# FINAL REPORT

**South Carolina State Wildlife Grant SC-T-F22AF03331**
South Carolina Department of Natural Resources (SCDNR)
Reporting Period: October 1, 2022 – March 30, 2025

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Project Title: Coastal Maternity Roost Sites of Five High Priority Bat Species

**This grant deadline was extended 6 months to March 30, 2025 per a no-cost extension dated June 5, 2024.**

The purpose of this grant is to collect important coastal information on 10 bat "Species of Greatest Conservation Need" (SGCN) and considered "Highest Priority" in the SWAP (SCDNR 2015) by identifying and characterizing maternity roosts of Little Brown, Northern Long-eared, Northern Yellow, Rafinesque's Big-eared, and Tricolored Bats; collecting morphological information on Big Brown, Eastern Red, Hoary, Seminole, and Southeastern Bats; and conducting early spring National Wildlife Health Center (NWHC) surveillance testing for *Pseudogymnoascus destructans* (*Pd*, the fungus that causes White-nose Syndrome) in the Coastal Plain ecoregion of South Carolina.

Species codes throughout this document are as follows: CORA = Rafinesque's Big-eared Bat (*Corynorhinus rafinesquii*); EPFU = Big Brown Bat (*Eptesicus fuscus*); LABO = Eastern Red Bat (*Lasiurus borealis*); LACI = Hoary Bat (*Lasiurus cinereus*); LAIN = Northern Yellow Bat (*Lasiurus intermedius*); LANO = Silver-haired Bat (*Lasiurus noctivagans*); LASE = Seminole Bat (*Lasiurus seminolus*); MYAU = Southeastern Bat (*Myotis austroriparius*); MYLU = Little Brown Bat (*Myotis lucifugus*); MYSE = Northern Long-eared Bat (*Myotis septentrionalis*); NYHU = Evening Bat (*Nycticeius humeralis*); PESU = Tricolored Bat (*Perimyotis subflavus*); and TABR = Brazilian Free-tailed Bat (*Tadarida brasiliensis*).

Due to the number of figures and tables needed for this report, a quick reference guide is provided here:

Objective 1: Conduct acoustic surveys on the Coastal Plain to determine species richness and identify netting hotspots.

Accomplishments:
Acoustic surveys completed during the 2023 summer bat season resulted in a total of 130 detector nights over 45 survey dates at 36 points distributed across 3 properties (Figure A1). We recorded 3,395 calls identifiable to species, representing 13 species at all properties: CORA, EPFU, LABO, LACI, LAIN, LANO, LASE, MYAU, MYLU, MYSE, NYHU, PESU, and TABR (Figure A3; Table B1).

Acoustic surveys completed during the 2024 summer bat season resulted in a total of 165 detector nights over 75 survey dates at 35 points distributed across 5 properties (Figure A2). We recorded 13,888 calls identifiable to species by BCID with 8,201 calls identifiable to species by KPro, representing 13 species cumulatively at all properties: CORA, EPFU, LABO, LACI, LAIN, LANO, LASE, MYAU, MYLU, MYSE, NYHU, PESU, and TABR (Figure A4, Table B3).

*Methods*
Acoustic surveys were conducted to determine species richness and as a scouting measure at or nearby locations identified through on-site exploration as potential hot-spots due to bat-friendly habitat features or areas physically ideal for mist-netting set-ups. Titley Scientific AnaBat Swifts or AnaBat Express acoustic devices were attached to trees with bungee cords about 5 feet from the ground with the cone of detection directed along a corridor, forest edge, or similar stretch of relatively unobstructed, low-clutter potential habitat. Devices were deployed for at least one night at or near each potential netting location at the study sites. At least 10 acoustic points were chosen and sampled at each property, with Hamilton Ridge WMA, Webb WMA, and Palachucola WMA (unsurveyed) combined into Webb Complex due to the contiguous nature of the properties, and South Fenwick Island added as a bonus site with 3 acoustic points chosen and sampled.

Collected data was analyzed using BCID v2.7d and these results were used to choose which locations to net based on presence/abundance of target species, relative species richness, and overall abundance of calls identifiable to species. In data review, collected data was analyzed a second time using Kaleidoscope Pro v5.6.0c to provide a species list for each property. All species IDs, call counts, and other acoustic information in this report have been pulled from Kaleidoscope Pro unless otherwise specified.

*Results*
In 2023, three properties - Marsh WMA, Woodbury WMA, and Waccamaw River HP - were acoustically surveyed between April 15 and August 15, 2023 (Figure A1), and calls were identified to 13 species at each of the properties: CORA, EPFU, LABO, LACI, LAIN, LANO, LASE, MYAU, MYLU, MYSE, NYHU, PESU, and TABR (Figure A3; Table B1).

Flooding at Marsh WMA delayed the beginning of the season from the projected date of April 15 to April 24, and additional flooding later in the season resulted in further delays. Twelve acoustic points were surveyed at Marsh WMA, accumulating 32 detector nights over 12 survey dates between April 24 and May 18 (Figure A5). Fourteen acoustic points were surveyed at Woodbury WMA, accumulating 58 detector nights over 15 survey dates between May 23 and June 8 (Figure A6). Ten acoustic points were surveyed at Waccamaw River HP, accumulating 40 detector nights over 18 survey dates between June 21 and July 12 (Figure A7). Marsh WMA had the most consistent species diversity with an average

species count of 5.6 per acoustic point, with Waccamaw River HP following close behind at an average of 5.5 species, and Woodbury WMA obtaining the lowest average species count of 5.0 per acoustic point.

Four of the 12 acoustic points at Marsh WMA were chosen as netting locations including Point 001, the first point with multiple calls IDed as *Myotis* species, Point 007 which had the season's highest species diversity and highest number of calls IDed as MYSE, Point 012 with the property's third highest species diversity, and Point 005 which had the highest number of calls IDed as *Myotis* species by BCID on the property. Three of the 14 acoustic points at Woodbury WMA were chosen as netting locations including Point 103 with the season's second highest count of calls IDed as MYSE by BCID, down the corridor from the point with the highest count of calls IDed as MYSE by BCID (Point 113, which was unable to be netted due to poor accessibility), Point 110 which had the highest number of calls IDed as PESU on the property, and Point 112 which had the season's highest number of calls IDed as *Myotis* species by BCID by a margin of 46%. Four of the 10 acoustic points at Waccamaw River HP were chosen as netting locations including Point 201 which tied for highest species diversity on the property, Point 202 which acquired the property's highest number of calls IDed as MYSE by BCID, and Point 209 which acquired the property's second highest number of calls IDed as MYSE by BCID. Point 207 was chosen without the assistance of acoustic scouting as the microphone appeared to have malfunctioned when the detector was retrieved.

The total number of Kaleidoscope Pro v5.6.0c auto identified bat calls detailed per species for each property and point in 2023 can be seen in Table B2. The two locations with the most MYSE calls for the season, Marsh WMA Point 007 and Woodbury WMA Point 103, were included in bat netting surveys.

In 2024, five properties - Donnelley WMA, Botany Bay HP, Hamilton Ridge WMA plus Webb WMA (Webb Complex), and South Fenwick Island - were acoustically surveyed between April 15 and August 15, 2024 in addition to two pre-season nights during March scouting (Figure A2). Calls were identified to 13 species for the season cumulatively: CORA, EPFU, LABO, LACI, LAIN, LANO, LASE, MYAU, MYLU, MYSE, NYHU, PESU, and TABR (Figure A4; Table B3).

Each of the main four properties had nine shared species identified acoustically: EPFU, LABO, LAIN, LASE, MYAU, MYLU NYHU, PESU, and TABR. Donnelley WMA and Hamilton Ridge WMA (Webb Complex) identifications also included CORA, LACI, and MYSE; Botany Bay HP – LACI and LANO; and Webb WMA – CORA and MYSE. South Fenwick Island identifications included EPFU, LABO, LACI, LAIN, LANO, LASE, MYLU, NYHU, PESU, AND TABR.

Ten acoustic sites were successfully surveyed at Donnelley WMA, accumulating 42 detector nights over 32 survey dates between March 27 and June 16 (Figure A8). Ten acoustic points were surveyed at Botany Bay HP, accumulating 46 detector nights over 28 survey dates between April 17 and June 2 (Figure A9). Three acoustic points were surveyed at South Fenwick Island, accumulating 22 detector nights over 12 survey dates June 7-18 (Figure A10). Within Webb Complex, 12 acoustic points were surveyed accumulating 57 detector nights over 22 survey dates June 25 – July 30 (Figure A11). Individually, Hamilton Ridge's 6 points accounted for 36 detector nights over 20 survey dates and Webb WMA's 6 points accounted for 19 detector nights over 11 survey dates with some overlap. Inclement weather and flooding shortened the projected season from August 15 to August 2 as evacuation from the property was required August 5. Additional challenges, including heavy rain and equipment malfunctions, also affected acoustic surveys throughout the season.

Hamilton Ridge WMA (Webb Complex) individually had the most consistent species diversity with an average species count of 7.3 per acoustic point and a median count of 8.5, followed by Donnelley WMA with an average of 7.2 and median of 7.0, and Webb WMA (Webb Complex) with an individual average of 6.8 and median of 8. Webb Complex combined had an average species count of 7.1 and a median of 8.0. Botany Bay's metrics of a 6.6 average species count and 6.5 median could be considered skewed with the inclusion of zero species count from a dud site. Similarly, South Fenwick Island had an average species count of 5.6 and median of 6 with the inclusion of a site with high noise files with 1 identifiable species versus an average and median of 8.0 when this site is excluded.

Seven of the 10 successful acoustic points at Donnelley WMA were chosen as netting locations. These included Point 005 with the property's highest species diversity, Point 007 with the season's highest number of calls identified as MYSE by BCID, and Point 010 with the property's highest and season's second highest number of calls identified as PESU and the property's highest number of calls identified as a *Myotis* species. Five of the 10 successful acoustic points at Botany Bay HP were chosen as netting locations. These included Point 104 with the property's highest number of calls IDed as PESU, Point 107 with the property's highest number of calls identified as *Myotis* species, and Point 108 with the property's highest number of calls identified as LAIN. Three of the 12 successful acoustic points at the Webb Complex were chosen as netting locations. These included Point 305 with the season's highest number of calls identified as MYSE by KPro, Point 401 with the property's highest species diversity at the time of selection, and Point 403 with the season's highest species diversity overall and the season's highest number of calls identified as CORA by BCID and KPro. Additional planned netting locations included Point 203 on South Fenwick Island which had the season's highest number of calls identified as LAIN but was cancelled due to boat scheduling conflicts. The other planned netting location was Webb Complex's Points 306 and 405 with the season's highest number of calls identified as *Myotis* species and the season's highest number of calls identified as PESU, but both were cancelled due to inclement weather evacuation shortening the season.

The total number of Kaleidoscope Pro v5.6.0c auto identified bat calls detailed per species for each property and point in 2024 can be seen in Table B4. The three locations with the most calls identified by BCID as MYSE for the season, Donnelley WMA Point 007 (58 calls – BCID; 4 calls – KPro), Webb WMA Point 305 (39 calls – BCID; 9 calls – KPro), and Hamilton Ridge WMA Point 403 (37 calls – BCID; 3 calls – KPro), were included in bat netting surveys.

Objective 2: Conduct bat netting surveys on the Coastal Plain to confirm species presence and collect morphological information for 10 of the highest priority SWAP bat species.

Accomplishments:

The 2023 summer mist-netting season resulted in a total netting effort of 51 net nights over 21 survey dates at 11 locations distributed across 3 properties. A total of 93 bats were captured, representing 8 different species including EPFU, CORA, MYAU, LABO, LASE, NYHU, TABR, and PESU (Table B5).

The 2024 summer mist-netting season resulted in a total netting effort of 63 net nights over 28 survey dates at 15 locations distributed across 4 properties. A total of 138 bats were captured, representing 8 different species including EPFU, CORA, MYAU, LABO, LAIN, LASE, NYHU, and PESU (Table B6).

*Methods*
Single-, double-, and triple-high nets ranging in width from 4m to 18m were set across flyways such as roads, trails, and streams to capture bats. Mist-netting set-up types included Chenger sets (single to triple), custom-made pulley sets (single to double), and a painter's pole set (single to triple). Captured specimens were examined systematically to determine species, age (adult or juvenile), sex, reproductive condition, wing damage index and buccal score, in addition to recording pertinent or unusual morphometric data. Any bats appearing to be under undue stress were released as soon as basic measurements and observations were obtained, omitting any additional processes that could increase stress levels. Staff and partners, including volunteers, followed WNS national decontamination protocols and utilized COVID-specific PPE required for bat work. All bat handlers were required to provide proof of rabies vaccine or valid titers.

*Results*
In 2023, three properties - Marsh WMA, Woodbury WMA, and Waccamaw River HP - were netted between April 15 and August 15, 2023. Flooding at Marsh WMA delayed the beginning of the season from the projected date of April 15 to April 24, and additional flooding later in the season resulted in further delays. Four locations were netted at Marsh WMA, accumulating a site effort of 18 net nights over 7 survey dates between April 25 and May 24 (Figure A5). Three locations were netted at Woodbury WMA, accumulating a site effort of 20 net nights over 8 survey dates between May 31 – June 13 and July 17 – August 1 (Figure A6). Four locations were netted at Waccamaw River HP accumulating a site effort of 13 net nights over 6 survey nights between June 28 – July 12 and August 2 (Figure A7).

Ninety-three bats were captured throughout the course of the 2023 season: 18 individuals representing 6 different species were caught at Marsh WMA, 51 individuals representing 8 species at Woodbury WMA, and 24 individuals representing 5 species at Waccamaw River HP (Table B5). The capture rates of bats per net night (total number of bats captured divided by total number of net nights) at each site from highest to lowest were: Woodbury WMA, 2.6; Waccamaw River HP, 1.8; and Marsh WMA, 1. Species richness was highest at Woodbury WMA with 8 different species captured including two of the five top priority species. Marsh WMA and Woodbury WMA tied for highest number of priority species captured with 2 CORA, 1 PESU, and 1 CORA, 2 PESU respectively; however, Marsh WMA had a higher percentage of target species relative to total bat count with ~17% in comparison to Woodbury WMA's ~6%. Woodbury WMA yielded the highest capture rate and overall number of MYAU, the only *Myotis* species positively identified in hand in the 2023 season, with a capture rate of 1.1 and individual count of 22 bats identified, making up 92% of all MYAU caught this season.

In 2024, four properties – Donnelley WMA, Botany Bay HP, Webb WMA (Webb Complex), and Hamilton Ridge WMA (Webb Complex) – were netted between April 15 and August 15, 2023. Inclement weather and flooding shortened the projected season from August 15 to August 2 as evacuation from the property was required August 5. Other instances of inclement weather including heavy rain, lightning, and high winds also limited netting efforts throughout the season. Seven locations were netted at Donnelley WMA, accumulating a site effort of 30 net nights over 12 survey dates between April 23 and June 19 (Figure A8). Five locations were successfully netted at Botany Bay HP, accumulating a site effort of 20 net nights over 9 survey dates between May 7 and June 5 (Figure A9). Three locations were netted at the Webb Complex – 1 location at Webb WMA, 2 at Hamilton Ridge

WMA - accumulating a site effort of 13 net nights over 5 survey nights between July 1 and July 30 (Figure A11).

A total of 138 bats were captured throughout the course of the 2024 season: 56 individuals representing 6 different species were caught at Donnelley WMA, 41 individuals representing 3 species at Botany Bay HP, and 41 individuals representing 8 species at the Webb Complex (Table B6). The capture rates of bats per net night at each site from highest to lowest were: Webb Complex, 3.2 overall – Hamilton Ridge WMA, 4.2 and Webb WMA, 0.75 individually; Botany Bay, 2.1; and Donnelley WMA, 1.9. Species richness was highest at Webb Complex – specifically Hamilton Ridge WMA – with 8 different species captured including three of the five top priority species. Webb Complex also accounted for the highest number of priority species individuals captured with 2 CORA, 1 LAIN, and 4 PESU captured at Hamilton Ridge WMA and an additional 1 PESU captured at Webb WMA with Donnelley WMA in second place with 1 LAIN, 5 PESU captured, and no priority species captured at Botany Bay HP. Additionally Webb Complex had the highest percentage of target species relative to total bat count with ~20% - Webb WMA, 33%; Hamilton Ridge WMA, 18% - followed by Donnelley WMA with 11%. Webb Complex was the only property to yield MYAU captures, the only *Myotis* species positively identified in hand in the 2024 season with 2 individuals captured – Hamilton Ridge WMA, 1 MYAU; Webb WMA, 1 MYAU. Within the Complex, Hamilton Ridge WMA had the highest capture rate of MYAU at 0.25 while Webb WMA had a capture rate of 0.11 and a combined rate of 0.15.

Objective 3: Radio-tag, track, and conduct emergence counts on a) pregnant or lactating CORA, LAIN, MYLU, MYSE, and PESU to locate and characterize coastal maternity colony roost habitat; and b) any non-pregnant or lactating LAIN, MYLU, or MYSE to locate and characterize coastal summer roost habitat for these data-deficient species.

Accomplishments:

In 2023, four individuals of two different species (2 CORA, 2 MYAU) were fitted with transmitters and tracked (Table B7). Radio-tracking was successfully used to locate roost trees for both tagged CORA; however, the tagged MYAU were unable to be found.

In 2024, four individuals of three different species (1 LAIN, 2 PESU, 1 CORA) were fitted with transmitters and tracked (Table B8). Radio-tracking was successfully used to locate roost trees for both tagged PESU; however, the tagged CORA and LAIN were unable to be found.

*Methods*

When a member of one of the 5 priority species (CORA, LAIN, MYLU, MYSE, or PESU) was captured during netting in Objective 2, we examined the individual to determine if they were an ideal candidate for tracking. We were particularly interested in pregnant or lactating CORA/PESU or any adult LAIN/MYLU/MYSE regardless of reproductive status. If the bat was large enough and in good condition, we affixed a Holohil Systems LB-2X radio-tag weighing less than 5% of the body weight of the bat to a trimmed area between the scapulae using a mixture of Perma-Type Surgical Cement and Torbot Bonding Cement. Using a handheld receiver and folding 3-element Yagi antennae (either car-mounted or handheld), we attempted to locate the radio-tagged bats throughout the life of the transmitter. When a roost tree occupied by a lactating female was located, we attempted to conduct an emergence count to determine the exact location of the roost and the number of bats using the roost. We recorded the following data for each roost located: tree species, diameter at breast height (dbh; cm),

height of tree (m), approx. height of roost (m), canopy closure at roost (%), exfoliating bark on bole (%), cavities present (y/n), and decay state (1-9).

*Results*

In 2023, three individuals of two different species (1 CORA, 2 MYAU) were fitted with transmitters and tracked after their capture at Marsh WMA. The MYAU were initially misidentified as MYLU and therefore chosen for tracking erroneously. CORA1-23, an adult male was tagged and tracked to 4 separate roost trees near the area of capture, all in cavities of large Water Tupelos (*Nyssa aquatica*). We radio-tagged a male CORA because we had no other bats to track and thought additional male roost data would be beneficial. After the 4$^{th}$ roost was located, a period of flooding stopped subsequent tracking for several days and the transmitter was not picked up by the tracker again. The 2 MYAU were unable to be tracked to a roost as MYAU1-23 (pregnant female) never pinged the tracker and MYAU2-23 (lactating female) was only picked up while foraging near the area of capture at dusk. One lactating adult female CORA was fitted with a transmitter and tracked after its capture at Woodbury WMA. This CORA2-23 was tracked to a single roost near the area of capture, in a cavity of a large bald cypress tree (*Taxodium distichum*). An emergence count was attempted but no bats were spotted leaving the roost and equipment failure left us unable to determine if the transmitter remained stationary after dusk. A subsequent attempt to relocate the signal was unsuccessful.

In 2024, four individuals of three different species (1 LAIN, 2 PESU, 1 CORA) were fitted with transmitters and tracked after their captures at Donnelley WMA (1 PESU; Figure A12) or Hamilton Ridge WMA in the Webb Complex (1 LAIN, 1 PESU, 1 CORA; Figure A13). One additional LAIN was caught but not tagged or tracked due to human error. PESU1-24, an adult, lactating female Tricolored Bat, was caught and tagged at Donnelley WMA on June 17, and tracked to the same roost area near the location of capture for 3 consecutive days following. The roost tree was amidst a cluster including an American Beech, a Sweet Gum, and a Loblolly Pine, but due to the proximity, the specific tree could not be determined as the bat was not visible. An emergence count was attempted June 18 with 3 to 5 individual bats seen in the area but none visually confirmed leaving any of the potential roost trees within the cluster. The tagged individual could not be visually confirmed as leaving the roost area, but the signal became quieter and seemed to change location. PESU, LABO, LASE, and NYHU calls were detected and identified with a handheld Wildlife Acoustics EchoMeter used during this count. On July 8, CORA1-24, a juvenile male Rafinesque's Big-eared Bat, was caught and tagged at Hamilton Ridge WMA, then searched for over several days until July 19 but the signal was never found. During the same period, LAIN1-24, an adult male Yellow Bat, was caught, tagged, and tracked on the same property; the signal for this individual was also not found and radio tags for both bats were assumed to be spent or detached by July 19. PESU2-24, an adult, post-lactating female Tricolored Bat, was caught and tagged July 30 at Hamilton Ridge and tracked to roost July 31 - August 2. Two distinct roost areas were located. PESU2-24_Roost1 was a multi-trunk hickory species, possibly Water Hickory, and PESU2-24_Roost2 was a large red oak species, possibly bluff oak. An emergence count was attempted August 1 at the second roost site with 1-2 individual bats seen flying very near the roost and 1 additional bat seen flying nearby but no bats were visually confirmed leaving the roost tree. The tagged individual could not be visually confirmed to have left the roost tree, but the signal became quieter and eventually disappeared during the count. The property was evacuated due to inclement weather August 5 so no further tracking was attempted until August 14 at which time the transmitter was still detectable but the roost – which seemed to be in the same general location as previously detected – could not be found due to residual flooding in the area.

Objective 4: Conduct early spring *Pd* surveillance testing in Apr-May in NWHC Coastal Plain priority areas.

Accomplishments:
We unable to participate in NWHC's spring *Pd* surveillance testing during either netting season.

Significant Deviations:
In 2023, we did not capture any species confirmed to be susceptible to WNS in SC out of those anticipated on the Coastal Plain (EPFU, MYLU, MYSE, or PESU) during the requested timeframe of April to mid-May. In 2024, the model-guided *Pd* risk map indicated that there were no high priority ecosections identified in the Eastern US, thus the number of surveillance kits to our region was limited and we were not provided with one.

Literature Cited:

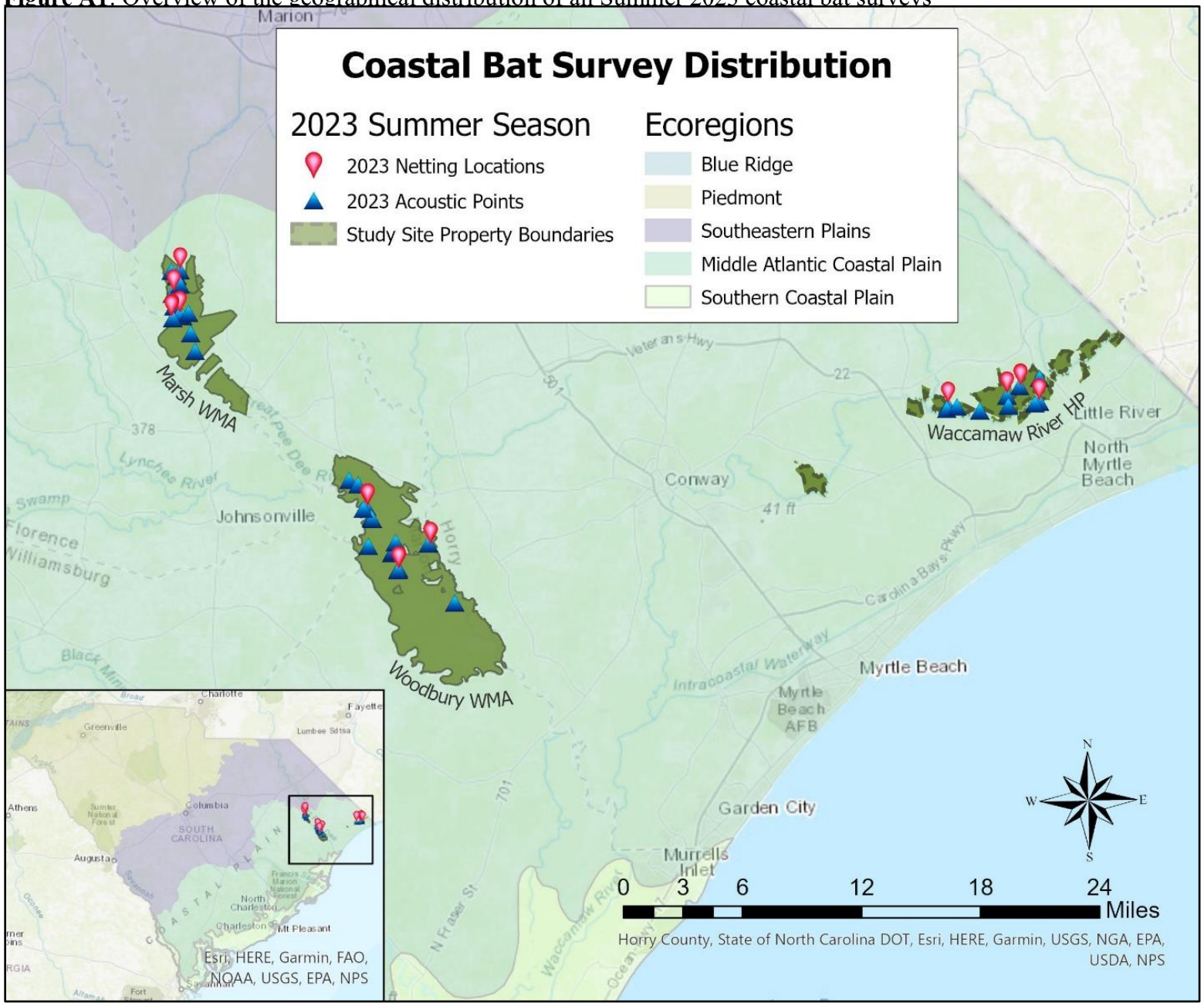
SCDNR. 2015. South Carolina State Wildlife Action Plan. Columbia, South Carolina. <http://www.dnr.sc.gov/swap/>. Accessed 5 Feb 2025.

Estimated Federal Cost: $85,000

Recommendations: Close the grant.

## Appendix A: Site Maps

**Figure A1**: Overview of the geographical distribution of all Summer 2023 coastal bat surveys



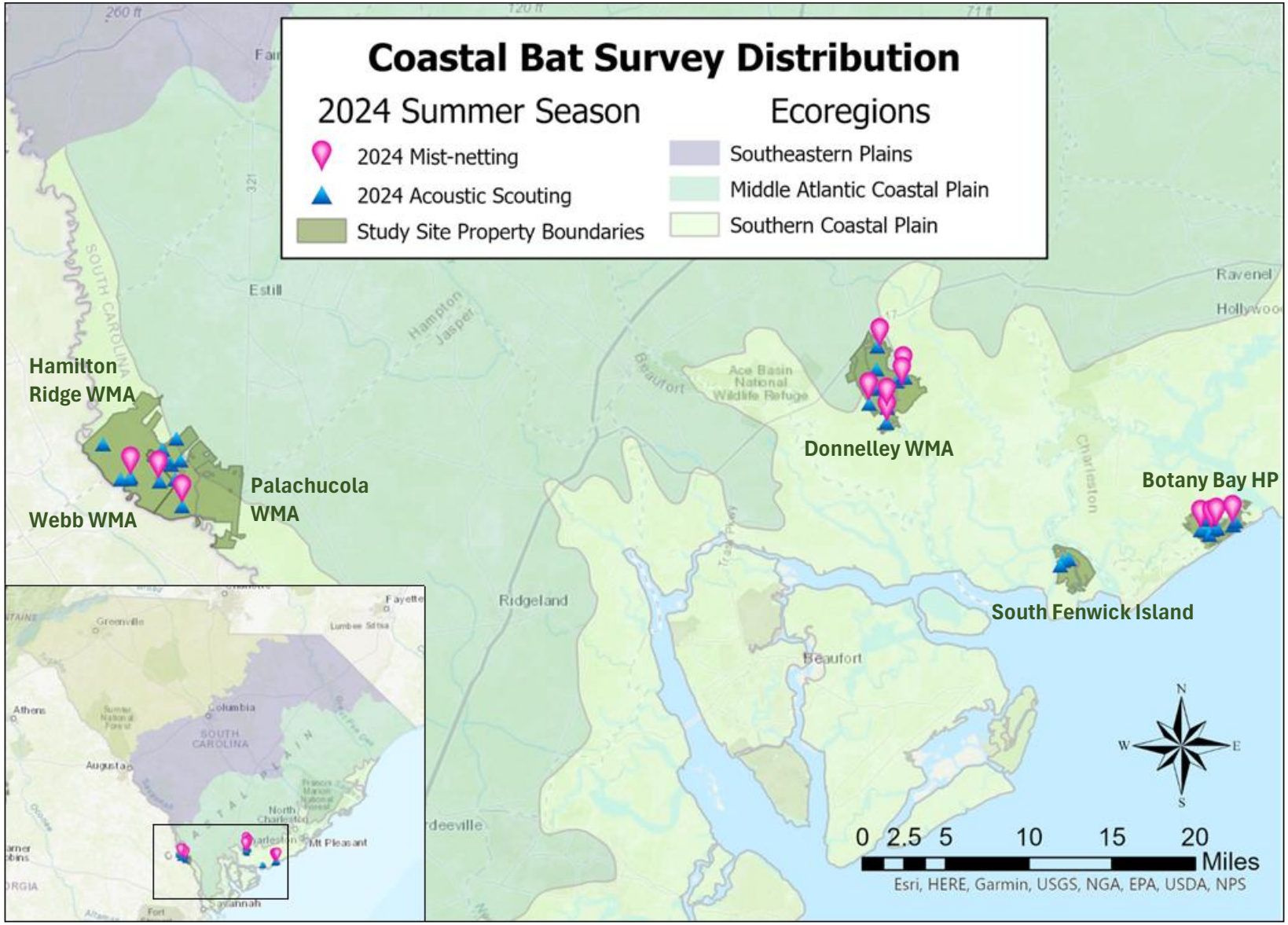



**Figure A2:** Overview of the geographical distribution of all Summer 2024 coastal bat surveys

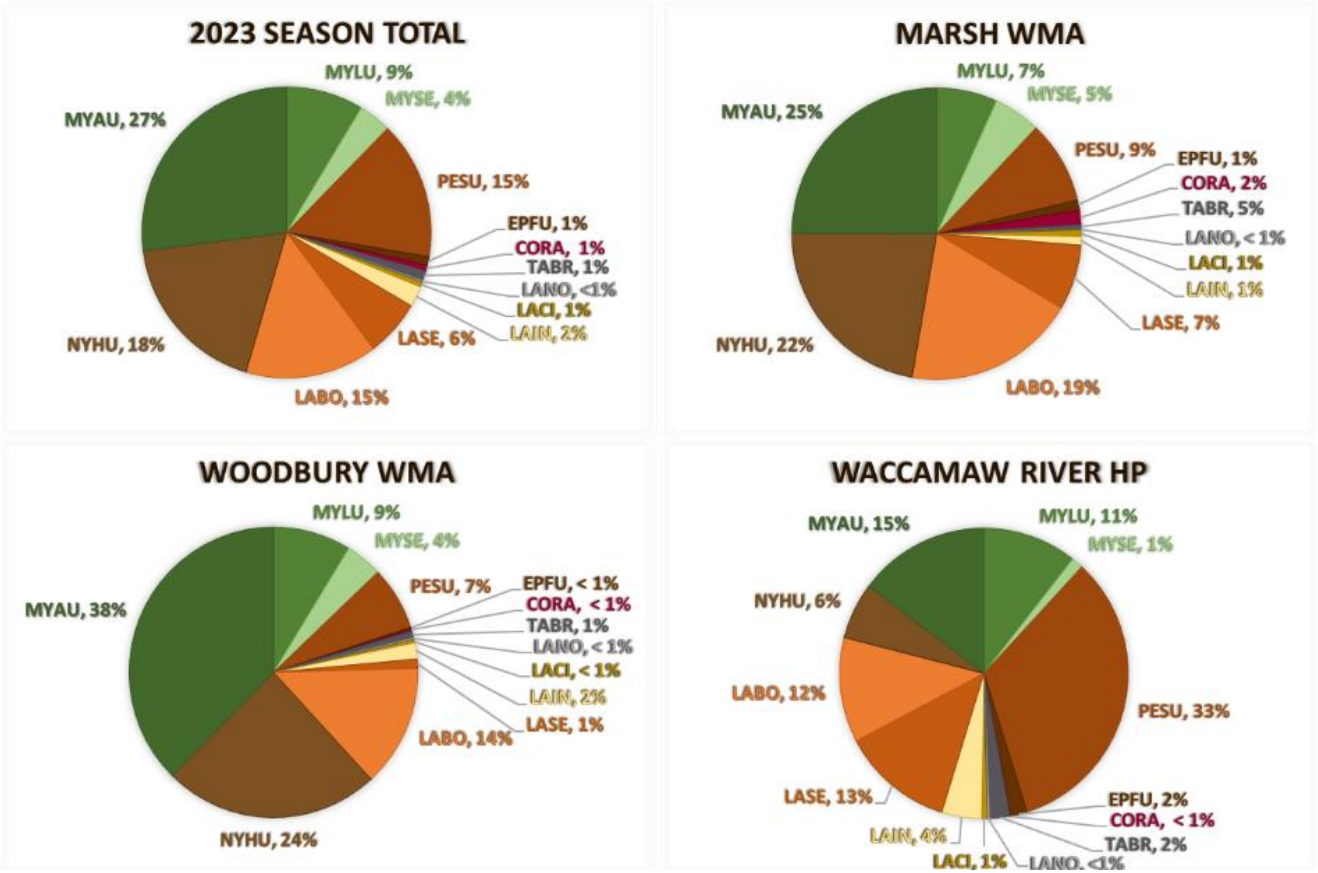



**Figure A3**: Species distribution of identified calls by property and 2023 season totals

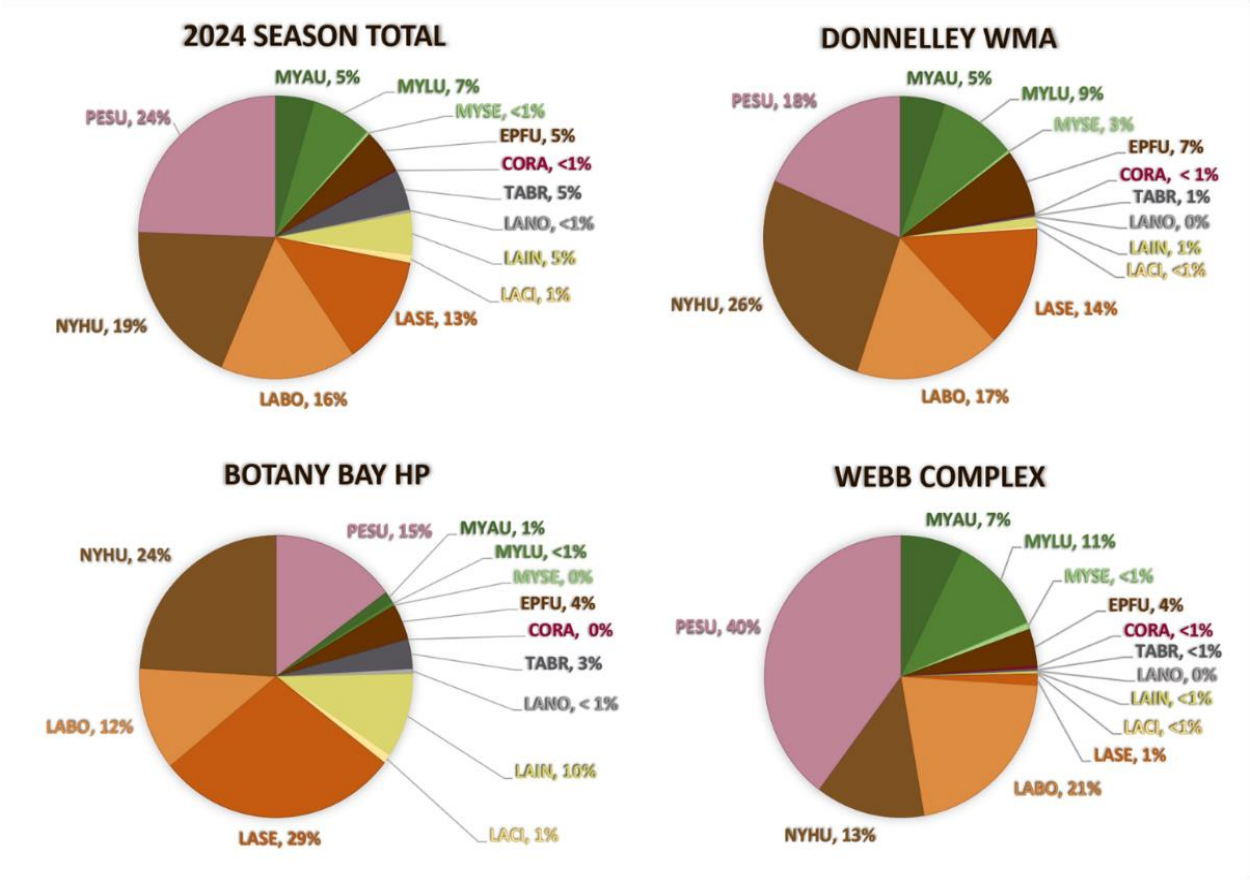



**Figure A4**: Species distribution of identified calls by property and 2024 season totals

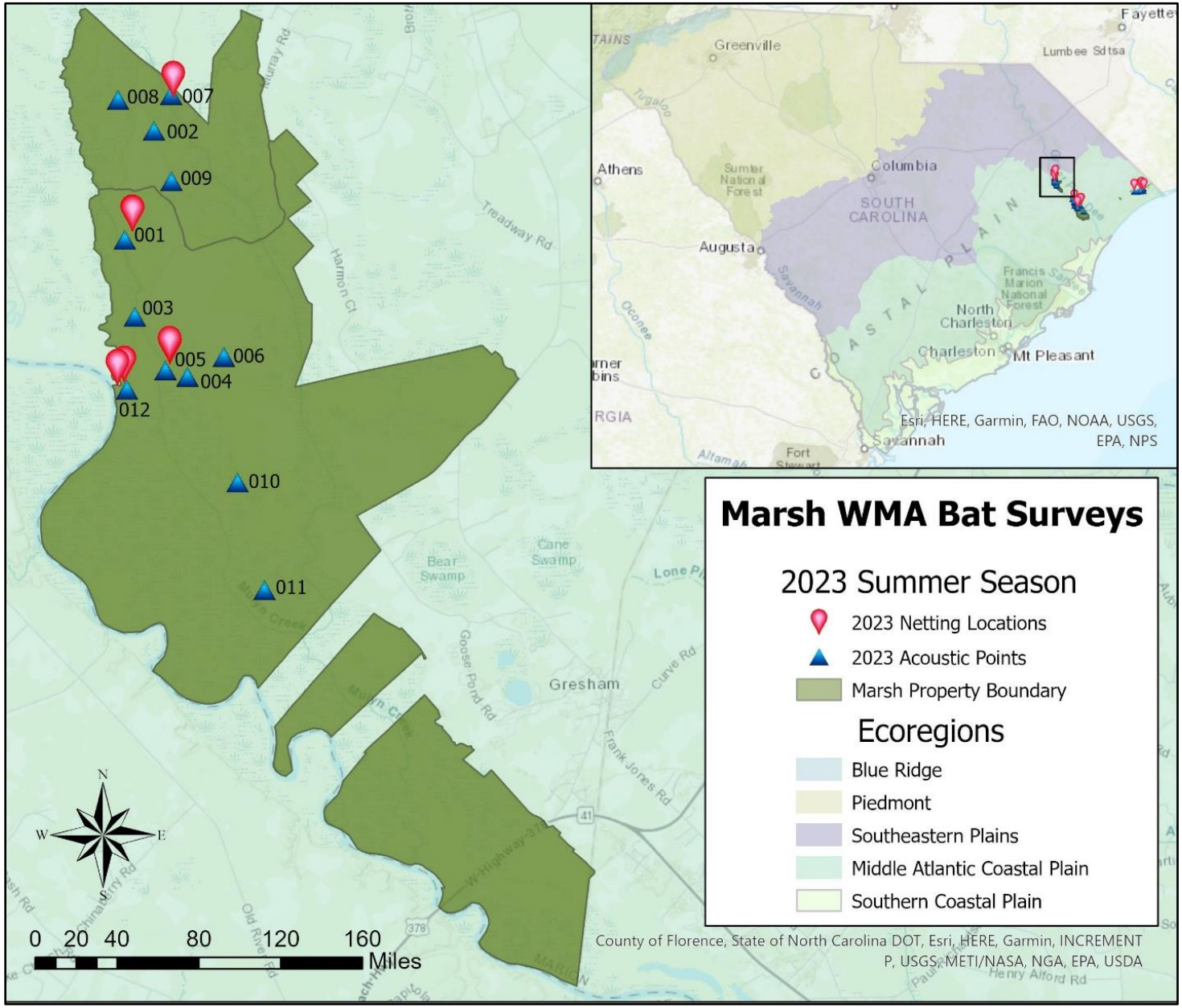
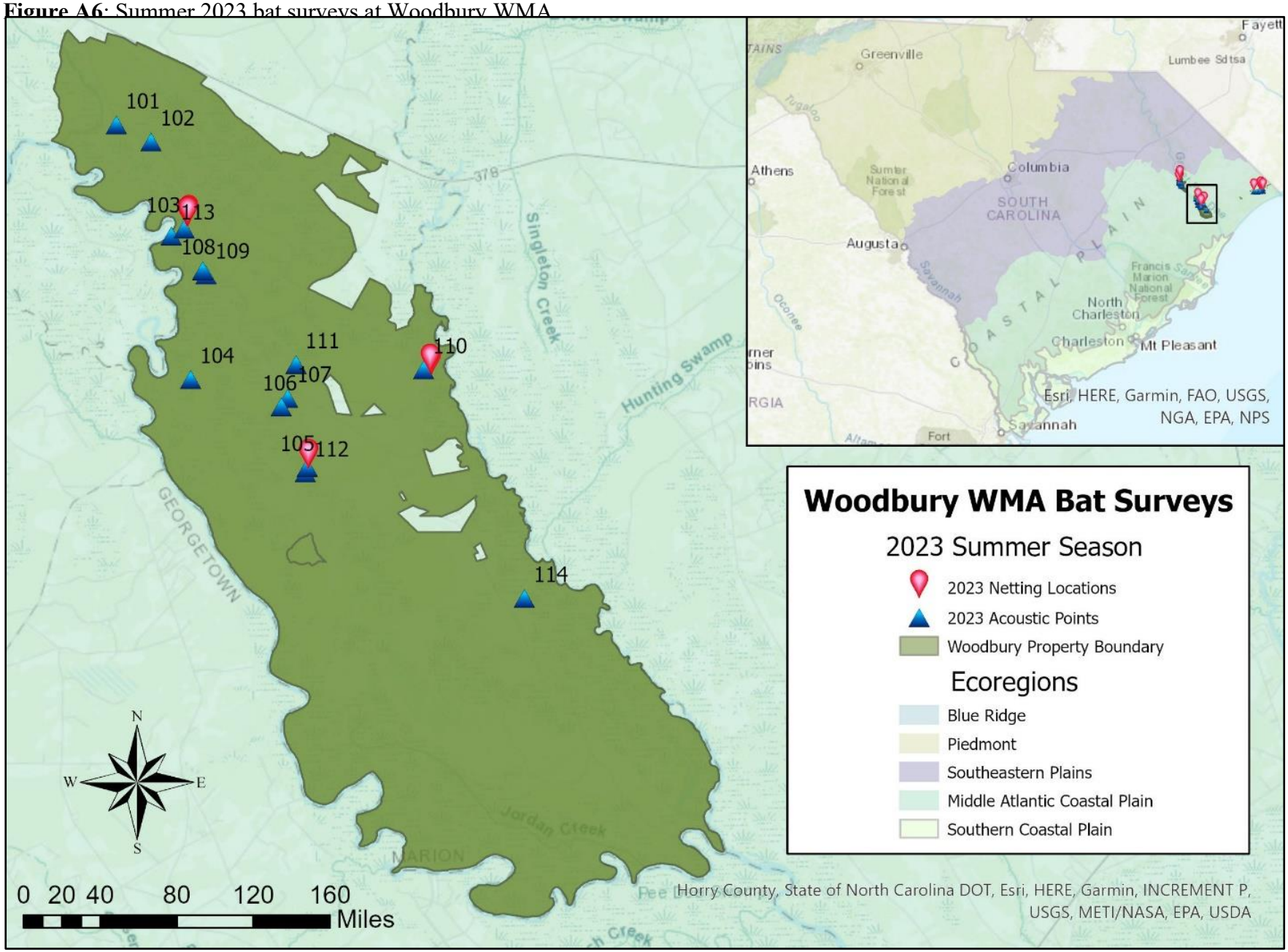



**Figure A5**: Summer 2023 bat surveys at Marsh WMA

**Figure A6**: Summer 2023 bat surveys at Woodbury WMA



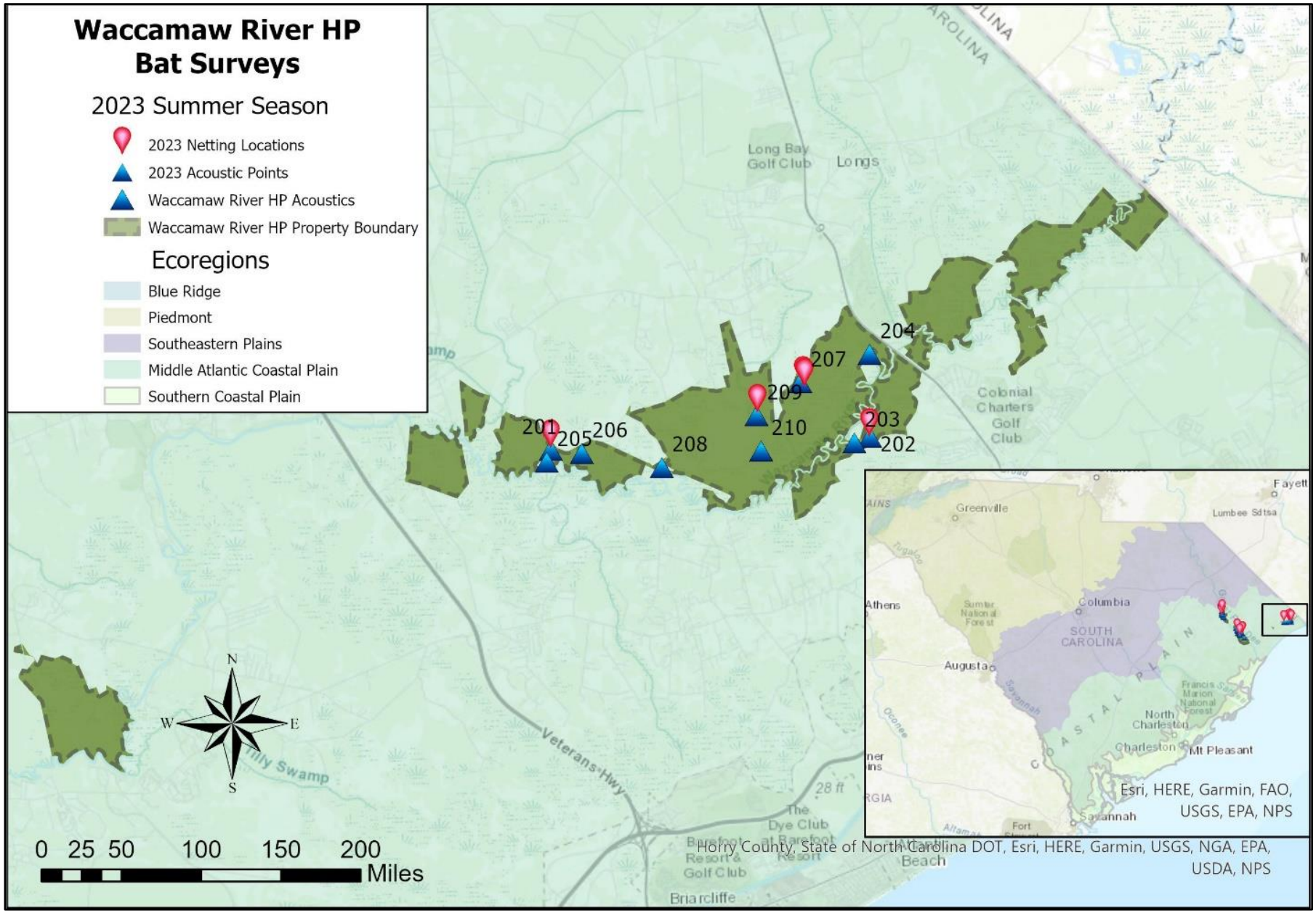



**Figure A7**: Summer 2023 bat surveys at Waccamaw River HP

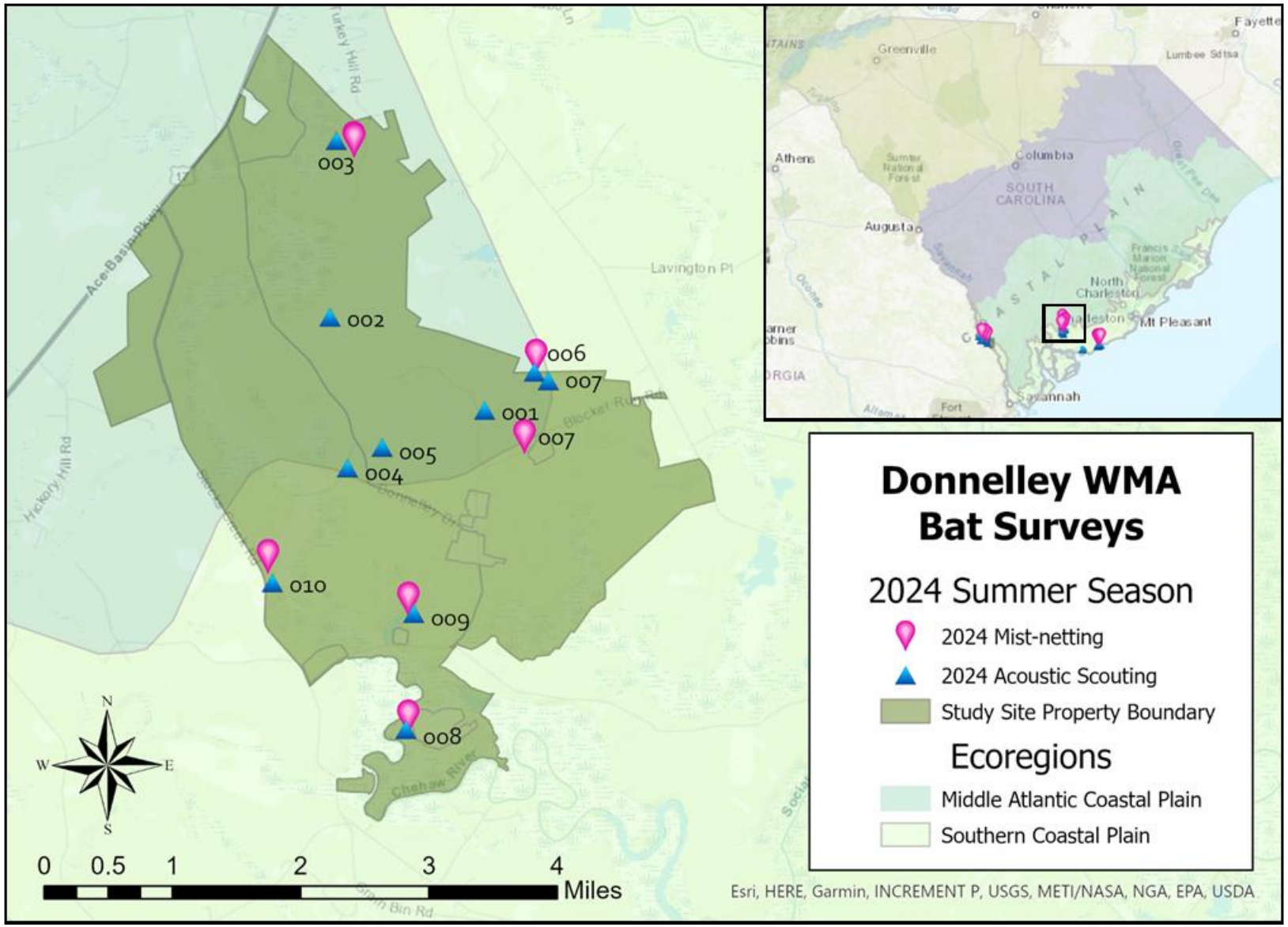



**Figure A8:** Summer 2024 bat surveys at Donnelley WMA

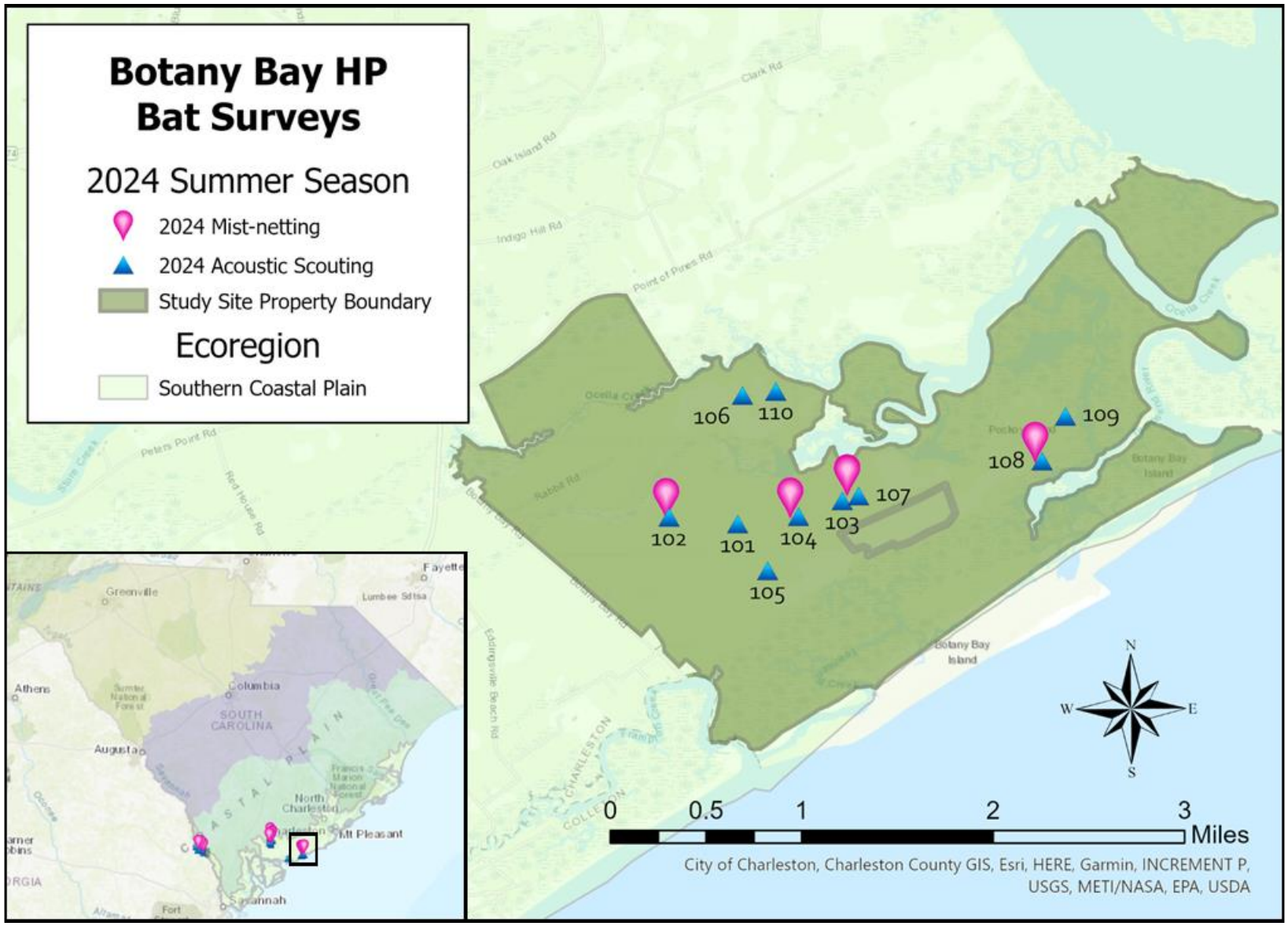



**Figure A9:** Summer 2024 bat surveys at Botany Bay HP

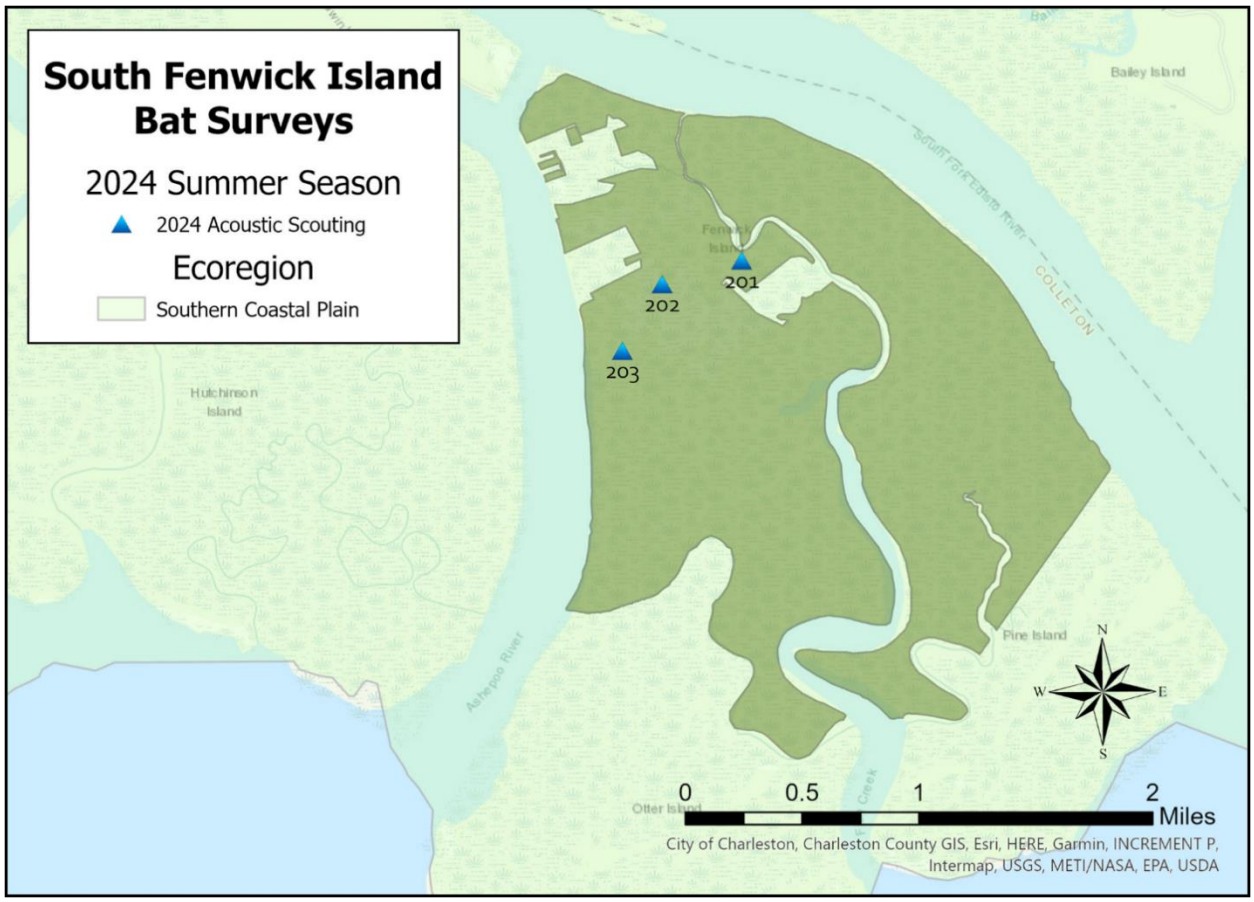



**Figure A10:** Summer 2024 bat surveys at South Fenwick Island

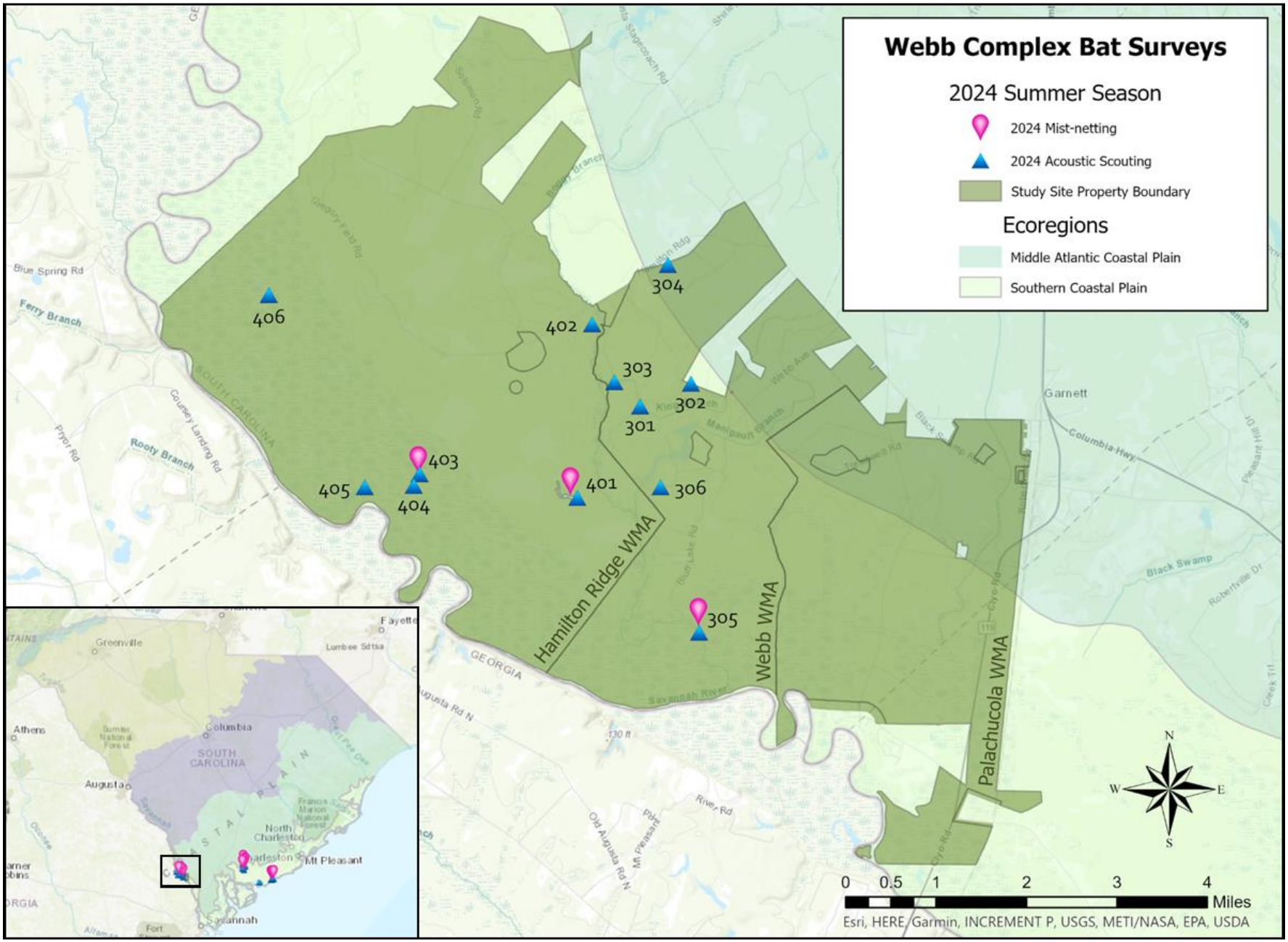

Webb Complex Bat Surveys
2024 Summer Season
2024 Mist-netting
2024 Acoustic Scouting
Study Site Property Boundary
Ecoregions
Middle Atlantic Coastal Plain
Southern Coastal Plain
406
402
304
303
302
301
403
405
404
401
306
305
Hamilton Ridge WMA
Webb WMA
Palachucola WMA
Garnett
Columbia Hwy
Black Swamp
Blue Spring Rd
Ferry Branch
Rooty Branch
Pryor Rd
Country Landing Rd
SOUTH CAROLINA
GEORGIA
Savannah River
Old Augusta Rd N
Mt Pleasant
Columbia
Augusta
Athens
Greenville
Charleston
Savannah
N
S
E
W
0 0.5 1 2 3 4
Miles
Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA

**Figure A11:** Summer 2024 bat surveys at Webb Complex – Hamilton Ridge WMA, Webb WMA, Palachucola WMA

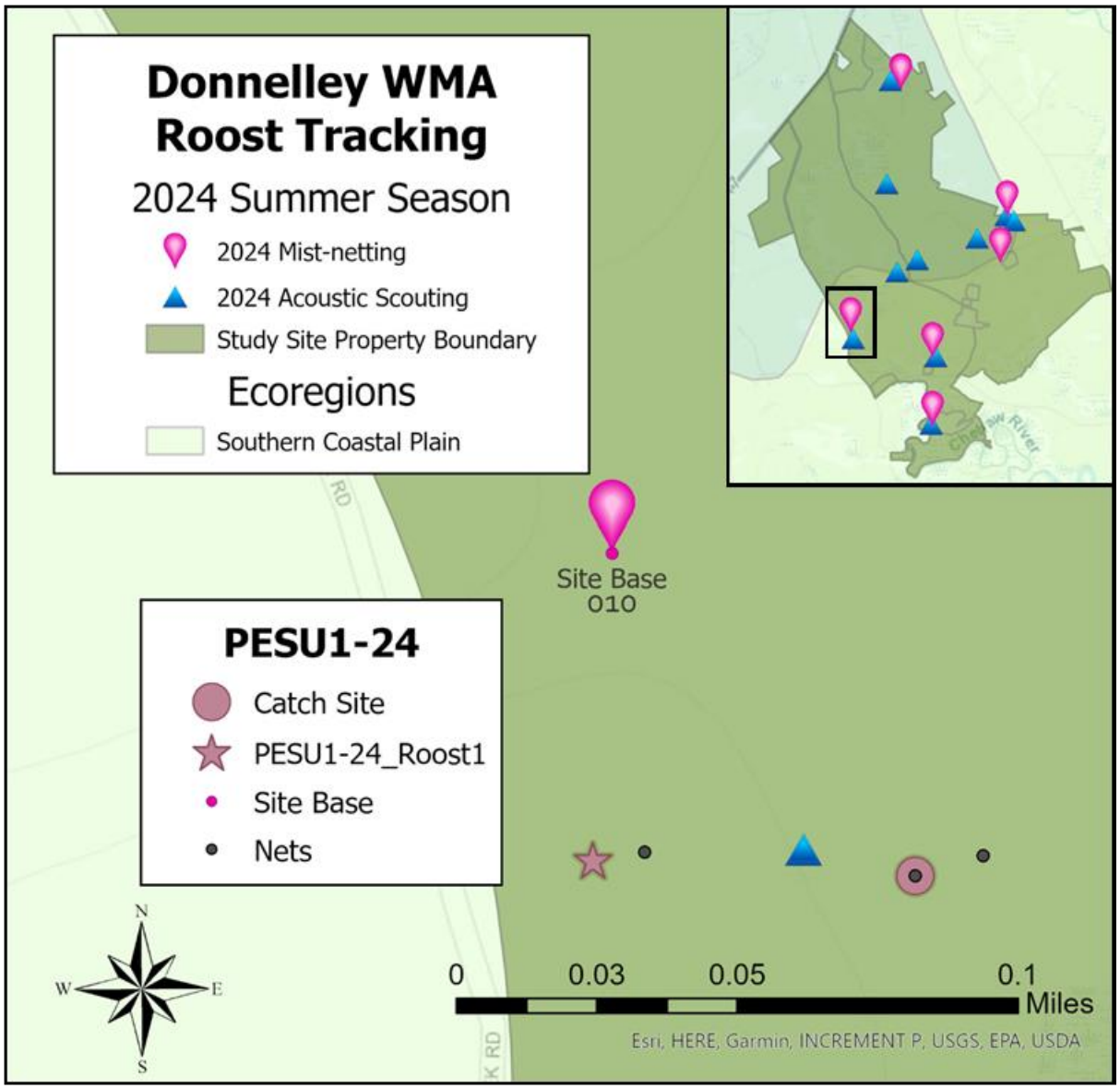
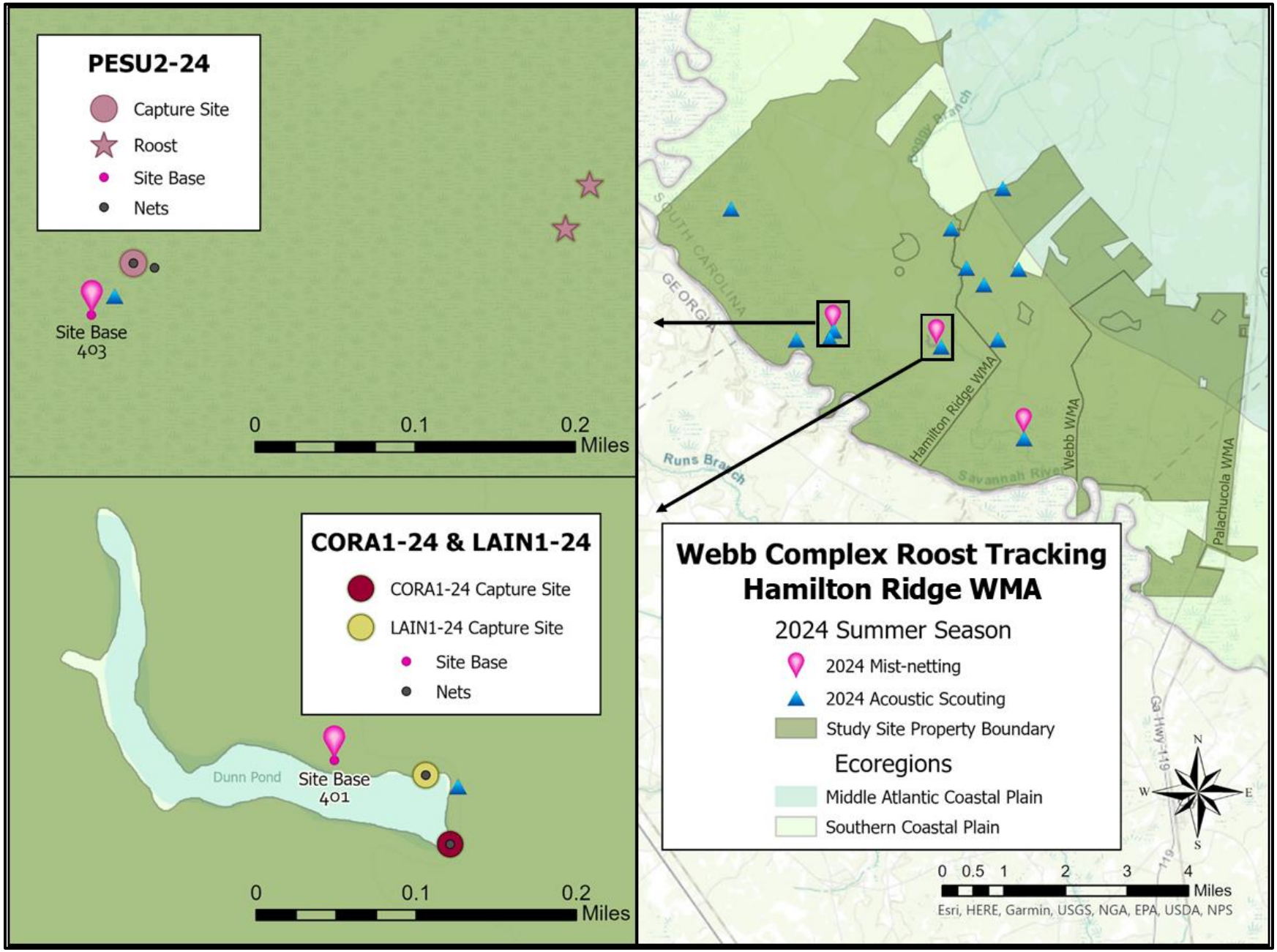



**Figure A12:** Summer 2024 roost tracking at Donnelley WMA


PESU2-24
Capture Site
Roost
Site Base
Nets
Site Base
403
0
0.1
0.2
Miles
CORA1-24 & LAIN1-24
CORA1-24 Capture Site
LAIN1-24 Capture Site
Site Base
Nets
Dunn Pond
Site Base
401
0
0.1
0.2
Miles
Webb Complex Roost Tracking
Hamilton Ridge WMA
2024 Summer Season
2024 Mist-netting
2024 Acoustic Scouting
Study Site Property Boundary
Ecoregions
Middle Atlantic Coastal Plain
Southern Coastal Plain
Hamilton Ridge WMA
Webb WMA
Palachucola WMA
Runs Branch
Savannah River
SOUTH CAROLINA
GEORGIA
0 0.5 1 2 3 4
Miles
Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

# Appendix B: Tables

**Table B1**: Summary of 2023 acoustic species identification totals by property and identification software.

**Acoustic Call Species ID Totals by Property and Software**

| | Marsh WMA | | Woodbury WMA | | Waccamaw River HP | | 2023 Cumulative | |
|---|---|---|---|---|---|---|---|---|
| | *BCID* | *KPro* | *BCID* | *KPro* | *BCID* | *KPro* | *BCID* | *KPro* |
| CORA‡ | 12 | 17 | 1 | 3 | 8 | 1 | 21 | 21 |
| EPFU | 27 | 12 | 41 | 3 | 23 | 18 | 91 | 33 |
| LABO | 606 | 204 | 490 | 184 | 539 | 115 | 1635 | 503 |
| LACI | 1 | 8 | 3 | 5 | 3 | 6 | 7 | 19 |
| LAIN* | N/A | 10 | N/A | 24 | N/A | 44 | N/A | 78 |
| LANO | 7 | 1 | 34 | 3 | 52 | 3 | 93 | 7 |
| LASE* | N/A | 77 | N/A | 14 | N/A | 124 | N/A | 215 |
| MYAU | 100 | 265 | 66 | 506 | 22 | 145 | 188 | 916 |
| MYLU | 298 | 72 | 461 | 118 | 174 | 104 | 933 | 294 |
| MYSE | 300 | 56 | 553 | 56 | 93 | 13 | 946 | 125 |
| NYHU | 652 | 237 | 775 | 327 | 227 | 62 | 1654 | 626 |
| PESU | 144 | 98 | 187 | 95 | 394 | 328 | 725 | 521 |
| TABR* | N/A | 5 | N/A | 10 | N/A | 22 | N/A | 37 |
| NoID | 89 | 1925 | 121 | 2580 | 133 | 1419 | 343 | 5924 |
| IDed Calls | 2147 | 1062 | 2611 | 1348 | 1535 | 985 | 6293 | 3395 |
| All Calls | 2236 | 2987 | 2732 | 3928 | 1668 | 2404 | 6636 | 9319 |

*LAIN, LASE, and TABR call identification is not supported in BCID v2.7d
‡*Corynorhinus* species calls IDed as COTO by KPro v.5.6.0c

**Table B2**: Kaleidoscope Pro v5.6.0c auto identified bat calls per species for each property and point during 2023 summer surveys. Highlighted are the two locations with the most MYSE calls for the season, which were subsequently netted.

| Property | CORA | EPFU | LABO | LACI | LAIN | LANO | LASE | MYAU | MYLU | MYSE | NYHU | PESU | TABR | NoID | Total Bat Calls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Marsh WMA** | **17** | **12** | **204** | **8** | **10** | **1** | **77** | **265** | **72** | **56** | **237** | **98** | **5** | **1925** | **2987** |
| Point 001 | | | | | | | | 1 | 1 | | | | | 3 | 5 |
| Point 002 | | | | | 1 | | 3 | | | | 1 | 3 | | 6 | 14 |
| Point 003 | | | 1 | 3 | | | | 1 | | | | | | 1 | 6 |
| Point 004 | | | 1 | | | | | 34 | 3 | 3 | 1 | 1 | | 97 | 140 |
| Point 005 | | | 31 | | | | | 64 | 13 | 3 | 17 | 8 | | 381 | 517 |
| Point 006 | 15 | 6 | 90 | 2 | 1 | | 46 | 17 | 4 | | 150 | 49 | 1 | 688 | 1069 |
| Point 007 | 2 | 3 | 35 | 1 | 5 | 1 | 28 | 35 | 8 | 46 | 10 | 13 | 3 | 246 | 436 |
| Point 008 | | 3 | 15 | | | | | 28 | 12 | 2 | 18 | 1 | | 155 | 234 |
| Point 009 | | | 3 | 1 | 2 | | | | 4 | | 18 | 1 | 1 | 71 | 101 |
| Point 010 | | | | | | | | 58 | | 1 | | | | 66 | 125 |
| Point 011 | | | | | | | | 2 | | | | | | 9 | 11 |
| Point 012 | | | 28 | 1 | 1 | | | 25 | 27 | 1 | 22 | 22 | | 202 | 329 |
| **Waccamaw HP** | **1** | **18** | **115** | **6** | **44** | **3** | **124** | **145** | **104** | **13** | **62** | **328** | **22** | **1419** | **2404** |
| Point 201 | | 2 | 108 | 1 | 9 | 2 | | 9 | 89 | 3 | 10 | 260 | 7 | 727 | 1227 |
| Point 202 | | | 2 | 1 | | | | 84 | 4 | 4 | 4 | | 2 | 107 | 208 |
| Point 203 | | 1 | 1 | | 3 | | 15 | 5 | 1 | 1 | 4 | 9 | | 96 | 136 |
| Point 204 | | | | | | | | | | | | | | | 0 |
| Point 205 | | | 2 | | | | | 4 | | | 2 | 2 | | 37 | 47 |
| Point 206 | | | | | | | | 3 | | | | | | 4 | 7 |
| Point 207 | | | | | 1 | | | | | | | | | 1 | 2 |
| Point 208 | | 15 | 2 | 4 | 31 | 1 | 108 | 2 | 1 | | 38 | 50 | 13 | 349 | 614 |
| Point 209 | 1 | | | | | | 1 | 26 | 8 | 1 | 4 | 6 | | 80 | 127 |
| Point 210 | | | | | | | | 12 | 1 | 4 | | 1 | | 18 | 36 |

| Property | CORA | EPFU | LABO | LACI | LAIN | LANO | LASE | MYAU | MYLU | MYSE | NYHU | PESU | TABR | NoID | Total Bat Calls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Woodbury WMA** | **3** | **4** | **187** | **6** | **24** | **3** | **14** | **605** | **123** | **67** | **327** | **109** | **12** | **2802** | **4286** |
| Point 101 | | | | | | | 2 | | 1 | | 7 | | | 72 | 82 |
| Point 102 | 1 | | | 1 | | | | 7 | | | 1 | 2 | 1 | 47 | 60 |
| Point 103 | 1 | | | | 2 | 1 | | 116 | | 27 | 1 | 1 | | 131 | 280 |
| Point 104 | | | | | | | | 8 | | | | | | 10 | 18 |
| Point 105 | | | | | | | | 1 | | | | | | 7 | 8 |
| Point 106 | | | | | 1 | | | 3 | | 2 | | | | 1 | 7 |
| Point 107 | | 1 | 39 | 1 | 3 | | 11 | 2 | | | 19 | 14 | 2 | 232 | 324 |
| Point 108 | | | | | | | | | | | | | | 1 | 1 |
| Point 109 | | | | | 7 | | 1 | 1 | | | | | | 27 | 36 |
| Point 110 | | 1 | 34 | | | | | 35 | 6 | 10 | 3 | 32 | | 182 | 303 |
| Point 111 | | | 9 | | | | | 67 | 2 | 3 | 7 | 11 | 1 | 283 | 383 |
| Point 112 | | | 85 | | 11 | 2 | | 77 | 106 | 2 | 278 | 8 | 4 | 1287 | 1860 |
| Point 113 | 1 | 1 | 20 | 1 | | | | 287 | 8 | 23 | 11 | 41 | 2 | 518 | 913 |
| Point 114 | | 1 | | 3 | | | | 1 | | | | | 2 | 4 | 11 |
| **Grand Total** | **21** | **34** | **506** | **20** | **78** | **7** | **215** | **1015** | **299** | **136** | **626** | **535** | **39** | **6146** | **9677** |

**Table B3**: Summary of 2024 acoustic species identification totals by property and identification software

**2024 Acoustic Call Species ID Totals by Property and Software**

| | Donnelley WMA | | Botany Bay HP | | Hamilton Ridge WMA | | Webb WMA | | South Fenwick Island | | 2024 Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *BCID* | *KPro* | *BCID* | *KPro* | *BCID* | *KPro* | *BCID* | *KPro* | *BCID* | *KPro* | *BCID* | *KPro* |
| CORA‡ | 40 | 3 | 27 | 0 | 69 | 5 | 35 | 2 | 0 | 0 | 171 | 10 |
| EPFU | 382 | 186 | 129 | 85 | 246 | 111 | 80 | 17 | 74 | 16 | 910 | 415 |
| LABO | 1376 | 427 | 761 | 241 | 1103 | 364 | 872 | 270 | 80 | 10 | 4169 | 1312 |
| LACI | 7 | 8 | 13 | 22 | 1 | 2 | 0 | 0 | 16 | 45 | 32 | 77 |
| LAIN* | N/A | 26 | N/A | 198 | N/A | 2 | N/A | 5 | N/A | 165 | N/A | 396 |
| LANO | 31 | 0 | 240 | 11 | 5 | 0 | 1 | 0 | 142 | 14 | 419 | 25 |
| LASE* | N/A | 345 | N/A | 583 | N/A | 29 | N/A | 11 | N/A | 61 | N/A | 1029 |
| MYAU | 33 | 133 | 22 | 26 | 55 | 138 | 27 | 80 | 13 | 0 | 156 | 377 |
| MYLU | 326 | 226 | 68 | 9 | 119 | 105 | 400 | 237 | 14 | 3 | 915 | 580 |
| MYSE | 107 | 8 | 18 | 0 | 93 | 9 | 80 | 13 | 0 | 0 | 301 | 30 |
| NYHU | 1908 | 657 | 1517 | 491 | 256 | 109 | 432 | 277 | 194 | 33 | 4288 | 1567 |
| PESU | 461 | 458 | 341 | 303 | 963 | 1011 | 175 | 174 | 85 | 57 | 2030 | 2003 |
| TABR* | N/A | 6 | N/A | 69 | N/A | 6 | N/A | 3 | N/A | 296 | N/A | 380 |
| NoID | 115 | 4329 | 97 | 3794 | 134 | 2386 | 90 | 1852 | 14 | 818 | 452 | 13179 |
| IDed Calls | 4671 | 2483 | 3137 | 2038 | 2910 | 1891 | 2102 | 1089 | 618 | 700 | 13391 | 8201 |
| All Calls | 4786 | 6812 | 3234 | 5832 | 3044 | 4277 | 2192 | 2941 | 632 | 1518 | 13843 | 21380 |

*LAIN, LASE, and TABR call identification is not supported in BCID v2.7d
‡*Corynorhinus* species calls IDed as COTO by KPro v.5.6.0c

**Table B4**: Kaleidoscope Pro v5.6.0c auto identified bat calls per species for each property and point during 2024 summer surveys. Highlighted are the two locations with the most MYSE calls for the season, which were subsequently netted.

| Property | CORA‡ | EPFU | LABO | LACI | LAIN | LANO | LASE | MYAU | MYLU | MYSE | NYHU | PESU | TABR | NoID | Total Bat Calls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Donnelley WMA** | **3** | **186** | **427** | **8** | **26** | | **345** | **133** | **226** | **8** | **657** | **458** | **6** | **4329** | **20517** |
| Point 001 | | 5 | 19 | 1 | | | 2 | 6 | | | 3 | 45 | 1 | 142 | 1977 |
| Point 002 | | | 20 | | | | | 1 | 4 | | 14 | 2 | | 49 | 772 |
| Point 003 | | 65 | 80 | | | | 290 | 2 | 39 | | 81 | 82 | | 1207 | 8770 |
| Point 004 | | 6 | | | 11 | | 9 | | | | 6 | | 1 | 109 | 348 |
| Point 005 | | 34 | 56 | 1 | 1 | | 40 | 32 | 35 | | 137 | 6 | 3 | 706 | 2074 |
| Point 006 | | | 40 | | 2 | | | 1 | 3 | | 36 | 16 | | 305 | 858 |
| Point 007 | | 1 | 19 | | | | 1 | 66 | 15 | 3 | 59 | 10 | 1 | 292 | 933 |
| Point 008 | 3 | 73 | 124 | | 12 | | | 5 | 49 | 1 | 125 | 77 | | 754 | 2517 |
| Point 009 | | 2 | 2 | 6 | | | | 2 | 2 | 4 | 7 | | | 83 | 464 |
| Point 010 | | | 67 | | | | 3 | 18 | 79 | | 189 | 220 | | 682 | 1804 |
| **Botany Bay HP** | | **85** | **241** | **22** | **198** | **11** | **583** | **26** | **9** | | **491** | **303** | **69** | **3794** | **11755** |
| Point 101 | | 6 | 4 | | 11 | | 10 | | | | 8 | | 1 | 155 | 326 |
| Point 102 | | 1 | 89 | | | | | 12 | | | 9 | 48 | | 130 | 371 |
| Point 103 | | 5 | 56 | | | | 1 | 1 | 1 | | 64 | 6 | | 248 | 637 |
| Point 104 | | 33 | 10 | | 33 | | 29 | 1 | 2 | | 103 | 131 | 5 | 601 | 2846 |
| Point 105 | | 31 | 27 | 5 | 69 | 5 | 226 | | 3 | | 96 | 11 | 6 | 912 | 2081 |
| Point 106 | | | 1 | | | | | | 1 | | 18 | 17 | | 41 | 117 |
| Point 107 | | 1 | 51 | 17 | 7 | 1 | 42 | 12 | 2 | | 153 | 87 | 1 | 842 | 2129 |
| Point 108 | | 7 | 2 | | 74 | 5 | 272 | | | | 36 | 3 | 50 | 822 | 3052 |
| Point 109 | | | | | | | | | | | | | | 1 | 32 |
| Point 110 | | 1 | 1 | | 4 | | 3 | | | | 4 | | 6 | 42 | 163 |
| **S. Fenwick Island** | | **16** | **10** | **45** | **165** | **14** | **61** | | **3** | | **33** | **57** | **296** | **818** | **21400** |
| Point 201 | | | 1 | 11 | 26 | | | | | | 1 | 30 | 38 | 253 | 994 |
| Point 202 | | | | | | | | | | | | | 2 | 13 | 15629 |
| Point 203 | | 16 | 9 | 34 | 139 | 14 | 61 | | 3 | | 32 | 27 | 256 | 552 | 4777 |

| Property | CORA‡ | EPFU | LABO | LACI | LAIN | LANO | LASE | MYAU | MYLU | MYSE | NYHU | PESU | TABR | NoID | Total Bat Calls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Webb Complex** | **7** | **128** | **634** | **2** | **7** | | **40** | **218** | **342** | **22** | **386** | **1185** | **9** | **4238** | **228795** |
| **Webb WMA** | **2** | **17** | **270** | | **5** | | **11** | **80** | **237** | **13** | **277** | **174** | **3** | **1852** | **24694** |
| Point 301 | | 2 | 3 | | | | 4 | 2 | 13 | 1 | 69 | 3 | | 247 | 2397 |
| Point 302 | | | | | | | | 3 | | | | | | 7 | 111 |
| Point 303 | | 6 | 27 | | 1 | | | 2 | 5 | | 81 | 14 | 1 | 374 | 1064 |
| Point 304 | | 1 | | | | | | | 1 | 1 | 2 | | | 34 | 2606 |
| Point 305 | 1 | 1 | 3 | | | | 1 | 51 | 2 | 9 | 2 | 14 | | 108 | 5793 |
| Point 306 | 1 | 7 | 237 | | 4 | | 6 | 22 | 216 | 2 | 123 | 143 | 2 | 1082 | 12723 |
| **Hamilton Ridge** | **5** | **111** | **364** | **2** | **2** | | **29** | **138** | **105** | **9** | **109** | **1011** | **6** | **2386** | **204101** |
| Point 401 | | 1 | | | 1 | | | 14 | 1 | 1 | 3 | 37 | 1 | 59 | 382 |
| Point 402 | | | 1 | | | | | 4 | 1 | | | | | 24 | 52 |
| Point 403 | 3 | 99 | 308 | 1 | 1 | | 26 | 55 | 66 | 3 | 94 | 91 | 3 | 1330 | 9373 |
| Point 404 | | | | | | | | 5 | | | | 1 | | 21 | 208 |
| Point 405 | 1 | 7 | 51 | 1 | | | 1 | 34 | 19 | 1 | 12 | 851 | | 395 | 1855 |
| Point 406 | 1 | 4 | 4 | | | | 2 | 26 | 18 | 4 | | 31 | 2 | 557 | 192231 |
| **Grand Total** | **10** | **415** | **1312** | **77** | **396** | **25** | **1029** | **377** | **580** | **30** | **1567** | **2003** | **380** | **13179** | **282467** |

‡*Corynorhinus* species calls IDed as COTO by KPro v.5.6.0c

**Table B5**: Mist netting survey sites and results for summer 2023. HP = Heritage Preserve, WMA = Wildlife Management Area. Net nights are calculated using the methods in the Range-wide Indiana Bat Summer Survey Guidelines (April 2023).

| Location | Dates | County | Net Sites | Net Nights | Rain Nights | Nights Surveyed | Bats [a] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | PESU | LABO | LASE | EPFU | NYHU | MYAU | MYSE | TABR | CORA | LAIN | Total |
| Marsh WMA | 4/25-5/24 | Marion | 4 | 18 | 0 | 7 | 1 | 8 | 3 | 0 | 0 | 2 | 0 | 2 | 2 | 0 | 18 |
| Woodbury WMA | 5/31-6/13, 7/17-8/1 | Marion | 3 | 20 | 0 | 8 | 2 | 11 | 4 | 6 | 4 | 22 | 0 | 1 | 1 | 0 | 51 |
| Waccamaw River HP | 6/28-7/12, 8/2 | Horry | 4 | 13 | 1 | 6 | 1 | 9 | 3 | 1 | 10 | 0 | 0 | 0 | 0 | 0 | 24 |
| **Totals** | | **5** | **11** | **51** | **1** | **21** | **4** | **28** | **10** | **7** | **14** | **24** | **0** | **3** | **3** | **0** | **93** |

[a] PESU = *Perimyotis subflavus* , LABO = *Lasiurus borealis* , LASE = *Lasiurus seminolus* , EPFU = *Eptesicus fuscus* , NYHU = *Nycticeius humeralis* , MYAU = *Myotis austroriparious* , MYSE = *Myotis septentrionalis* , TABR = *Tadarida brasiliensis,* CORA = *Corynorhinus rafinesquii,* LAIN = *Lasiurus intermedius*

**Table B6**: Mist netting survey sites and results for summer 2024. HP = Heritage Preserve, WMA = Wildlife Management Area. Net nights are calculated using the methods in the Range-wide Indiana Bat Summer Survey Guidelines (April 2023).

| Location | Dates | County | Net Sites | Net Nights | Rain Nights | Nights Surveyed | Bats [a] PESU | LABO | LASE | EPFU | NYHU | MYAU | MYSE | TABR | CORA | LAIN | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Donnelley WMA | 4/23-6/19 | Colleton | 7 | 30 | 0 | 12 | 5 | 9 | 11 | 13 | 17 | 0 | 0 | 0 | 0 | 1 | 56 |
| Botany Bay HP | 5/7 - 6/5 | Charleston | 5 | 20 | 1 | 9 | 0 | 0 | 12 | 4 | 25 | 0 | 0 | 0 | 0 | 0 | 41 |
| Webb Complex | 7/1-7/30 | Hampton | 4 | 13 | 0 | 7 | 5 | 3 | 2 | 9 | 17 | 2 | 0 | 0 | 2 | 1 | 41 |
| **Totals** | | | **16** | **63** | **1** | **28** | **10** | **12** | **25** | **26** | **59** | **2** | **0** | **0** | **2** | **2** | **138** |

[a] PESU = *Perimyotis subflavus*, LABO = *Lasiurus borealis*, LASE = *Lasiurus seminolus*, EPFU = *Eptesicus fuscus*, NYHU = *Nycticeius humeralis*, MYAU = *Myotis austroriparious*, MYSE = *Myotis septentrionalis*, TABR = *Tadarida brasiliensis,* CORA = *Corynorhinus rafinesquii,* LAIN = *Lasiurus intermedius*

**Table B7**: 2023 Roost Tracking Log

| Bat ID | Tracking Date | Roost ID | Roost Location Desc. |
|---|---|---|---|
| CORA1-23, adult male<br>Frequency: 151.346<br>Captured: 4/26/2023<br>Marsh WMA, Point 001 | 4/27/2023 | CORA1-23-Roost1 | Bottomland swamp |
| | 4/28/2023 | CORA1-23-Roost2 | Bottomland swamp |
| | 5/2/2023 | CORA1-23-Roost3 | Bottomland swamp |
| | 5/3/2023 | CORA1-23-Roost3 | Bottomland swamp |
| | 5/10/2023 | CORA1-23-Roost4 | Bottomland swamp |
| | 5/11/2023 | CORA1-23-Roost4 | Bottomland swamp |
| MYAU1-23, pregnant female<br>Frequency: 151.145<br>Captured: 5/11/2023<br>Marsh WMA, Point 005 | | | Roost not found |
| MYAU2-23, lactating female<br>Frequency: 151.781<br>Captured: 5/20/2023<br>Marsh WMA, Point 012 | | | Roost not found; picked up signal just after sunset twice near the capture location but never when roosting |
| CORA2-23, lactating female<br>Frequency: 151.225<br>Captured: 6/8/2023<br>Woodbury WMA, Point 112 | 6/15/2023 | CORA2-23-Roost1 | Bottomland forest/swamp |
| | 6/16/2023 | CORA2-23-Roost1 | Attempted emergence count but no bats seen |

**Table B8**: 2024 Roost Tracking Log

| Bat ID | Tracking Date | Roost ID | Roost Location Desc. |
|---|---|---|---|
| PESU1-24, lactating female<br>Frequency: 151.098<br>Captured: 6/17/2024<br>Donnelley WMA, DON010 | 6/18/2024 | PESU1-24_Roost1 | Deciduous forest; emergence count completed |
| | 6/19/2024 | PESU1-24_Roost1 | Deciduous forest |
| | 6/20/2024 | PESU1-24_Roost1 | Deciduous forest |
| CORA1-24, juvenile male<br>Frequency: 151.537<br>Captured: 7/8/2024<br>Hamilton Ridge WMA, HAM001 | | | Roost not found |
| LAIN1-24, adult male<br>Frequency: 151.900<br>Captured: 7/11/2024<br>Hamilton Ridge WMA, HAM001 | | | Roost not found |
| PESU2-24, post-lactating female<br>Frequency: 151.151<br>Captured: 7/30/2024<br>Hamilton Ridge WMA, HAM003 | 7/31/2024 | PESU2-24_Roost1 | Bottomland forest/swamp |
| | 8/1/2024 | PESU2-24_Roost2 | Bottomland forest/swamp; emergence count completed |
| | 8/2/2024 | PESU2-24_Roost1 | Bottomland forest/swamp |