

# Inventory of Bats in High Plateau Forests of Central and Southern Utah

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**Abstract.** Bats utilizing water sources within plateau forests were surveyed at 24 sites in southern and central Utah. Fourteen taxa were captured, with eight of these formerly listed by the U.S. Fish and Wildlife Service as Category 2 species. The first documented capture of *Euderma maculatum* from the Manti-LaSal Mountains is noted.

**Key words:** Bats, forests, survey, water.

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Information on presence/absence or distribution of bat species in forested areas of south and central Utah is incomplete. Of the bat species known to occur in Utah, 16 have the potential to inhabit high plateau forested areas (Hasenyager 1980). Concerns about possible declines in bat populations prompted the listing of 10 Utah species of bats as Category 2 candidate species in the fall of 1994 by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1994). This classification is no longer used by the U.S. Fish and Wildlife Service and such species may now be called species of special concern.

A variety of land management practices such as timber harvest, abandoned mine reclamation, and recreation use may impact these taxa, thus necessitating further understanding of bats and their habitats in the region.

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A cooperative effort between Bryce Canyon National Park, Dixie National Forest, Fishlake National Forest, Manti-La Sal National Forest, and the National Biological Service was undertaken in 1995 to inventory bat species in high plateau forests.

The project had the following objectives:

1. determine presence/absence of bat species on forested lands in areas of potential water use,
2. obtain information on relative abundance of species present,
3. identify habitat types surrounding water sources, and
4. establish better working relationships between agencies for managing appropriate habitat.

The results from this research were intended to aid in understanding bat species occurrence and habitats used, allowing formulation of inter- and intra-agency efforts to protect and manage appropriate habitat for bat species.

## Methods

The project was coordinated by the Division of Resource Management staff at Bryce Canyon National Park. Surveyors were volunteers and Bryce Canyon National Park staff. They were trained by personnel from the National Biological Service.

Survey sites (water sources) were determined in joint consultation among resource managers of the four management agencies. Due to the amount of area covered by the study (approximately 4.8 million acres) and the survey time available, each participating area was allotted six sites to be surveyed. Additional sites were identified if the initial six proved unacceptable. Hence, 24 sites were selected, with the intent to visit each two times in the survey season.

Site characteristics and conditions varied and changed throughout the season. Therefore, the actual location of the inventory site was determined in the field by the survey crew. Some sites were inaccessible early in the season due to snow or road condition, while others proved too large in surface area for effective coverage by mist nets. The field crew was given latitude to move the site to pre-selected alternative areas when necessary.

The two methods chosen for survey were mist netting and echolocation detection. Mist nets were set up approximately 30 minutes prior to sunset and monitored for at least 3 hours. The nets used were 50 denier, 1 1/2" mesh, in 18, 30, and 42 foot lengths. A Titley Anabat II was used for determination of echolocation signals of bats in flight. We also made 15-minute taped recordings at each site during peak activity. These recordings will aid in the building of time-frequency diagram (sonograms) libraries for future research purposes. Echolocation detecting equipment provides the ability to monitor

bat activity at the site, but species identification must be based on sonograms available for comparison (Toone 1994). Sonograms are being developed for the species in this study from recordings, but we were not able to make total use of this tool at this time. The major drawback to monitoring echolocation signals is the inability to differentiate between a single bat passing over many times or several bats passing a few times.

Brief descriptions of the area surrounding the net sites were included on field forms developed by the National Biological Survey. Information such as slope, aspect, elevation, and dominant vegetative cover in both distribution and height was described.

## Results

A total of 238 bats were netted, representing 14 species, including eight species formerly listed Category 2 by the U.S. Fish and Wildlife Service. Appendix A lists the sites surveyed by cooperating agency with land management responsibility and the species and number of individuals captured at each location. A general list of the species netted in the study area includes:

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<i>Myotis californicus</i>	California myotis
<i>Myotis ciliolabrum</i> <sup>a</sup>	western small-footed myotis
<i>Myotis evotis</i> <sup>a</sup>	long-eared myotis
<i>Myotis lucifugus</i>	little brown bat
<i>Myotis thysanodes</i> <sup>a</sup>	fringed myotis
<i>Myotis volans</i> <sup>a</sup>	long-legged myotis
<i>Myotis yumanensis</i> <sup>a</sup>	Yuma myotis
<i>Lasiurus cinereus</i>	hoary bat
<i>Lasionycteris noctivagans</i>	silver-haired bat
<i>Eptesicus fuscus</i>	big brown bat
<i>Euderma maculatum</i> <sup>a</sup>	spotted bat
<i>Idionycteris phyllotis</i> <sup>a</sup>	Allen's big-eared bat
<i>Antrozous pallidus</i>	pallid bat
<i>Nyctinomops macrotis</i> <sup>a</sup>	big free-tailed bat

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<sup>a</sup>Former U.S. Fish and Wildlife Service Category 2 species.

A vegetation classification of each survey site is also presented in Appendix B, according to the Spence/Romme/Floyd-Hanna/Rowlands (SRFR) classification (Spence et al. 1995) for the Colorado Plateau.

## Discussion

No single method for determining the presence or absence of bat species has come to the forefront as the best (Thomas and La Val 1988). Capture by mist net allowed us to make positive identification of species, but included a bias from netting at water locations. It has been shown that at habitual drinking locations bats have a higher incidence of capture than at infrequently used watering locations (Kunz and Brock 1975). Bats using habitual flyways and watering sources may become accustomed to their surroundings and although echolocating, probably pay little attention to weaker echoes of nets and other traps (Thomas and West 1989), making them more susceptible to capture. Species that continually move roost, feeding, and watering sites may reduce their familiarity with a single location and decrease their susceptibility of capture, due to increased awareness of surroundings. Other biases introduced by use of mist net capture include: (1) visually oriented bats may be adept at avoiding nets; (2) different species forage and water in different manners; and (3) environmental conditions may limit bats encountered (Kunz and Kurta 1988). Mist nets also have the limitation of only sampling those bats flying at net height. Therefore, our capture of bats at watering locations may not be an accurate inventory of all the bats utilizing each habitat.

Comparison of our findings may be correlated to other studies and reports of habitat utilizations to corroborate habitat usage in the areas of our studies.

We were able to determine the presence of a variety of species on forest lands in the study area. Abundance of individual species would be inappropriate to speculate on based on the number of sites surveyed and the biases already discussed. Some interesting information did, however, come to light. First, silver-haired bats, long-legged myotis, long-eared myotis, and big brown bats were the most frequently netted bat species. These species seem to be common users of water at most sites; however no attempt at population trends can be made here. The second interesting find is species that were captured at only one net site in the study were *Yuma myotis*, Allen's big-eared bat, pallid bat, and big free-tailed bat. The latter three are more common in lower, warmer elevations than in the forested areas surveyed, but many factors may account for isolated occurrences of an individual species such as elevation, temperature, microhabitat, and so forth. Third was the capture of spotted bats in the Manti-LaSal Mountains. These are the first documented captures of spotted bats in this mountain range and two of the females captured were lactating, indicative of breeding in the area by this species (M. Bogan, National Biological Service, Albuquerque, New Mexico, personal communication). Appendix B provides a simplified listing of the habitat types surrounding the water sources where bats were identified. However, we recognize that use of the surrounding habitats was not determined. Species abundance and specific habitat use could only be determined by detailed, site-

specific studies which include identification of roost sites and counting of individual animals for population estimates.

This study was a multi-agency cooperative effort. Continued coordination between the agencies involved in the management and protection of habitat for various bat species should be enhanced by the ground work laid by this project. This is important in that resources that cross management boundaries are shared and, therefore, must be managed by cooperative efforts and understanding.

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### Appendix A. Species and numbers netted by survey site.

Net site	Numbers of species netted using the accompanying list													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Bryce Canyon National Park</b>														
East Creek	1	1	6			10	2		9	6				
Mossy Cave		2	1			4			10	1				
Swamp Canyon		2				4	1							
Bryce Creek		13	1			4			2					
Yovimpa Pass		1			1	1			2					
Hatch Pond			1											
<b>Dixie National Forest</b>														
Crawford Canyon	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Blubber Creek	1 <sup>a</sup>	1 <sup>a</sup>	5			1		1		8				
Yankeec Meadow		1	1						4					
Leeds Creek									2					
Blue Spruce	1 <sup>a</sup>	1 <sup>a</sup>				1			1					
Tantalus Creek			1						4		2	4		
<b>Fishlake National Forest</b>														
Burnt Flat	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Forshea Spring			1	1		1								
Seven Mile Creek				2		1			2	3				
Eldridge Hollow						1								
Pahvant Road									4	1				
Beaver Valley														
Big Flat <sup>b</sup>									1					

## Appendix A. Concluded.

Net site	Numbers of species netted using the accompanying list													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Manti-LaSal National Forest														
Lake Hill														
Elk Ridge	1	3	4		3		1	1	23	9	1			
Huntington Canyon					1		1	1	18	1				
Warner Lake			1		3		3	3	2	1	1			2
Deer Springs														
Medicine Lake <sup>b</sup>	2			4	2									
Pigeon Creek								4						

<sup>a</sup>Individual bat was either *Myotis californicus* or *Myotis ciliolabrum*.

<sup>b</sup>Moved from the preceding location due to dry conditions.

Species list for Appendix A.

1. *Myotis californicus* (California myotis)
2. *Myotis ciliolabrum* (Western small-footed myotis)
3. *Myotis evotis* (Long-eared myotis)
4. *Myotis lucifugus* (Little brown bat)
5. *Myotis thysanodes* (Fringed myotis)
6. *Myotis volans* (Long-legged myotis)
7. *Myotis yumanensis* (Yuma myotis)
8. *Lasturus chereus* (Hoary bat)
9. *Lasiocyclops noctivagans* (Silver-haired bat)
10. *Eptesicus fuscus* (Big brown bat)
11. *Eidemia maculatum* (Spotted bat)
12. *Idionycteris phyllotis* (Allen's big-eared bat)
13. *Antrozous pallidus* (Pallid bat)
14. *Nyctinomops macrotis* (Big free-tailed bat)

## Appendix B. Survey locations and characteristic plant species.

Site	Elevation	SSRFR formation	Characteristic species
<b>Bryce Canyon National Park</b>			
East Creek	7900'	montane grassland	Grass spp./ <i>Artemisia nova</i> / <i>Pinus ponderosa</i>
Mossy Cave	6830'	montane forest and woodland	<i>Pinus edulis</i> / <i>Juniperus scopulorum</i>
Swamp Canyon	7120'	montane forest and woodland	<i>Quercus gambelii</i> / <i>Juniperus scopulorum</i>
Bryce Creek	6840'	montane forest and woodland	<i>Pinus edulis</i> / <i>Juniperus scopulorum</i>
Yovimpa Pass	8310'	montane forest and woodland	<i>Pseudotsuga menziesii</i> / <i>Populus tremuloidea</i>
Hatch Pond	7650'	montane grassland	Grass spp./ <i>Artemisia nova</i>
<b>Dixie National Forest</b>			
Crawford Canyon	8370'	montane forest and woodland	<i>Populus tremuloidea</i> / <i>Abies concolor</i>
Blubber Creek	7940'	montane low shrubland	<i>Artemisia nova</i> / <i>Abies concolor</i>
Yankee Meadow	8300'	montane low shrubland	<i>Artemisia nova</i> / <i>Grass spp.</i> / <i>Populus tremuloidea</i>
Leeds Creek	5500'	submontane tall shrubland	<i>Quercus gambelii</i> / <i>Amelanchier utahensis</i>
Blue Spruce	7800'	montane forest and woodland	<i>Pinus ponderosa</i> / <i>Salix spp.</i>
Tantalus Flat	6500'	submontane tall shrubland	<i>Tamarix ramosissima</i> / <i>Salix spp.</i> / <i>Pinus edulis</i>
<b>Fishlake National Forest</b>			
Burnt Flat	8750'	subalpine low shrubland	<i>Artemisia nova</i> / <i>Populus tremuloidea</i>
Forshea	8860'	subalpine low shrubland	<i>Artemisia nova</i> / <i>Populus tremuloidea</i>
7-Mile	9300'	subalpine low shrubland	<i>Artemisia nova</i> / <i>Salix spp.</i> / <i>Populus tremuloidea</i>
Eldridge Hollow	8150'	montane tall shrubland	<i>Artemisia tridentata</i> / <i>Populus tremuloidea</i>
Pahvant	5538'	submontane forest and woodland	<i>Pinus edulis</i> / <i>Juniperus osteosperma</i>
Beaver Canyon	8475'	montane forest and woodland	<i>Salix spp.</i> / <i>Pseudotsuga menziesii</i> / <i>Abies lasiocarpa</i>
Big Flat <sup>a</sup>	9022'	montane forest and woodland	Grass spp./ <i>Abies lasiocarpa</i>

## Appendix B. Concluded.

Site	Elevation	SSRFR formation	Characteristic species
<b>Manti-LaSal National Forest</b>			
Lake Hill	7801'	montane forest and woodland	<i>Populus tremulooides</i>
Elk Ridge	8320'	montane grassland	Grass spp./ <i>Populus tremulooides</i>
Huntington Canyon	5928'	montane forest and woodland	Grass spp./ <i>Pseudotsuga menziesii</i>
Warner Lake	9200'	montane forest and woodland	Grass spp./ <i>Picea engelmannii</i> / <i>Populus tremulooides</i>
Deer Springs	7700'	submontane tall shrubland	<i>Quercus gambelii</i> /Grass spp.
Medicine Lake <sup>a</sup>	9800'	subalpine grassland	Grass spp./ <i>Picea engelmannii</i> / <i>Populus tremulooides</i>
Reddick Canyon	6360'	montane forest and woodland	<i>Acer negundo</i> /Grass spp.

<sup>a</sup>Moved from the preceding location due to dry conditions.