas of Old Growth. They form maternity colonies almost exclusively in tree cavities or small hollows. And like many forest-roosting bats, silver-haired bats will switch roosts throughout the maternity season. Because silver-haired bats are dependent upon

roosts in Old Growth areas, managing forests for diverse age structure and maintaining forested corridors are important to these bats. It is estimated that these bats require snag densities of at least 21 per hectare and often forest management practices have fallen far short of this figure. Unlike many bat species, silver-haired bats also appear to hibernate mainly in forested areas, though they may be making long migrations from their summer forest to a winter forest site. Typical hibernation roosts for this species include small tree hollows, beneath exfoliating bark, in wood piles, and in cliff faces. Occasionally silver-haired bats will hibernate in cave entrances, especially in northern regions of their range. Like big brown bats, the silver-haired bats have been documented to feed on many insects perceived as pest species to humans and/or agriculture and forestry. Even though they are highly dependent upon Old Growth forest areas for roosts, silver-haired bats feed predominantly in disturbed areas, sometimes at tree-top level, but often in small clearings and along roadways or water courses. Though their diets vary widely, these bats feed chiefly on small, soft-bodied insects. Silver-haired bats have been known to take flies, midges, leafhoppers, moths, mosquitoes, beetles, crane flies, lacewings, caddis flies, ants, crickets, and occasional spiders. Although once suggested to be the most abundant mammal in the northeast US, it is rarely captured in the summer.



Figure 14: Silver-haired Bat

Eastern Small-footed Bat

Myotis leibii

No federal listing; state listed threatened in NH, VT, NY, PA, MD

Weight: 3 - 5 grams (0.1 - 0.2 ounces)

Wingspan: 21 - 25 centimeters (8 - 10 inches)

Distribution: Appalachian Mountain range, including cave areas of western Kentucky, Missouri, and southeast Iowa.

Population trends of the small-footed *Myotis* remain largely unknown due to the secretive nature of this species during its winter hibernation. Although historically known from only a few sites, recent discoveries have substantially increased the number of sites at which it occurs. Populations of bats found at these sites remain very low and in many cases, only one or two bats are seen. It is because of the very low numbers of bats found during the hibernacula censuses and the many unknown factors concerning its biology that this species remains classified as threatened throughout most of its range.

The small-footed bat is the smallest bat in the Northeast. It's little more than 3½ inches long, including a 1½-inch tail. It is most often recognized by its short, black forearms (less than 1½ inches) and small feet (less than a half-inch). While its coloration is comparable to the more common little brown bat, a distinctive characteristic is the black facial mask that spreads from the base of each ear across its face.

Little is known about the biology and natural history of the small-footed *Myotis*. It appears to enter into hibernation later than other bat species and is generally found in low numbers. While other bats, such as the little brown bat, form large clusters, this small bat remains solitary or in crevices with fewer than a dozen others during the hibernating season. One young is produced a year, although one record for twins has been recorded. It is often found hibernating closer to the entrances of caves and mines than other bats and generally alone. This could be because they're often overlooked during census counts because of their use of small, tight crevices in the walls and ceilings and sometimes among the rocks on the hibernacula's floor.

There is little to no information on the summer feeding habits of the small-footed *Myotis*. Summer records of this species remain rare with only a few being captured in mist nets. It is thought that they may form small maternity roosts in crevices along rock outcrops, under boulders, quarries, and sometimes buildings.

As with other species of hibernating bats, control of winter disturbances is seen as a big factor influencing the small-footed bat's survival. As virtually nothing is known about the summer habitat of these bats, foraging and day roost studies should become a priority as technology becomes available to study them.



Figure 15: Hibernating Eastern Small-footed Bats

Appendix B

Mist Net/Trap Data Sheets

Notes and key to abbreviations used on data sheets

Instructions

All information must be completed each night. Partially complete forms will not be accepted. Completed forms are to be turned in to the Team Leader each morning.

PROJECT: Name of the entire survey project.

SITE#: The number given to every trap site in a separate geographic location. Site # remains the same regardless of how many nights are spent at the same location.

DATE: Pre-midnight date which trapping began.

LONGITUDE/LATITUDE: Coordinates from a GPS receiver.

I.D. BY: USFWS qualified person identifying bats at this site.

MOON AFFECT: Was moon present during survey? If so what phase? Was moonlight illuminating nets? Note times.

NUMBER OF NETS/TRAPS: Description of nets, e.g. A: 3Hx9m, B: 2Hx6m, C: 1Hx9mx12m "L" configuration.

SKY CONDITIONS: General weather conditions and temperature in °F, at start, middle, and end of sampling times.

WIND CONDITIONS: Use Beauford scale and note time.

SITE DESCRIPTION: A general overview of the site, e.g. "Shallow stream with long pools surrounded by deciduous forest with maple, oak, and beech. A small clearing and residence is nearby."

ANDERSON III CODE: Use Level III codes and percentages within 1KM of site. Percentages should total 100%.

DISTURBANCE CODE: List up to three of the most significant disturbances within 500 meters. Include distance to disturbance.

Common name:

Little brown
Big brown
Pipistrelle
Northern longear
Smallfooted
Indiana
Red
Hoary
Silver haired
Townsend's Big-eared
Rafinesque's Big-eared
Evening

Species:

Myotis lucifugus
Eptesicus fuscus
Pipistrellus subflavus
Myotis septentrionalis
Myotis leibii
Myotis sodalis
Lasiurus borealis
Lasiurus cinereus
Lasiurus noctivagans
Corynorhinus townsendii
Corynorhinus rafinesquii
Nycticeius humeralis

Reproductive condition:

NR= Non Reproductive
PG= Pregnant
L= Lactating
PL= Post Lactating
SCR= Scrotal

Age:

A: Adult
J: Juvenile

Anderson Classification Codes first and second level categories

- 1 **Urban or Built-Up Land**
- 11 Residential
- 12 Commercial Services
- 13 Industrial
- 14 Transportation, Communications
- 15 Industrial and Commercial
- 16 Mixed Urban or Built-Up Land
- 17 Other Urban or Built-Up Land
- 2 **Agricultural Land**
- 21 Cropland and Pasture
- 22 Orchards, Groves, Vineyards, Nurseries
- 23 Confined Feeding Operations
- 24 Other Agricultural Land
- 3 **Rangeland**
- 31 Herbaceous Rangeland
- 32 Shrub and Brush Rangeland
- 33 Mixed Rangeland
- 4 **Forest Land**
- 41 Deciduous Forest Land
- 42 Evergreen Forest Land
- 43 Mixed Forest Land
- 5 **Water**
- 51 Streams and Canals
- 52 Lakes
- 53 Reservoirs
- 54 Bays and Estuaries
- 6 **Wetland**
- 61 Forested Wetlands
- 62 Non forested Wetlands
- 7 **Barren Land**
- 72 Beaches
- 73 Sandy Areas Other than Beaches
- 74 Bare Exposed Rock
- 75 Strip Mines, Quarries, and Gravel Pits
- 76 Transitional Areas
- 77 Mixed Barren Land

Disturbance Codes and Key

PROXIMITY	TYPE	
1 Disturbance on site	A Dumping	H Unimproved roads
	B Party spot	I Recreation area
2 Disturbance within 100 meters of site	C Buildings	J Mining
	D Agriculture	K Fire
	E Utility rights-of-way	L Clearcut
3 Disturbance 100-500 meters of site	F Railroad rights-of-way	M Insect defoliation
	G Improved roads	N No disturbance

Beauford Wind Scale Codes and Key

Code	Speed(m/s)	Description	Land Condition	Comfort
0	0 - 0.5	Calm	Smoke rises	No noticeable wind
1	0.5 - 1.5	Light air	Smoke drifts vertically	
2	1.6 - 3.3	Light breeze	Leaves rustle	Wind felt on face
3	3.4 - 5.4	Gentle breeze	Wind extends	Hair disturbed, clothing flaps
4	5.5 - 7.9	Moderate breeze	Small branches in motion	Hair disarranged, raises dust & loose
5	8.0 - 10.7	Fresh breeze	Small trees w/leaf begin to sway	Force of wind felt on body
6	10.8 - 13.8	Strong breeze	Whistling in telegraph wires	Umbrellas used with difficulty
			large branches in motion	
7	13.9 - 17.1	Near gale	Whole trees in motion	Inconvenience in walking
8	17.2 - 20.7	Gale	Twigs broken from trees	Progress impeded/difficult in gusts

DO NOT WRITE IN MARGINS OF
DATA SHEETS

Bat Survey Data Form

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Project: COLD AIR CAVE	County: Monroe	Site #: 1	Night #: 1	Site Name: COLD AIR CAVE	Date: 8-22-05
Latitude: 40 57 51.79	Longitude: 75 07 20.98	Datum: NAD 27	Elevation: 330 circle: 100 meters	ID By: J. Chenger	
Observers: J. Chenger			Actual net open time: 8:15	Actual net close time: 3:00 AM	
Sky Conditions: 71°F clear 8:30	mid-sample, note time+temp+description: 65°F 12:30 clear		end, note time+temp+description: 3:00 60°F clear		
Wind Description: 1 light air	0		0		
Moon effect: (specify net and effect length if any) Moon LT River Gorge after 1 AM					Start: Stop:
Number of nets/traps: (label and include size and configuration) A (1) - 6' wide, 7' tall HARP TRAP B: PATTERSON 240x					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) Trap Placed Roughly Parallel with CAVE ENTRANCE.					
240x MOVED DUE TO INSECT NOISE					
Anderson Level II:	most common+distance: 74 0	2nd common+distance: 43 10m	3rd common+distance: 51 200m		
Disturbance codes:	2 G	1 I			
Remarks: (note rain event time and length, other wildlife, etc.) BAT RECORDER MOVED DUE TO					
High INSECT ACTIVITY					
2nd TRAP NOT SET TO ASSESS SWARM					

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Page 1 of 3

Time	Common name	Age (AJV)	Sex (MF)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
9:10	Myotis Lucifugus	A	M	NR	8.2	37.2				1
9:10	Myotis Lucifugus	A	M	NR	7.1	38.0				2
9:35	Myotis Lucifugus	A	M	NR	6.9	37.4				3
10:30	Myotis Lucifugus	A	M	SCR	5.8	34.5				4
10:30	Myotis Septentrionalis	A	M	NR	6.0	33.7				5
10:30	Myotis Lucifugus	A	M	SCR	7.0	36.5				6
10:30	Myotis Lucifugus	A	M	SCR	7.1	37.2				7
10:30	Myotis Septentrionalis	A	M	SCR	5.7	34.7				8
10:30	Myotis Septentrionalis	A	M	SCR	5.9	35.0				9
10:30	Pipistrellus Subflavus	A	F	NR	5.8	34.1				10
10:30	Pipistrellus Subflavus	A	F	NR	6.4	33				11
10:30	Pipistrellus Subflavus	A	F	NR	6.0	32.1				12
10:30	Myotis Lucifugus	A	M	SCR	6.7	37.0				13
10:30	Myotis Lucifugus	A	M	NR	7.5	36.0				14
10:30	Myotis Lucifugus	A	F	NR	7.5	33.2				15
10:30	Myotis Lucifugus	A	M	SCR	7.0	35.7				16
10:30	Myotis Lucifugus	A	M	NR	8.1	37.0				17
12:00	Myo Luc	A	M	NR	7.8	6				18
12:00	Myo Luc	A	M	NR	8.0					19
12:00	Myo Luc	A	M	NR	7.8					20

Bat Survey Data Form

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Page 2 of 3

Project: COLD AIR CAVE		County: Monroe		Site #:	Night #:	Site Name: COLD AIR CAVE				Date: 8-22-05
Time	Common name	Age (A/JV)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
12:00	Myo Lc	A	M	SCR	7.0					1
12:00	Myo Lc	A	M	NR	7.6					2
12:00	Myo Lc	A	M	NR	6.9					3
12:00	Myo Lc	A	M	NR	6.5					4
12:00	Myo Lc	A	M	SCR	7.3					5
12:00	Myo SPT	A	M	SCR	6.0					6
12:00	Myo Lc	A	M	NR	7.0					7
12:00	PIP SUB	A	M	NR	5.8					8
12:00	PIP SUB	A	F	NR	6.0					9
12:00	PIP SUB	JY	F	NR	5.9					10
12:00	Myo SPT	A	M	SCR	6.5					11
12:00	Myo Lc	A	M	NR	7.1					12
12:00	Myo Lc	A	M	NR	7.3					13
12:00	Myo Lc	A	M	NR	7.6					14
12:00	PIP SUB	JV	M	NR	6.0					15
12:00	Myo Lc	A	M	SCR	7.9					16
12:00	Myo Lc	A	M	SCR	7.0					17
12:00	PIP SUB	A	M	NR	6.0					18
12:00	PIP SUB	A	M	NR	5.7					19
12:00	Myo Lc	JV	M	NR	6.6					20

Bat Survey Data Form

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Project: COLD AIR CAVE		County: Monroe		Site #:	Night #:	Site Name: COLD AIR CAVE				Date: 8-22-05
Time	Common name	Age (A/JV)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
12:00	Myo Lc	A	M	SCR	6.9					1
12:00	Myo Lc	A	F	NR	8.1					2
12:00	Myo Lc	A	M	SCR	7.5					3
12:00	Myo Lc	A	M	SCR	7.6					4
12:00	Myo Lc	A	M	NR	8.2					5
12:00	Myo Lc	A	M	NR	7.3					6
3:00	PIP SUB	A	M	SCR	5.8					7
3:00	PIP SUB	A	M	SCR	5.5					8
3:00	Myo Lc	A	M	NR	7.0					9
3:00	Myo Lc	A	F	NR	7.8					10
3:00	Myo Lc	A	M	SCR	7.5					11
3:00	PIP SUB	A	F	PL	6.0					12
3:00	PIP SUB	A	M	NR	5.3					13
3:00	PIP SUB	A	M	NR	5.8					14
3:00	PIP SUB	A	M	NR	5.8					15
3:00	PIP SUB	A	M	NR	5.7					16
										17
										18
										19
										20

Bat Survey Data Form

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Project: <u>COLD AIR CAVE</u>	County: <u>MONROE</u>	Site #: <u>1</u>	Night #: <u>2</u>	Site Name: <u>COLD AIR CAVE</u>	Date: <u>8-23-05</u>
Latitude: <u>40 57 51.79</u>	Longitude: <u>75 07 20.98</u>	Datum: <u>NAD 27</u>	Elevation: <u>330</u> feet	ID By: <u>J. Chengel</u>	
Observers: <u>J. Chengel</u>			Actual net open time: <u>8:00</u>	Actual net close time: <u>11:00</u>	
Sky Conditions: <u>PARTLY CLOUDY 75°F</u>	mid-sample, note time+temp+description: <u>69°F 12:00 P. Cloudy</u>		end, note time+temp+description: <u>68°F P. Cloudy 11:00</u>		
Wind Description: <u>1</u>	<u>1</u>		<u>1</u>		
Moon effect: (specify net and effect length if any)					Start: _____ Stop: _____
Number of nets/traps: (label and include size and configuration) <u>A: 6'x7' HARP</u> <u>B: 2Hx6m</u> <u>C: PATTERSON 240x</u>					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species)					
Anderson Level II:	most common+distance: <u>74 0</u>	2nd common+distance: <u>43 10m</u>	3rd common+distance: <u>51 200m</u>		
Disturbance codes:	<u>2 6</u>	<u>1 1</u>	<u>1</u>		
Remarks: (note rain event time and length, other wildlife, etc.)					

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Page 1 of 2

Project: <u>COLD AIR CAVE</u>	County: <u>MONROE</u>	Site #: <u>1</u>	Night #: <u>2</u>	Site Name: <u>COLD AIR CAVE</u>	Date: <u>8-23-05</u>					
Time	Common name	Age (A/J/V)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
8:30	Myotis	A	M	SCR	5.6			B		
	Myotis							B		ESCAPED
	Myotis							B		ESCAPED
9:20	Myotis	A	M	SCR	5.9			A		
9:20	Myotis	A	M	SCR	9.4			A		
9:20	PPSUB	A	F	NR	5.2			A		
9:50	Myotis	A	M	NR	8.0			A		
9:50	Myotis	A	F	NR	8.7			A		
9:50	Myotis	A	M	SCR	7.3			A		
9:50	Myotis	A	M	SCR	7.3			A		
10:30	Myotis	A	F	NR	9.0			B		
10:30	Myotis	A	M	SCR	7.8			B		
10:30	PPSUB	A	M	NR	6.2			B		
10:30	Myotis	A	F	NR	8.1			B		
10:40	PPSUB	A	F	NR	6.9			A		
10:40	Myotis	A	M	SCR	7.9			A		
10:40	PPSUB	A	M	NR	6.0			A		
10:40	PPSUB	A	M	NR	6.6			A		
12:30	PPSUB	A	M	SCR	7.3			A		
12:30	PPSUB	A	M	SCR	6.1			A		

Bat Survey Data Form

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Page 2 of 2

Time	Common name	Age (AJV)	Sex (MF)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
1230	PIPSUB	A	M	SCR	6.8					1
1230	MYOLUC	A	M	SCR	7.6					2
100	MYOLUC	A	M	SCR	6.6					3
100	PIP SUB	A	F	NR	5.6					4
100	PIP SUB	A	M	NR	5.8					5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20

Bat Survey Data Form

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Project: COLD AIR CAVE	County: Monroe	Site #: 1	Night #: 3	Site Name: COLD AIR CAVE	Date: 9-12-05
Latitude: 40 57 51.74	Longitude: 75 07 20.98	Datum: NAD 27	Elevation: 330	ID By: J. Chenger	
Observers: John Chenger	Actual net open time: 7:45	Actual net close time: 2:10			
Sky Conditions: clear 8:00 75°F	mid-sample, note time+temp+description: 68°F clear 11:00	end, note time+temp+description: 2:00 64°F clear			
Wind Description: 1	1	1			
Moon effect: (specify net and effect length if any) N/A			Start/Stop:		
Number of nets/traps: A: 6'x7' HARP TRAP B: POTTERSON 240x C: 24x6m					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) TRAP PLACED ROUGHLY PARALLEL TO CAVE ENTRANCE. LEFT SIDE REQUIRED PLASTIC SHEETING					
Anderson Level II: 74 0 43 10m 51 200m					
Disturbance codes: 2 G 1 I					
Remarks: (note rain event time and length, other wildlife, etc.) POTTERSON START 8:00 END 2:00					

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Project:	County:	Site #:	Night #:	Site Name:	Date:					
		1	3	Cold Air Cave	9-12-05					
Time	Common name	Age (AJV)	Sex (MF)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
8:00	myo luc	A	M	SCR	8.1			A		1
9:50	myo luc	A	M	SCR	7.4			A		2
9:00	myo luc	A	M	SCR	6.1			A		3
9:00	myo luc	A	M	SCR	7.5			A		4
9:00	myo luc	A	M	SCR	7.7			C		5
9:00	myo luc	A	F	NR	7.5			A		6
9:00	myo luc	A	M	SCR	9.8			A		7
10:00	myo luc	A	M	SCR	8.4			C		8
10:00	myo luc	A	M	SCR	9.3			A		9
10:00	myo luc	A	M	SCR	7.5			A		10
10:00	PIP SUB	A	F	NR	7.5			A		11
10:00	PIP SUB	A	F	NR	9.1			C		12
10:00	PIP SUB	A	M	NR	8.8			A		13
10:00	myo luc	A	M	SCR	9.3			A		14
10:00	myo SEP	A	M	NR	6.0			A		15
10:00	myo luc	A	M	NR	8.3			A		16
10:00	myo luc	A	F	NR	6.4			A		17
11:00	myo luc	A	M	SCR	7.1			A		18
11:00	myo luc	A	M	SCR	7.5			A		19
11:00	PIP SUB	A	M	NR	7.5			A		20

Bat Survey Data Form

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Project:	COLD AIR CAVE	County:	Monroe	Site #:	1	Night #:	3	Site Name:	COLD AIR CAVE	Date:	9-12-05
Time	Common name	Age (A/JV)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments	
11:00	MYO SEP	JV	M	NR	4.7			A		1	
11:00	MYO SEP	A	F	PL	8.7			A		2	
11:00	MYO LUC	A	F	NR	7.0			A		3	
12:00	PIPSUB	A	F	NR	7.9			A		4	
12:00	MYO LUC	A	M	SCR	7.0			A		5	
12:00	MYO SEP	A	F	NR	7.9			A		6	
12:00	MYO SEP	A	M	NR	5.2			A		7	
12:00	PIPSUB	A	F	PL	5.8			A		8	
12:00	PIPSUB	A	F	PL	8.0			A		9	
12:00	PIPSUB	A	M	NR	7.0			A		10	
12:00	MYO LUC	A	M	SCR	10.2			A		11	
12:00	MYO SEP	A	M	SCR	6.0			A		12	
1:00	PIPSUB	A	F	NR	9.0			A		13	
1:00	MYO LUC	A	M	SCR	6.2			A		14	
2:00	MYO SEP	A	F	NR	8.4			A		15	
2:00	MYO LUC	A	F	NR	9.4			A		16	
2:00	MYO LUC	A	M	SCR	6.6			A		17	
2:00	MYO LUC	A	M	SCR	7.4			A		18	
2:00	MYO LUC	A	M	SCR	6.2			A		19	
										20	

Bat Survey Data Form

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Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 4	Site Name: COLD AIR CAVE	Date: 9-14-05
Latitude: 40 57 51.79	Longitude: 75 07 20.98	Datum: NAD83	Elevation: 330 meters	ID By: John Chengel	
Observers: John Chengel			Actual net open time: 7:30	Actual net close time: 200	
Sky Conditions: Partly cloudy	78°F 7:30	mid-sample, note time+temp+description		end, note time+temp+description	
Wind Description: 1				60°F 200 Partly cloudy	
Moon effect: (specify net and effect length if any) N/A					Start Stop:
Number of nets/traps: (label and include size and configuration) A: 6'x7' HARP TRAP B: PETERSSON 240x					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) HARP PLACED ROUGHLY PARALLEL TO CAVE ENTRANCE. LEFT SIDE REQUIRED. Plastic sheeting 240x PLACED ON EDGE OF PARKING AREA.					
Anderson Level II:	most common+distance	2nd common+distance	3rd common+distance		
	74 0	43 10m	51 200m		
Disturbance codes:	2 6	1 1			
Remarks: (note rain event time and length, other wildlife, etc.) LIGHT INTERMITTENT RAIN SHOWERS					
LIMITED USE OF BAT DETECTOR					

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

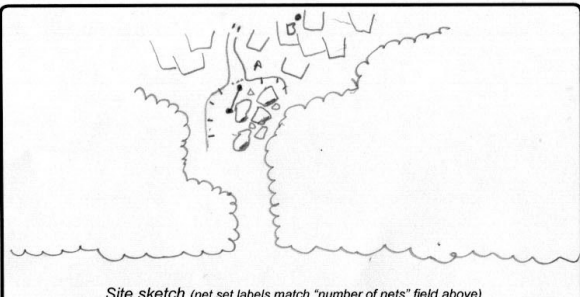
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Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 4	Site Name: COLD AIR CAVE	Date: 9-14-05					
Time	Common name	Age (A/J/V)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
9:00	M40 LC	A	M	SCR	6.9					1
9:00	M40 LC	A	M	SCR	7.2					2
9:20	M40 LC	A	M	SCR	7.9					3
10:15	PIP SUB	A	M	SCR	7.6					4
11:40	M40 LC	A	K	NR	8.2					5
11:40	PIP SUB	A	F	NR	6.8					6
12:45	M40 LC	A	M	SCR	7.6					7
12:45	M40 SEP	A	F	PL	8.2					8
12:50	M40 SEP	A	M	SCR	5.8					9
1:45	PIP SUB	A	F	NR	6.4					10
										11
										12
										13
										14
										15
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										17
										18
										19
										20

Bat Survey Data Form

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Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 5	Site Name: COLD AIR CAVE	Date: 9-25-05
Latitude: 40 57 51.79	Longitude: 75 07 20.98	Datum: NAD83	Elevation: 330 circle: feet meters	ID By: S. Chongor	
Observers: S. Chongor	Actual net open time: 7:00		Actual net close time: 1:00		
Sky Conditions: 8:00 69°F OVERCAST	mid-sample, note time+temp+description		end, note time+temp+description 61°F 100 OVERCAST		
Wind Description: 1 Light Air			1		
Moon effect: (specify net and effect length if any) N/A					Start: Stop:
Number of nets/traps: (label and include size and configuration) A: 6'x7' HARP TRAP B: PERSSON 240x					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) TRAP PLACED PERPENDICULAR TO CAVE ENTRANCE, ENTRANCE SEALED WITH PLASTIC. 240x PLACED ON TALUS PILE ABOVE ENTRANCE AWAY FROM SWARM					
Anderson Level II:	most common+distance 74 0	2nd common+distance 43 10m	3rd common+distance 51 200		
Disturbance codes:	2 6	1 1			
Remarks: (note rain event time and length, other wildlife, etc.) 240x START 8:00					
					
Site sketch (net set labels match "number of nets" field above)					

Bat Survey Data Form

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Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 5	Site Name: COLD AIR CAVE	Date: 9-25-05					
Time	Common name	Age (AJV)	Sex (MF)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
8:20	MYO LC	A	M	SCR	7.1					1
8:20	MYO LC	A	M	SCR	7.6					2
8:20	MYO LC	A	M	SCR	7.1					3
9:20	PIPSUB	A	M	SCR	7.9					4
9:20	MYO LC	A	M	SCR	7.5					5
9:20	MYO SOP	A	M	SCP	7.2					6
9:20	MYO LC	A	M	SCR	7.1					7
10:30	MYO SOP	A	M	SCR	8.2					8
10:30	MYO SOP	A	K	NRL	7.9					9
11:30	MYO SOP	A	F	NRL	8.1					10
12:30	PIPSUB	A	K	NRL	7.6					11
12:30	PIPSUB	A	F	NRL	7.0					12
										13
										14
										15
										16
										17
										18
										19
										20

Bat Survey Data Form

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Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 6	Site Name: COLD AIR CAVE	Date: 9-27-05
Latitude: 40 57 51.79	Longitude: 75 67 20.98	Datum: NAD27	Elevation: 330 circle: feet meters	ID By: J. Cheng	
Observers: J. Cheng	Actual net open time: 700		Actual net close time: 1230		
Sky Conditions: dusk, note time+temp+description. 8:00 clear 62°F	mid-sample, note time+temp+description		end, note time+temp+description 53°F 12:30 clear		
Wind Description: 2			2 Breezy		
Moon effect: (specify net and effect length if any) N/A					Start Stop
Number of nets/traps: (label and include size and configuration) A: 6'x7' HARP TRAP B: 6'x7' HARP TRAP C: PATTERSON 240x					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) ONE HARP PLACED ROUGHLY PARALLEL WITH ENTRANCE. SECOND HARP PLACED PERPENDICULAR TO THE FIRST. PLASTIC COVERS ENTRANCE.					
Anderson Level II: most common-distance 74 0 43 10m 51 200m					
Disturbance codes: 2 6 1 I					
Remarks: (note rain event time and length, other wildlife, etc.) FOR THE FIRST TIME DURING THIS PROJECT, CAVE IS DRAWING AIR RATHER THAN BLOWING. 240x START: 800. END 1200					
NO BATS AFTER 9130. - NO SWARM					

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 6	Site Name: COLD AIR CAVE	Date: 9-27-05					
Time	Common name	Age (AJV)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
930	Myotis	A	F	NR	8.2			A		1
	Pipistrellus	A	M	NR	7.1			A		2
	Myotis	A	F	NR	8.1			A		3
	Pipistrellus	A	M	NR	7.4			A		4
	Pipistrellus	A	F	NR	7.6			A		5
930	Pipistrellus	A	M	SCR	7.3			B		6
930	Myotis	A	M	SCR	6.6			B		7
9130	Pipistrellus	JV	F	NR	6.8			A		8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20

Bat Survey Data Form

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Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 7	Site Name: COLD AIR CAVE	Date: 16-30-05
Latitude: 40 57 51.79	Longitude: 75 07 20.98	Datum: NAD 83	Elevation: 330 circle: (feet) meters	ID By: J. Chenger	
Observers: J. Chenger	Actual net open time: 7:00		Actual net close time: 11:00		
Sky Conditions: 6:30 60°F clear	mid-sample, note time+temp+description		end, note time+temp+description		
Wind Description: 1 Light AIR			43 1045		
Moon effect: (specify net and effect length if any) N/A					
Number of nets/traps: A: 1-3' TRAP B: PETERSSON 240x C: PETERSSON 240x					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) Trap placed Parallel with entrance					
Anderson Level II:	most common+distance 74 0	2nd common+distance 43 10m	3rd common+distance 51 200m		
Disturbance codes:	2 G	1 I			
Remarks: (note rain event time and length, other wildlife, etc.)					

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Page ____ of ____

Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 7	Site Name: COLD AIR CAVE	Date: 10/30					
Time	Common name	Age (A/JV)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments
8:30	Myotis	A	M	SCR	6.8	35.3		A		1
9:00	Myotis	A	M	SCR	7.1	35.6		A		2
9:30	Myotis	A	M	SCR	7.4	33.9		A		3
										4
										5
										6
										7
										8
										9
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Bat Survey Data Form

Bat Conservation and Management, Inc. • 814-442-4246

Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 8	Site Name: COLD AIR CAVE	Date: 10-31-05
Latitude: 40 57 51.79	Longitude: 75 07 20.98	Datum: NAD27	Elevation: 330 circle: feet meters	ID By: J. Chenger	
Observers: J. Chenger	Actual net open time: 5:00		Actual net close time: 11:00		
Sky Conditions: clear 50°F 5:30	mid-sample, note time+temp+description		end, note time+temp+description: 42°F 11:00 clear		
Wind Description: 1 LIGHT AIR			1 LIGHT AIR		
Moon effect: (specify net and effect length if any) N/A					Start: Stop:
Number of nets/traps: (label and include size and configuration) A: 3' HARP TRAP B: PETERSSON 240x					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) HARP TRAP HUNG IN CAVE ENTRANCE, PARALLEL WITH DRIPLINE					
Anderson Level II:	most common+distance: 74 0	2nd common+distance: 43 10m	3rd common+distance: 51 200m		
Disturbance codes:	2 G	1 I			
Remarks: (note rain event time and length, other wildlife, etc.) PETERSSON STARTS 5:00 NO BATS CAPTURED					

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Project: COLD AIR CAVE	County: MONROE	Site #: 1	Night #: 9	Site Name: COLD AIR CAVE	Date: 11-1-05
Latitude: 40 57 51.79	Longitude: 75 07 20.98	Datum: NAD27	Elevation: 330 circle: feet meters	ID By: J. Chenger	
Observers: J. Chenger	Actual net open time: 5:00		Actual net close time: 11:00		
Sky Conditions: cloudy 54°F 5:00	mid-sample, note time+temp+description		end, note time+temp+description: 54°F 11:00 cloudy		
Wind Description: 1 - LIGHT AIR			3 - Breezy		
Moon effect: (specify net and effect length if any) N/A					Start: Stop:
Number of nets/traps: (label and include size and configuration) A: 3' HARP B: 6'x7' HARP C: PETERSSON 240x					
Site Description: (net placement, stream data, cover composition, surrounding habitat, dominant species) 3' TRAP PARALLEL TO DRIPLINE. 6' TRAP SET PERPENDICULAR TO THE 3' TRAP. PLASTIC SEALS ENTRANCE AROUND 3' TRAP					
Anderson Level II:	most common+distance: 74 0	2nd common+distance: 43 10m	3rd common+distance: 51 200m		
Disturbance codes:	2 G	1 I			
Remarks: (note rain event time and length, other wildlife, etc.)					

Site sketch (net set labels match "number of nets" field above)

Bat Survey Data Form

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Project: <u>COLD AIR CAVE</u>		County: <u>MONROE</u>		Site #: <u>1</u>		Night #: <u>9</u>		Site Name: <u>COLD AIR CAVE</u>		Date: <u>11-01-05</u>	
Time	Common name	Age (A/JV)	Sex (M/F)	Reproductive Condition	Weight (grams)	Forearm Length	Above ground	Net Set	Band	Comments	
9100	Myo Luc	A	M	NR	6.5	37.2		B		FROSTBITTEN EARS	
											1
											2
											3
											4
											5
											6
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Appendix C

Commonwealth of Pennsylvania
Pennsylvania Game Commission, Bureau of Wildlife Management
Wildlife Diversity Section
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Protocol for Assessing Abandoned Mines/Caves for Bat Surveys

In general, openings can be dismissed from bat surveys when:

1. There is only one horizontal opening less than 6 inches in diameter and no or very little airflow is detected.
2. Vertical shafts <1 foot in diameter.
3. Passage continues less than 50 feet and terminates with no fissures that bats can access.
4. Mines that are prone to flooding, collapsed shut and completely sealed, or otherwise inaccessible to bats.
5. Openings, which have occurred recently (within 1 year) due to subsidence.

Additional notes: Bats can access mines via old open buildings such as a fan house. Foliage and other vegetation in front of mine openings do not stop use by bats. They can navigate through foliage. Collapsed entrances with multiple crevices between boulders etc. are accessible to bats and should be sampled. Collapses completely sealed with fine soil are of course inaccessible to bats.

Sampling Dates, Times and Temperature Criteria

1. Spring sampling will be conducted between: April 10 thru May 10
2. Fall sampling will be conducted between: September 15 thru October 31
3. Sampling will start ½ hour before sunset and continue for at least 5 hours.
4. Weather must provide for:
 - a. Temperatures $\geq 50^{\circ}\text{F}$ (10°C) for first 2 hours of sampling and not fall below 35°F (1.6°C) by midnight.
 - b. At least 3 hours free of heavy rain and thunderstorms.
5. Sampling will be conducted on two evenings. If no captures occur and no bat activity is noted with a bat detector on the first evening during acceptable weather conditions, sampling can be suspended for the site.
6. The shining of lights, and noise will be kept to a minimum with no smoking around the sample site. The use of radios, campfires, running vehicles, punk sticks, citronella candles and other disturbances will not be permitted within 300 feet of site during surveys.
7. Before conducting surveys, local residents and/or law enforcement agencies should be informed of the scheduled nighttime activities.

Equipment

No equipment, litter or other debris will be left unattended at site that could result in the capture or entanglement of any animals. Any equipment stored at site between sampling sessions will be clearly labeled with contact information.

- Harp Trap:** Place in front of opening and block surrounding space with plastic sheeting or bird netting. Traps should be tended at least once per hour. When the catch rate is high (>25 bats per hour) or during inclement weather, traps should be tended more frequently.
- Mist Nets:** 50 denier, 38mm mesh. Place in front or around opening. Nets need to be monitored closely and checked at least once every 20 minutes. At sites with a heavy bat swarm, the net may need to be monitored continuously.
- Bat Detector:** A bat detector should be on site to monitor bat activity when trapping or netting. Bat passes should be monitored and tallied for at least one hour after 10pm. Bat tallies should be reported along with the time sampled. Reporting format will be: Start and end time for 1-hour sample period and bat passes for that hour.
- Other:** In situations where it is too dangerous to approach an entrance, bat detectors and/or night vision/infrared recording devices may be used to monitor and record bat activity to determine bat use of the site. Bat activity in or around the entrance can be monitored by counting bat passes with a bat detector, or night vision/infrared video tapes can be made providing actual counts of bats entering the opening. As with trapping, monitoring should be conducted for 5 hours. Reporting format will be: Start and end time for 1-hour sample period and bat passes for that hour.

Reporting

In addition to reports for the client, the Pennsylvania Game Commission requires copies of the report as part of the vendor's permitting requirement. To simplify data entry, mandatory sampling summary forms are also required by the PA Game Commission for bat surveys within the Commonwealth. If the vendor did not receive a copy of the data form with the permit, they can be obtained by contacting the:

Pennsylvania Game Commission
Bureau of Law Enforcement, Technical Services Division
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
717/787-5740

INTERIOR WINTER HIBERNACULA SURVEYS

Sites that are determined to be safe for entry to conduct winter counts (primarily caves & stable hard rock mines) will be coordinated with the PA Game Commission, Wildlife Diversity Section and scheduled for interior surveys between January 1 and March 10. Contact information for the Wildlife Diversity Section is:

PA Game Commission
Bureau of Wildlife Management, Wildlife Diversity Section
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
(717) 787-5529