Region 4 Inventory and Monitoring Branch

Mobile Acoustical Bat Monitoring
Annual Summary Report

2019

Felsenthal National Wildlife Refuge

The Region 4 Inventory and Monitoring Branch coordinates acoustical bat monitoring on participating National Wildlife Refuges and Ecological Services field offices in Regions 2, 3, and 4. Surveys establish baseline inventories of bat species at each station and contribute to a landscape-level understanding of bat population trends and habitat associations. Bat call data are collected using Anabat SD2 detectors along road-based transects during June and July of each year following the procedures outlined in the Mobile Bat Acoustical Survey Protocol[1].

This report summarizes bat calls collected along driven survey routes at Felsenthal National Wildlife Refuge in 2019 and provides annual species detections from 2012 to 2018 for comparison. Calls were classified using the BCID Eastern USA (version 2.7c) software. Automated acoustical bat classification is limited in part by call quality, species filter constraints, and statistical model agreement parameters. We applied a species filter to limit classifications only to those bat species expected to occur at Felsenthal National Wildlife Refuge during the sampling interval. We considered species classifications conservatively by classifying only those calls with ≥ 5 ultrasonic pulses. While we expect that this conservative approach resulted in robust species classifications, it necessarily means that we may underestimate the actual number of bats detected. We geo-referenced calls to the nearest corresponding GPS location collected along the route.

The accuracy of call classification varies among species but is generally reported to be $> 85\%$ correct. Measures of confidence in species identification are available as a maximum-likelihood estimator p-value for each observed species in the BCID output files included in this report package. BCID software does not classify the following species: Seminole bat (*Lasiurus seminolus*), Northern yellow bat (*Lasiurus intermedius*), or Brazilian free-tailed bat (*Tadarida brasiliensis*). These species generally will be classified to a species with the closest model agreement or classified as "unknown."

This annual report package contains summary information on route surveys, and a digital folder containing shapefiles and BCID classification output files. Summary tables include all classified species observations including those lacking an associated spatial reference. All submitted raw call data and survey metadata are archived and available on the Mobile Acoustical Bat Monitoring SharePoint site (https://fishnet.fws.doi.net/regions/4/nwrs/IM/bats). Bat call files, GPS data, and survey metadata sheets were reviewed for quality assurance prior to generation of this report. Some submitted data were necessarily excluded due to errors identified in the collection processes.

[1] U.S Fish and Wildlife Service. 2012. Mobile Bat Acoustical Survey Protocol, U.S. Fish and Wildlife Service, Region 4, Division of Refuges

Felsenthal NWR (FslNWR) route

Table 1: 2019 survey route (FslNWR) summary.

Survey date	# bat calls	Route completed?	GPS data?	Survey notes
26 Jun	79	✓	✓	
11 Jul	82	✓	✓	9:18pm microphone was displaced by hanging limb but was re situated immediately

Table 2: 2019 survey route (FslNWR) nightly species detection summary. Total route length = 20.66 miles.

Species	Survey date	# bats detected	Bats/mile
Big Brown Bat	26 Jun	18	0.87
	11 Jul	3	0.15
Eastern Red Bat	26 Jun	18	0.87
	11 Jul	26	1.26
Evening Bat	26 Jun	20	0.97
	11 Jul	18	0.87
Hoary Bat	26 Jun	0	0.00
	11 Jul	3	0.15
Northern Long-eared Bat	26 Jun	0	0.00
	11 Jul	1	0.05
Tricolored Bat	26 Jun	23	1.11
	11 Jul	27	1.31
Unknown	26 Jun	0	0.00
	11 Jul	4	0.19

Species detection summary (2012 - 2019)

Table 3: Annual survey route (FslNWR) species detection summary, including classified calls without a spatial reference. Total route length = 20.66 miles.

Species	Year	Total # detected	# surveys	Total bats/mile
Big Brown Bat	2012	17	2	0.41
	2013	50	5	0.48
	2014	15	2	0.36
	2015	25	2	0.61
	2016	13	2	0.31
	2017	21	2	0.51
	2018	7	2	0.17
	2019	21	2	0.51
Eastern Red Bat	2012	19	2	0.46
	2013	23	5	0.22
	2014	18	2	0.44
	2015	20	2	0.48
	2016	27	2	0.65
	2017	15	2	0.36
	2018	14	2	0.34
	2019	44	2	1.06
Evening Bat	2012	31	2	0.75
	2013	45	5	0.44
	2014	27	2	0.65
	2015	37	2	0.90
	2016	27	2	0.65
	2017	31	2	0.75
	2018	48	2	1.16
	2019	38	2	0.92
Hoary Bat	2012	1	2	0.02
	2013	9	5	0.09
	2014	1	2	0.02
	2015	3	2	0.07
	2016	2	2	0.05
	2017	4	2	0.10
	2018	2	2	0.05
	2019	3	2	0.07
Northern Long-eared Bat	2012	1	2	0.02
	2013	0	5	0.00
	2014	0	2	0.00
	2015	0	2	0.00

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Species	Year	Total # detected	# surveys	Total bats/mile
	2016	0	2	0.00
	2017	1	2	0.02
	2018	0	2	0.00
	2019	1	2	0.02
Rafinesque's Big-eared Bat	2012	0	2	0.00
	2013	0	5	0.00
	2014	0	2	0.00
	2015	0	2	0.00
	2016	0	2	0.00
	2017	1	2	0.02
	2018	0	2	0.00
	2019	0	2	0.00
Tricolored Bat	2012	40	2	0.97
	2013	68	5	0.66
	2014	30	2	0.73
	2015	40	2	0.97
	2016	40	2	0.97
	2017	29	2	0.70
	2018	15	2	0.36
	2019	50	2	1.21
Unknown	2012	3	2	0.07
	2013	4	5	0.04
	2014	4	2	0.10
	2015	5	2	0.12
	2016	2	2	0.05
	2017	1	2	0.02
	2018	3	2	0.07
	2019	4	2	0.10

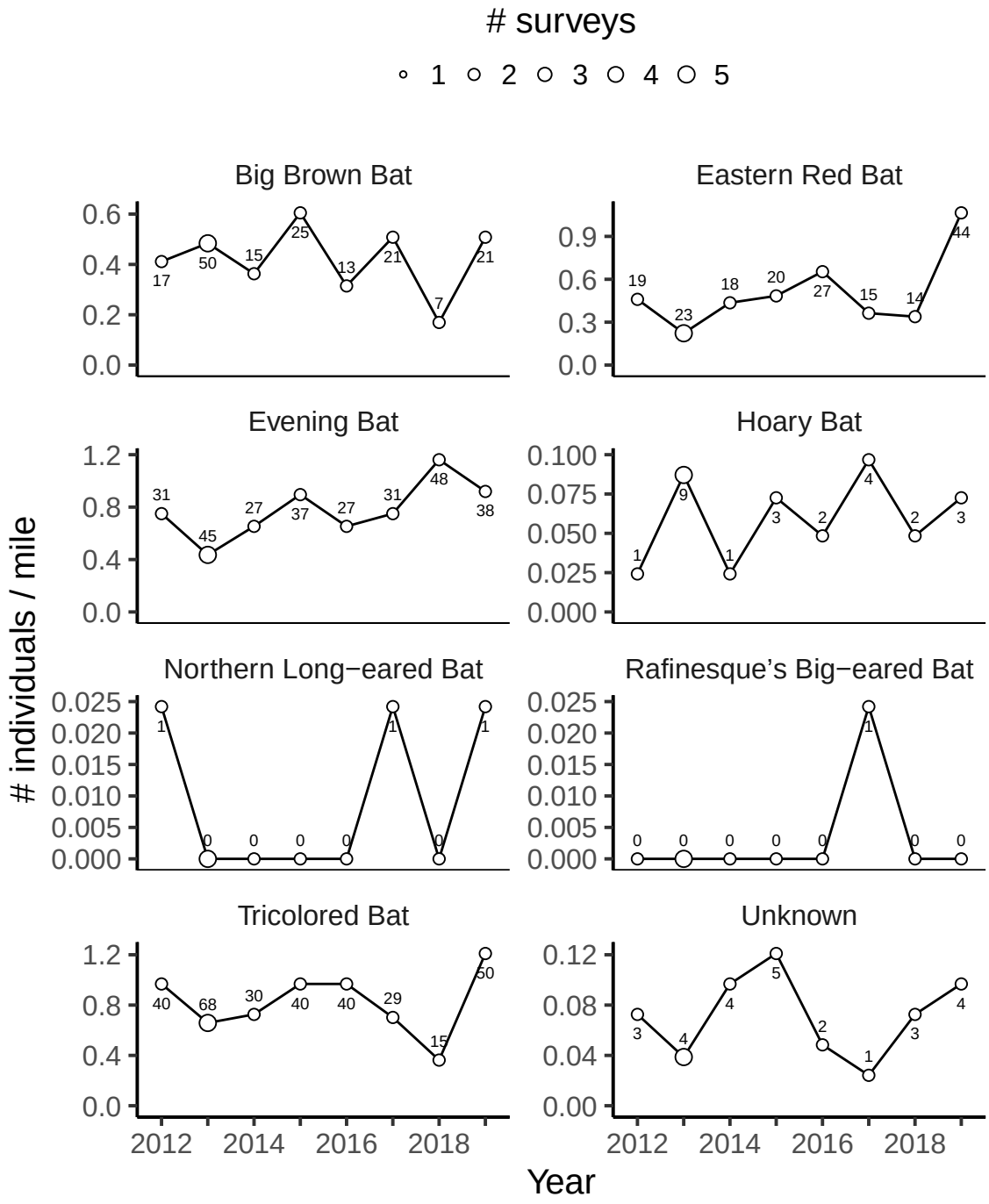

Figure 1: Figure version of the previous table. Detection rates of bat species. Point size indicates the number of surveys conducted for the route. The number associated with each point indicates the total number of individuals detected across all surveys. Total route length = 20.66 miles.

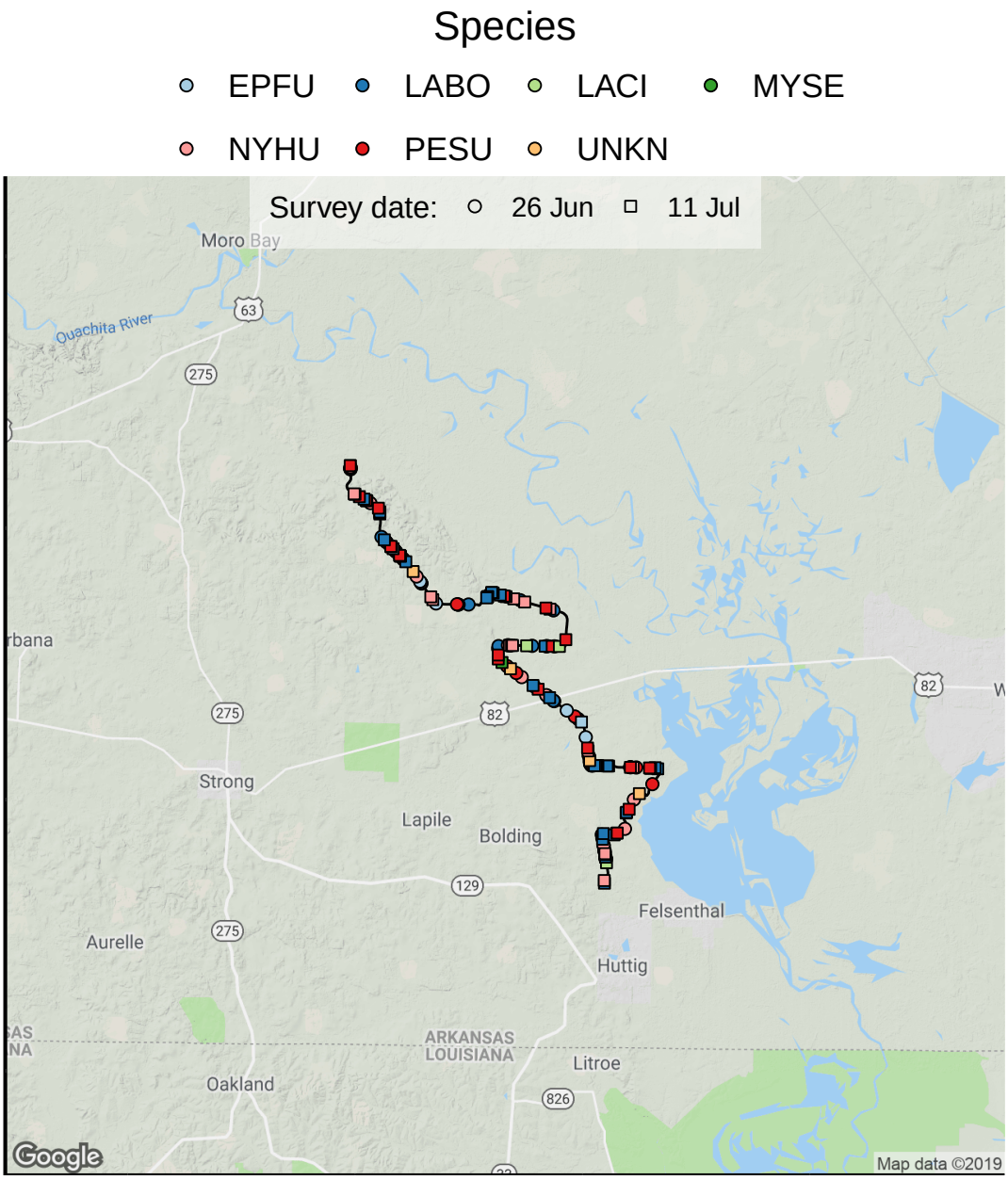

Figure 2: 2019 georeferenced bat detections superimposed on the FslNWR survey route. All recorded calls are represented. Total route length = 20.66 miles.