FINAL REPORT

White-nose Syndrome Grants to States and Tribes, SC-E-F19AP00830

South Carolina Department of Natural Resources

October 1, 2019 – September 30, 2020

Project Title: South Carolina White-nose Syndrome State Support FY19

The purpose of this grant was to fund the South Carolina Department of Natural Resources (SCDNR) bat biologist (herein referred to as the bat biologist) salary for 5 months as well as provide per diem, mileage, and truck repairs needed for two temporary hourly SCDNR technicians working directly on this project. The goals of this project were to help fulfill data needs such as distribution and habitat requirements of White-nose Syndrome (WNS)-affected bats via culvert surveys with potential to contain MYGR hibernacula and summer netting for MYSE on the SC coastal plain; WNS winter and early spring *Pd* surveillance to continue to track the spread of WNS in SC; and participation of the bat biologist in relevant WNS workshops and regional meetings.

Due to the COVID-19 pandemic and concerns over the potential for SARS-CoV-2 to spread to bats (Runge et al. 2020), instead of conducting summer netting, we used acoustic devices to determine bat species present at those sites. In addition, because the WNS workshop was made into a webinar, funds set aside for WNS workshop travel were used on additional acoustic supplies.

Objective: Continue to ship bat samples from rabies-negative bats submitted to the SC Department of Health and Environmental Control (SCDHEC) to the Southeastern Cooperative Wildlife Disease Study (SCWDS) for WNS testing, as SCDHEC makes those specimens available. Ship specimens of bat species known to be affected by WNS from public sources and sick or dead bats collected from Objective 2.

Accomplishments:

SCDNR sent 69 total bat specimens to SCWDS to determine cause of death and test for samples of pooled patagium and muzzle for *Pseudogymnoascus destructans (Pd*, the causative agent of WNS; Table 1) via polymerase chain reaction (PCR) testing. These specimens were provided by the public (7 specimens) or were rabies negative bats collected by SCDHEC (62 specimens). Twenty-nine specimens were collected in winter from Dec – April 2020. Specimens were also saved for *Pd* testing outside of winter to help determine its spread statewide on bat species known to carry *Pd*, especially in counties where *Pd* had not yet been tested. Chesterfield, Darlington, Florence, Georgetown, and Lee counties were all tested for *Pd* for the first time in 2020, while other *Pd* negative counties continued to test negative with number of bat specimens tested ranging from 1-10 bats per county (Figure 1, Table 1).

One specimen tested positive for *Pd*: a Brazilian free-tailed bat (*Tadarida brasiliensis*, TABR) juvenile from a maternity bat box colony in Greenville Co (Table 1, highlighted). The other four Greenville County submissions in June were also from the same site, though they tested negative.

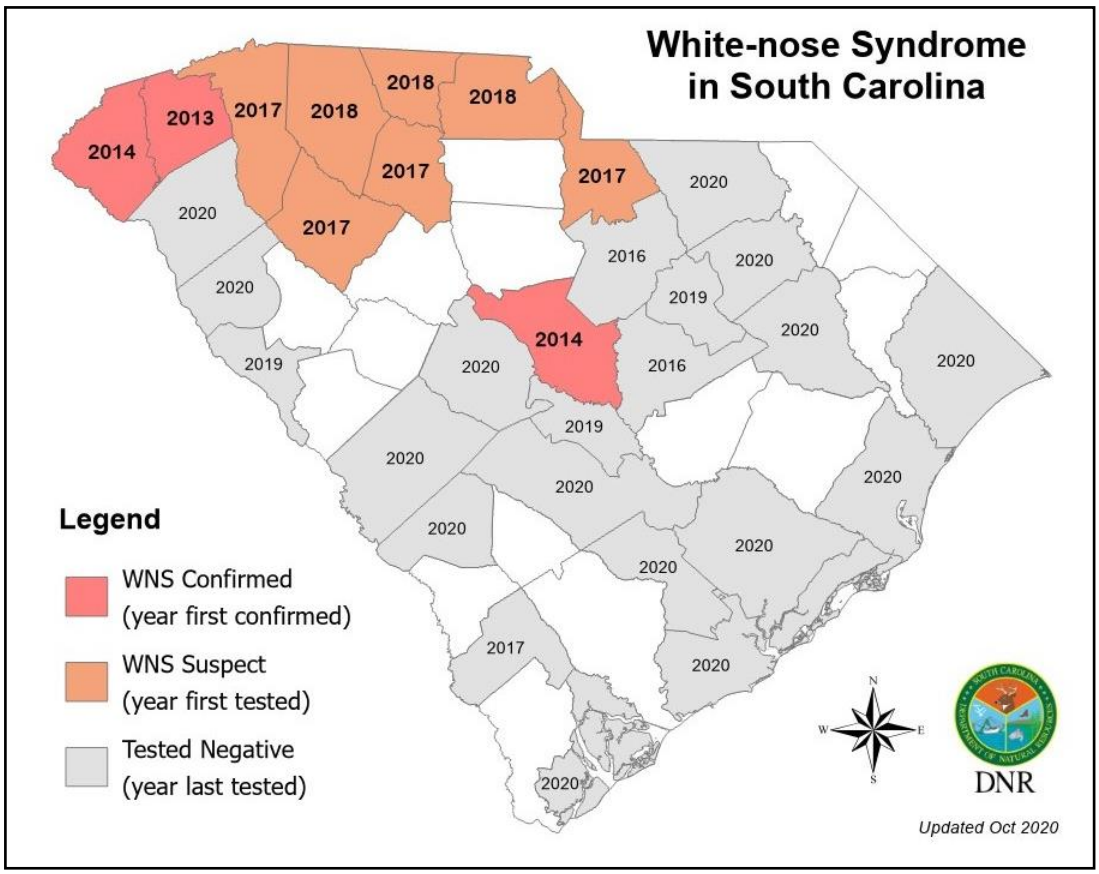


Figure 1: White-nose Syndrome and *Pd* testing in South Carolina since 2013.

The five individuals were sampled from a total of 142 TABR pups that had been found dead under three of eight maternity bat boxes at this site within a 24-hr period on June 19, 2020. The eight bat boxes house approximately 1,000 big brown (*Eptesicus fuscus*, EPFU) and Brazilian free-tailed bats. Temperatures were recorded for an adjacent box, and high temperatures during this period ranged from 96° to 104°F, with a nighttime low of 70°F. Pesticide spraying occurs in the area, although off-property. The bats were undergoing maternity season, in which sporadic pup mortality is known to occur. SCWDS reported the cause of death as undetermined but commented:

> *"Considering such a large number of deaths, possible causes or contributors include severe or extreme weather events, ongoing, detrimental environmental factors, chronic exposure to low-grade toxins, and lack of or poor resource availability; unfortunately, these causes are difficult to determine by postmortem examination. These factors also may impose undue physiologic stress for which juveniles are more prone, and all but one of the submitted bats were juveniles. The bats examined microscopically had abundant food (insect parts) in the intestines and adequate fat reserves, suggesting this may have been a point source or short-term event."*

We suspect that the low nighttime temperature for TABR pups at this point in their development may have been the cause of the mass deaths.

Table 1: Bat specimens collected by SCDNR and SCDHEC in FY19 for SCWDS *Pseudogymnoascus destructans* polymerase chain reaction testing. Gray highlights indicate outside of winter season.

SCWDS ID	Date Collected	County	Species	Sex	Age	*Pd*
CC19-974	12/16/19	Lexington	*Tadarida brasiliensis*	Female	Adult	Neg
W20-574 A	1/9/20	Georgetown	*Tadarida brasiliensis*			Neg
W20-574 B	1/28/20	Charleston	*Tadarida brasiliensis*			Neg
W20-574 C	1/29/20	Georgetown	*Tadarida brasiliensis*			Neg
W20-574 D	1/31/20	Richland	*Tadarida brasiliensis*			Neg
W20-574 E	2/7/20	Anderson	*Eptesicus fuscus*			Neg
W20-574 F	2/20/20	Horry	*Tadarida brasiliensis*			Neg
W20-574 G	2/25/20	Anderson	*Tadarida brasiliensis*			Neg
W20-574 H	2/27/20	Anderson	*Eptesicus fuscus*			Neg
W20-574 I	3/3/20	Greenville	*Tadarida brasiliensis*			Neg
W20-336	3/6/20	Greenville	*Tadarida brasiliensis*	Female	Adult	Neg
W20-574 J	3/10/20	Anderson	*Tadarida brasiliensis*			Neg
W20-574 K	3/11/20	Aiken	*Lasiurus borealis*			Neg
W20-574 L	3/13/20	Florence	*Tadarida brasiliensis*			Neg
W20-574 M	3/13/20	Horry	*Tadarida brasiliensis*			Neg
W20-574 N	3/18/20	Anderson	*Tadarida brasiliensis*			Neg
W20-574 O	3/20/20	Charleston	*Tadarida brasiliensis*			Neg
W20-574 P	3/23/20	Richland	*Tadarida brasiliensis*			Neg
W20-574 Q	3/24/20	Oconee	*Tadarida brasiliensis*			Neg
W20-574 R	3/27/20	Anderson	*Lasiurus borealis*			Neg
W20-574 S	3/31/20	Anderson	*Lasiurus borealis*			Neg
W20-574 T	4/16/20	York	*Eptesicus fuscus*			Neg
W20-574 U	4/16/20	Spartanburg	*Eptesicus fuscus*			Neg
W20-574 V	4/21/20	Charleston	*Tadarida brasiliensis*			Neg
W20-574 W	4/27/20	Abbeville	*Tadarida brasiliensis*			Neg
W20-574 X	4/28/20	Aiken	*Tadarida brasiliensis*			Neg
W20-574 Y	4/29/20	Georgetown	*Tadarida brasiliensis*			Neg
W20-574 Z	4/29/20	Charleston	*Lasiurus seminolus*			Neg
W20-574 AA	4/29/20	Berkeley	*Tadarida brasiliensis*			Neg
W20-574 AB	5/5/20	York	*Eptesicus fuscus*			Neg
W20-574 AC	5/5/20	Lexington	*Lasiurus seminolus*			Neg
W20-574 AD	5/13/20	Dorchester	*Lasiurus seminolus*			Neg
W20-574 AE	5/14/20	Charleston	*Lasiurus seminolus*			Neg
W20-574 AF	5/19/20	Spartanburg	*Eptesicus fuscus*			Neg
W20-574 AG	5/19/20	Anderson	*Eptesicus fuscus*			Neg
W20-574 AH	5/19/20	Beaufort	*Lasiurus seminolus*			Neg
W20-574 AI	5/19/20	York	*Eptesicus fuscus*			Neg
W20-574 AJ	5/20/20	Pickens	*Eptesicus fuscus*			Neg
W20-574 AK	6/2/20	York	*Eptesicus fuscus*			Neg
W20-574 AL	6/9/20	Lexington	*Tadarida brasiliensis*			Neg
W20-574 AM	6/16/20	Aiken	*Lasiurus borealis*			Neg
W20-574 AN	6/16/20	Oconee	*Eptesicus fuscus*			Neg

Table 1 (cont.)

SCWDS ID	Date Collected	County	Species	Sex	Age	*Pd*
W20-335A	6/19/20	Greenville	*Tadarida brasiliensis*	Female	Juv	Neg
W20-335B	6/19/20	Greenville	*Tadarida brasiliensis*	Male	Juv	Neg
W20-574 AO	6/19/20	Darlington	*Lasiurus seminolus*			Neg
W20-574 AP	6/22/20	Lancaster	*Eptesicus fuscus*			Neg
W20-337-A	6/24/20	Greenville	*Tadarida brasiliensis*	Female	Juv	Neg
W20-337-B	6/24/20	Greenville	*Tadarida brasiliensis*	Male	Juv	Pos
W20-337-C	6/24/20	Greenville	*Tadarida brasiliensis*	Male	Juv	Neg
W20-574 AQ	6/25/20	York	*Tadarida brasiliensis*			Neg
W20-574 AR	6/26/20	Spartanburg	*Lasiurus borealis*			Neg
W20-574 AS	6/30/20	Abbeville	*Lasiurus borealis*			Neg
W20-574 AT	7/7/20	Barnwell	*Eptesicus fuscus*			Neg
W20-574 AU	7/16/20	Greenville	*Eptesicus fuscus*			Neg
W20-574 AV	7/16/20	Lexington	*Eptesicus fuscus*			Neg
W20-574 AW	7/23/20	Anderson	*Eptesicus fuscus*			Neg
W20-574 AX	7/25/20	Oconee	*Eptesicus fuscus*			Neg
W20-574 AY	7/26/20	Spartanburg	*Eptesicus fuscus*			Neg
W20-574 AZ	7/29/20	Greenville	*Eptesicus fuscus*			Neg
W20-574 BA	8/1/20	Greenville	*Eptesicus fuscus*			Neg
W20-574 BB	8/6/20	Oconee	*Lasiurus borealis*			Neg
W20-574 BC	8/8/20	Lexington	*Lasiurus borealis*			Neg
W20-574 BD	8/8/20	Lexington	*Lasiurus borealis*			Neg
W20-574 BE	8/11/20	Pickens	*Eptesicus fuscus*			Neg
W20-574 BF	8/12/20	York	*Eptesicus fuscus*			Neg
W20-574 BG	8/13/20	Greenville	*Eptesicus fuscus*			Neg
W20-574 BH	8/13/20	Chesterfield	*Eptesicus fuscus*			Neg
W20-574 BI	8/21/20	Greenville	*Eptesicus fuscus*			Neg
W20-574 BJ	9/11/20	Berkeley	*Lasiurus seminolus*			Neg

Significant deviations:
There were no significant deviations.

Objective: Conduct WNS surveillance in the winter of 2019/2020 at 10 or more key known hibernacula; survey potential hibernacula at 10 or more culverts, and any promising new hibernacula identified via LiDAR. Focus for *Pd* testing will be in the Piedmont and Coastal Plain.

Accomplishments:
Thirty-four hibernacula surveys were conducted in the winter of 2019/2020 (Table 2): 10 mines, 3 caves, 1 railroad tunnel, and 20 culverts. The total count was 401 tri-colored bats (*Perimyotis subflavus*, PESU), 27 Rafinesque's big-eared bats (*Corynorhinus rafinesquii*, CORA), 6 unknown Myotis, 1 EPFU, and 1 Silver-haired bat (*Lasiurus noctivagans*, LANO). None of these bats had obvious clinical signs of WNS, and none tested positive for *Pd*. All hibernacula data were submitted to the NABat online database by June 2020.

Table 2. Winter bat counts in South Carolina (winter 2019-2020). Type: BR= bridge, C= cave, CU= culvert, M= mine, RS= rock shelter; Bat Count/Previous Count: CORA= *Corynorhinus rafinesquii*, MYLU= *Myotis lucifugus*, MYSE= *Myotis septentrionalis*, PESU= *Perimyotis subflavus*, Myotis= unknown *Myotis* species. No new counties were considered WNS suspect in winter of 2019/2020.

Date	Type	Site	County	Bat Count	Previous Count	*Pd* testing	Owner
1/21/20	M	Ledyard 1	Oconee	15 PESU, 23+ CORA	12/07/2016: 20 CORA, 18 PESU		Private
1/21/20	M	Ledyard 2	Oconee	21 PESU	03/12/2015: 15 CORA, 3 PESU		Private
1/28/20	M	Cheoend Mine	Oconee	17 PESU	03/12/2015: 16 PESU		Public
1/28/20	M	Soap107A	Oconee	10 PESU	12/12/2016: 6 PESU		Private
1/28/20	M	Soap107B	Oconee	0 Bats	12/07/2016: 0 Bats		Private
1/28/20	M	Soap107C	Oconee	0 Bats	01/26/2018: 1 PESU		Private
1/27/20	C	Table Rock	Pickens	158 PESU, 1 MYLU, 1 CORA, 6 Myotis	02/17/2016: 295 PESU, 2 MYSE, 3 MYLU, 2 Myotis		Public
1/29/20	M	Hammet Mine	Spartanburg	106 PESU	2018-02-14: 55 PESU, tested positive for *Pd*		Private
2/3/20	M	UN1A	Union	38 PESU	03/11/2015: 11 PESU		Private
2/3/20	M	UN13A (Union Hole)	Union	2 PESU	New		Private
2/3/20	M	UN3B	Union	26 PESU	03/14/2016: 16 PESU		Private
2/5/20	CU	McCrady Tunnel 1	Richland	0 Bats	02/27/2015: 0 Bats	NWHC	Private
2/5/20	CU	McCrady Tunnel 2	Richland	0 Bats	02/27/2015: 1 EPFU	NWHC	Private
2/5/20	CU	McCrady Tunnel 3	Richland	1 CORA	02/27/2015: 4 EPFU	NWHC	Private
2/5/20	CU	McCrady Tunnel 4	Richland	0 Bats	02/27/2015: 0 Bats	NWHC	Private
2/5/20	CU	McCrady Tunnel 5/6	Richland	2 PESU, 2 CORA	02/27/2015: 1 CORA, 3 EPFU	NWHC	Private
2/7/20	C	Santee	Orangeburg	Water filled, could not enter	02/20/2014: ~150 MYAU		Public
2/10/20	T	Middle Tunnel	Oconee	7 PESU	01/21/2017: 12 PESU, 1 CORA		Public
2/21/20	C	Union Water Cave	Union	0 Bats	New		Private
2/21/20	CU	Culvert 6	Laurens	1 PESU	New		SCDOT
2/21/20	CU	Culvert 9	Laurens	0 Bats	New		SCDOT
2/25/20	C	Santee	Orangeburg	Mist-net Survey: 2 PESU	02/20/2014: ~150 MYAU	NWHC	Public
2/28/20	CU	Culvert 1	Newberry	0 Bats	New		SCDOT
2/28/20	CU	Culvert 2	Newberry	0 Bats	New		SCDOT
2/28/20	CU	Culvert 3	Newberry	0 Bats	New		SCDOT
2/28/20	CU	Culvert 4	Newberry	0 Bats	New		SCDOT
2/28/20	CU	Culvert 5	Laurens	0 Bats	New		SCDOT
2/28/20	CU	Culvert 7	Laurens	0 Bats	New		SCDOT
2/28/20	CU	Culvert 7 B	Laurens	0 Bats	New		SCDOT
2/28/20	CU	Culvert 7 C	Laurens	0 Bats	New		SCDOT
2/28/20	CU	Culvert 11	Newberry	0 Bats	New		SCDOT
3/2/20	CU	Clemson Culvert 1	Pickens	0 Bats	New		SCDOT
3/2/20	CU	Clemson Culvert 2	Pickens	1 EPFU, 1 LANO	New		SCDOT
3/2/20	CU	Clemson Culvert 3	Pickens	0 Bats	New		SCDOT
3/2/20	CU	Abernathy Park	Pickens	0 Bats	New		SCDOT

Two sites, Table Rock cave and Hammet mine, produced the largest overall numbers with 158 PESU, 1 MYLU, 1 CORA, 6 Myotis; and 106 PESU, respectively. Table Rock PESU numbers were down 137 PESU, or 46%, since the previous count in 2016. Though the numbers were down, we expected a higher decrease in a 4-year period compared to other key PESU hibernacula declines in the state. A bat near this site tested positive for *Pd* in 2013, and a MYSE in this cave was seen with white fungus in 2016. Therefore, we're hopeful that the decline at this site may be slowing and/or holding steady, similar to the Main Stumphouse Tunnel surveyed by Dr. Susan Loeb where numbers have leveled off over the past few years. At the Table Rock site, 6 unknown Myotis were also seen, a few of which were low enough to measure but didn't fall within the ear measurements of MYSE, nor had the toe hairs of MYLU, and were too big for Eastern small-footed bat (*Myotis leibii*, MYLE). We suspect they were either Southeastern bats slightly out of their range (*Myotis austroriparious*, MYAU), or less likely, federally endangered Indiana bats (*Myotis sodalis*, MYSO). We have scheduled another survey for the winter of 2020/21 to identify any unknown Myotis if they are reachable for measurements. The Hammet Mine that tested positive for *Pd* in 2018 had 51 more PESU in 2020, representing an increase of 93%. Though it's unclear what this increase represents, we will survey again in 2022 when the fungus has been present for four years (the period at which bat populations have begun to decrease most) before determining a population increase at this site.

On 2/7/20, we attempted to survey the Santee limestone cave known to harbor approximately 150 MYAU; however, with recent rains plus silt collection at the bottom of the passages, we were unable to enter the cave due to high water levels and 6 inches of breathable head space. We returned on 2/25/20 to conduct a mist net survey at the main opening (there is also a pit opening), but only 1 PESU emerged and another was found roosting just inside the entrance. Both were tested for *Pd*, and results came back negative. We plan to attempt another hibernacula survey in Feb 2021, and if water levels are again too high, net once more to determine if this population is still present at the site. We also surveyed and tested for *Pd* at the McCrady Tunnels, for a total of 3 CORA and 2 PESU; all of which came back negative for *Pd.*

Significant deviations:
There were no significant deviations.

Objective: Conduct summer netting or trapping on state-owned or conservation partner-held properties at sites with MYSE or within suspected MYSE range. The focus will be Coastal Plain netting and *Pd* testing. This effort will identify important MYSE habitat and help delineate the range of MYSE and the southeastern edge of *Pd* spread.

Accomplishments:
Due to the inability to net bats due to COVID-19 concerns (see significant deviations below), our goal was to record, identify, and manually vet MYSE calls at each site to ultimately determine best future net placement for confirmation of presence or hotspots for future research. At Santee Coastal Reserve Wildlife Management Area (WMA), MYSE had already been confirmed, but acoustic hotspots found in 2020 will produce more efficient future netting locations. Though the number of days recorded per Anabat location varied due to weather, high public use areas (fewer days to minimize chance of gear being stolen), and battery problems (Sand Hills Anabats #20, #21, and #28), the number of days an Anabat recorded at each location was usually between 4 to 6 days. Detectors were attached to trees at least 1.5 m above the ground with the omnidirectional microphone facing areas with as little clutter as possible. Acoustic calls were analyzed using Kaleidoscope Pro (Kpro; version 5.1.9i) software. In the

Kpro "Signal Params" tab for signal detection parameters, we kept all automatic recommended settings except for the frequency of interest. The recommended frequency range is 8 to 120 kHz in Kpro, but the minimum signal of interest appropriate for the expected bat community could be set at a slightly higher minimum of 12 kHz for better accuracy. Therefore, the minimum and maximum frequency range was set to 12- 120 kHz. In the "Auto ID for Bats" tab we chose Bats of North America 5.1.0, and the level of sensitivity "+1 More Accurate (Conservative)" out of the three levels available (-1 More Sensitive, 0 Balanced, +1 More Accurate). We selected South Carolina for the region, and chose all the species seen in Appendix A.

Overall, SCDNR recorded a grand total of 46,785 bat calls of 13 species from 98 Anabat locations across 5 sites in the summer of 2020 (see Appendix A for Tables 3-6, Appendix B for maps). In the coastal ecoregion, 59 Anabat locations recorded calls at 3 total sites: One at Bonneau Ferry WMA (Table 3 and map on page 14); 31 at Little Pee Dee Heritage Preserve (HP)/WMA (Table 4 and maps on pages 15-17); and 27 at Santee Coastal Reserve WMA (Table 6 and map on page 23). The highest numbers of bat species recorded on the coast were LASE/LABO (Seminole and Eastern red bat calls are generally indistinguishable when manually vetted) and PESU. In the Sandhills ecoregion, 39 locations recorded calls at 2 overall sites: 37 at Sand Hill State Forest (SF) and two at Cheraw State Park (SP) (Table 5 and maps on pages 18-22). The highest numbers recorded in this region were LASE/LABO, PESU and EPFU.

Bonneau Ferry WMA only had one recording night at one site, but with some Myotis calls (MYLU) plus its proximity to Francis Marion National Forest makes it a site worth netting in the future.

Little Pee Dee HP/WMA had 8 sites with MYSE calls. The most promising area with manually vetted MYSE calls (including MYSE calls found in KPro NoID folder) was the area with Anabats #17**,** #18, #19 and #20 (map page 17). Manually vetted calls from other Anabat sites looked more like MYAU but could also be MYSE. Netting would be required to confirm MYSE at this site.

Sand Hill SF had 5 sites with MYSE calls, but with only 1-2 calls each. Though MYSE calls are a small percentage of the total calls for the site, the following are locations with manually vetted MYSE calls in order of priority: Anabats #25 and #26 (map page 19); Anabats #37 and #38 (promising manually vetted MYSE calls found in KPro NoID folder; map page 22); and Anabat #31 (map page 19). Netting would be required to confirm MYSE at this site.

Cheraw SP had one site with MYSE calls, Anabat #39 (map page 19). This call and other calls found in the KPro NoID folder were manually vetted and look like they could be MYSE calls. Netting would be required to confirm MYSE at this site.

Santee Coastal Reserve WMA had 18 sites with MYSE calls. The best sites for future netting will be at Anabat #16 and #24 (map page 22) due to higher numbers of MYSE and other Myotis such as MYLU. A relatively high number of calls for the rarely captured Northern yellow bat (*Lasiurus intermedius*) were seen at Anabats #1, #5 and #6 (also with high number of MYLU, map page 23).

<u>Significant deviations:</u>
Due to the COVID-19 pandemic and concerns over the potential for SARS-CoV-2 to spread to bats, we did not net bats, and we didn't have the opportunity to conduct *Pd* testing during summer. Our objective shifted from netting with some acoustic work to no netting and all acoustic work. This method shift was

based on restrictions provided to us in a memo from the USFWS. Our deviations were approved per the COVID-19 flexibilities document, item 6(c).

Objective: Keep staff and partners current by participating in WNS partner conference calls, the 2020 WNS Workshop, and the 2020 Southeastern Bat Diversity Network (SBDN) Meeting.

Accomplishments:
The SCDNR bat biologist attended the SBDN meeting in Athens, GA from Feb 12 – 14, 2020. The SCDNR bat biologist and WNS technician participated in monthly WNS partner conference calls and watched the WNS Webinar on June 10 and 11, 2020.

Significant deviations:
Because the WNS meeting was made into a webinar, funds set aside for the bat biologist to travel to the WNS meeting were used on additional acoustic supplies.

Literature Cited:
Runge, M. C., E. H. C. Grant, J. T. H. Coleman, J. D. Reichard, S. E. J. Gibbs, P. M. Cryan, K. J. Olival, D. P. Walsh, D. S. Blehert, M. C. Hopkins, and J. M. Sleeman. 2020. Assessing the risks posed by SARS-CoV-2 in and via North American bats—Decision framing and rapid risk assessment. Open-File. Open-File Report 2020–1060 54.

Estimated Federal Cost: $40,000

Recommendations:
Close the grant. Beyond the life of this grant, we recommend continued mist netting efforts in acoustic hotspots for species most at risk from WNS such as the MYSE, MYLU and PESU in the Coastal, Sandhills, and Piedmont ecoregions to learn more about their survival, distribution and habitat use.

Appendix A: Acoustic results for the summer of 2020. Species identification with Kaleidoscope Pro.
Species codes:
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 notivagans*)
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 (*Nycticeus humeralis*)
PESU = Tri-colored Bat (*Perimyotis subflavus*)
TABR = Brazilian Free-tailed Bat (*Tadarida brasiliensis*)

Table 3: Bonneau Ferry Wildlife Management Area acoustic results for one point during the period of 5/14/20 – 5/15/20.

Anabat 1	LABO	LASE	MYLU	NYHU	PESU	Totals	Species	NoID	Total Calls
Totals	39	19	7	4	27	96	6	93	189

Table 4: Little Pee Dee Heritage Preserve / Wildlife Management Area acoustic results for 31 points during the period of 5/19/20 - 6/5/20, ordered by total species numbers from high to low.

Anabat	LASE	LABO	PESU	NYHU	LAIN	MYLU	MYAU	EPFU	TABR	LACI	MYSE	CORA	LANO	Totals	Species	NoID	Total Calls
1	54	79	70	38		21	7							269	6	298	**567**
2	22	6	12	16	3	10			1					70	7	111	**181**
3	18	2	4	1	2	1			2	1				31	8	59	**90**
4						1								1	1	1	**2**
5						11								11	1	3	**14**
6	63	6	7	8	15	1	1	1	1	1				104	10	115	**219**
7	87	14	34	13	14	11	20	2	8		5			208	10	145	**353**
8	22	1	32	8	5	6		6	1	1				82	9	61	**143**
9		3	1		1	10	3				1			19	6	35	**54**
10	14	22	19	9	14	13	3	4	6	1				105	10	104	**209**
11	4	5	3	1	3	6	1	5						28	8	36	**64**
12	45	5	44	12	15	5	1		1			1		129	9	98	**227**
13			2			3	6							11	3	12	**23**
14	26	4	22	8		7	6					1		74	7	57	**131**
15	6	12	12	3	1	12	6	1			3			56	9	80	**136**
16	51	11	20	14	8	12	22	1	2		2	2		145	11	110	**255**
17	44	226	251	54	3	14	46	78	4	2	3		1	726	12	453	**1179**
18		1	64			7	1				2			75	5	48	**123**
19	61	458	40	26	13	6	10	31	1	1				647	10	336	**983**
20	108	34	25	14	17	7	8	3	4	2				222	10	287	**509**
21			1		1		3		1					6	4	19	**25**
22	34	6	13	4	5	8			1					71	7	89	**160**
23	7		1											8	2	23	**31**
25	148	4	4	34	13	11	3		1					218	8	302	**520**
26	58	22	5	31	10	46	9	2	1	1	1			186	11	269	**455**
27	237	16	5	36	23	9	3	2	5	7			1	344	11	256	**600**
28	7	23	6	16		1	3	9		1				66	8	102	**168**
29	106	14	10	56	40	3	7	4	1	1	2		1	245	12	349	**594**
30														0	0	1	**1**
31	45	7	45	12	16	11	1		1			1		139	9	108	**247**
32	106	22	19	25	5	24	18	5	2	1		1		228	11	526	**754**
Totals	**1373**	**1003**	**771**	**439**	**227**	**277**	**188**	**154**	**44**	**20**	**19**	**6**	**3**	**4524**	**13**	**4493**	**9017**

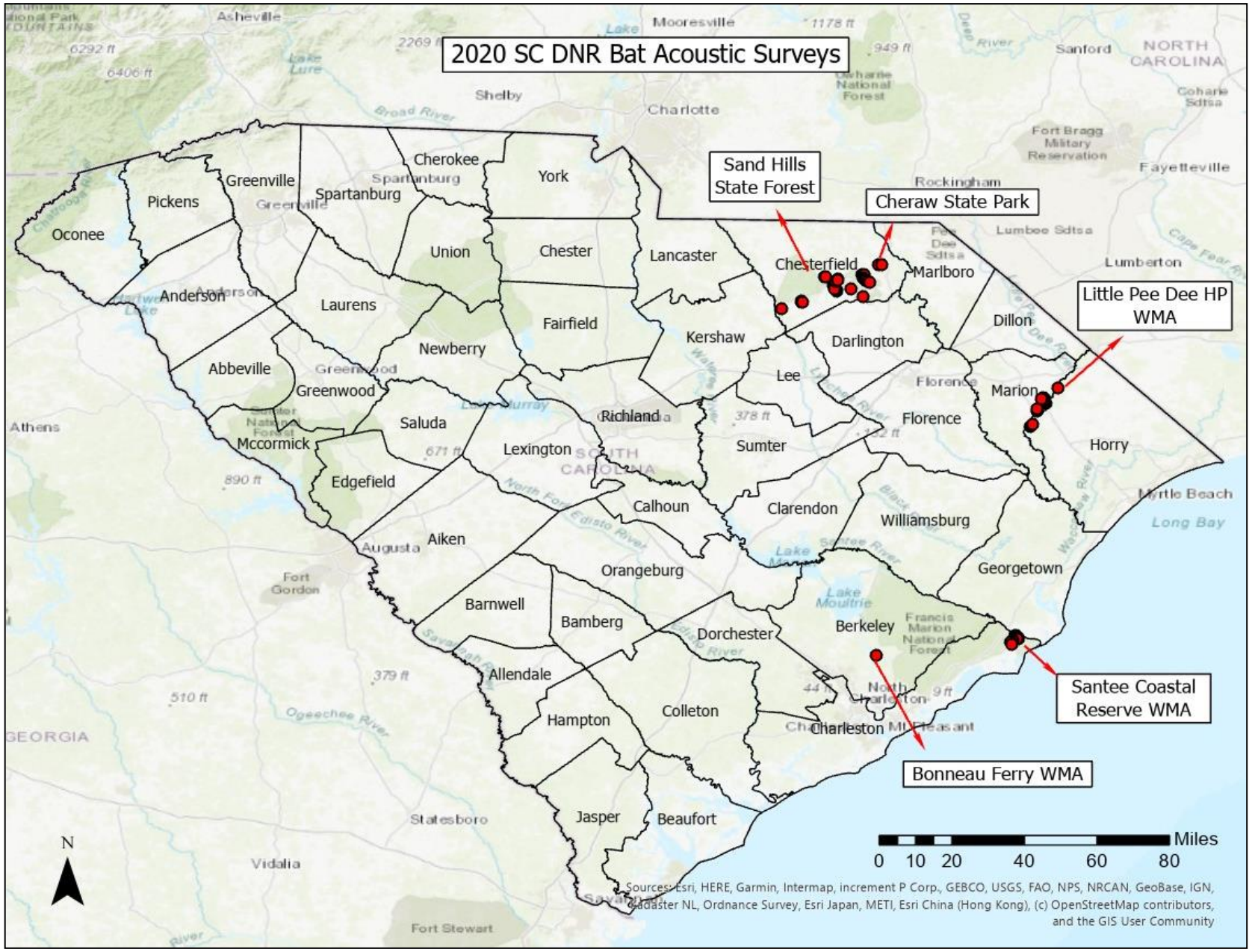
Table 5: Sand Hills State Forest (Anabats 1-38) and Cheraw State Park (Anabats 39 & 40) acoustic results for 39 points and one route during the period of 6/8/20 – 6/26/20, ordered by total species numbers from high to low.

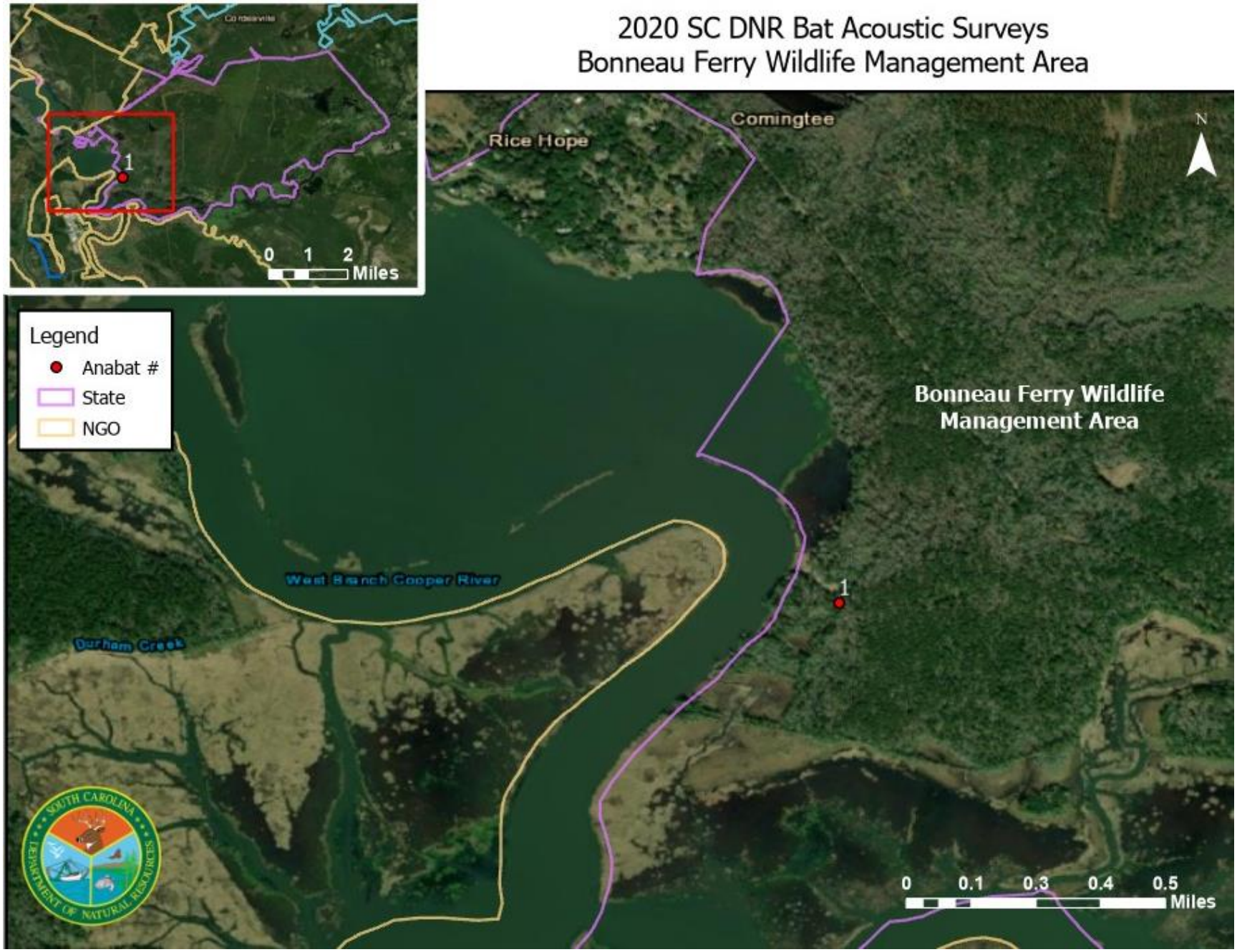
Anabat	PESU	LASE	EPFU	NYHU	LABO	LAIN	LACI	MYLU	TABR	CORA	LANO	MYAU	MYSE	Totals	Species	NoID	Total Calls
1	6	12	4	2		6	4	3	1					38	8	30	**68**
2	5	12	32	5	1	3		1		1				60	8	75	**135**
3	34	11	308	3	16	3		5		1	1	1		383	10	81	**464**
4	21	39	64	13	4	18	3	2	3	1	2			170	11	137	**307**
5	17	6	4	1		5	1		4					38	7	35	**73**
6	10	21	3	12	1	2	6							55	7	47	**102**
7	1	67	21	9		12	1		5		1			117	8	147	**264**
8														0	0	4	**4**
9	215	90	16	20	8	10	8	8	5	1				381	10	201	**582**
10	151	361	6	32	7	18	7	4	8					594	9	276	**870**
11		13		1		2			1					17	4	21	**38**
12	1643	206	7	27	3	30	14	3	11					1944	9	339	**2283**
13		2		1	3			9						15	4	20	**35**
14														0	0	3	**3**
16		12	1	1		4	1							19	5	16	**35**
17	45	1	2	3		3		1	2					57	7	19	**76**
18	8	18	5	5	1		1	1						39	7	35	**74**
19	139			4		1		1			1			146	5	14	**160**
20														0	0		**0**
21														0	0		**0**
22	27	6	22	3	8	3	3	3	1		1			77	10	40	**117**
23	8	1		1	2									12	4	4	**16**
24	35	126	7	65	13	7	53	3	4					313	9	263	**576**
25	371	2	1	1	2			8					2	387	7	25	**412**
26	7	1		1	1	4							1	15	6	30	**45**
27	3		1	1	2		2	3			1			13	7	13	**26**
28														0	0		**0**
29	1	3	2		1	2		2	1					12	7	11	**23**
30														0	0	2	**2**
31	3	33	15	17	37	9	4	7	1		1		1	128	11	120	**248**
32	2	7	16	7	24			21	1		1			79	8	84	**163**
33	347	65	4	24	9			15						464	6	366	**830**
34	1297	181	41	53	11	6	4	8	3	1			1	1606	11	459	**2065**
35	1	2	5	3	15		2	10	2					40	8	30	**70**
36		20	5	1	3	4	4	1	2					40	8	36	**76**
37		13	126	2		6	2	2	5	3				159	8	156	**315**
38			16	1	1			3						21	4	37	**58**
39	2	666	336	150	59	34	10	3		4	1	1	1	1267	12	992	**2259**
40			1				1		2					4	3	3	**7**
Route	2	35		5	4	3	2				1			52	7	4	**56**
Totals	**4399**	**1997**	**1071**	**469**	**232**	**192**	**131**	**127**	**62**	**12**	**10**	**2**	**6**	**8710**	**13**	**4171**	**12881**

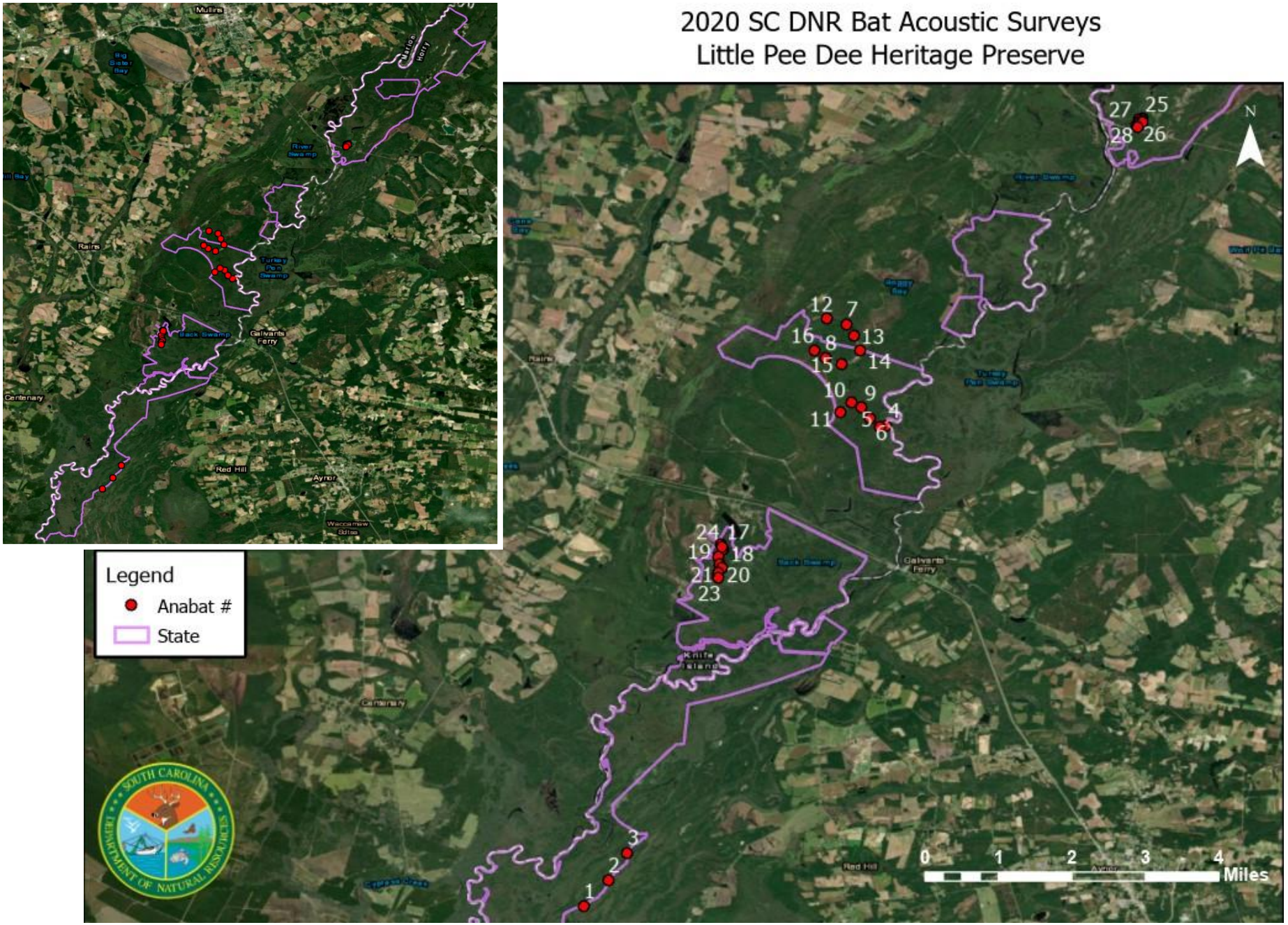
Table 6: Santee Coastal Reserve Wildlife Management Area acoustic results for 27 points and one route during the period of 4/30/20 – 5/15/20, ordered by total species numbers from high to low.

Anabat	PESU	LASE	LABO	MYLU	NYHU	LAIN	EPFU	MYAU	LACI	TABR	MYSE	LANO	CORA	Totals	Species	NoID	Total Calls
1	371	279	38	34	68	163	62	24	30	34		2		1105	11	670	**1775**
2	26		25	19	4		5	15	2	1	4	1		102	10	120	**222**
3	42	265	23	11	156	4	14	4	6	1	2			528	11	724	**1252**
4	342	67	5	8	21	64	70	6	21	10	4	1		619	12	312	**931**
5	36	50	7	9	19	134	62		10	12		1		340	10	278	**618**
6	1164	765	80	102	116	164	112	30	30	34	1	2		2600	12	1817	**4417**
7	25	22	85	41	24	1		8	1	1	1		1	210	11	175	**385**
8	54	62	36	41	29	2	1	4	1	3				233	10	306	**539**
9	150	4	94	66	20		76	29	2	1	2			444	10	292	**736**
10	225		9	22		1	1	11			1			270	7	136	**406**
11	272	61	38	128	23	5	3	14	2	3	2	1	2	554	13	755	**1309**
12														0	0	6	**6**
13	504	375	120	27	75	4	5	10	5	2	1			1128	11	565	**1693**
14	96	34	21	18	7	11	2	36	18	9	4	2		258	12	161	**419**
15	83	2	26	19	11		4	1						146	7	140	**286**
16	293		438	603	2	7	4	72	3	1	16		1	1440	11	1149	**2589**
17	267	76	49	14	22	18	3	6	12	25		3		495	11	420	**915**
18	32	362	47	8	14		5	5	3	2	3			481	10	360	**841**
19	1	105	36	5	31									178	5	305	**483**
20	70	25	260	60	75		15	9			1	1		516	9	484	**1000**
21	42	2	45	18	2		15	10	3	3		1		141	10	113	**254**
22	146	169	120	42	40	1	48	9		2	4	1		582	11	455	**1037**
23	8	1	135	50	2		2	3						201	7	178	**379**
24	19	17	197	54	18	2	30	10	1		15	2		365	11	288	**653**
25	71	21	32	73	16	5	18	3	19	2	3			263	11	250	**513**
26	19		99	56	2	2	1	11	2		6	1		199	10	302	**501**
27	56	41	75	33	22	1	20	21			4			273	9	225	**498**
Route	19	10	2	3	3	2	2							41	7	226	**267**
Totals	**4433**	**2815**	**2142**	**1564**	**822**	**591**	**580**	**351**	**171**	**146**	**74**	**19**	**4**	**13712**	**13**	**10986**	**24698**

Appendix B: 2020 SC DNR bat acoustic survey maps.

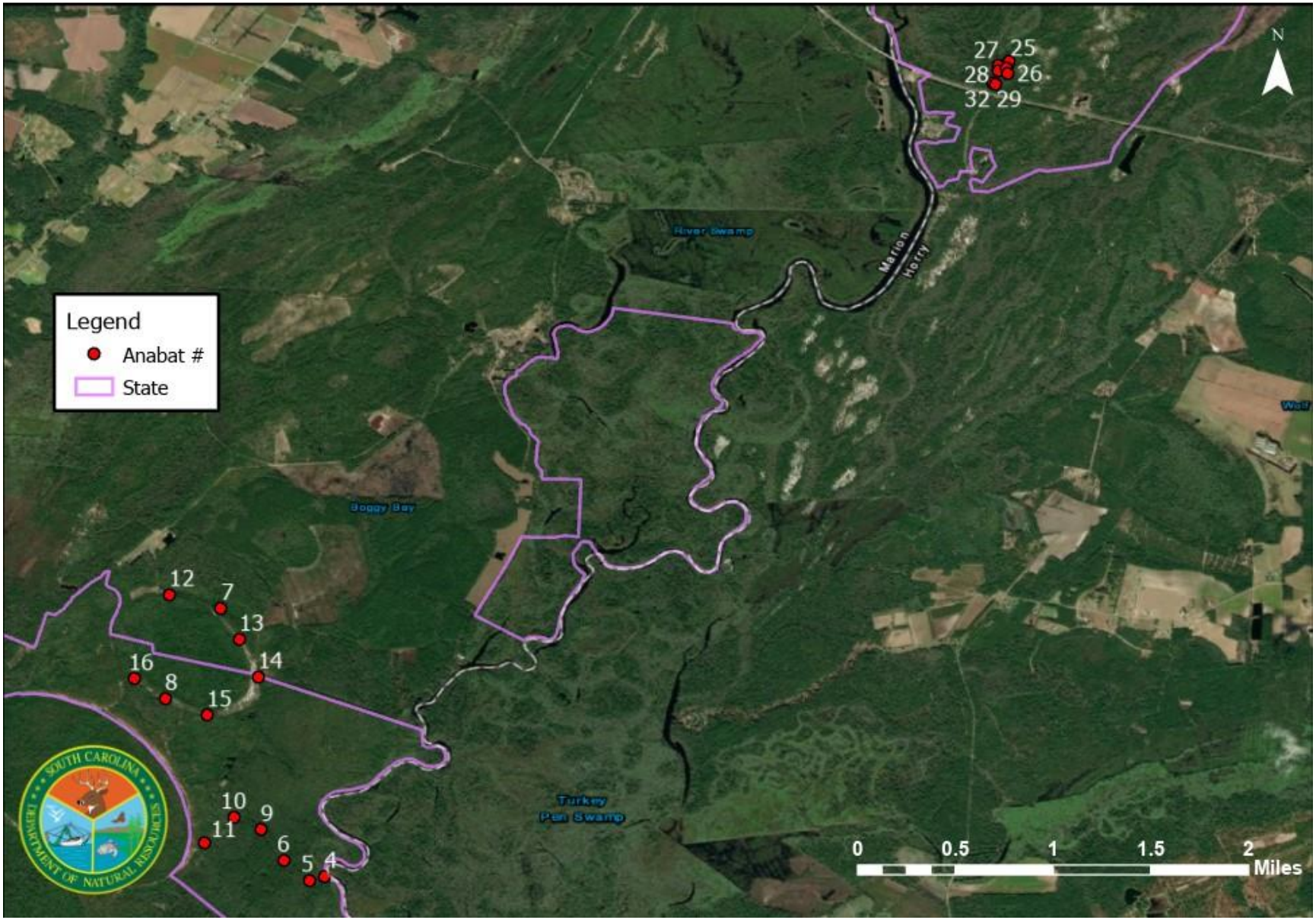



2020 SC DNR Bat Acoustic Surveys
Bonneau Ferry Wildlife Management Area
Rice Hope
Comingtee
N
Bonneau Ferry Wildlife Management Area
West Branch Cooper River
Durham Creek
1
Legend
Anabat #
State
NGO
0 1 2 Miles
0 0.1 0.3 0.4 0.5 Miles
SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES


2020 SC DNR Bat Acoustic Surveys
Little Pee Dee Heritage Preserve
Legend
Anabat #
State
N
0 1 2 3 4
Miles
Mullins
Marion
Horry
Rains
Turkey Pen Swamp
Galivants Ferry
Centenary
Red Hill
Ayrer
Knife Island

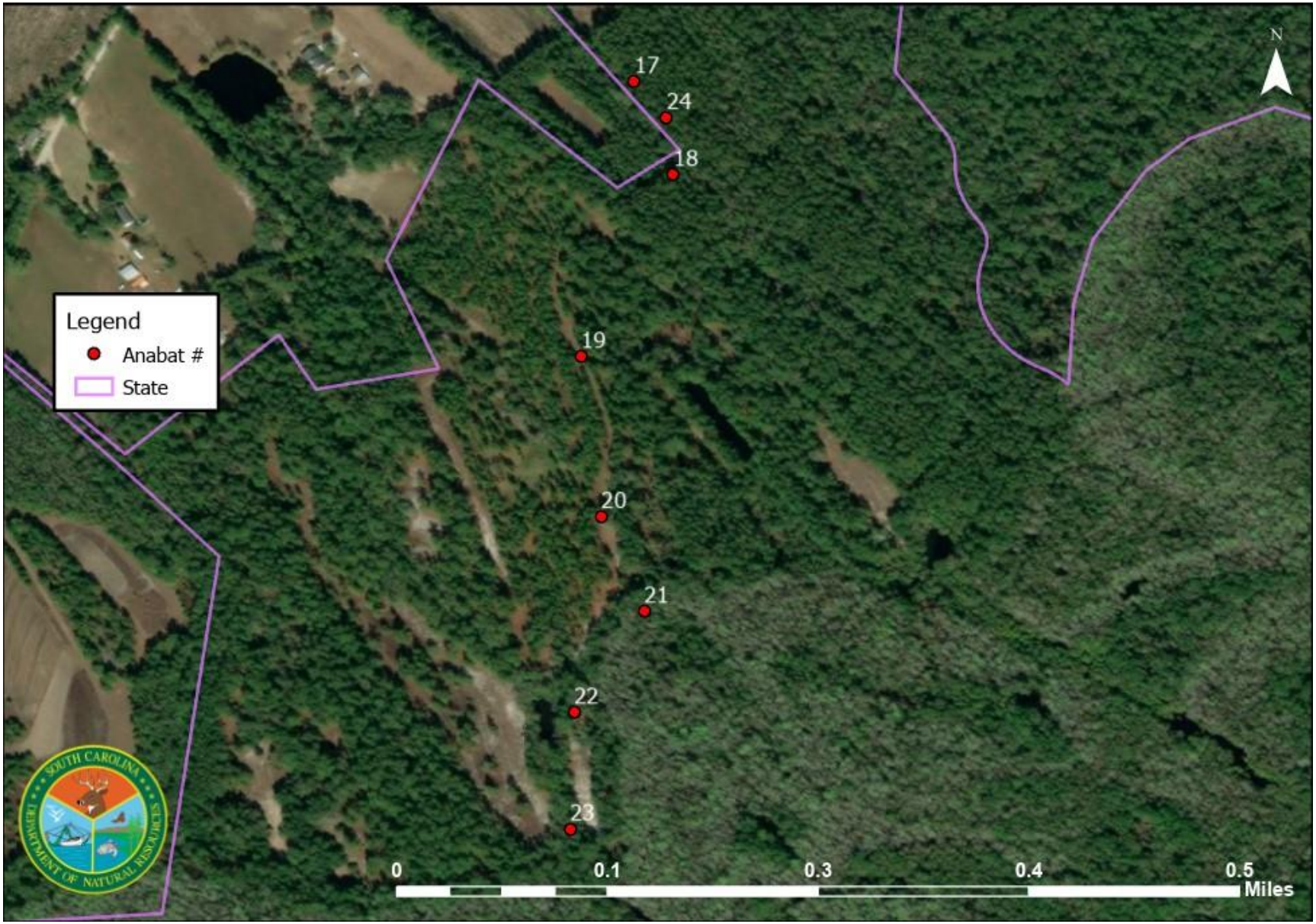
Northeast Section

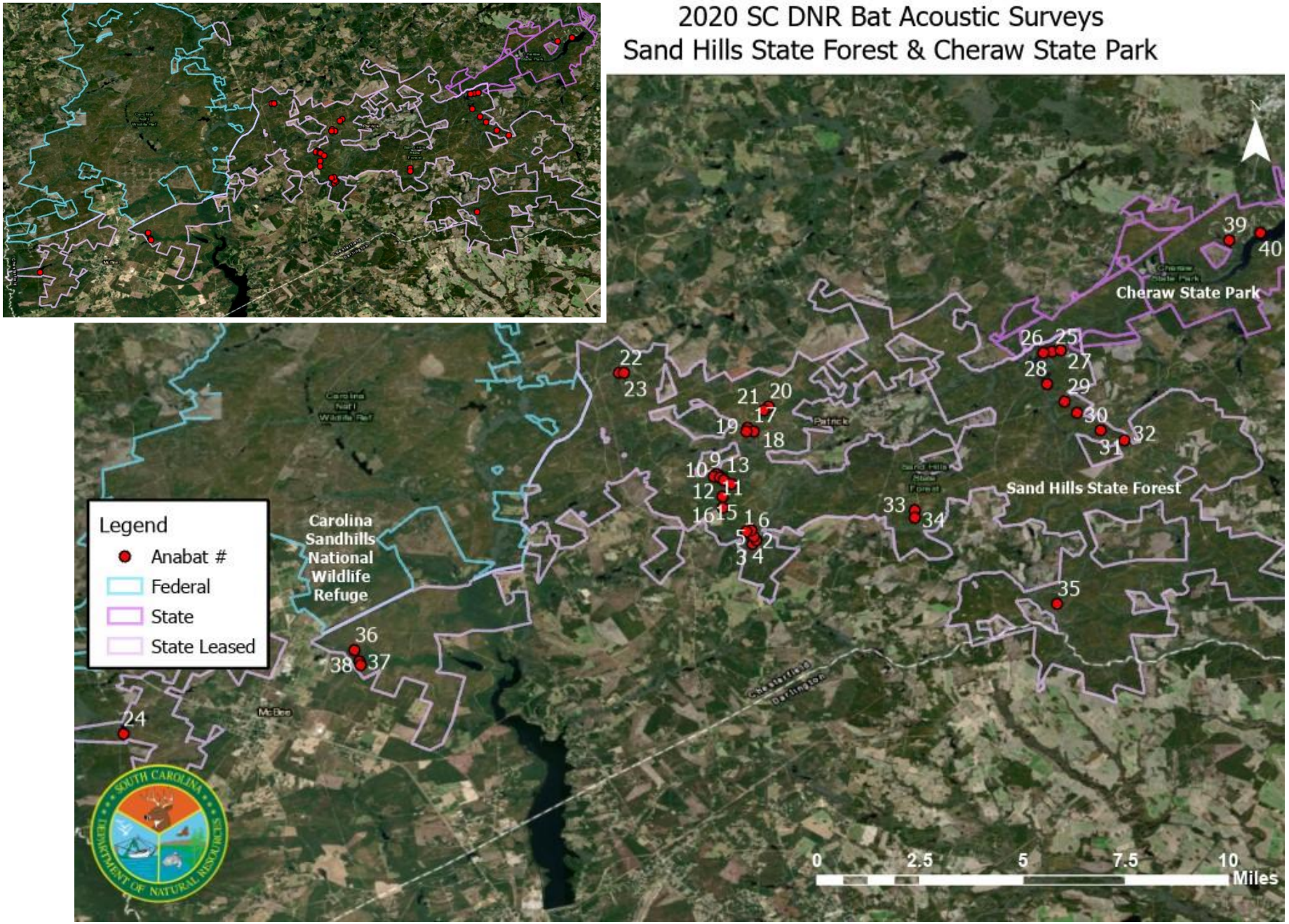
2020 SC DNR Bat Acoustic Surveys
Little Pee Dee Heritage Preserve



Central Section

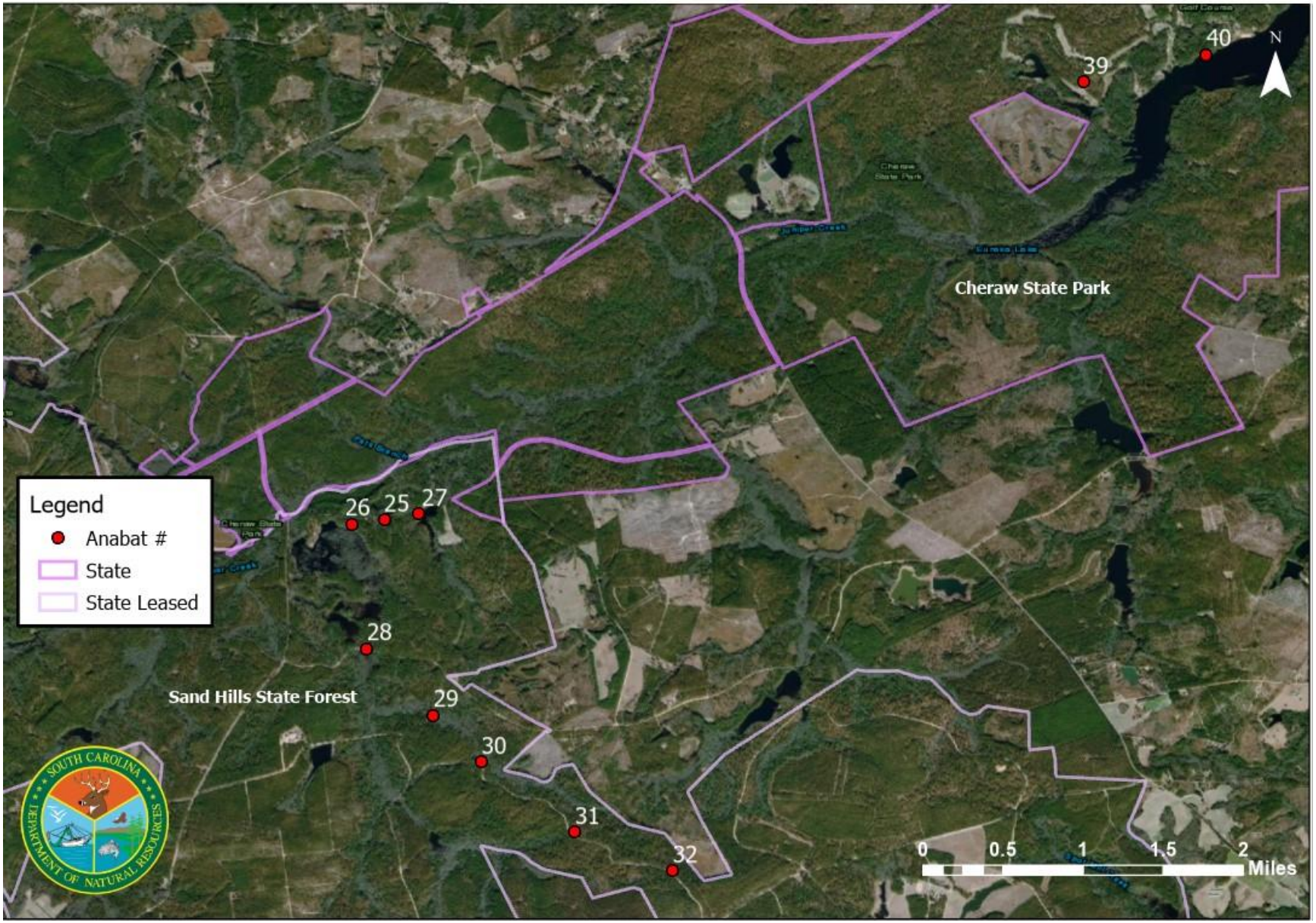
2020 SC DNR Bat Acoustic Surveys
Little Pee Dee Heritage Preserve




2020 SC DNR Bat Acoustic Surveys
Sand Hills State Forest & Cheraw State Park
Legend
Anabat #
Federal
State
State Leased
Carolina Sandhills National Wildlife Refuge
Cheraw State Park
Sand Hills State Forest
Patrick
McBee
0
2.5
5
7.5
10
Miles

Northeast Section

2020 SC DNR Bat Acoustic Surveys
Sand Hills State Forest & Cheraw State Park

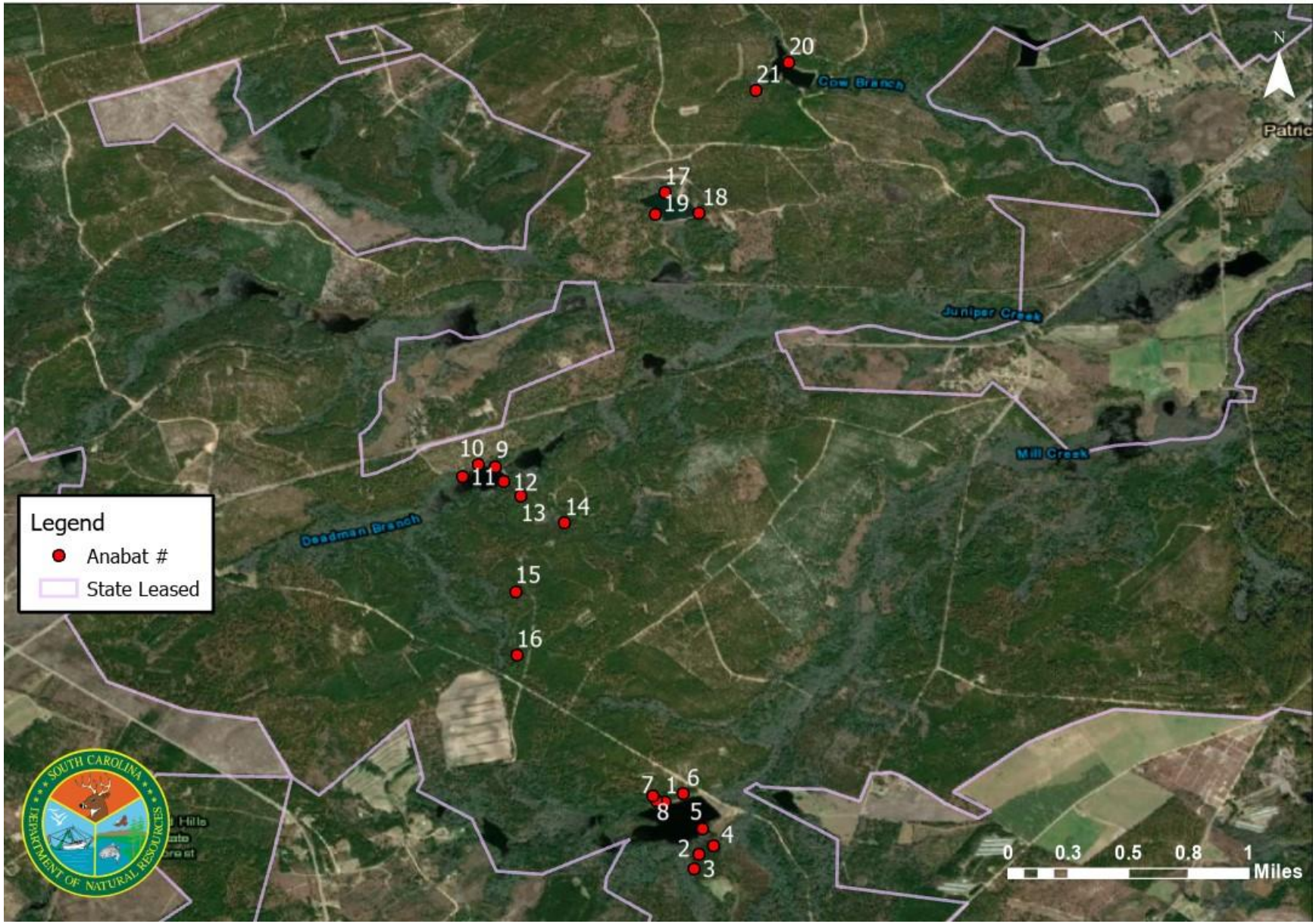


Central East Section

2020 SC DNR Bat Acoustic Surveys
Sand Hills State Forest

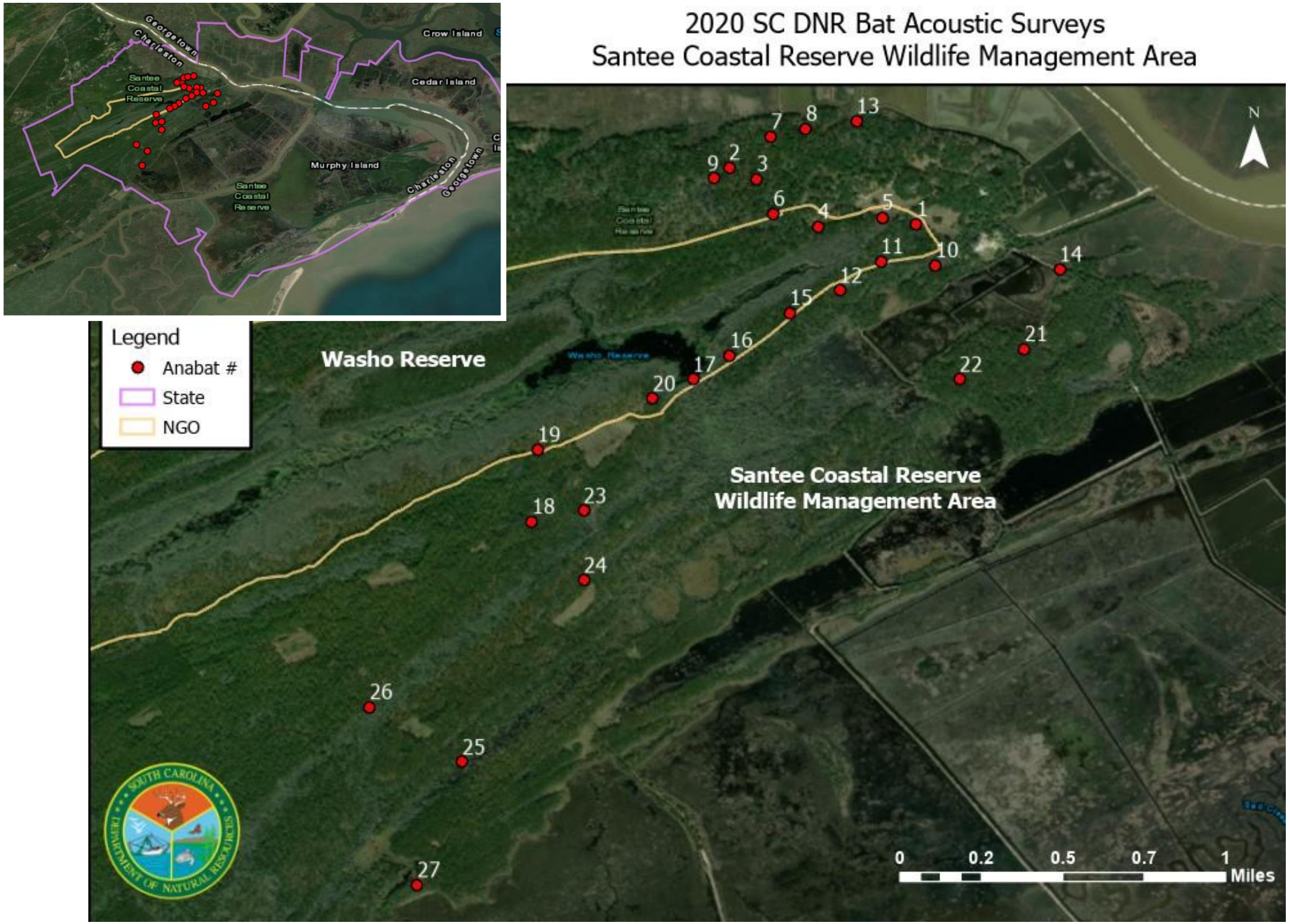
Central Section

2020 SC DNR Bat Acoustic Surveys
Sand Hills State Forest



Southwest Section

2020 SC DNR Bat Acoustic Surveys
Sand Hills State Forest


2020 SC DNR Bat Acoustic Surveys
Santee Coastal Reserve Wildlife Management Area
Georgetown
Charleston
Crow Island
Cedar Island
Santee Coastal Reserve
Murphy Island
Legend
Anabat #
State
NGO
Washo Reserve
Santee Coastal Reserve Wildlife Management Area
N
0 0.2 0.5 0.7 1
Miles