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**Introduction**

Bats are an important component of Wisconsin's wildlife heritage. The eight bat species recorded in Wisconsin constitute 12% of the state's mammal diversity. The Wisconsin Wildlife Action Plan (WAP) recognizes 14 mammal Species of Greatest Conservation Need, including four bat species (hoary bat, eastern red bat, silver-haired bat, and northern long-eared bat). As of June 1, 2011, all four cave bats (excluding the federally endangered Indiana bat) have been listed as state threatened species, and are therefore protected under the Wisconsin endangered species act (WI WNS Implementation Strategy 2011).

In 2007 the Wisconsin Bat Program initiated the first mobile acoustic bat surveys in Wisconsin in order to inform our knowledge of species ranges and determine statewide relative abundance. Since that time, White-nose Syndrome (WNS), which is produced by a cold-loving fungus that causes mortality in hibernating bats, was found in New York and has quickly spread to 25 US States and five Canadian Provinces. The lack of information and unprecedented mortality has increased the need for coordinated bat population monitoring beyond the exploratory surveys completed thus far in Wisconsin.

Since 2007, land managers, conservation groups and volunteers have had the opportunity to conduct acoustic bat surveys in Wisconsin by using one of the 30 bat detection systems available throughout the state. The use of bat detectors provides detailed species-specific ecological data which is a non-invasive and cost-effective method for monitoring multiple bat species simultaneously at large spatial scales. Until recently, surveys have been land-based walking routes or water-based paddling/trolling routes. In 2013, the Wisconsin Bat Program expanded its offering of bat surveying opportunities by adding 38 driving bat surveys (transects). This report summarizes the methods and results from the driving survey transects that were conducted in Wisconsin in 2013.

**Methods**

Over 20 states in the US have conducted acoustic driving transects that range from 20 to 30 miles per survey. The protocol, which was developed by Dr. Eric Britzke, involves driving a pre-determined route with a roof-mounted microphone attached to a bat detection system. Unfortunately minimal guidance was provided on where surveys should be conducted, although recent work by the Bat Population Monitoring Group aims to better define the sampling area. In order to identify the most appropriate sampling area in Wisconsin, 38 driving transects were developed in each of the 16 ecological landscapes rather than using the politically-shaped county boundaries (Figure 1). Ecological landscapes were developed to identify the best areas of the state to manage for different natural communities, key habitats, aquatic features, and native plants and animals using an ecosystem management perspective.

In addition to using the ecological landscapes to determine transect placement, pre-existing lake and river routes were considered, and if possible the driving transect was placed on suitable roads near or adjacent to the existing waterway routes.

The acoustic detection system passively records bat activity by detecting ultrasonic echolocation calls emitted as bats forage and navigate across the landscape. These echolocation calls are saved on either a hand-held computer (personal data assistant) or directly to a compact flash card.

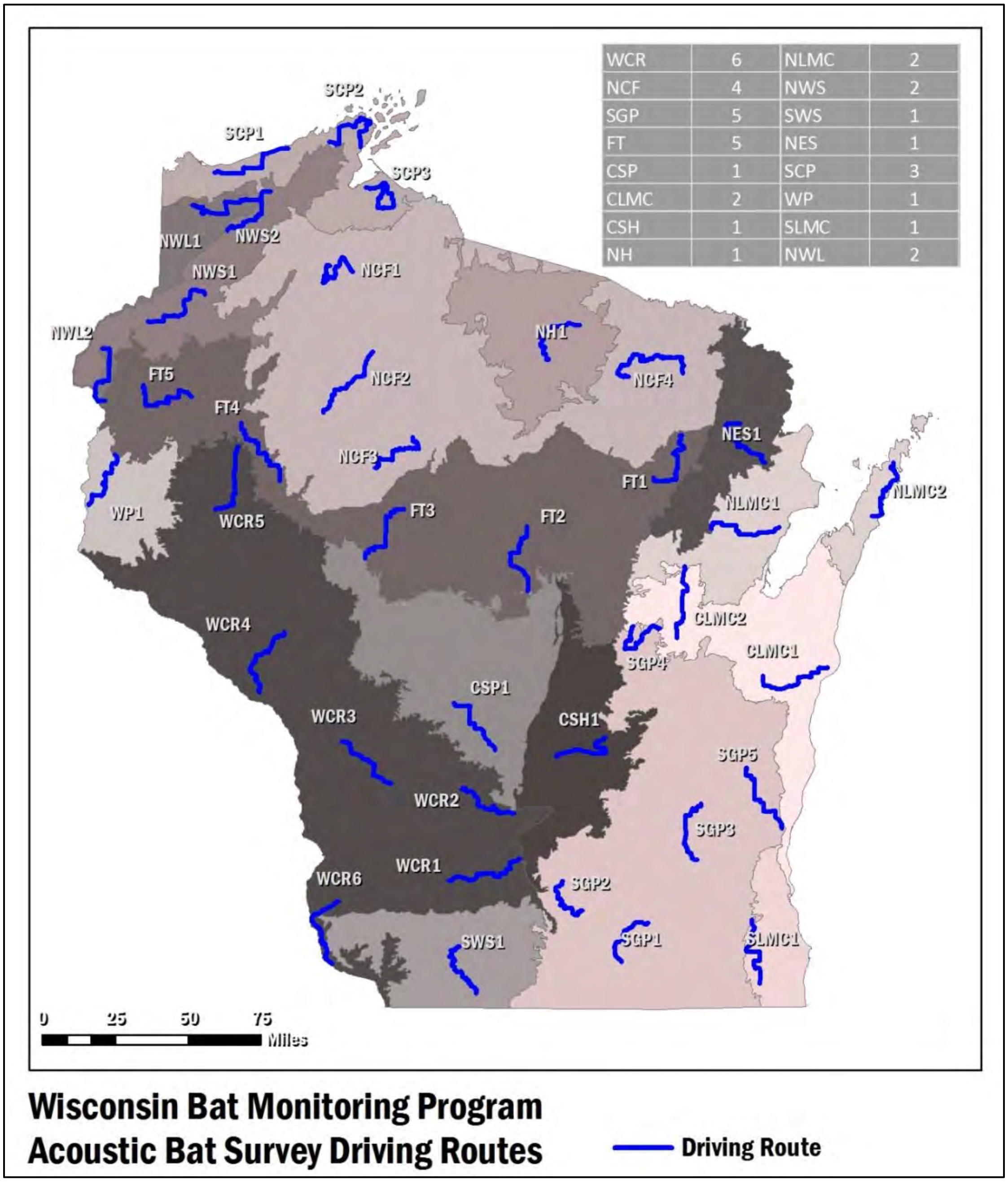


**Figure 1. Acoustic bat survey driving routes (n=38) seperated by ecological landscape.**

Surveyed routes in 2013 were driven one to five times across a six-week window, beginning June 1 and ending July 15***.*** Surveys began approximately 30 minutes after local sunset time and were driven at a target of 20 miles per hour. Of the 38 routes, 31.4 miles was the mean driving length, with the greatest distance being 45.5 miles (NCF4) and the shortest distance being 24.6 miles (SGP2) with at least one route driven in each ecological landscape. Routes were to be completed at least once during the three primary survey periods: June 1 - June 15, June 16 - June 30 and July 1- July 15. There was a minimum of five days between replicates of the same transect. Routes were surveyed on evenings with weather conditions suitable for bat activity which included low wind (<30 mph), no precipitation and a daytime temperature of 50F° or above. Survey equipment included the roof-mounted microphone, an AnaBat SD1/2 bat detector, a hand-held computer to interface with the Anabat SD1/2, a compact flash GPS unit to record the location of each acoustic file, and other appropriate items (instructions, route maps, datasheets, batteries and cables).

Acoustic files were analyzed using Titley Scientific AnalookW (version 3.8.17). Surveys were manually filtered to separate files containing bat encounters and ignore those with only extraneous noise from insects, birds, wind, road noise, and other sources of static. Files with bat encounters were then categorized into one of the following seven species or species group categories: (1) hoary (*Lasiurus cinereus*), (2) big brown (*Eptesicus fuscus*), (3) silver-haired (*Lasionycteris noctivagans*), (4) eastern red (*L. borealis*), (5) eastern pipistrelle (*Perimyotis subflavus*), (6) little brown (*Myotis lucifugus),* (7) northern long-eared (*Myotis septentrionalis*), (8) big brown/silver-haired, (9) eastern pipistrelle/eastern red, (10) little brown/northern long-eared, (11) low frequency and (12) high frequency. Low and high frequency bat passes were later grouped as unclassified encounters because one of the following scenarios: there were too few calls recorded to further separate, the calls were of low quality recording (fragmented), the bat pass did not contain search-phase calls, or general uncertainty. In order to compare our results to other state-wide acoustic inventories, results were evaluated using a calls per detector-hour metric to mitigate for variations in driving speeds among surveyors.

**Results**

The 2013 acoustic driving survey effort was a testament to the great partnerships the Wisconsin Bat Program (WBP) has created as nearly two-thirds of the transects were conducted by surveyors outside of the WBP. One hundred surveys were conducted by six Wisconsin Department of Natural Resources' staff members, one Bad River Department of Natural Resources biologist (Tribal), 11 U.S. Forest Service biologists and 38 volunteers. Of those surveys, 92 returned complete acoustic results. At least one survey was completed on each of the 38 driving transects. Although due to technical difficulties, eight surveys were incomplete and were not included in the results, leaving valid data for 37 of the 38 routes. Technical issues ranged from loss of GPS data to surveyor error when setting the record options. 24,223 files were recorded on 92 surveys, 5,870 files were identified as bat encounters. Surveys had a mean of 35.1 bat calls per detector-hour, with a minimum of 4.6 (FT3 on 26 June) and a maximum of 128.5 (CSH1 on 5 July). The number of call files per completed survey had a mean of 63.8 and ranged from 8 (FT3 on 26 June on 30 May) to 208 (CSH1 on 5 July). The number of bat calls per survey trended upward from the beginning of the survey window in early June until the completion of surveying in mid-July (Figure 3).

Nearly a third of completed surveys (30.4%) had between 26-50 bat encounters detected, while 20.7% of completed surveys had between 51-75 bat encounters detected (Figure 2) (Table 1).

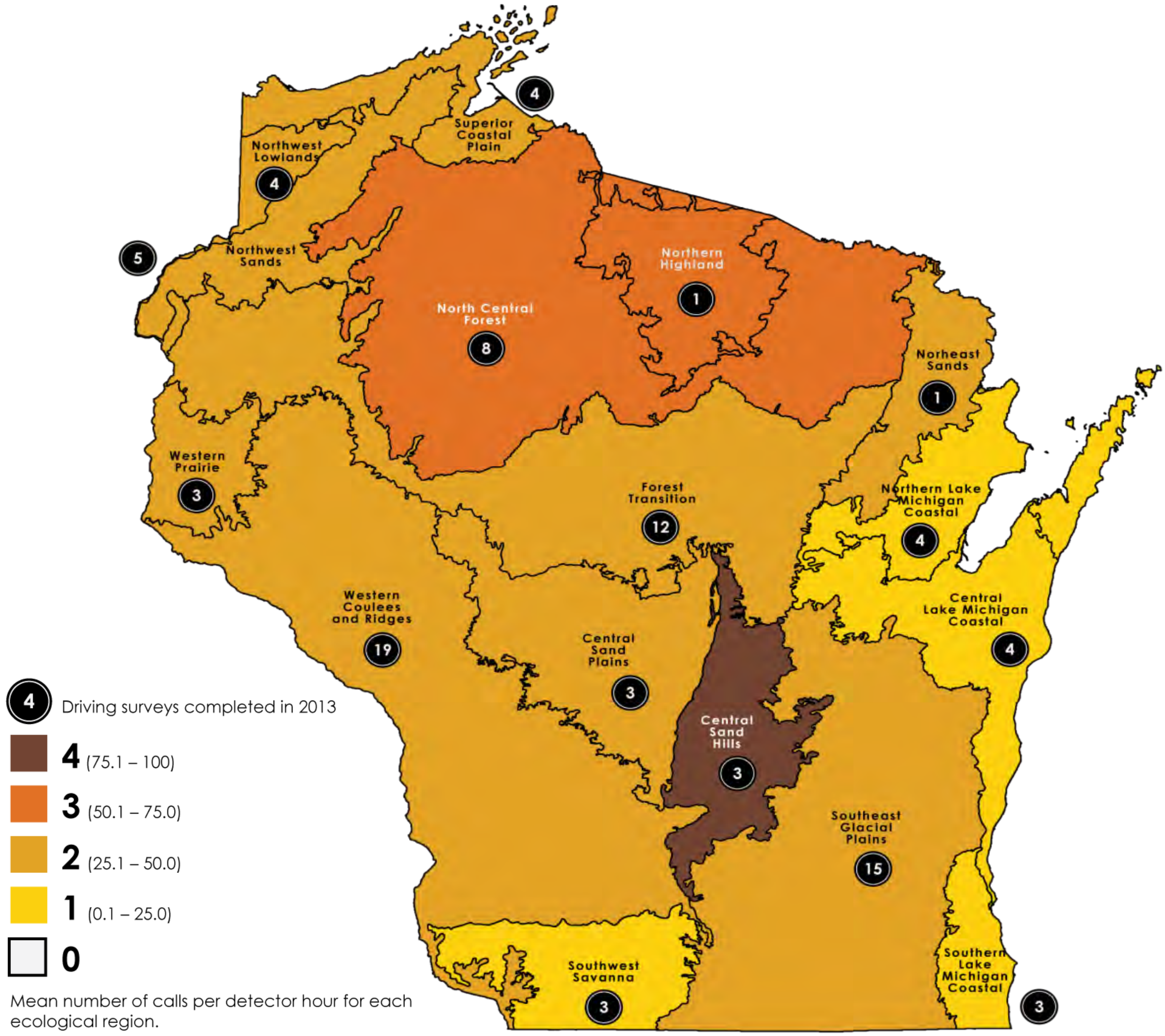


**Figure 2. MEAN CALLS PER DETECTOR HOUR**
**The ecological region with the highest rate of mean calls per detector hour was the Central Sand Hills ecological region with 81.24 calls per detector hour. Only three ecological regions averaged more than 50 calls per detector hour (Northern Highland, North Central Forest and Central Sand Hills). Two of the ecological regions averaged less than 15 calls per detector hour (Southwest Savanna and Southern Lake Michigan Coastal).**

Of the 5,870 encounters, 2,699 were classified into species groups: high frequency group (940), low frequency group (547), big brown/silver-haired (813), eastern red/eastern pipistrelle (153) and little brown/northern long-eared (246) because the bat passes have similar characteristics to two or more species. The remaining 3,171 files were classified as little brown (34.3%), big brown (30.4%), eastern red (20.1%), hoary (11.4%), silver-haired (3.4%), eastern pipistrelle (0.3%) and the northern long-eared bat (0.1%). The big brown bat was the most commonly encountered in 8 of the 16 ecological regions, followed by the little brown bat (n=6), eastern red bat (n=1) and the hoary bat (n=1) (Figure 5) (Table 2).

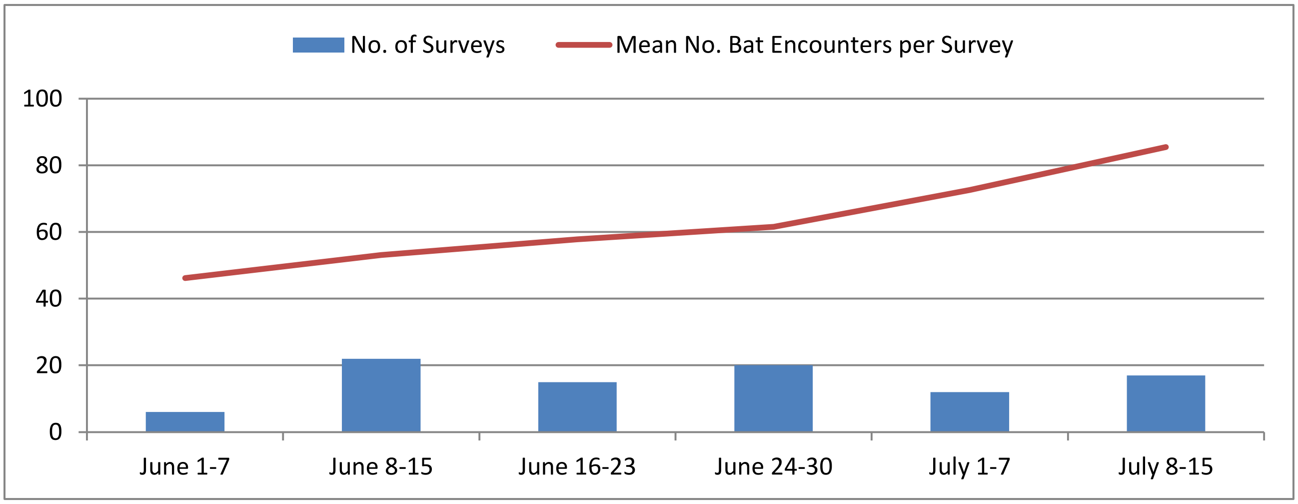


**Figure 3. Total number of surveys by week and average number of bat calls per survey by week, 2013. Partial surveys (*n*=8) excluded.**

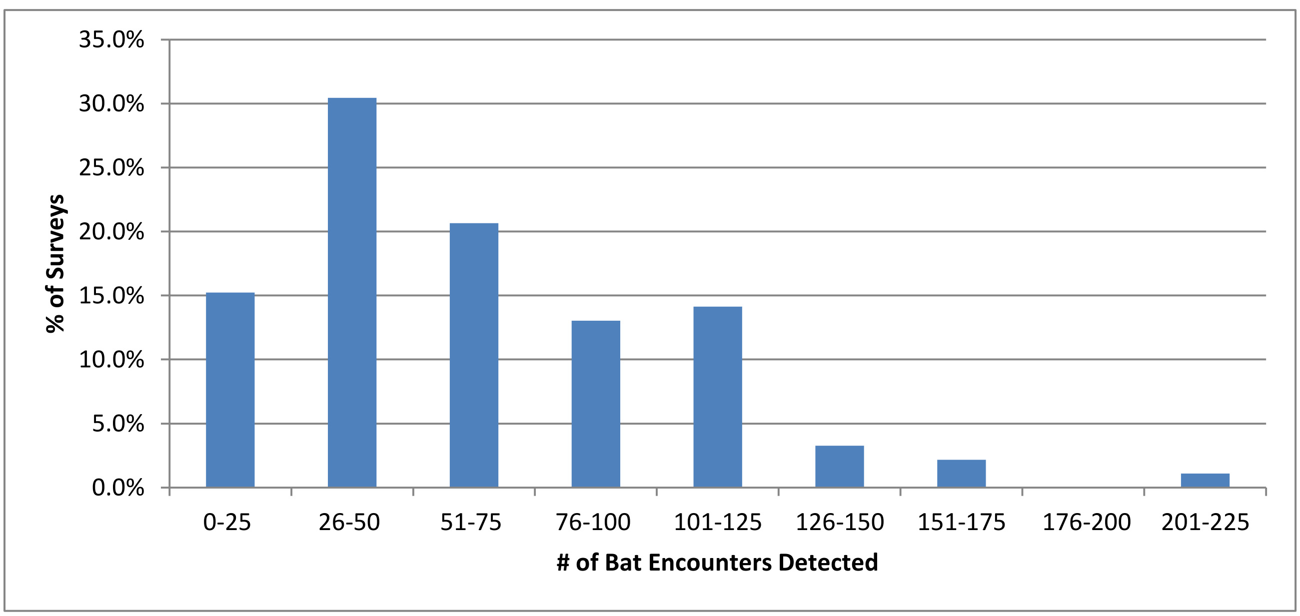


**Figure 4. Number of bat calls detected, 2013. Partial surveys (*n*=8) excluded.**

**Discussion**

Of the sixteen ecological landscapes, Lake Michigan Coastal regions (Northern, Central and Southern) produced lower than average bat calls per detector-hour rates which is conceivably due to the loss of habitat along densely populated urban areas and/or because of the Great Lakes create a cold landscape (Jackson 1961, Kurta 1995). Only one other region (Southwest Savanna) was similar in bat detection rate. While the lower bat calls per detector-hour rate of the Southwest Savanna cannot be contributed to high-density urban areas, it is however, the region with the least amount of permanent water resources. Conversely, the three regions with the highest bats per detector-hour had the greatest proportion of permanent water resources in Wisconsin.

Overall, the inferred geographic ranges of species from driving transect results (Figures 6-12) were similar to the current understanding of bat summer ranges in Wisconsin with the exception of two species: northern long-eared bat and eastern pipistrelle.

*Northern long-eared bat*: According to Jackson (1961) northern long-eared bats are found throughout the state of Wisconsin, but are never abundant. Echolocation calls of the northern long-eared bat (NLEB) were only observed in three of the sixteen (19%) ecological landscapes representing 0.1% of the 3,171 bat encounters. Low detection rates could be a result of poor-quality echolocation calls, intensity of calls and habitat surveyed. NLEB are well-known gleaners; capturing prey from surfaces of vegetation or ground, subsequently their echolocation calls are shorter and less intense and frequent compared to other methods of hunting (Norberg and Rayner 1987; Neuweiler 1989; Hofstede 2008). Additional information also implies acoustic road transects are not a suitable method for detecting some bat species, especially gleaners or passive listening bats because intense broadband noise (vehicular traffic) that degrades suitability (Schaub 2008). Supplemental acoustic sampling using passive (unmanned) and mobile (water and walking surveys) may be useful to better determining the range of the NLEB.

*Eastern pipistrelle*: Eastern pipistrelles are primarily found in the western half of the state and are not considered a common species in Wisconsin (Jackson 1961, Kurta 1995, WDNR 2013). Both mist-netting data and acoustic data spanning seven years from both land-based (walking) and water-based routes have observed the eastern pipistrelle in the Southeast Glacial Plains (SGP) whereas none of the 15 driving routes in 2013 encountered this species. It is known that foraging habitats of the eastern pipistrelle include waterways, along forest edges and in forest canopies (Fujita and Kunz 1984). Current information from acoustic surveys (driving transects excluded), suggest a closer relationship between eastern pipistrelles and waterways than other habitats in Wisconsin, thus driving surveys may underestimate the full geographic range of this species.

All acoustic data was processed through manual examination by one staff member who has >4 years of experience in identifying Wisconsin bat species and has an extensive call library from which to reference. Due to the limitations of the use of filters and automated identification software, such as difficulties differentiating multiple bats calls with a bat pass; manual interpretation of acoustic data remains preferable at this time. Although manual interpretation is not without its disadvantages, with

**Table 1 Driving acoustic bat surveys (n=92) conducted in Wisconsin, June-July 2013. Incomplete surveys (n=8) excluded.**

| Ecological landscape | No. Surveys | Total Miles | Total detector-hours | Mean Speed (mph) | Total Calls detected | Mean Calls per detector-hour |
|---|---|---|---|---|---|---|
| **CLMC1** | 3 | 88.2 | 4.63 | 19.03 | 149 | 32.16 |
| **CLMC2** | 1 | 39.8 | 1.83 | 21.74 | 21 | 11.45 |
| **CSH1** | 3 | 89.7 | 4.85 | 18.49 | 394 | 81.24 |
| **CSP1** | 3 | 83.4 | 5.45 | 15.31 | 224 | 41.10 |
| **FT1** | 3 | 96.6 | 5.42 | 18.02 | 323 | 59.63 |
| **FT2** | 1 | 31.7 | 1.67 | 19.05 | 117 | 70.20 |
| **FT3** | 4 | 125.8 | 6.85 | 18.37 | 81 | 11.82 |
| **FT4** | 3 | 102.3 | 5.37 | 19.06 | 97 | 18.07 |
| **FT5** | 1 | 31.5 | 1.57 | 20.11 | 30 | 19.15 |
| **NCF1** | 2 | 53.3 | 4.07 | 13.12 | 219 | 53.85 |
| **NCF3** | 3 | 90.1 | 6.23 | 14.46 | 372 | 59.68 |
| **NCF4** | 3 | 137.6 | 7.47 | 18.43 | 299 | 40.04 |
| **NES1** | 1 | 32.0 | 1.67 | 19.18 | 55 | 33.00 |
| **NH1** | 1 | 30.1 | 2.05 | 14.68 | 122 | 59.51 |
| **NLMC1** | 2 | 62.2 | 3.48 | 17.87 | 65 | 18.66 |
| **NLMC2** | 2 | 58.8 | 3.92 | 15.01 | 89 | 22.72 |
| **NWL1** | 1 | 33.3 | 1.77 | 18.84 | 51 | 28.87 |
| **NWL2** | 3 | 87.1 | 5.13 | 16.96 | 188 | 36.62 |
| **NWS1** | 3 | 87.1 | 5.05 | 17.25 | 197 | 39.01 |
| **NWS2** | 2 | 58.4 | 3.32 | 17.60 | 80 | 24.12 |
| **SCP1** | 1 | 32.5 | 1.70 | 19.13 | 24 | 14.12 |
| **SCP2** | 2 | 70.4 | 4.32 | 16.31 | 114 | 26.41 |
| **SCP3** | 1 | 34.3 | 2.08 | 16.47 | 87 | 41.76 |
| **SGP1** | 4 | 127.3 | 5.92 | 20.49 | 252 | 42.59 |
| **SGP2** | 5 | 123.7 | 6.30 | 19.63 | 142 | 22.54 |
| **SGP3** | 2 | 61.5 | 4.33 | 14.19 | 122 | 28.15 |
| **SGP4** | 3 | 96.4 | 5.25 | 17.80 | 117 | 22.29 |
| **SGP5** | 1 | 33.9 | 1.73 | 19.53 | 46 | 26.54 |
| **SLMC1** | 3 | 95.0 | 5.15 | 18.44 | 66 | 12.82 |
| **SWS1** | 3 | 87.7 | 4.70 | 18.65 | 69 | 14.68 |
| **WCR1** | 5 | 168.1 | 8.73 | 19.25 | 460 | 52.67 |
| **WCR2** | 3 | 83.7 | 5.27 | 15.89 | 175 | 33.23 |
| **WCR3** | 2 | 60.8 | 3.48 | 17.44 | 86 | 24.69 |
| **WCR4** | 3 | 94.9 | 5.63 | 16.85 | 170 | 30.18 |
| **WCR5** | 3 | 87.1 | 5.92 | 14.72 | 159 | 26.87 |
| **WCR6** | 3 | 92.1 | 5.43 | 17.87 | 388 | 71.41 |
| **WP1** | 3 | 90.3 | 4.80 | 18.82 | 220 | 45.83 |
| **Total** | **92** | **2858.6** | **162.53** | **-** | **5870** | **-** |
| **Mean** | **2.49** | **77.3** | **4.39** | **17.83** | **158.65** | **35.07** |

**Table 2 Mean number of species or species groups detected per survey during driving acoustic surveys in Wisconsin, June-July 2013. Data are listed in an approximated north-to-south direction by, and within, ecological region. Incomplete surveys (n=8) excluded.**

| Location | No. Surveys | Big brown | Hoary | Eastern red | Silver-haired | Little brown | Eastern Pipistrelle | Northern long-eared | Little brown/Northern long-eared | Eastern red/Eastern pipistrelle | Big brown/Silver-haired | Unclassified | All Bats |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Superior Coastal Plain | | | | | | | | | | | | | |
| SCP1 | 1 | 0.0 | 9.0 | 0.0 | 4.0 | 1.0 | 0.0 | 0.0 | 1.0 | 0.0 | 3.0 | 3.0 | **24.0** |
| SCP2 | 2 | 1.5 | 12.0 | 9.5 | 10.5 | 6.5 | 0.0 | 0.0 | 2.5 | 0.0 | 3.5 | 5.5 | **57.0** |
| SCP3 | 1 | 3.0 | 18.0 | 10.0 | 10.0 | 14.0 | 0.0 | 0.0 | 12.0 | 0.0 | 5.0 | 7.5 | **87.0** |
| Northwest Lowlands | | | | | | | | | | | | | |
| NWL1 | 1 | 0.0 | 14.0 | 11.0 | 5.0 | 3.0 | 0.0 | 0.0 | 2.0 | 0.0 | 4.0 | 6.0 | **51.0** |
| NWL2 | 3 | 20.0 | 1.0 | 2.3 | 1.7 | 6.3 | 0.0 | 0.0 | 1.7 | 0.7 | 20.0 | 4.5 | **62.7** |
| Northwest Sands | | | | | | | | | | | | | |
| NWS1 | 3 | 14.7 | 2.0 | 5.7 | 1.0 | 10.7 | 0.0 | 0.0 | 2.7 | 1.3 | 15.7 | 6.0 | **65.7** |
| NWS2 | 2 | 2.0 | 4.5 | 6.5 | 4.5 | 2.0 | 0.0 | 0.0 | 1.5 | 0.0 | 8.5 | 5.3 | **40.0** |
| Northern Highland | | | | | | | | | | | | | |
| NH1 | 1 | 4.0 | 10.0 | 11.0 | 2.0 | 61.0 | 0.0 | 0.0 | 6.0 | 1.0 | 7.0 | 10.0 | **122.0** |
| North Central Forest | | | | | | | | | | | | | |
| NCF1 | 2 | 2.5 | 11.5 | 26.5 | 2.5 | 14.0 | 0.0 | 0.0 | 7.0 | 7.0 | 2.0 | 18.3 | **109.5** |
| NCF2 | 3 | 15.3 | 9.0 | 23.3 | 4.3 | 15.3 | 0.0 | 0.0 | 5.0 | 7.7 | 10.0 | 17.0 | **124.0** |
| NCF3 | 3 | 2.0 | 10.0 | 32.7 | 0.7 | 18.7 | 0.0 | 0.3 | 7.0 | 2.0 | 5.3 | 10.5 | **99.7** |
| Forest Tranisition | | | | | | | | | | | | | |
| FT1 | 3 | 4.0 | 6.5 | 53.5 | 4.0 | 23.5 | 0.0 | 0.0 | 8.5 | 7.0 | 9.5 | 22.5 | **107.7** |
| FT2 | 1 | 44.0 | 2.0 | 3.0 | 0.0 | 17.0 | 0.0 | 0.0 | 3.0 | 2.0 | 24.0 | 11.0 | **117.0** |
| FT3 | 4 | 3.5 | 0.3 | 1.0 | 0.8 | 5.5 | 0.0 | 0.0 | 0.3 | 0.0 | 4.0 | 2.5 | **20.3** |
| FT4 | 3 | 6.7 | 3.0 | 2.0 | 0.7 | 7.3 | 0.0 | 0.0 | 0.7 | 0.0 | 4.7 | 3.7 | **32.3** |
| FT5 | 1 | 4.0 | 3.0 | 1.0 | 0.0 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 5.5 | **30.0** |
| Northeast Sands | | | | | | | | | | | | | |
| NES1 | 1 | 9.0 | 1.0 | 10.0 | 0.0 | 19.0 | 0.0 | 0.0 | 2.0 | 0.0 | 7.0 | 3.5 | **55.0** |
| Central Lake Michigan Coastal | | | | | | | | | | | | | |
| CLMC1 | 3 | 11.3 | 3.7 | 1.7 | 2.0 | 7.3 | 0.0 | 0.0 | 1.7 | 0.3 | 8.3 | 6.7 | **49.7** |
| CLMC2 | 1 | 3.0 | 2.0 | 2.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 5.0 | **21.0** |
| Central Sand Hills | | | | | | | | | | | | | |
| CSH1 | 3 | 24.7 | 2.3 | 3.3 | 1.0 | 48.3 | 0.0 | 0.0 | 3.7 | 0.0 | 20.7 | 13.7 | **131.1** |
| Central Sand Plains | | | | | | | | | | | | | |
| CSP1 | 3 | 25.3 | 0.7 | 5.0 | 0.0 | 16.7 | 0.0 | 0.0 | 2.7 | 1.3 | 4.7 | 9.2 | **74.7** |
| Western Prairie | | | | | | | | | | | | | |
| WP1 | 3 | 17.0 | 1.3 | 3.3 | 0.3 | 13.0 | 0.0 | 0.0 | 1.7 | 1.3 | 13.7 | 10.8 | **73.3** |
| North Lake Michigan Coastal | | | | | | | | | | | | | |
| NLMC1 | 2 | 5.5 | 1.5 | 1.0 | 1.0 | 2.0 | 0.0 | 0.0 | 2.5 | 0.0 | 10.5 | 4.3 | **32.5** |
| NLMC2 | 2 | 1.0 | 1.0 | 1.5 | 0.0 | 20.5 | 0.0 | 0.0 | 8.0 | 0.0 | 5.0 | 3.8 | **44.5** |
| Western Coulee and Ridge | | | | | | | | | | | | | |
| WCR1 | 5 | 19.0 | 5.6 | 2.2 | 0.0 | 15.0 | 1.0 | 0.0 | 1.4 | 4.0 | 20.4 | 11.7 | **92.0** |
| WCR2 | 3 | 20.0 | 3.3 | 2.3 | 0.3 | 4.7 | 0.3 | 0.0 | 1.3 | 1.7 | 9.7 | 7.3 | **58.3** |
| WCR3 | 2 | 13.0 | 1.0 | 3.5 | 0.0 | 6.5 | 0.0 | 0.0 | 1.5 | 0.0 | 6.5 | 5.5 | **43.0** |
| WCR4 | 3 | 14.0 | 5.3 | 2.7 | 0.0 | 8.7 | 0.3 | 0.0 | 3.3 | 2.7 | 4.7 | 7.5 | **56.7** |
| WCR5 | 3 | 13.0 | 9.0 | 7.7 | 0.7 | 2.7 | 0.3 | 0.0 | 0.7 | 0.0 | 9.0 | 5.0 | **53.0** |
| WCR6 | 3 | 17.3 | 1.3 | 19.0 | 0.0 | 21.3 | 0.0 | 0.7 | 8.3 | 9.7 | 6.0 | 22.8 | **129.3** |
| Southeast Glacial Plains | | | | | | | | | | | | | |
| SGP1 | 4 | 6.3 | 0.8 | 1.3 | 0.0 | 20.5 | 0.0 | 0.0 | 3.8 | 1.3 | 8.0 | 10.6 | **63.0** |
| SGP2 | 5 | 4.8 | 1.8 | 0.6 | 0.0 | 5.6 | 0.0 | 0.0 | 0.8 | 0.6 | 6.4 | 3.9 | **28.4** |
| SGP3 | 2 | 11.0 | 3.5 | 2.5 | 0.5 | 10.5 | 0.0 | 0.0 | 1.5 | 1.5 | 14.5 | 7.8 | **61.0** |
| SGP4 | 3 | 4.0 | 3.3 | 3.7 | 0.3 | 4.3 | 0.0 | 0.0 | 0.7 | 0.0 | 11.3 | 5.7 | **39.0** |
| SGP5 | 1 | 8.0 | 3.0 | 4.0 | 0.0 | 9.0 | 0.0 | 0.0 | 1.0 | 1.0 | 7.0 | 6.5 | **46** |
| Southern Lake Michigan Coastal | | | | | | | | | | | | | |
| SLMC1 | 3 | 8.0 | 1.0 | 1.3 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 3.0 | **22.0** |
| Southwest Savanna | | | | | | | | | | | | | |
| SWS1 | 3 | 3.0 | 2.0 | 1.7 | 0.0 | 4.3 | 0.3 | 0.0 | 1.0 | 1.3 | 3.0 | 3.2 | **23.0** |

the greatest concern attributed to the time spent processing each bat pass. With that said, until the confidence in available automated identification software increases, processing will remain unchanged.

The acoustic data collected both historically (Pre-WNS) and in future efforts (Post-WNS) will continue to provide useful information. Currently, little brown bats and big brown bats are common and widespread throughout Wisconsin, which is reflected in the high encounter per detector-hour rate found by driving transects for both species (Figure 5). But as WNS continues to pose an imminent and deadly threat to the overall existence of hibernating bats in Wisconsin, driving transect data will be increasingly more important to identify general trends of bat populations.

**Acknowledgements**

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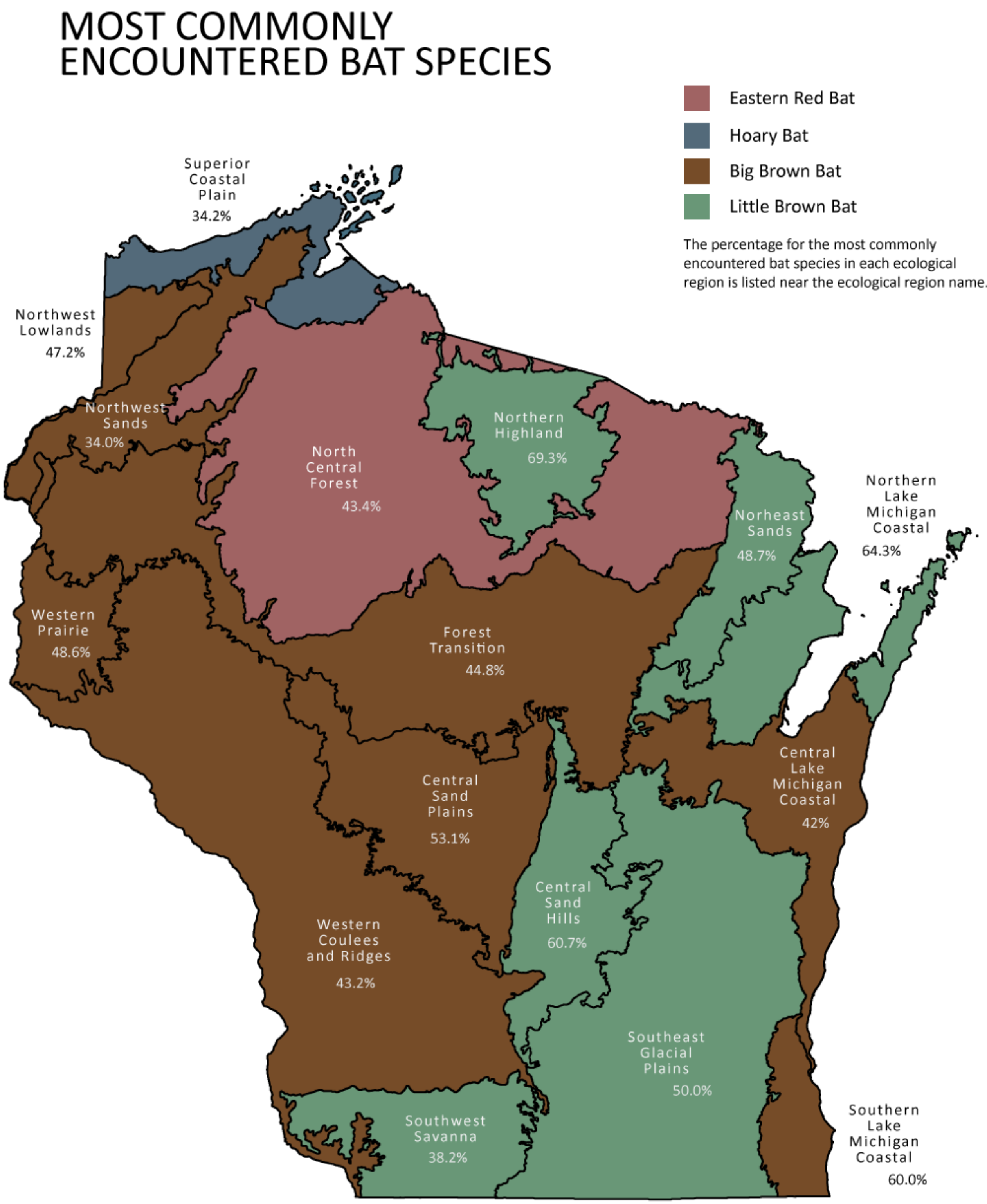


**Figure 5. The most commonly encountered bat species by ecological region was the big brown bat (8), little brown bat (6), hoary (1) and eastern red bat (1).**

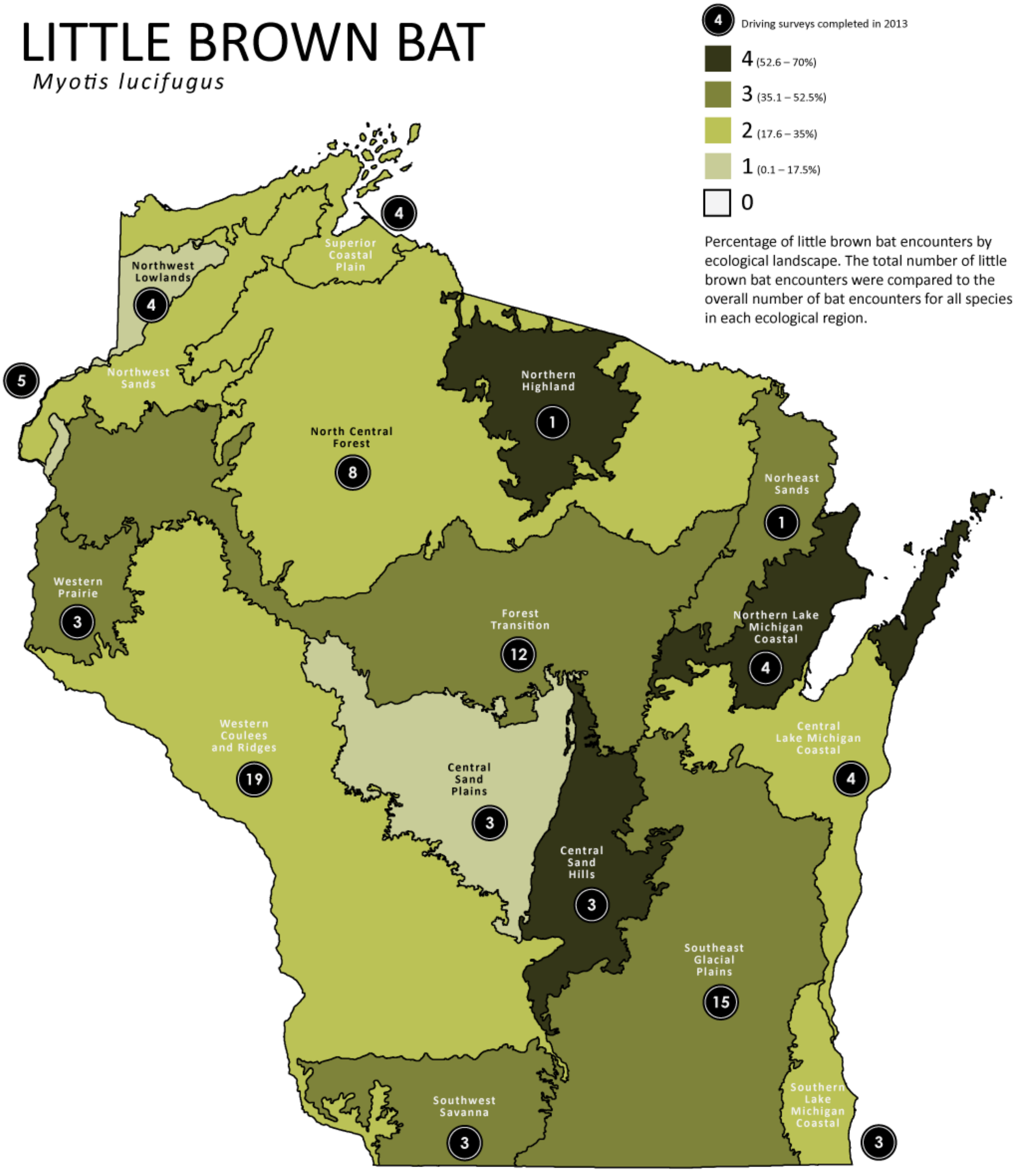


**Figure 6. The range of percentages were chosen based upon the highest percentage of encounters for any one species (MYLU - 68.3% in the Northern Highland ecological landscape). Little brown bats accounted for over half of all recorded species in three ecological regions: Northern Highland (69.3%); Northern Lake Michigan Coastal (64.3%); and Central Sand Hills (60.7%).**

# BIG BROWN BAT

*Eptesicus fuscus*

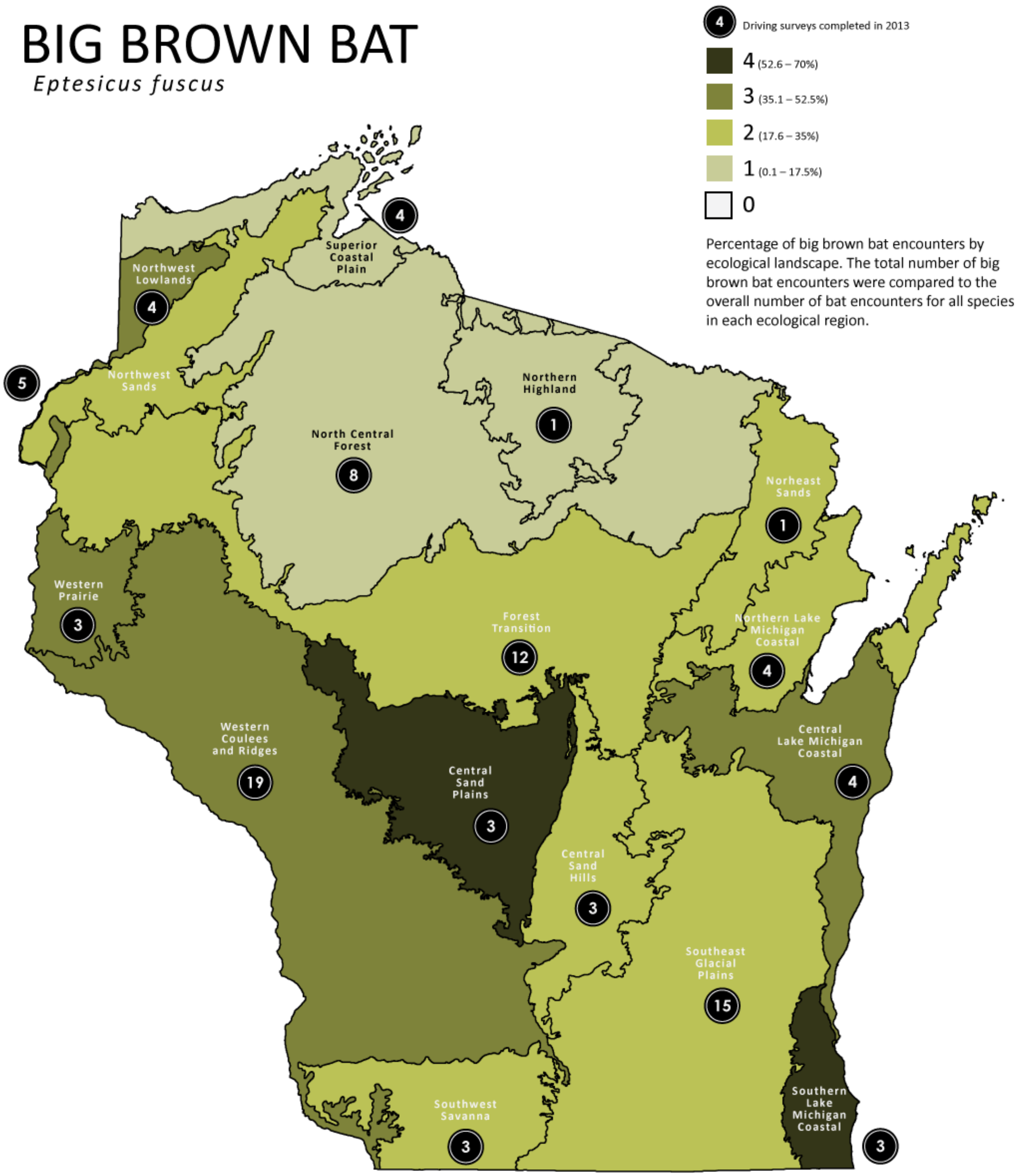


**Figure 7. The range of percentages were chosen based upon the highest percentage of encounters for any one species (MYLU - 68.3% in the Northern Highlands ecological landscape). Big brown bats accounted for over half of all recorded species in two ecological regions: Southern Lake Michigan Coastal (60.0%); Central Sand Plains (53.1%).**

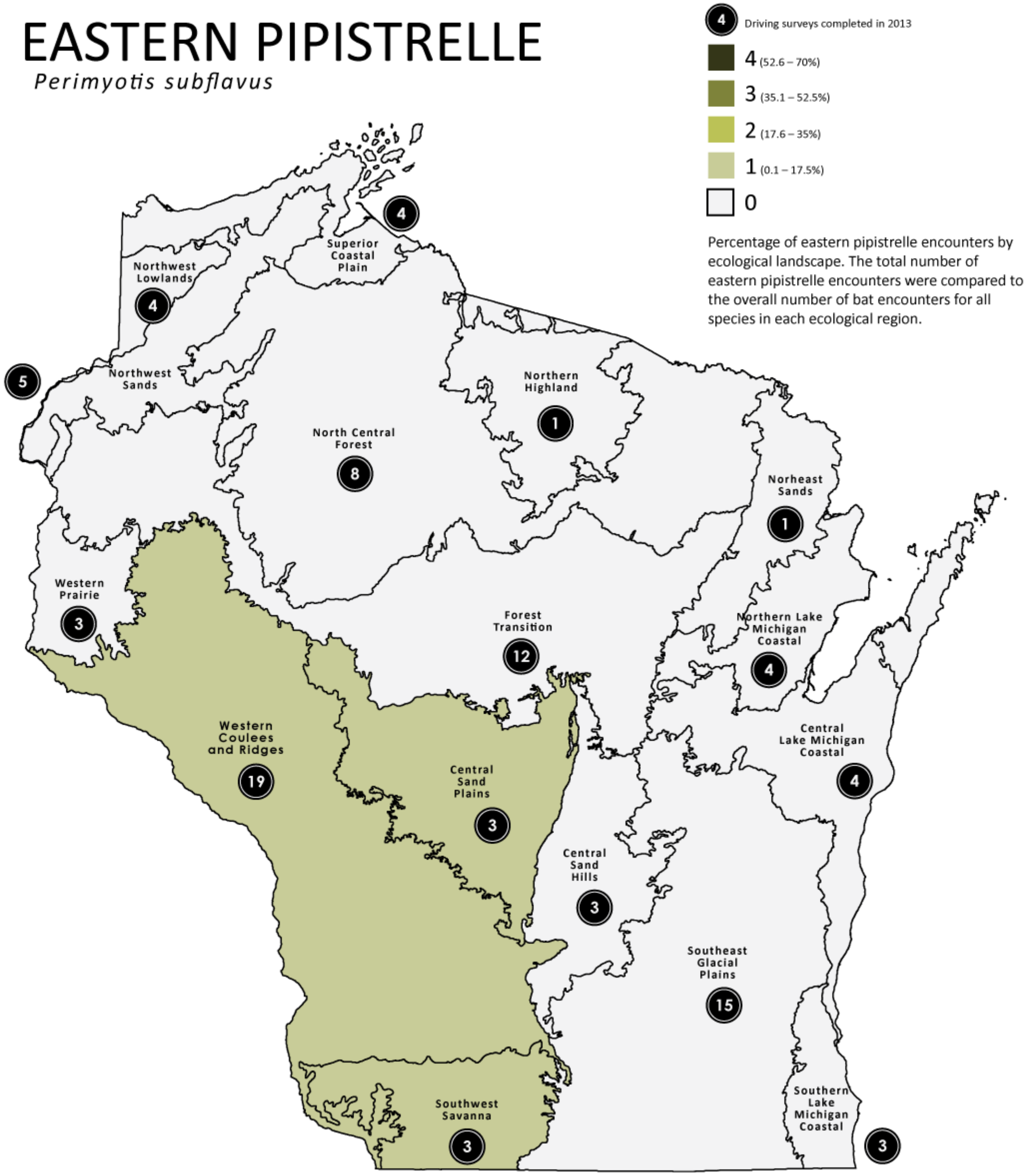


**Figure 8. The range of percentages were chosen based upon the highest percentage of encounters for any one species (MYLU - 68.3% in the northern highlands ecological landscapes). The eastern pipistrelle only accounted for 2.9% of all bat encounters in the Southwest Savanna ecological region and 1.1% in the Western Coulees and Ridges region.**

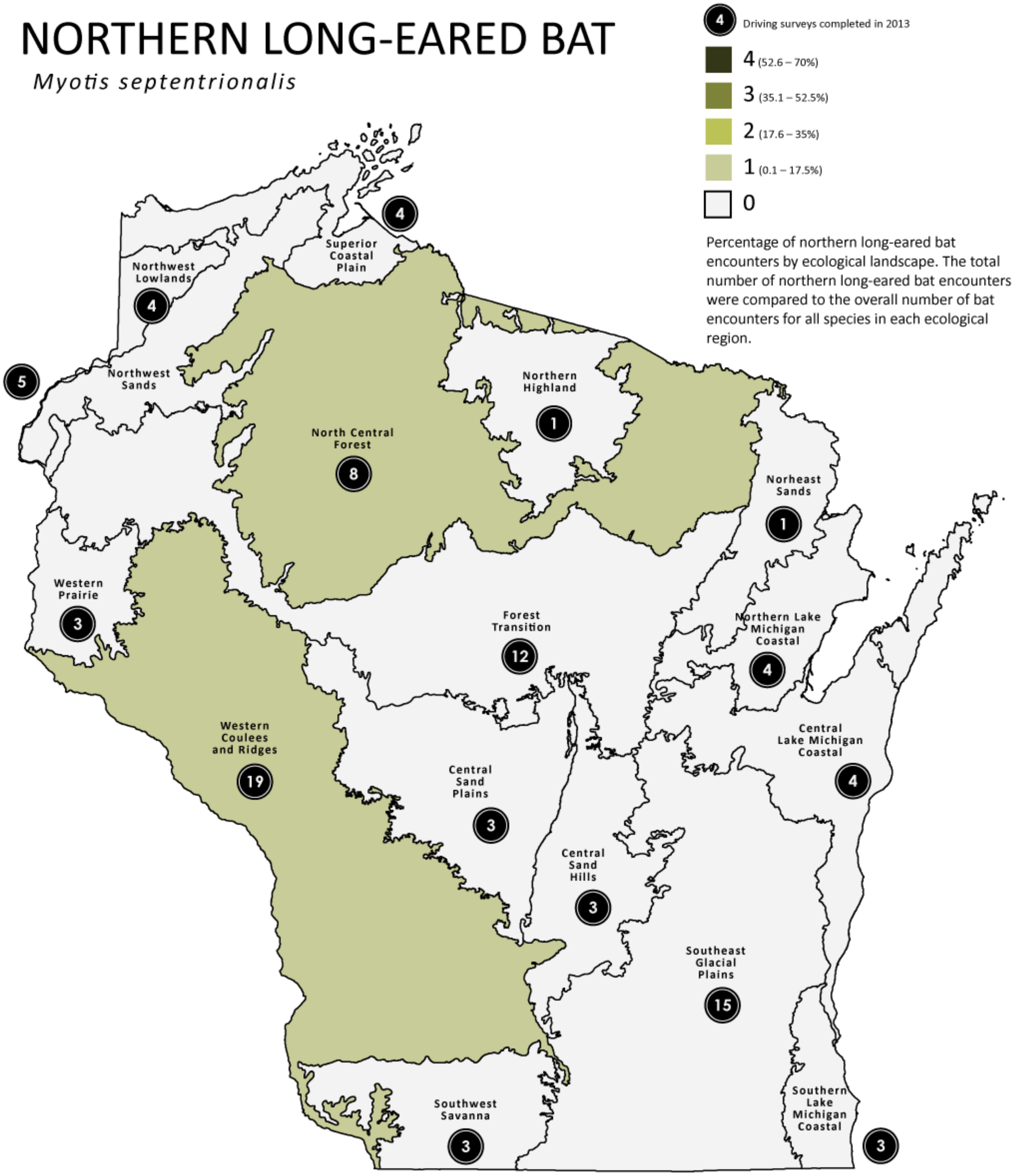


**Figure 9. The range of percentages were chosen based upon the highest percentage of encounters for any one species (MYLU - 68.3% in the Northern Highlands ecological landscape). Northern long-eared bats only accouted for 0.3% of all encounters in the Western Coulees and Ridges region and 0.2% of all encounters in the North Central Forest.**

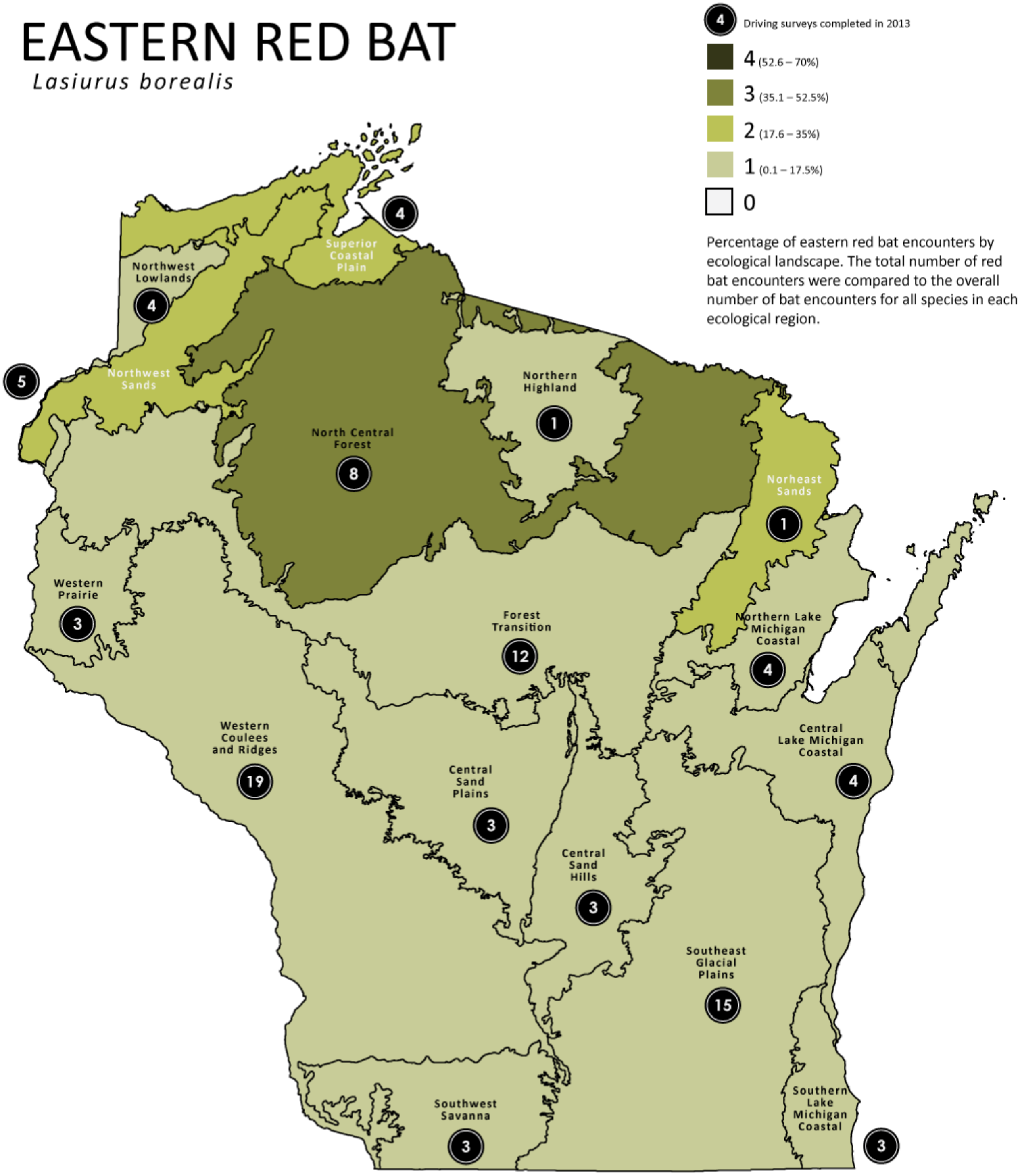


**Figure 10. The range of percentages were chosen based upon the highest percentage of encounters for any one species (MYLU - 68.3% in the Northern Highlands ecological landscapes). Eastern red bat encounters accounted for 25.6% of all the encounters in the Northeast Sands ecological region. They accounted for less than 10% of all encounters in six ecological regions.**

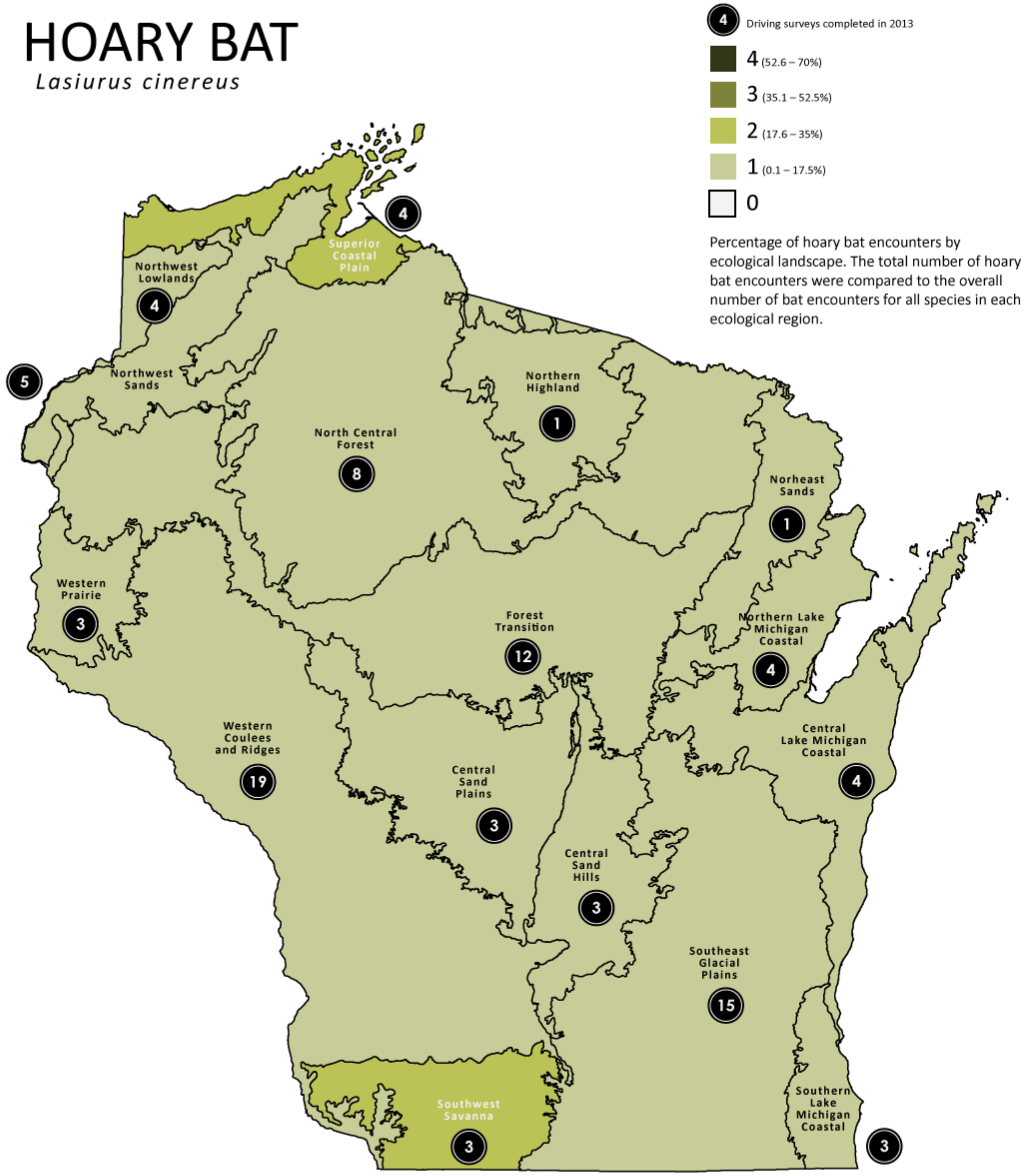


**Figure 11. The range of percentages were chosen based upon the highest percentage of encounters for any one species (MYLU - 68.3% in the Northern Highlands ecological landscape). Hoary bat encounters accounted for 34.2% of all recored encounters in the Superior Coastal Plain ecological region.**

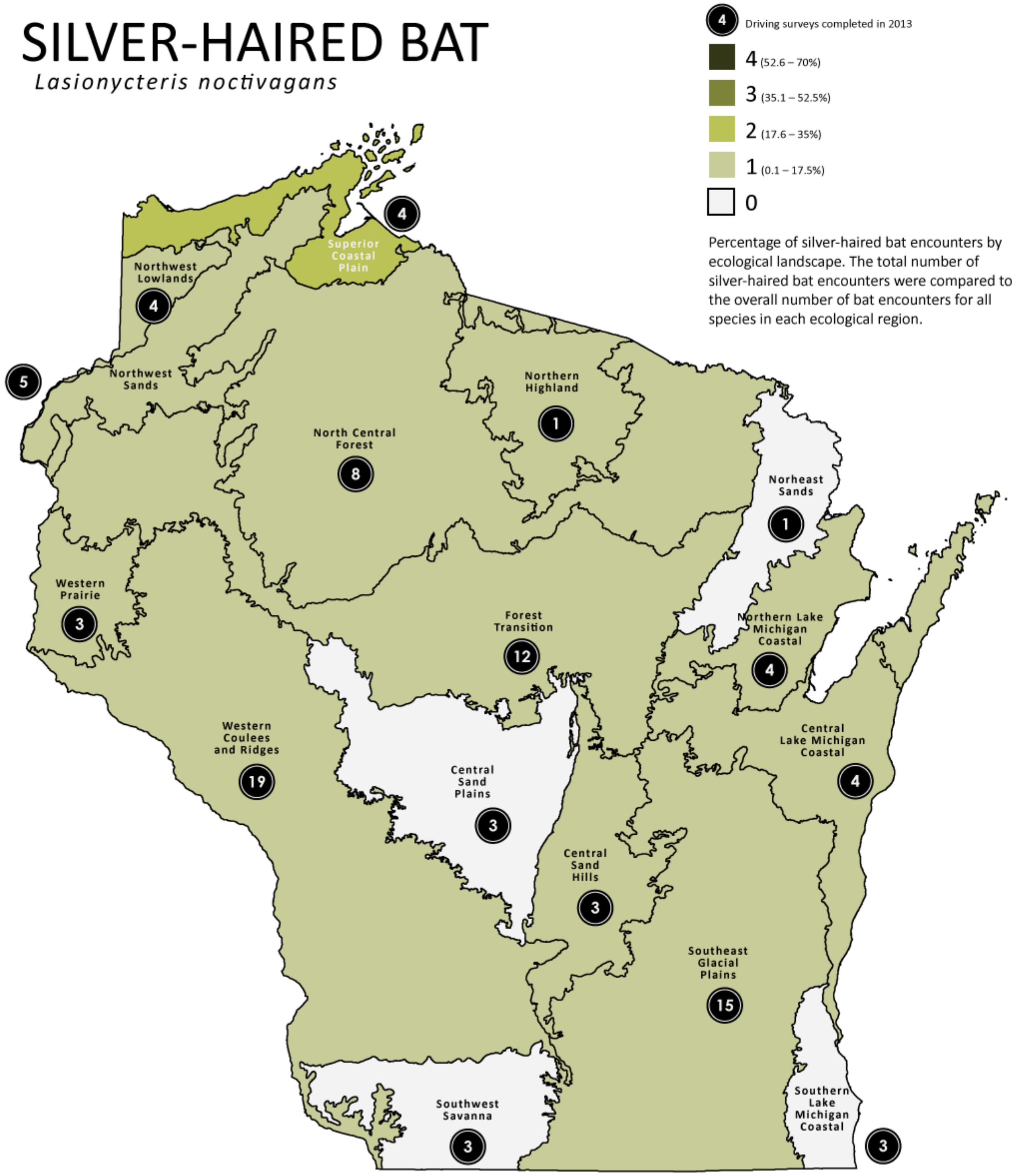


**Figure 12. The range of percentages were chosen based upon the highest percentage of encounters for any one species (MYLU - 68.3% in the northern highlands ecological landscapes). Silver-haired bat encounters accounted for 23.5% of all encounters in the Superior Coastal Plain region, but in all other regions in which this bat was found it accounted for less than 10% of all encounters.**