

Exhibit 3

**Survey of Threatened and Endangered Bat Species on Big Creek
by James W. Gore, B.S., M.S. Candidate**

**Survey of Threatened and Endangered Bat
Species On Big Creek**

Prepared for:

Buffalo River Watershed Alliance

Prepared by:

James W. Gore

Endangered Bat Species Presence/Absence Survey

At the request of the Buffalo River Watershed Alliance, a survey was performed in order to determine the possible presence of any endangered or threatened bat species along Big Creek, an integral part of the Buffalo River watershed. Big Creek is located within the known ranges of three species of bat that are currently included on the U.S. Fish & Wildlife Service's List of Threatened and Endangered Species. These are the endangered Indiana bat (*Myotis sodalis*), the endangered gray bat (*M. grisescens*), and the threatened northern long-eared bat (*M. septentrionalis*). Acoustic monitoring was conducted within the project area in order to determine the presence or absence of these species. One Anabat II bat detector (Titley Scientific, Inc.) was placed at each of three locations along the banks of Big Creek in Newton County, near the community of Mt. Judea, AR (Fig. 1, Photo Log) on the nights of August 19-20, 2015. Detectors were positioned to detect bats foraging over large pools within the creek, and programmed to record beginning 30 minutes before sunset until approximately 30 minutes after sunrise. Recorded bat calls were then identified to species using Bat Call Identification (BCID) auto-i.d. software. Calls identified as one of the listed species were then manually inspected for confirmation and/or correction. Three Indiana bats and several hundred gray bats were detected within the study area, as well as several northern long-eared bats (BCID Data Summaries).



Figure 1. Locations of deployed acoustic devices along Big Creek in Newton Co. Arkansas.

The **Indiana Bat** (*Myotis sodalis*) is a medium-sized bat species with dull gray and chestnut colored fur. Indiana bats are migratory, mating in September and begin hibernation in October. Young are born in June and July. During the summer, Indiana bats roost under tree bark or in tree cavities along streams or in upland forests, with females and their young forming small colonies of 50 to 100 individuals. Limestone caves with stable temperatures of three to six degrees Celsius and 66 to 95 percent humidity are required for winter hibernation. In Arkansas, Indiana bats are known to occur in Benton, Clay, Independence, Izard, Johnson, Madison, Marion, Newton, Searcy, Stone, and Washington Counties. Pesticides, commercialization of roosting caves, and loss of foraging habitat all pose threats to the species. However, the most severe current threat to Indiana bat populations is the continued spread of white-nose syndrome which was first detected in Arkansas in January of 2014. The Study Area is located within the suitable limestone habitat that is required by Indiana bats for hibernation during the winter months. Additionally, Indiana bats were detected foraging along Big Creek within the Study Area during the August survey.

The **Gray Bat** (*Myotis grisescens*) is a medium-sized bat species with dull gray or chestnut colored dorsal fur, and paler ventral fur. Gray bats are migratory, roosting almost exclusively in caves. In winter, deep vertical caves with temperatures between 5 and 11°C are preferred, while maternity colonies in the summer prefer domed caves between 14 and 24°C, with flowing water. Occasionally, gray bats will use alternative roost structures such as the storm drain located in Newark, AR which houses a maternity colony during the summer. Summer roosts are most often located within one kilometer of a stream or lake, over which the gray bats forage. Mating occurs in September and October, immediately before hibernation. Young are born in May or June, with larger colonies exhibiting higher rates of reproductive success. In Arkansas, Indiana bats are known to occur in Baxter, Benton, Boone, Carroll, Cleburne, Crawford, Franklin, Fulton, Independence, Izard, Jackson, Johnson, Lawrence, Madison, Marion, Newton, Pope, Searcy, Sebastian, Sharp, Stone, Van Buren, and Washington Counties.

Human disturbance of maternity roosts and hibernacula, pesticides, and loss of foraging habitat are the most critical threats to the species. The Study Area is located within the suitable habitat required by gray bat maternity and bachelor colonies. Additionally, gray bats were detected foraging along Big Creek within the Study Area during the August survey.

The **Northern Long-Eared Bat** (*Myotis septentrionalis*) is a medium-sized bat species with olive or light brown fur above and light gray fur below and ears that extend well beyond the muzzle when folded forward. Northern long-eared bats mate in late summer or early fall and usually begin hibernation in October. Hibernation occurs in cool caves (6 - 9°C) with high humidity, and little or no air flow where the bats tuck themselves into small cracks and crevices in the cave wall. Young are born in May and June. During the summer, northern long-eared bat maternity colonies roost under tree bark or in tree cavities found in upland pine forests. The bats will also frequently roost in buildings, bat houses, or under bridges. Northern long-eared bats occur in virtually every county in Arkansas. Currently, the most severe threat to northern long-eared bat populations is the continued spread of white-nose syndrome which has caused 99% population reductions in the eastern United States, and has been detected in Arkansas since January of 2014. The Study Area is located within the suitable upland forest habitat that is required by northern long-eared bats. Additionally, northern long-eared bats were detected foraging along Big Creek within the Study Area during the August survey.

References

Sealander, J.A, and G.A Heidt. 1990. *Arkansas Mammals*. The University of Fayetteville Press, Fayettevill, AR

U.S. Fish and Wildlife Services. "Listed species by county report."
http://ecos.fws.gov/tess_public/reports/species-by-current-range-county?fips=05101

U.S. Fish and Wildlife Services. "Species Profile: Gray Bat."
<http://ecos.fws.gov/speciesProfile/profile/speciesProfile?spcode=A04J>

U.S. Fish and Wildlife Services. "Species Profile: Indiana Bat."
<http://ecos.fws.gov/speciesProfile/profile/speciesProfile?spcode=A000>

U.S. Fish and Wildlife Services. "Species Profile: Northern Long-eared Bat."
<http://ecos.fws.gov/speciesProfile/profile/speciesProfile?spcode=A0JE>

James W. Gore

Wildlife Biologist / Environmental Technician

Summary of Qualifications

Education

- Bachelor of Science
Wildlife Ecology & Management
Arkansas State University
- Master of Science Candidate
Biology
Arkansas State University

Work Experience


- Six years surveying for Indiana bats throughout Ozark National Forest in Arkansas
- Captured and processed all Threatened & Endangered bat species native to Arkansas including:
Hundreds of threatened northern long-eared bats (*Myotis septentrionalis*)
Hundreds of endangered gray bats (*M. grisescens*)
Twenty-two endangered Ozark big-eared bats (*Corynorhinus townsendii ingens*)
Ten endangered Indiana bats (*M. sodalis*)
- Located Indiana bat and evening bat roosts throughout Ozark National Forest using radio telemetry
- Performed multiple threatened & endangered bat surveys for Arkansas Highway and Transportation Dept.
- Performed multiple threatened & endangered bat surveys for U.S. Department of Defense


Professional Credits and Affiliations

- Techniques and Identification Bat Acoustics Course
- Southeastern Bat Diversity Network Annual Meeting, 2015
- Bat Capture Technique Demonstrator for Devil's Den State Park
- Member of Southeastern Bat Diversity Network
- Member of Bat Conservation International

Photographic Log


PHOTOGRAPHIC LOG

Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	1		
Photo Description:			
Anabat and microphone setup at Site A			
Latitude: 35.939198 Longitude: -93.072212 Elevation: 183.8m Accuracy: 74.0m Azimuth: 8° (N) Pitch: -25.9° (2.6°) Time: 08-19-2015 18:29			


Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	2		
Photo Description:			
Facing north from Site A			
Latitude: 35.939197 Longitude: -93.072211 Elevation: 184.5m Accuracy: 16.0m Azimuth: 360° (N) Pitch: -1.2° (1.7°) Time: 08-19-2015 18:30			


PHOTOGRAPHIC LOG

Project Name:		Buffalo River Watershed Alliance		
Location:		Newton	AR	19 Aug 2015
		County	State	Date
Photo Number:	3			
Photo Description:				
Facing east from Site A				
		<small>Latitude: 35.939197 Longitude: -93.072211 Elevation: 184.6m Accuracy: 30.0m Azimuth: 114° (SE) Pitch: 0.8° Time: 08-19-2015 18:30</small>		


Project Name:		Buffalo River Watershed Alliance		
Location:		Newton	AR	19 Aug 2015
		County	State	Date
Photo Number:	4			
Photo Description:				
Facing south from Site A				
		<small>Latitude: 35.939197 Longitude: -93.072211 Elevation: 184.6m Accuracy: 24.0m Azimuth: 210° (SW) Pitch: 0.5° Time: 08-19-2015 18:30</small>		


PHOTOGRAPHIC LOG

Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	5		
Photo Description:			
Facing west from Site A			
	Latitude: 35.939198 Longitude: -93.072211 Elevation: 184.5m Accuracy: 156.0m Azimuth: 275° (W) Pitch: -1.4° Time: 08-19-2015 18:31		


Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	6		
Photo Description:			
Anabat and microphone setup at Site B			
	Latitude: 35.928254 Longitude: -93.067979 Elevation: 204.1m Accuracy: 9.0m Azimuth: 71° (E) Pitch: -25.8° (4.5°) Time: 08-19-2015 19:05		


PHOTOGRAPHIC LOG

Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	7		
Photo Description:			
Facing north from Site B			
	<small>Latitude: 35.928254 Longitude: -93.067979 Elevation: 204.0m Accuracy: 58.0m Azimuth: 9° (N) Pitch: -2.2° (1.8°) Time: 08-19-2015 19:06</small>		


Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	8		
Photo Description:			
Facing east from Site B			
	<small>Latitude: 35.928254 Longitude: -93.067979 Elevation: 204.0m Accuracy: 54.0m Azimuth: 108° (E) Pitch: 1.2° (-1.5°) Time: 08-19-2015 19:06</small>		


PHOTOGRAPHIC LOG

Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	9		
Photo Description:			
Facing south from Site B			
	<small>Latitude: 35.928254 Longitude: -93.067979 Elevation: 204.0m Accuracy: 30.0m Azimuth: 265° (W) Pitch: 4.3° Time: 08-19-2015 19:07</small>		


Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	10		
Photo Description:			
Facing west from Site B			
	<small>Latitude: 35.928254 Longitude: -93.067978 Elevation: 203.9m Accuracy: 155.0m Azimuth: 329° (NW) Pitch: -1.6° Time: 08-19-2015 19:07</small>		


PHOTOGRAPHIC LOG

Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	11		
Photo Description:			
Anabat and microphone setup at Site C			
	<small>Latitude: 35.894937 Longitude: -93.067439 Elevation: 233.1m Accuracy: 40.0m Azimuth: 302° (NW) Pitch: -26.8° (-2.9') Time: 08-19-2015 19:43</small>		


Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	12		
Photo Description:			
Facing north from Site C			
	<small>Latitude: 35.894937 Longitude: -93.067439 Elevation: 233.1m Accuracy: 50.0m Azimuth: 13° (N) Pitch: 0.5° Time: 08-19-2015 19:43</small>		

PHOTOGRAPHIC LOG

Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	13		
Photo Description:			
Facing east from Site C			
	<small>Latitude: 35.894937 Longitude: -93.067439 Elevation: 233.1m Accuracy: 38.0m Azimuth: 92° (E) Pitch: -0.5° (-1.2°) Time: 08-19-2015 19:44</small>		

Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	14		
Photo Description:			
Facing south from Site C			
	<small>Latitude: 35.894936 Longitude: -93.067439 Elevation: 233.1m Accuracy: 160.0m Azimuth: 184° (S) Pitch: -0.5° (0.5°) Time: 08-19-2015 19:44</small>		

PHOTOGRAPHIC LOG

Project Name:	Buffalo River Watershed Alliance		
Location:	Newton	AR	19 Aug 2015
	County	State	Date
Photo Number:	15		
Photo Description:			
Facing west from Site C			
	<small>Latitude: 35.894937 Longitude: -93.067439 Elevation: 233.1m Accuracy: 12.0m Azimuth: 279° (W) Pitch: 1.6° (1.9°) Time: 08-19-2015 19:45</small>		

Bat Call Identification Summaries

FILENAME	SPECIES	SP PERCENT	GROUP	GR PERCENT	TOTAL PULSES	DISC PROB	FOLDER
P8191934.26#	PESU	80	MID	100	5	0.761972	site a
P8191934.44#	PESU	66.6667	MID	66.6667	21	0.411945	site a
P8191935.00#	PESU	68	MID	68	25	0.437819	site a
P8191939.41#	PESU	66.6667	MID	71.4286	21	0.43669	site a
P8192011.25#	MYGR	100	MYOTIS	100	5	0.93388	site a
P8192012.09#	NYHU	83.3333	MID	100	6	0.518037	site a
P8192012.35#	LABO	66.6667	MID	93.3333	15	0.262326	site a
P8192013.58#	PESU	60	MID	100	5	0.178439	site a
P8192014.29#	NYHU	83.3333	MID	83.3333	6	0.473987	site a
P8192014.58#	LABO	28.5714	MID	57.1429	7	0.111737	site a
P8192015.58#	NYHU	100	MID	100	7	0.625523	site a
P8192016.20#	LABO	60	MID	80	5	0.279685	site a
P8192016.42#	NYHU	100	MID	100	5	0.906703	site a
P8192020.33#	MYGR	100	MYOTIS	100	5	0.19796	site a
P8192021.59#	PESU	77.7778	MID	88.8889	9	0.665776	site a
P8192035.03#	PESU	83.3333	MID	83.3333	6	0.668814	site a
P8192046.42#	PESU	40	MID	40	5	0.0417638	site a
P8192052.40#	MYSO	60	MYOTIS	80	5	0.448583	site a
P8192059.08#	PESU	86.6667	MID	86.6667	15	0.729556	site a
P8192107.10#	PESU	88.8889	MID	100	9	0.864969	site a
P8192107.26#	LACI	100	LOW	100	6	0.963542	site a
P8192110.05#	MYGR	50	MYOTIS	50	6	0.235877	site a
P8192112.30#	UNKN		MID	40	5		site a
P8192115.55#	PESU	78.5714	MID	92.8571	14	0.714286	site a
P8192122.25#	PESU	60	MID	60	5	0.334228	site a
P8192130.35#	LABO	37.5	MID	62.5	8	0.0712959	site a
P8192138.01#	MYGR	57.1429	MYOTIS	57.1429	14	0.0965346	site a
P8192140.20#	PESU	83.3333	MID	83.3333	6	0.665273	site a
P8192141.38#	UNKN		MID	33.3333	6		site a
P8192142.05#	PESU	100	MID	100	5	0.885176	site a
P8192142.33#	PESU	75	MID	93.75	16	0.691539	site a
P8192144.44#	PESU	100	MID	100	10	0.917284	site a
P8192150.45#	PESU	75	MID	100	8	0.724482	site a
P8192200.45#	PESU	47.3684	MID	68.4211	19	0.310562	site a
P8192204.13#	PESU	83.3333	MID	100	6	0.788441	site a
P8192205.30#	PESU	100	MID	100	16	0.961713	site a
P8192215.15#	PESU	83.3333	MID	83.3333	12	0.64665	site a
P8192226.42#	MYGR	100	MYOTIS	100	6	0.960614	site a
P8192228.36#	PESU	45.4545	MID	72.7273	11	0.323105	site a
P8192231.02#	MYGR	57.1429	MYOTIS	85.7143	7	0.0967623	site a
P8192231.18#	NYHU	55.5556	MID	77.7778	9	0.188207	site a

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Pages 19 to 100 of this report, containing the remainder of the Bat Call Identification Summaries, is available online at <http://buffaloriveralliance.org/Resources/Documents/Bat%20Survey.pdf>