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ABSTRACT Regional wildlife diversity biologists initiated an annual bat acoustic transect survey project in 2013. The primary intent of this annual survey is to provide a dataset to assess trends in species composition and bat activity within established survey routes over time. We will also document the locations of endangered, threatened, rare, and previously undocumented bat species for subsequent surveys. In 2015, bat calls were recorded along 36 survey routes (6 per region) that were 20 miles in length and driven at a rate of 20 miles per hour in July. The 36 sampling routes were completed from 1 July to 15 July and recorded 3,143 bat detections. The initial step of the analyses classified 631 detections (23.7%) as high-frequency and 2,031 (76.3%) classified as low-frequency bat detections. Bat activity ranged from 22 to 169 bat detections with an average of 87.3 per route. Six of the 9 species known to occur in Pennsylvania were recorded. Auto-classifying software failed to identify 1,818 (57.8%) of the total detections to the species level. Of the 1,202 files that were identified to species, the majority were big brown bat (*Eptesicus fuscus; n* = 810, 67.3%), followed by eastern red bat (*Lasiurus borealis*; *n* = 161, 13.4%), hoary bat (*L. cinereus*; *n* = 138, 11.5%), silver-haired bat (*Lasionycteris noctivagans*, *n* = 83, 6.9%), tri-colored bat (*Perimyotis subflavus*; *n* = 7, 0.6%), evening bat (*Nycticeius humeralis*; *n* = 2, 0.2%) and northern long-eared bat (*Myotis septentrionalis*; *n* = 1, 0.1%). Indiana bat (*Myotis sodalis*), little brown bat (*Myotis lucifugus*), and eastern small-footed bat (*Myotis leibii*) were not detected. Although not historically common in Pennsylvania, we detected two evening bats on different routes in the Northeast and Southcental regions. A total of 123 (3.9%) bat detections was not identified to species but was identified to a guild.

OBJECTIVES

1. Provide current information on summer location (or absence) of bat species in Pennsylvania.

2. Track potential changes in bat species composition and activity over time within established survey routes post-white-nose syndrome (WNS).

3. Detect the presence of endangered, threatened, rare, and previously undocumented bat species in Pennsylvania where possible with acoustic detection.

INTRODUCTION

With 17 families, 170 genera and over 900 species, bats are the second largest mammalian order behind rodents (Merritt 1987; Altringham 1996). Bat populations are difficult to estimate due to many factors (nocturnal habits, flying, etc.). Complicating detection surveys, bat populations currently are being reduced by 2 relatively recent, but significant sources of mortality: WNS (Turner et al. 2011) and wind energy development (Arnett et al. 2008).

Threats

White-nose syndrome continues to spread west and south across the U.S. and north into Canada. Lesions on infected bats are caused by a cold-loving fungus originally identified as WNS (*Pseudogymnoascus destructans*, Minnis and Lindner 2013). This fungus has been documented on all Pennsylvania cave-dwelling bats: big brown bat (*Eptesicus fuscus* [EPFU]), little brown bat (*Myotis lucifugus* [MYLU]), northern long-eared bat (*Myotis septentrionalis* [MYSE]), tri-colored bat (*Perimyotis subflavus* [PESU]), eastern small-footed bat (*Myotis leibii* [MYLE]), and Indiana bat (*Myotis sodalis* [MYSO]) (Blehert el al. 2009, Table 1). As of early 2016, WNS is considered statewide, with mortality estimates exceed 90% for many sites and species (Turner el al. 2011).

Commercial wind facilities have been operating for many years, and have contributed to large numbers of bat kills (Kerns and Kerlinger 2004). Mortality studies consistently find the highest levels of mortality among migratory hoary bats (*Lasiurus cinereus*; LACI), red bats (*Lasiurus borealis*; LABO), and silver-haired bats (*Lasionycteris noctivagans*; LANO), whereas non-migratory cave bats generally have suffered much lower rates of mortality from wind energy (Johnson et al. 2003; Johnson et al. 2004; Reynolds 2006; Arnett et al. 2008). Approximately 720 turbines are currently operational in Pennsylvania and recent surveys estimated that an average of 27 (range 5-71) bats per turbine are killed per year (J. Taucher, Pennsylvania Game Commission, personal communication, October 2014). As wind energy development continues, its influence may become even more significant to bat populations already in decline due to the spread of WNS.

Acoustic Monitoring

Hibernacula and mist-netting surveys are labor intensive and biased toward cave-dwelling and bat. Acoustic surveys are an efficient technique for collecting data on species distribution and to detect trends in species composition or bat activity. Acoustic monitoring is a sampling technique in which vocalizations of bats are recorded by microphones. Vocalizations are analyzed by specialized software that compares recorded observations to libraries of species-specific reference bat detections and classifies them to species, genus, or other guilds. The technique does not influence bat behavior or generate avoidance responses (Fenton 1970; Reynolds 2006), allows researchers to sample bats in areas where conventional methods (e.g., mist nets, harp traps, etc.) are difficult or not feasible, and enables sampling large areas (O'Farrell and Gannon 1999). Acoustic surveys do not estimate population abundance, but instead provide an index of activity (Kunz and Brock 1975; Hayes 1997; Sherwin et al. 2000; Hayes 2000; Erickson and West 2002). While widely accepted, acoustic monitoring has limitations and the technique makes a number of assumptions. Hayes (2000) states 6 assumptions: 1) bat detectors reliably and consistently detect echolocation calls emitted by bats; 2) the number of echolocation calls recorded at a site accurately reflects the amount of use by bats; 3) bat detection activity recorded at a site would be the same as similar but unsurveyed sites; 4) activity recorded is related to habitat quality; 5) the number of feeding buzzes is proportional to foraging activity; and 6) bats can be reliably identified to taxa. Therefore, acoustic data can be used as an additional data source to assess changes is species composition, distribution, and activity. Measuring bat activity along established survey routes over time can then be used as a measure of population trends. However, all bat survey techniques (mist-netting, hibernacula surveys, etc.) inherently have some level of bias.

Many northeastern states (New Hampshire, Rhode Island, Connecticut, Delaware, Maryland, New York, New Jersey, Ohio, West Virginia, and Vermont) use acoustic surveys to monitor summer population trends in bats. Survey protocols used during our 2013 pilot study mimicked those of other states and were later modified for 2014 based on input from additional experts and our experience gained from the pilot study. Using similar protocols enables analysis to detect trends in the northeast region of the United States and the recently launched North American Bat Monitoring Program (NABat) by U.S. Geological Survey is attempting to do this. Ford et al. (2011) suggest summer acoustic monitoring can estimate bat relative abundance. Because rates of mortality vary among species affected by WNS, these surveys may help determine summer population trends and aid in documentation of declines and recoveries.

METHODS

Each regional wildlife diversity biologist (RWDB) randomly selected 6 routes from existing breeding bird survey (BBS) routes (i.e., 36 routes across the state) using desktop Geographic Information Systems (GIS) (Fig. 1). We assessed routes prior to surveys for suitability, routes were shortened to 20 miles, and some routes required minor adjustments to accommodate safe driving while conducting the survey. We surveyed routes in July by driving 20 miles per hour, starting no sooner than 30 minutes after sunset and ending no later than 11:00 PM. One Binary Acoustics AR125 detector installed inside a section of 6-inch PVC pipe was affixed with a magnet to the roof of each survey vehicle. SPECT'R III software recorded detected bat detections as *.wav files. Global Positioning System (GPS) units were time-synchronized to the track driven and location of detections using Myotisoft Transect Pro. Georeferencing these files allows for identification of specific locations for species of interest, generation of maps (Fig. 2), and understanding of changes in distribution. The settings used in SPECT'R III are provided in Figure 3.

The SPECT'R III settings vary from those used during the 2013 pilot year to be congruent with NABat and other regional surveys, and to more accurately assess individual calls. Specifically, the snapshot duration and idle timeout settings were set at 1 second for 2013 and has been changed to a snapshot duration of 5 seconds and a 2 second idle timeout to collect longer and more complete bat call sequences. This likely will produce better call classification and reduce bias on abundance of calls (where long calls counted >1 time). These snapshot duration and idle timeout settings should not be changed in future years if comparing the number of files generated between years as an index of bat activity is desired.

We used SCAN'R software and SonoBat Batch Scrubber medium filter to selectively remove files that did not contain bat detections (defined as ≥1 echolocation pulse). After SCAN'R and SonoBat identified the *.wav files considered to contain bat detections, we used SonoBat 3 and manually deleted files we visually deemed not to be actual bat detections (i.e., interference). This final number of actual bat detections recorded was then used as our index of bat activity. These accepted *.wav files were then passed through the SonoBat Batch Classifier tool to determine the most likely species. We used the SonoBat 'consensus decision' category results rather than the 'by vote' or 'mean classification' for species identification because consensus accepts the identification only when there is agreement (or consensus) between those 2 and therefore is presumably the most accurate and should result in stronger confidence. The settings used in SonoBat Batch Classifier for this year are provided in Figure 4.

Files that were identified by SonoBat Batch Classifier as an endangered, threatened, rare, or undocumented bat species were then teased out and visually compared to reference bat detections provided in SonoBat by 2 independent observers. The independent determinations made by the 2 observers were then compared and discussed. If the observers both concurred that the files still appeared to be from an endangered, threatened, rare, or undocumented bat species it was sent to Janet Tyburec an expert in identifying bat acoustic detections. If the pulses within a file were not identifiable to species or the observers could not come to a consensus, we deferred to species guilds, which were determined by the software (e.g., EPFU/LANO, evening bat; *Nycticeius humeralis* [NYHU]/LABO, *Myotis* spp., etc.).

RESULTS

2015 Data

We recorded 3,143 bat detections: 631 were classified as high frequency bat detections (*Myotis* spp., PESU, LABO, and NYHU) and 2,031 were classified as low frequency bat detections (EPFU, LANO, and LACI) (Tables 2 and 3). Bat activity averaged 87.3 detections per route, with a range of 22 to 169 bat detections per route (Fig. 5, Table 4). Six of 9 species known to occur in Pennsylvania were recorded. Nearly 58% of bat detections were not identifiable to species (NoID; 57.8%; n = 1,818). Of the 1,202 files that were identified to species, the majority were big brown bat EPFU (n=810; 67.%), followed by LABO (n=161; 13.4%), LACI (n=138; 11.5%), LANO (n=83; 6.9%), PESU (n=7; 0.6%), NYHU (n=2; 0.2%), and MYSE (n=1; 0.1%) (Table 2). A total of 85 files were originally identified as an endangered, threatened, rare, or undocumented bat species in Pennsylvania. However, after the visual check by the 2 independent observers only 4 were convincing enough to send out for expert identification. Although not historically common in Pennsylvania, 2 files from 2 separate routes were determined (and secondarily verified) to be NYHU, with routes located in the Northeast and Southcentral regions. A total of 123 (3.9%) bat detections were not identified to species but were identified to a guild of species with very similar pulse characteristics (e.g. EPFU/LANO, NYHU/LABO, *Myotis* spp.) (Fig. 6).

Cumulative Data

There is substantial variation within routes between years (Fig. 5), but the average detections per route is similar (81.5 in 2014 and 87.3 in 2015 [$p = 0.31$], Table 4). Percentage of bat detections by species within and between years was similar in that EPFU was the most common species, followed by LACI or LABO, and LANO. Six of 9 species known to occur in Pennsylvania were recorded in 2015 compared to 5 species recorded in 2014. These data can also be used to indicate species activity and eventually compared long term to evaluate trends in bat activity per route. For example, the highest number of LABO detections were within 1 route located in southcentral Pennsylvania for both years ($n = 86$; Fig. 7). One (0.03%) *Myotis* spp. guild and 1 (0.03%) MYSE detection occurred in 2015 compared to no Myotis bat detections during 2014. From 2014 to 2015, the relative percentage of EPFU, LABO, NYHU, and MYSE detections increased, LACI and LANO decreased, and PESU remained the same (Table 5; Fig. 8).

Species detection was heavy toward EPFU, followed by migratory bat species (Fig. 8 and 9). Interestingly, EPFU is a cave-dwelling species showing decline as a result of WNS. However, some studies have shown that EPFU may be less susceptible to WNS (Frank et al. 2014) possibly due to larger body size and tendency to congregate in smaller clusters during hibernation. Further, increasing mean body mass index (BMI) has been detected in fall swarming MYLU (Hauser et al. 2014). These observations suggest that current survivors of WNS may demonstrate behavioral or physiological plasticity that potentially may lead to population stability or growth. In Pennsylvania, preliminary results from roost surveys conducted through the Appalachian bat counts indicate historic roost sites have converted from MYLU to EPFU (Zalik 2016). The only other cave-dwelling species we detected during our survey were MYSE and PESU, but we detected these species in comparatively low proportion in both 2014 (MYSE $n = 0$; 0%, PESU $n = 6$; 0.6%) and 2015 (MYSE $n = 1$; 0.05%, PESU $n = 13$; 0.6%). Our results further support that EPFU may be the least impacted of Pennsylvania's cave-dwelling species supporting Frank el al.'s 2014 hypothesis that EPFU is highly resistant to WNS. Long-term acoustic surveys will serve as an additional, independent effort to detect bat population trends.

RECOMMENDATIONS

Protocol

Settings used in SPECT'R, such as snapshot duration of 5 seconds, idle timeout of 2 seconds, and others in this report (Fig. 3) should be used throughout the life of this project. This project does not follow all recommendations provided within the draft NABat protocol (Loeb et. al 2014). Routes were not surveyed twice within 1 week in both June and July and route selection protocols differed. NABat protocols will be considered to enable our data to be used in regional bat population assessments.

Data Processing and Storage

"Archived Data" and "Final Data" folders should be retained in the event other analyses of the raw data are desired in the future or we want to re-examine the final results without reanalyzing all data.

Potential Endangered, Threatened, Rare or Undocumented Files in Pennsylvania

Bat detections in which independent visual identifications corroborate a possible endangered, threatened, rare, or undocumented bat species detection in Pennsylvania, will continue to be sent out for expert verification.

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Table 1. List of species common names, binomial name, and 4 letter code.

Common Name	**Binomial Name**	**4 Letter Code**
Little Brown Bat	*Myotis lucifugus*	MYLU
Northern Long-eared Bat	*Myotis septentrionalis*	MYSE
Small-footed Bat	*Myotis leibii*	MYLE
Indiana Bat	*Myotis sodalis*	MYSO
Tri-colored Bat	*Perimyotis subflavus*	PESU
Big Brown Bat	*Eptesicus fuscus*	EPFU
Red Bat	*Lasiurus borealis*	LABO
Hoary Bat	*Lasiurus cinereus*	LACI
Silver-haired Bat	*Lasionycteris noctivagans*	LANO
Evening Bat	*Nycticeius humeralis*	NYHU

Table 2. Number of bat detections (and percent) by Pennsylvania Game Commission Region in 2015.

Region	Total Detections	High Freq.	Low Freq.	MYOTIS SPP	MYSE	EPFU	PESU	LABO	LACI	LANO	NYHU	NOID	EPFU/ LANO	PESU/ LABO	LACI/ EPFU	LACI/ LANO	MYLU/ MYSO	NYHU/ LABO
NC[a]	416	86 (20.7)	279 (67.1)			135 (32.5)	3 (0.7)	14 (3.4)	14 (3.4)	7 (1.7)		235 (56.5)	6 (1.4)					2 (0.5)
NE[b]	583	109 (18.7)	422 (72.4)	1 (0.2)		158 (27.1)	1 (0.2)	16 (2.7)	39 (6.7)	21 (3.6)	1 (0.2)	328 (56.3)	14 (2.4)	1 (0.2)				3 (0.5)
NW[c]	429	103 (24.0)	276 (64.3)			105 (24.5)	1 (0.2)	32 (7.5)	24 (5.6)	16 (3.7)		221 (51.5)	21 (4.9)			2 (0.5)	1 (0.2)	6 (1.4)
SC[d]	675	154 (22.8)	380 (56.3)			167 (24.7)	1 (0.1)	48 (7.1)	16 (2.4)	6 (0.9)	1 (0.1)	417 (61.8)	10 (1.5)		1 (0.1)			8 (1.2)
SE[e]	718	83 (11.6)	466 (64.9)		1 (0.1)	169 (23.5)		31 (4.3)	22 (3.1)	27 (3.8)		435 (60.6)	26 (3.6)		2 (0.3)	1 (0.1)	1 (0.1)	3 (0.4)
SW[f]	322	96 (29.8)	208 (64.6)			76 (23.6)	1 (0.3)	20 (6.2)	23 (7.1)	6 (1.9)		182 (56.5)	6 (1.9)		1 (0.3)	2 (0.6)		5 (1.6)
Total	3143	631 (20.1)	2031 (64.6)	1 (0.0)	1 (0.0)	810 (25.8)	7 (0.2)	161 (5.1)	138 (4.4)	83 (2.6)	2 (0.1)	1818 (57.8)	83 (2.6)	1 (0.0)	4 (0.1)	5 (0.2)	2 (0.1)	27 (0.9)

[a] Northcentral Region
[b] Northeast Region
[c] Northwest Region
[d] Southcentral Region
[e] Southeast Region
[f] Southwest Region

Table 3. Number (percent) of bat detections per route surveyed in 2015.

Routes	Date	Total Detections	High Freq.	Low Freq.	MYOTIS SPP	MYSE	EPFU	PESU	LABO	LACI	LANO	NYHU	NOID	EPFU/ LANO	PESU/ LABO	LACI/ EPFU	LACI/ LANO	MYLU/ MYSO	NYHU/ LABO
NC01	20150716	53	12 (22.6)	39 (73.6)			25 (47.2)		1 (1.9)				27 (50.9)						
NC02	20150727	102	13 (12.7)	58 (56.9)			35 (34.3)		5 (4.9)	2 (2.0)	4 (3.9)		56 (54.9)						
NC03	20150729	77	11 (14.3)	62 (80.5)			24 (31.2)			5 (6.5)	2 (2.6)		45 (58.4)	1 (1.3)					
NC04	20150707	22	7 (31.8)	14 (63.6)			4 (18.2)		1 (4.5)				16 (72.7)	1 (4.5)					
NC05	20150713	74	26 (35.1)	43 (58.1)			12 (16.2)	3 (4.1)	3 (4.1)	2 (2.7)			52 (70.3)	1 (1.4)					1 (1.4)
NC06	20150723	88	17 (19.3)	63 (71.6)			35 (39.8)		4 (4.5)	5 (5.7)	1 (1.1)		39 (44.3)	3 (3.4)					1 (1.1)
NE01	20150715	47	27 (57.4)	15 (31.9)	1 (2.1)		1 (2.1)		3 (6.4)	4 (8.5)			38 (80.9)						
NE02	20150708	95	8 (8.4)	75 (78.9)			25 (26.3)		3 (3.2)		1 (1.1)		65 (68.4)	1 (1.1)					
NE03	20150713	73	6 (8.2)	61 (83.6)			28 (38.4)		2 (2.7)	8 (11.0)	3 (4.1)		31 (42.5)	1 (1.4)					
NE04	20150722	59	11 (18.6)	45 (76.3)			15 (25.4)		2 (3.4)	8 (13.6)	3 (5.1)		30 (50.8)	1 (1.7)					
NE05	20150723	162	33 (20.4)	114 (70.4)			43 (26.5)	1 (0.6)	3 (1.9)	16 (9.9)	4 (2.5)		87 (53.7)	6 (3.7)	1 (0.6)				1 (0.6)
NE06	20150720	147	24 (16.3)	112 (76.2)			46 (31.3)		3 (2.0)	3 (2.0)	10 (6.8)	1 (0.7)	77 (52.4)	5 (3.4)					2 (1.4)
NW01	20150715	33	4 (12.1)	23 (69.7)			11 (33.3)		2 (6.1)	1 (3.0)			18 (54.5)	1 (3.0)					
NW02	20150721	78	24 (30.8)	44 (56.4)			23 (29.5)	1 (1.3)	7 (9.0)	1 (1.3)	3 (3.8)		37 (47.4)	3 (3.8)					3 (3.8)
NW03	20150712	50	5 (10.0)	38 (76.0)			9 (18.0)		1 (2.0)	7 (14.0)	2 (4.0)		27 (54.0)	2 (4.0)			2 (4.0)		
NW04	20150708	49	8 (16.3)	37 (75.5)			15 (30.6)		4 (8.2)	2 (4.1)	2 (4.1)		20 (40.8)	5 (10.2)					1 (2.0)
NW05	20150709	131	33 (25.2)	83 (63.4)			25 (19.1)		10 (7.6)	4 (3.1)	5 3.8)		76 (58.0)	8 (6.1)				1 (0.8)	2 (1.5)
NW06	20150716	88	29 (33.0)	51 (58.0)			22 (25.0)		8 (9.1)	9 (10.2)	4 (4.5)		43 (48.9)	2 (2.3)					

Table 3. cont.

Routes	Date	Total Detections	High Freq.	Low Freq.	MYOTIS SPP	MYSE	EPFU	PESU	LABO	LACI	LANO	NYHU	NOID	EPFU/ LANO	PESU/ LABO	LACI/ EPFU	LACI/ LANO	MYLU/ MYSO	NYHU/ LABO
SC01	20150712	113	31 (27.4)	62 (54.9)			34 (30.1)		6 (5.3)	1 (0.9)		1 (0.9)	65 (57.5)	1 (0.9)					5 (4.4)
SC02	20150723	131	69 (52.7)	31 23.7)			18 (13.7)		25 (19.1)	1 (0.8)			84 (64.1)	1 (0.8)					2 (1.5)
SC03	20150727	134	5 (3.7)	77 (57.5)			39 (29.1)		2 (1.5)	3 (2.2)	3 (2.2)		81 (60.4)	6 (4.5)					
SC04	20150720	126	19 (15.1)	89 (70.6)			31 (24.6)	1 (0.8)	5 (4.0)	9 (7.1)	2 (1.6)		77 (61.1)	1 (0.8)					
SC05	20150705	102	22 (21.6)	69 (67.6)			29 (28.4)		6 (5.9)		1 (1.0)		63 (61.8)	1 (1.0)		1 (1.0)			1 (1.0)
SC06	20150715	69	8 (11.6)	52 (75.4)			16 (23.2)		4 (5.8)	2 (2.9)			47 (68.1)						
SE01	20150729	113	2 (1.8)	78 (69.0)			33 (29.2)		1 (0.9)		3 (2.7)		73 (64.6)	3 (2.7)					
SE02	20150722	89	7 (7.9)	62 (69.7)			14 (15.7)		3 (3.4)		8 (9.0)		56 (62.9)	7 (7.9)					1 (1.1)
SE03	20150715	87	26 (29.9)	44 (50.6)			24 (27.6)		9 (10.3)	4 (4.6)			45 (51.7)	2 (2.3)		1 (1.1)		1 (1.1)	1 (1.1)
SE04	20150720	142	26 (18.3)	91 (64.1)			34 (23.9)		12 (8.5)	3 (2.1)	4 (2.8)		84 (59.2)	4 (2.8)			1 (0.7)		
SE05	20150719	169	10 (5.9)	112 (66.3)		1 (0.6)	37 (21.9)		3 (1.8)	5 (3.0)	9 (5.3)		108 (63.9)	6 (3.6)					
SE06	20150710	118	12 (10.2)	79 (66.9)			27 (22.9)		3 (2.5)	10 (8.5)	3 (2.5)		69 (58.5)	4 (3.4)		1 (0.8)			1 (0.8)
SW01	20150722	66	24 (36.4)	40 (60.6)			13 (19.7)	1 (1.5)	6 (9.1)	8 (12.1)	1 (1.5)		34 (51.5)	1 (1.5)			1 (1.5)		1 (1.5)
SW02	20150716	67	29 (43.3)	32 (47.8)			14 (20.9)		4 (6.0)	6 (9.0)	2 (3.0)		36 (53.7)	1 (1.5)			1 (1.5)		3 (4.5)
SW03	20150711	26	5 (19.2)	20 (76.9)			6 (23.1)			1 (3.8)	3 (11.5)		15 (57.7)	1 (3.8)					
SW04	20150710	42	6 (14.3)	34 (81.0)			14 (33.3)		3 (7.1)	4 (9.5)			21 (50.0)						
SW05	20150715	37	12 (32.4)	20 (54.1)			3 (8.1)		2 (5.4)	1 (2.7)			30 (81.1)	1 (2.7)					
SW06	20150720	84	20 (23.8)	62 (73.8)			26 (31.0)		5 (6.0)	3 (3.6)			46 (54.8)	2 (2.4)		1 (1.2)			1 (1.2)
Total		3143	631 (20.1)	2031 (64.6)	1 (0.0)	1 (0.0)	810 (25.8)	7 (0.2)	161 (5.1)	138 (4.4)	83 (2.6)	2 (0.1)	1818 (57.8)	83 (2.6)	1 (0.0)	4 (0.1)	5 (0.2)	2 (0.1)	27 (0.9)

Table 4. Average bat detections per route.

Year	Total detections	Ave detections per route (95% CI)
2014	2935	81.5 (70.9, 92.1)
2015	3143	87.3 (74.6, 100.0)

Table 5. Relative percentage of each species identified in 2014 and 2015.

Species	2014 (%)	2015 (%)	% change
EPFU	67.0	67.4	0.6
LABO	11.3	13.4	18.6
LACI	14.0	11.5	-17.9
LANO	7.1	6.9	-2.8
PESU	0.6	0.6	100.0
NYHU	0.0	0.2	100.0
MYSE	0.0	0.1	100.0

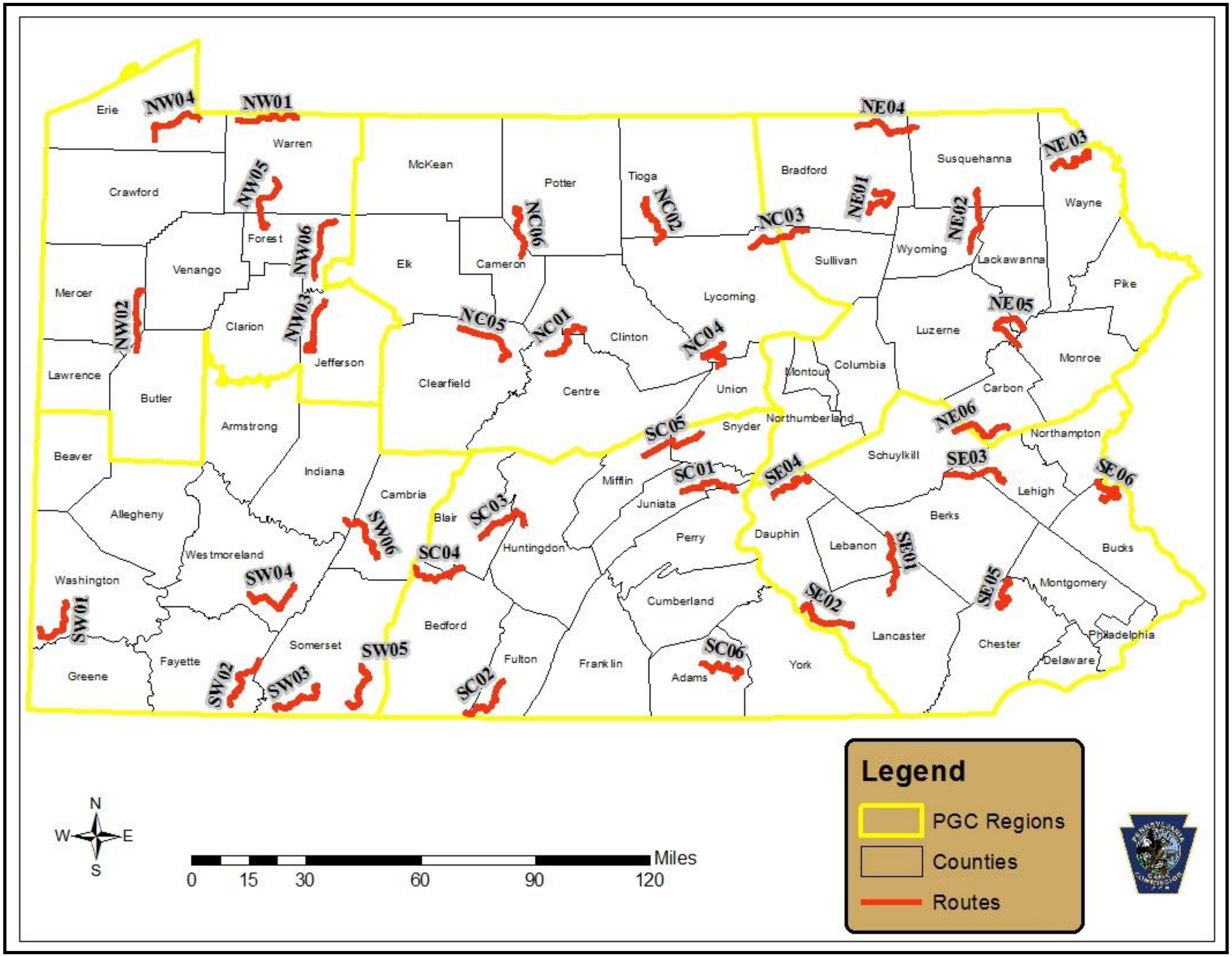

Figure 1. Map of the 36 routes surveyed.

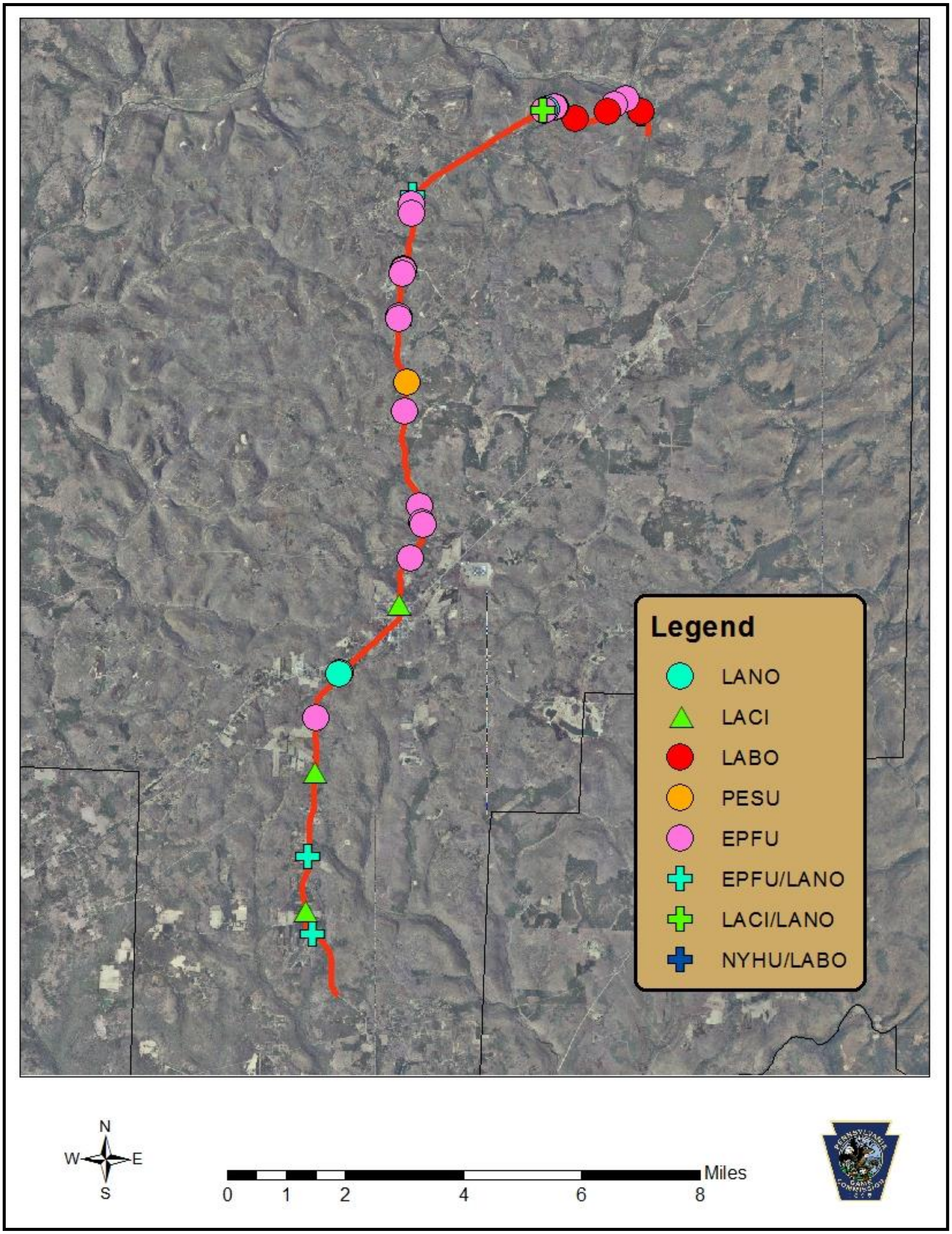

Figure 2. Detections from route NW06, surveyed on 29 July 2014, provided as an example.

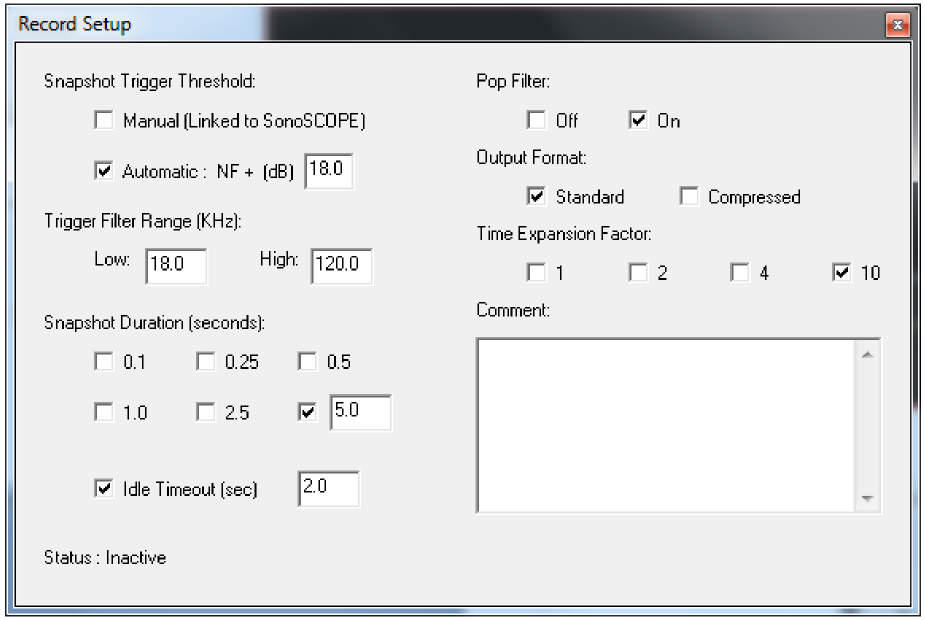

Figure 3. Screenshot of SPECT'R III settings used for analyses.

Figure 4. Screenshot of SonoBat Batch Classifier settings used for analyses.

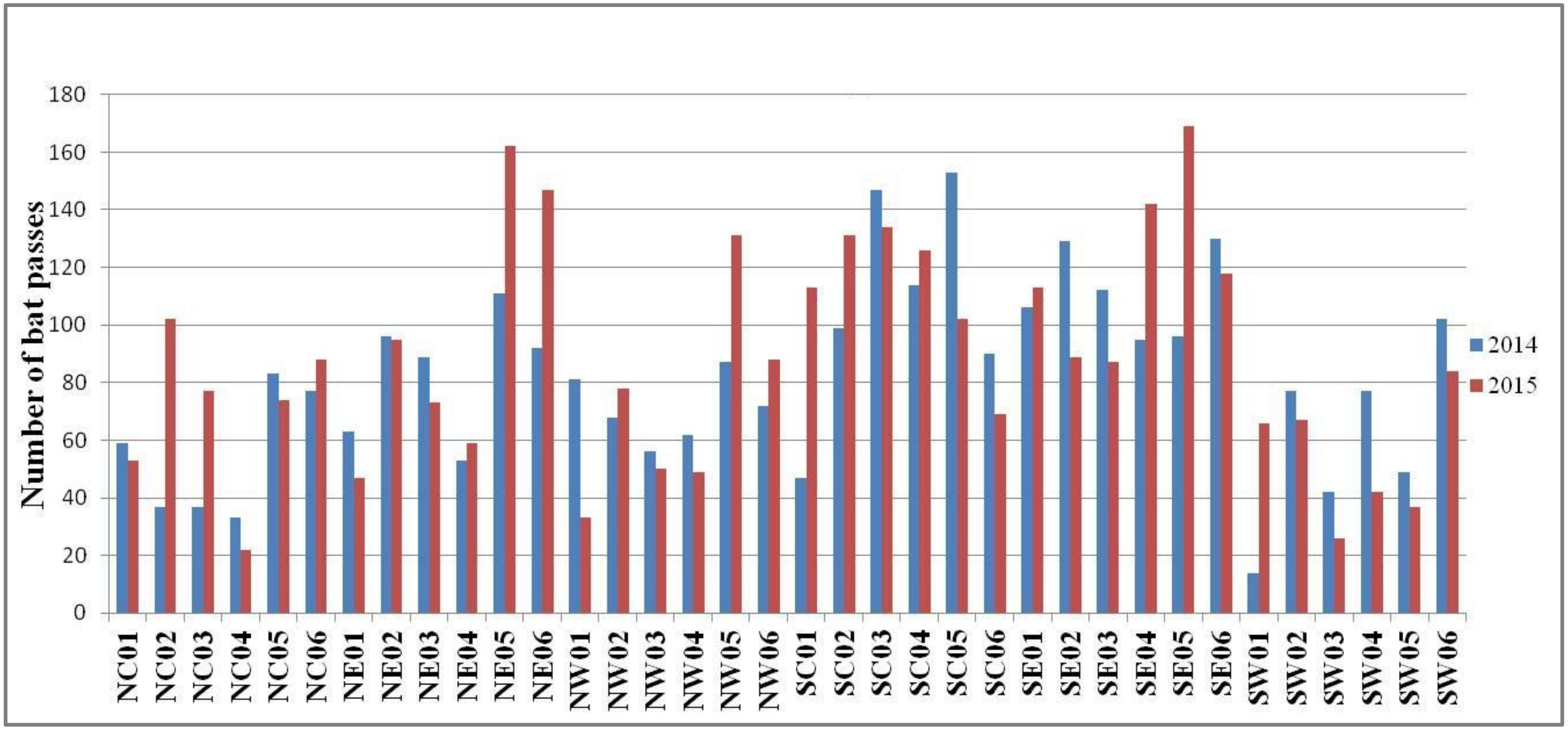

Figure 5. Bat activity per route for 2014 & 2015. *Route SW01 was a partial route in 2014.

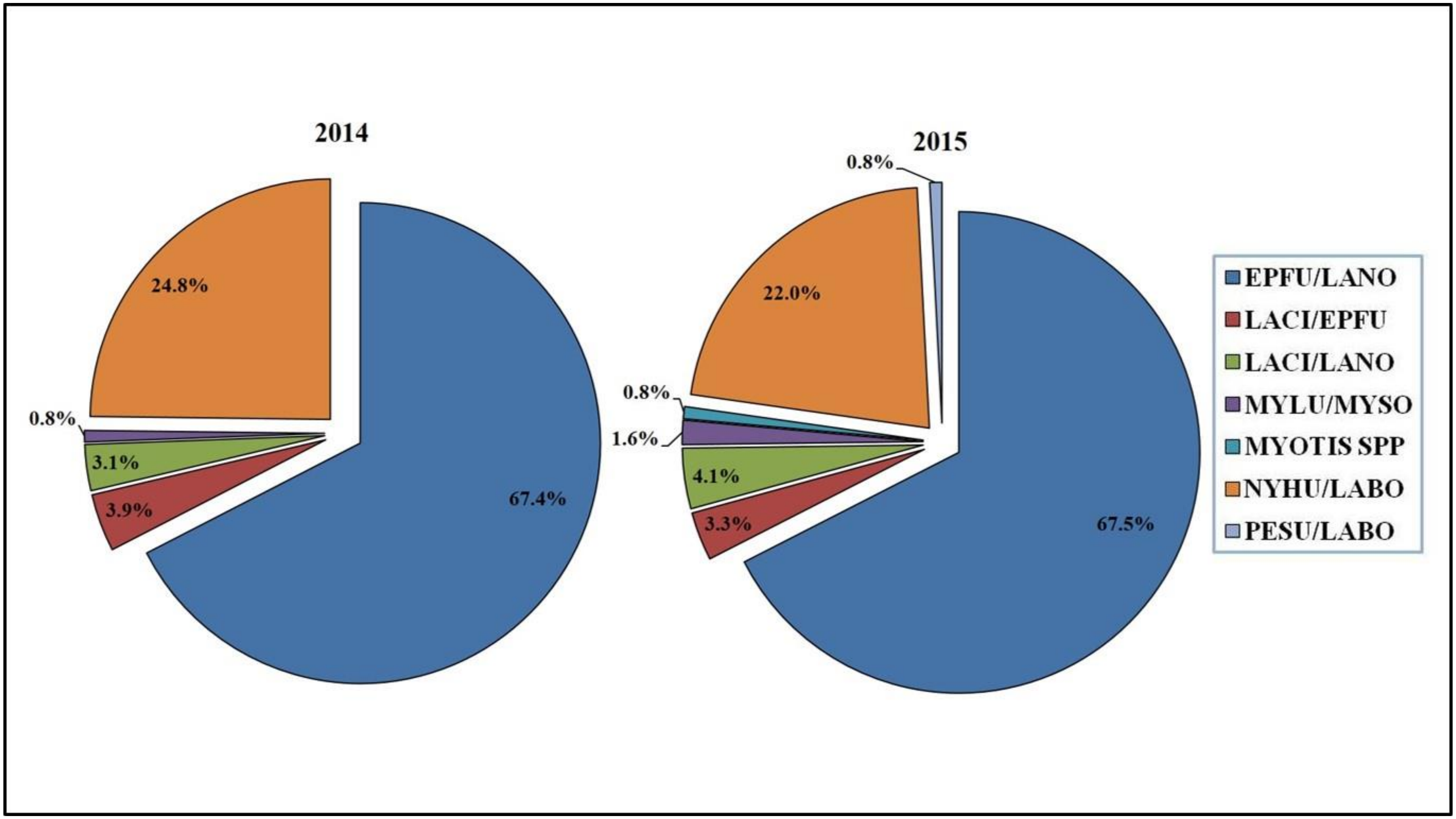

Figure 6. Percentage of bat detections identified by guild in 2014 and 2015.

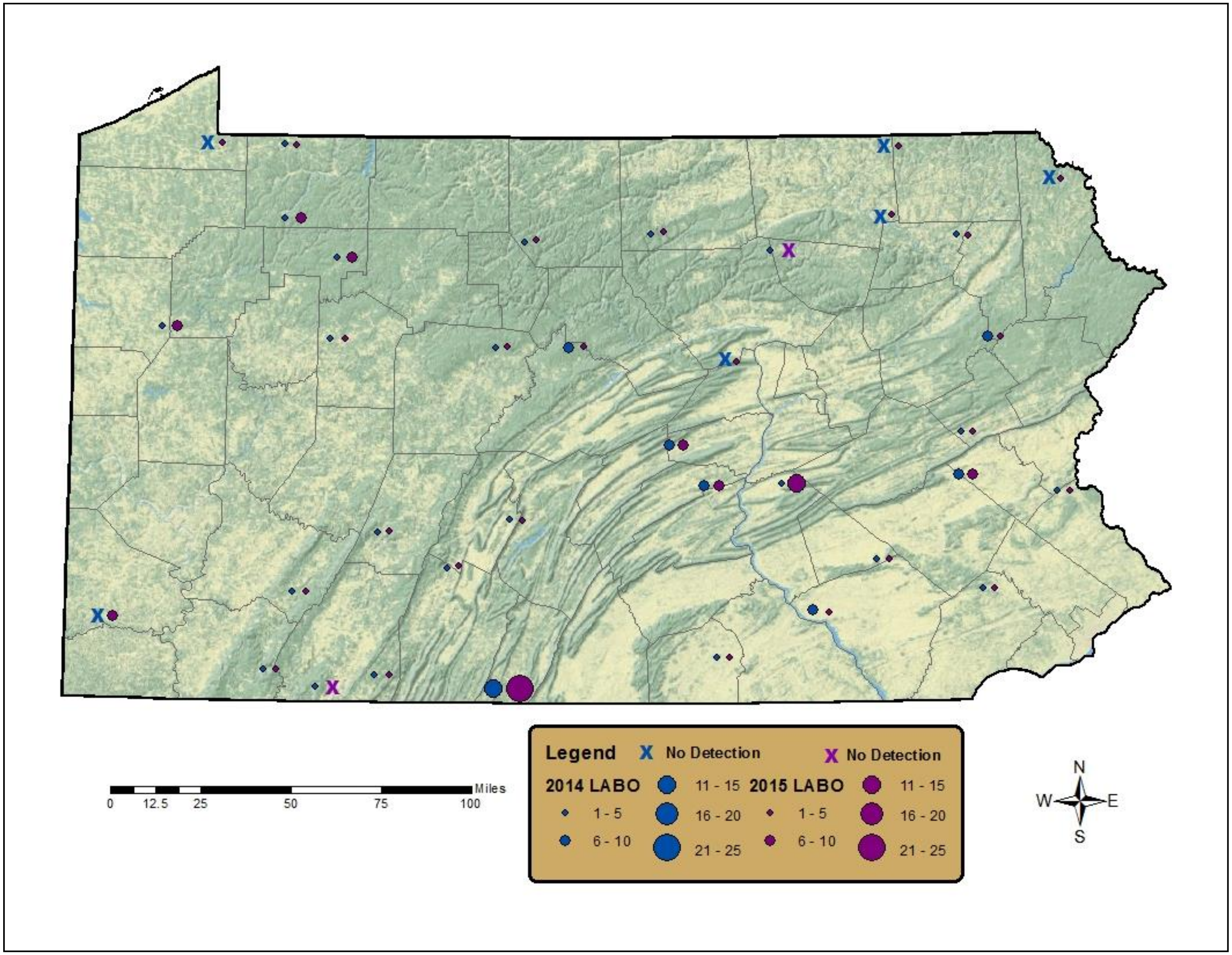

Figure 7. Map showing number of LABO detections between 2014 and 2015.

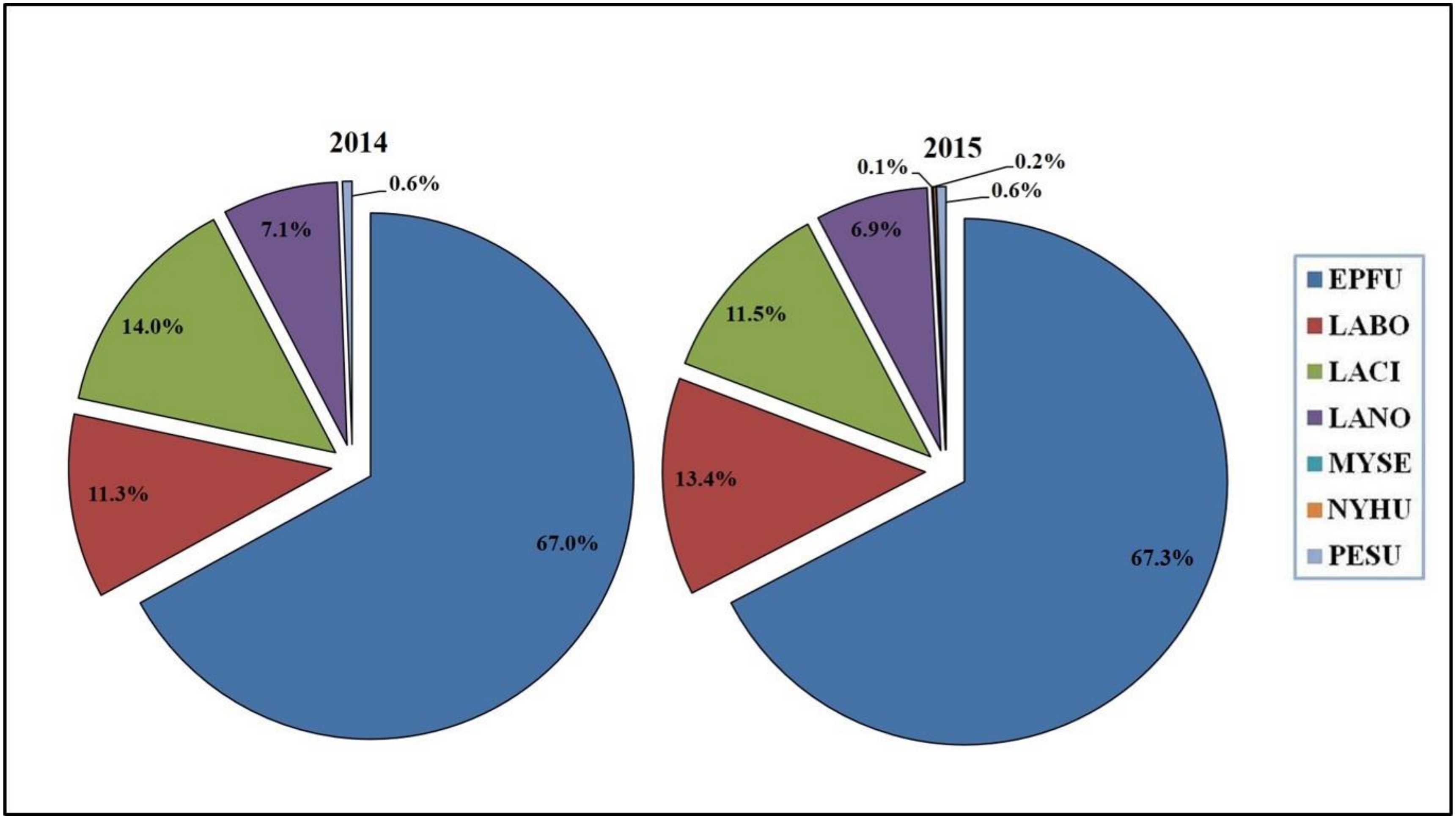

Figure 8. Percentage of bat detections by species in 2014 & 2015.