National Wildlife Refuge System
Southeast Region Inventory & Monitoring Network

2012 Regional Summary Report
Mobile Acoustical Bat Monitoring

Bats are integral to sustaining biodiversity of both simple and complex ecosystems in the eastern U.S. Bats have been specifically identified as species of concern in many National Wildlife Refuge Comprehensive Conservation and Habitat Management Plans and are otherwise recognized as a species group of interest on many refuge lands. Recent recognition of landscape level threats to bat populations and refuge-scale needs for baseline information on bat abundance and distribution has prompted refuges to initiate coordinated acoustical monitoring of bats in the Southeast.

Objectives

- Provide a baseline inventory of bat species occurrence on refuges.
- Institute long-term monitoring of bat population trends at local and landscape scales using a standardized survey protocol.
- Develop local and landscape-scale species-habitat associations based on bat occurrence along transects.
- Integrate indices of species abundance and richness with other agencies and partners to support broad-scale Strategic Habitat Conservation Initiatives for bats.

Survey Area

The mobile acoustical bat monitoring project is coordinated by the Southeast Region Inventory and Monitoring Network (I&M) and includes survey transects at 45 USFWS stations (42 National Wildlife Refuges, 3 Ecological Services Field Offices) in 13 states, 3 USFWS administrative regions (2, 3, and 4), and 3 Landscape Conservation Cooperatives (Fig. 1).

Methods

Nocturnal habits and ultrasonic echolocations of most bat species render them difficult to detect and monitor via traditional wildlife survey techniques. However, a standardized survey protocol using acoustical detection techniques as outlined in detail in the Mobile Acoustical Bat Survey Protocol (USFWS, Region 4, Division of Refuges, 2012) provides a new approach. From June-July 2012, stations used Anabat SD2 detectors (Fig. 2) to log bat

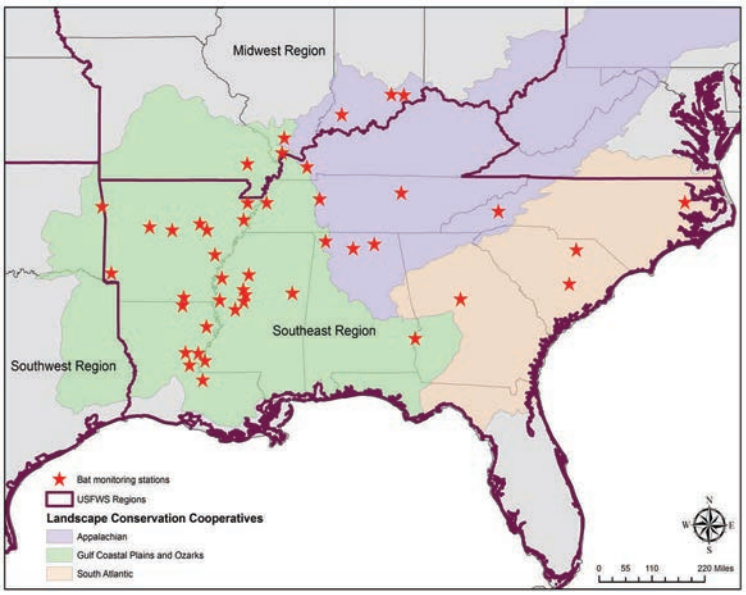

Figure 1. Locations of U.S. Fish and Wildlife Service stations conducting mobile acoustical bat monitoring in 2012.

Figure 2. Anabat SD2 detector and roof-mounted microphone and GPS unit used to log acoustical bat detections while mobile.

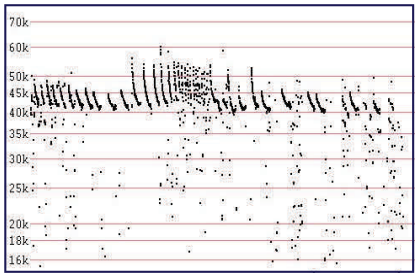

Figure 3. Ultrasonic echolocation call of a tricolored bat (Perimyotis subflavus), commonly known as the eastern pipistrelle, detected with an Anabat SD2 detector.

echolocation data (Fig. 3) collected via a roof-mounted microphone/GPS unit. Participants drove a 3-30 mile transect at ≈20 mph while bat echolocation data were logged with the Anabat detector. Transects were primarily superimposed across refuge lands with some areas extending along other ownership. Bat call files and survey metadata were submitted to a centralized data archive and checked for quality assurance of bat echolocation and GPS data. Data were pre-processed and initially restricted to georeferenced total number of bat calls, not classified to species, along each survey transect. Models to auto-classify the calls to specific bat species are currently undergoing additional beta testing for verification and validation of their accuracy.

Preliminary Results

Data from 129 survey nights on 55 unique transects collected at 40 stations in 2012 are summarized in Tables 1 and 2. Stations detected 14,477 bat calls across 2,351 miles of transect during 2012. Transects averaged 121 bat detections per transect night (range 7-510) and were widely variable across stations (e.g., Figs. 4-5). Fern Cave and White River NWRs exhibited the greatest abundance of bat calls, though 14 other refuges exhibited >200 detections/transect night. Data from Ozark Plateau and Piedmont refuges, and the Asheville, NC Ecological Services Field Office have not yet been processed and are not included in reported summary information. Bat calls will be classified and summarized by species once bat species classification software is validated and approved. Individual station-level summary reports were produced showing survey results for each transect sampling period. Reports and archived call data are available for review at (https://fishnet.fws.doi.net/regions/4/nwrs/IM/bats/default.aspx). Mobile acoustical surveys are scheduled to continue in June-July 2013 at all participating stations. A refresher web-based training will be available to stations prior to 2013 survey implementation.

Acknowledgements

This project has been supported through the Southeast Region Inventory and Monitoring Network in partnership with Refuges and Ecological Services Field Offices in the Southeast, Midwest, and Southwest Regions, the Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative, and the Engineering Research and Development Center, U.S. Army Corps of Engineers. We recognize the many hours of local staff and volunteer time spent to enable this unprecedented monitoring effort.

Figure 4. Example output map of 377 bat detections along a 30 mile transect route at Fern Cave NWR (7/19/2012).

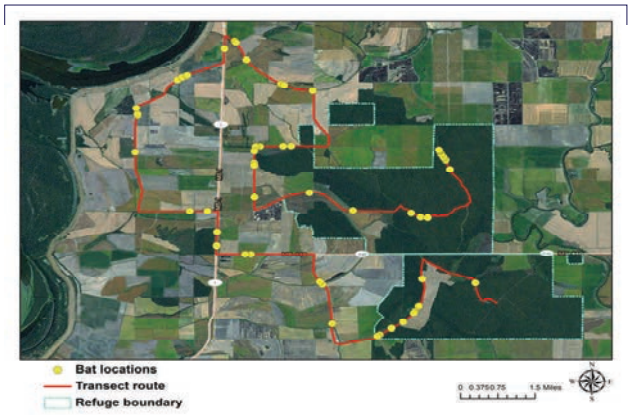

Figure 5. Example output map of 54 bat detections along a 28 mile transect route at Dahomey NWR (7/05/2012).

Table 1. Summary totals of bat call and survey route data collected via mobile acoustical bat monitoring at 40 stations in 2012.

Total miles of transects driven:	2,351 mi
Average length of survey transect:	19.43 mi
Total number of bat calls detected:	14,477
Average number of bat calls/transect:	121
Average number of bat calls/mile:	6.16 bat calls/mi

For more information about this and other regional Inventory and Monitoring efforts contact:

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Table 2. Station-level summary of bat call and survey route data collected via mobile acoustical bat monitoring at 40 stations in 2012.

Station	*# Transects*	*# Nights*	*Total bat calls*	*Mean # bat calls/night*	*Total length (mi)*	*Mean length/night (mi)*	*# Bat calls/mile*
Arkansas ES Field Office	1	2	105	52.5	39.9	19.9	2.6
Bald Knob NWR	1	2	101	50.5	43.0	21.5	2.3
Bayou Cocodrie NWR	2	6	463	77.2	70.0	11.7	6.6
Big Lake NWR	1	1	64	64.0	20.1	20.1	3.2
Big Oaks NWR	2	2	134	67.0	64.7	32.3	2.1
Cache River NWR	2	4	498	124.5	95.1	23.8	5.2
Carolina Sandhills NWR	1	4	353	176.5	54.7	27.3	6.5
Cat Island NWR	1	3	120	40.0	25.3	8.4	4.7
Catahoula NWR	1	2	114	57.0	18.6	9.3	6.1
Chickasaw NWR	1	2	346	173.0	55.4	27.7	6.2
Clarks River NWR	1	4	268	134.0	65.6	32.8	4.1
Coldwater River NWR	1	3	240	80.0	76.5	25.5	3.1
Cypress Creek NWR	1	2	167	83.5	36.7	18.3	4.6
Dahomey NWR	1	3	179	59.7	83.3	27.8	2.1
Eufaula NWR	3	12	390	35.5	62.6	5.2	6.2
Felsenthal NWR	1	2	284	142.0	57.0	28.5	5.0
Fern Cave NWR	1	4	725	362.5	60.5	30.3	12.0
Hillside NWR	1	2	296	148.0	62.0	31.0	4.8
Holla Bend NWR	1	3	510	170.0	73.9	24.6	6.9
Key Cave NWR	1	3	640	213.3	90.1	30.0	7.1
Lake Ophelia NWR	1	2	191	95.5	22.5	11.2	8.5
Mathews Brake NWR	1	2	48	24.0	5.7	2.8	8.5
Mingo NWR	1	4	975	243.8	102.0	25.5	9.6
Morgan Brake NWR	1	2	309	154.5	33.8	16.9	9.1
Panther Swamp NWR	1	2	467	233.5	61.7	30.8	7.6
Patoka River NWR	2	4	250	62.5	48.5	12.1	5.2
Pond Creek NWR	1	2	404	202.0	59.9	29.9	6.7
Roanoke River NWR	2	2	130	65.0	13.3	6.7	9.8
SDH Noxubee NWR	1	3	636	212.0	87.8	29.3	7.2
Santee NWR	4	4	97	24.3	24.1	6.0	4.0
St. Catherine Creek NWR	2	6	666	111.0	95.1	15.9	7.0
Tallahatchie NWR	1	4	678	169.5	121.1	30.3	5.6
Tennessee ES Field Office	3	4	785	196.3	111.1	27.8	7.1
Tennessee NWR	1	2	280	140.0	55.2	27.6	5.1
Tensas River NWR	1	3	894	298.0	93.3	31.1	9.6
Upper Ouachita NWR	1	3	231	77.0	59.5	19.8	3.9
Wapanocca NWR	1	2	252	126.0	45.8	22.9	5.5
Wheeler NWR	1	4	402	201.0	60.8	30.4	6.6
White River NWR	3	6	389	64.8	34.0	5.7	11.4
Yazoo NWR	1	2	396	198.0	61.4	30.7	6.4