BAD CREEK PUMPED STORAGE PRESENCE/ABSENCE ACOUSTIC AND MIST-NET SURVEYS FOR THREATENED & ENDANGERED BAT SPECIES

REPORT
PRESENTED TO

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In an email dated January 10, 2025, USFWS provided their determination that the results of this report are acceptable for probable absence of northern long-eared bat, presence of the gray bat, and presence of the proposed endangered tricolored bat in the project area. For Indiana bat, USFWS does not agree with the determination of probable absence due to the many calls in the acoustic data set that are consistent with this species; therefore, acoustic presence of the species cannot be excluded and Indiana bat is tentative presumed present.

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1.0 EXECUTIVE SUMMARY

Biotope Forestry & Environmental completed a presence/probable absence survey for threatened and endangered bat species as a part of the Section 7 Endangered Species Act requirements for the proposed Bad Creek II Complex in Oconee County, South Carolina. The project area of interest (AOI) consists of both linear and non-linear areas of potential summer habitat for target species (i.e., trees greater than three inches diameter at breast height) that could be impacted by the construction of an additional power complex. The level of effort was based upon the limits of disturbance, which comprises approximately 179.3 acres of suitable non-linear habitat and 45 kilometers of suitable linear habitat.

Biotope was contracted in May 2024 by HDR to conduct a combined mist-net and acoustic survey approach to determine presence/probable absence of both state and federally protected bats as well as state listed species of concern known to be present in Oconee County. The survey was conducted within the AOI on the nights of June 1st through 19th, 2024. Forested acreage onsite was primarily comprised of upland, mature pine-hardwood forests interspersed with early successional habitat throughout. Predominant canopy species were *Pinus strobus*, *Liriodendron tulipifera, Acer rubrum,* and *Quercus coccinea*.

Summer roosting and foraging habitat for both the federally listed northern long-eared bat (*Myotis septentrionalis*) and proposed tricolored bat (*Perimyotis subflavus*) located within the AOI were generally observed to be of good quality. Potential roosting features included both living trees with cavities, sloughing bark and leaf clusters in addition to snags. Foraging areas (e.g., canopy gaps, open fields, creeks and lake water source) and commuting habitats of use to both species are found throughout the AOI. Main flight corridors consisted of forest interior openings, riparian corridors, existing right of ways and access roads.

Fifteen mist-net sites were surveyed for two calendar nights, totaling 62 net nights for the entire project. Additionally, 37 acoustic sites were surveyed totaling 144 detector nights for the entire project. Mist-nets were established along primary corridors, interior forest, forest strips, forest gaps, and forest edges within the AOI to maximize bat captures while detectors were deployed along similar features where lack of side and top cover made mist-nets less desirable. A total of 41 individual bats consisting of three species - eastern red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), and eastern small-footed bat (*Myotis leibii*) - were captured during mist-net surveys. Acoustic auto identification software suggested a diverse species use of the AOI, qualitative analysis of high frequency calls confirmed the likely presence of gray bat (*Myotis grisescens*), little brown bat (*Myotis lucifugus*), and the tricolored bat (*P. subflavus*).

A probable absence determination was made with regards to the federally listed northern long-eared and Indiana bat, while the results indicate the proposed federally endangered tricolored bat, and the little brown bat likely use the AOI in some capacity. Biotope recommends coordination with HDR, Duke Energy, South Carolina Department of Natural Resources and the United States Fish and Wildlife Service for concurrence with the findings of this survey.

2.0 INTRODUCTION

Biotope was contracted by HDR to assess the status of the federally proposed tricolored bat (*Perimyotis subflavus*; TCB) and the endangered northern long-eared bat (*Myotis septentrionalis*; NLEB) as well as South Carolina species of concern including the little brown bat (*Myotis lucifugus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), hoary bat (*Lasiurus cinereus*), and gray bat (*Myotis grisescens*) as indicated in the approved Study Plan for the proposed Bad Creek II Complex in Oconee County, South Carolina (see Appendix F). Biotope is submitting this bat survey report as per the requirements set forth by the South Carolina Department of Natural Resources, the Federal Energy Regulatory Commission (FERC) and Clean Water Act (CWA) permitting process and to fulfill section 7 Endangered Species Act requirements set forth by the US Fish and Wildlife Service (USFWS).

3.0 PROJECT LOCATION

The project area of interest (AOI) is located approximately 8miles north of Salem, South Carolina. The approximate center of the project area is located at 34.956254°-82.984148°. The proposed project covers approximately 179.3 acres (non-linear) and 45 kilometers (linear) of forested habitat with trees greater than three inches diameter at breast height (DBH), which is suitable summer habitat for the target bat species. The land use within and surrounding the AOI is primarily forest, roads, and pasture. The topography in the AOI is characterized as mountainous/steep terrain within the Blue Ridge Mountains. Project maps can be found in Appendix A.

4.0 METHODS

4.1 Habitat Assessment

A bat study plan was developed by HDR and Duke Energy and approved by USFWS and SCDNR prior to commencing surveys. The surveys were then conducted in the field by Biotope and were carried out in accordance with the approved study plan. Field reconnaissance was conducted throughout the entirety of the AOI by federally permitted bat biologists before initiation of the survey to determine the highest quality mist-net and acoustic site locations (see Appendix A for project maps). To assess the AOI for potential summer habitat, biologists conducted a desktop review of the AOI. Publicly available recent aerial imagery was used to delineate non-forested and forested areas within the AOI and to determine the distance to available water sources. The onsite field reconnaissance involved the characterization of forest cover types near survey sites, including overall composition (i.e., species, successional stage, etc.) and qualitative assessment of habitat suitability (i.e., potential roost trees, riparian/upland corridors, forest understory clutter, etc.).

4.2 Survey Locations

The level of survey effort required was based on the limit of disturbance (LOD) that contained potential NLEB and/or TCB habitat within the AOI and the requirements dictated in the USFWS *2024 Indiana Bat & Northern Long-eared Bat Survey Guidelines*[1] (USFWS Guidelines). Desktop analysis determined approximately 179.3 acres of suitable non-linear habitat and 45 kilometers of suitable linear habitat within the LOD. Upon the completion of field reconnaissance site visits performed by Duke Energy bat biologists, approximately 30% of the potential summer habitat identified within the LOD was deemed suitable for mist-net surveys, thus a combined mist-net and acoustic survey approach was taken. Note that access was restricted in some portions of proposed access roads due to legal (i.e., deeded access) or physical barriers (e.g., cliffs) preventing placement of sites along each square kilometer (see Appendix A maps for detailed site placement).

[1] U.S. Fish and Wildlife Service. 2024. Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines. U.S. Fish and Wildlife Service, Region 3, Bloomington, MN. 95pp

4.2.1 Mist-Net Surveys

A total of fifteen summer mist-net surveys were conducted for two calendar nights, totaling 62 net nights of survey effort across the project (see Appendix A for maps). Twelve of the mist-net sites were placed along the linear section of the AOI. The remaining three mist-net sites were placed within the nonlinear portion of the AOI. All the nonlinear and linear mist-net sites utilized two mist-net sets except for mist-net site BC-6, where an additional mist-net set was deployed. Mist-net surveys were conducted from June 1st-June 14th, 2024. All survey methods strictly adhered to the USFWS Guidelines.

Mist-net sets were spaced at least 100 feet (30 meters) apart, so as not to interfere with each other, and evenly distributed throughout the suitable habitat that was safely accessible to prevent over-sampling individual habitat features (e.g., three or more mist-net sets on a single travel corridor) at the discretion of the federally permitted bat biologist running the site. Net locations were selected in areas that provided preferred habitat for NLEB where available (see Appendix B for photos of net sets and Appendix D for site diagrams). Preferred habitat includes potential travel corridors (e.g., forest interior corridors and forest edge). Nets filled corridors from side to side, extending beyond the corridor boundaries when possible, and from ground level up to the overhanging canopy where possible. Surveys were conducted using black nylon mist-nets (38mm mesh) ranging from 5.2m to 7.8m high, consisting of two or more nets stacked on top of one another, and from 4m to 18m in length.

4.2.1.1 Survey Period

Nets were opened approximately 10 minutes before sunset and checked every 10 minutes for at least five hours. Care was taken to minimize noise, lights, and movement near the nets. Biologists were prepared to cut the net if a bat became severely entangled and could not be safely extracted within four minutes. Surveys were not conducted in adverse weather conditions including: (a) temperatures below 50°F (10°C) during the survey period; (b) precipitation that exceeded 30 minutes either continuously or intermittently during the survey, and (c) sustained wind speeds greater than nine miles/hour for more than 30 minutes during the survey period. Weather delays during mist-net surveys occurred on June 3rd, 4th, 7th, and 9th.

4.2.1.2 Morphological Data Collected

The capture time, species, age, sex, reproductive condition, right forearm (RFA) length, mass, Reichard's wing damage index score (WNS column), net ID, and net capture height were recorded for all bats captured. Bat identification was performed by a qualified state and federally permitted bat biologist. Completed data sheets can be found in Appendix D.

4.2.1.3 White-Nose Syndrome

To minimize the potential transmission of white-nose syndrome to captured bats, all netting and field activities followed the most recent decontamination protocols (October 2020) set forth by the USFWS. All disposable scientific equipment (bags and exam gloves) were used on only one bat then discarded. All submersible equipment (mist-nets and ropes) was fully immersed in hot water that maintained a temperature of at least 55°C (131°F) for a minimum of five minutes on a nightly basis. All non-submersible equipment (rulers, calipers, and scales) was wiped down with Lysol® IC Quaternary Disinfectant Cleaner Wipes after each use between bats while mist-net set poles were wiped down at the end of each night.

4.2.2 Acoustic Surveys

A total of thirty-seven acoustic surveys were conducted across the AOI, resulting in the collection of a total of 144 detector nights (see Appendix A for maps). Thirty-three acoustic sites were placed along the

linear section where two detectors were deployed for two calendar nights to give a total of four detector nights per site. An additional three acoustic sites were placed within the nonlinear section where one detector was deployed for four calendar nights to give a total of four detector nights per site. Acoustic surveys were conducted from June 1st-June 19th, 2024. All survey methods strictly adhered to the USFWS Guidelines.

Anabat Express acoustic detectors were deployed at all sites with either directional or omnidirectional microphones, dictated by the specific landscape feature being surveyed. All detectors were placed by federally permitted bat biologists with experience selecting optimal habitat for acoustic bat surveys (Appendix C Table A1) and executing correct detector deployment. Site locations were selected in areas that provided preferred habitat for NLEB as well as TCB (see Appendix C for photos of detector units), which included likely travel corridors such as interior forest trails, road corridors, water sources, ephemeral stream beds or forest edge. Microphones were elevated at least three meters above ground level vegetation using mounting poles to remove them from excessive noise clutter and elevate them closer to the suspected flight paths. Additionally, the detectors were placed a) at least three meters from any vegetation or other obstructions in the 360° radius surrounding the detector; b) in areas without, or with minimal vegetation in front of the microphone; c) parallel to woodland edges; and d) at least 15 meters from known or suspect roosts (e.g., buildings, bridges, large snags). Where two detectors were deployed, they were set a minimum of 30 meters apart. Completed datasheets with details on the deployment of each site and detector placement can be found in Appendix E.

4.2.2.1 Survey Period

Detectors were deployed at each site prior to sunset on night one and programmed to start recording 30 minutes prior to sunset and stop recording 30 minutes after sunrise. Surveys were not conducted in adverse weather conditions including: (a) temperatures below 50°F (10°C) during the survey period; (b) precipitation that exceeded 30 minutes either continuously or intermittently during the survey, and (c) sustained wind speeds greater than nine miles/hour for more than 30 minutes during the survey period. Adverse weather conditions which delayed surveys occurred on June 3rd,4th, 7th, 9th, and 15th. At a minimum, nightly weather conditions for survey sites were checked using the nearest weather station at the Greenville Spartanburg International Airport in Greer, South Carolina (Appendix C Table A2).

The proper functionality of each acoustic detector was confirmed at each field deployment by internal software displaying correct values for scheduled recording times and the absence of error or warning messages during programming (e.g., SD not detected). Microphones were also calibrated at deployment with chirp and sensitivity tests as directed by the manufacturer instructions. The acoustic detector settings (sensitivity, frequency, etc.) were set according to USFWS mandated values established in the approved study plan (Appendix F).

4.2.2.2 Recorded Call Analysis

Following the completion of field work at each acoustic detector site, data was compiled and processed using the USFWS approved acoustic bat identification program, Kaleidoscope Pro 5.6.3, to initially classify all bat calls to species. The program used the approved classifier Bats of North America 5.4.0 on the "-1 more Sensitive, Liberal" setting. The following bat species were included in analyses: *Corynorhinus rafinesquii*, *Eptesicus fuscus*, *Lasiurus borealis*, *L. seminolus*, *L. cinereus*, *Lasionycteris noctivagans*, *Myotis austroriparius*, *M. grisescens*, *M. leibii*, *M. lucifugus*, *M. septentrionalis*, *Nycticeius humeralis*, *Perimyotis subflavus*, and *Tadarida brasiliensis*. Additionally, the analyses were run both with and without *M. sodalis* as the AOI is at the edge of their range. Note that *Corynorhinus rafinesquii* calls are indistinguishable from *C. townsendii* and are run under the same acronym (CORTOW) within

Kaleidoscope, given that the AOI is far outside the known range of *C. townsendii*, we assume only *C. rafinesquii* are possible. Results were analyzed by night and site; the software output maximum likelihood estimates and the number of bat calls per species for each night at each acoustic site. Total data for each site and night with probable detection of a potential target species with a high frequency call - defined here as any *Myotis* or TCB calls - were then vetted through qualitative analysis, as per the USFWS Guidelines, given that variation in recording quality and overlap in species calls that can result in false positives from automated call identification programs. Recorded files were reviewed by a qualified bat biologist, per the USFWS Guidelines, for accuracy by visually comparing echolocation call characteristics (e.g., minimum frequency, slope, duration) to reference calls from known bat species.

5.0 RESULTS

5.1 Mist-net Bat Captures

A total of 41 bats were captured on the project across three species (Table 1). Approximately 51% and 41% of the captures were big brown bats (*Eptesicus fuscus*) and eastern red bats (*Lasiurus borealis*) respectively, with the remaining 7% accounted for by eastern small-footed bats (*Myotis leibii*). Completed data sheets can be found in Appendix D with detailed data on each capture.

Table 1. Summary table of all bats captured during presence/probable absence mist-net surveys conducted on the Bad Creek II Complex Project area of interest. Note that bats with unknown age and/or sex were those that escaped the net during removal process.

Species	Sex	Age	Reproductive Condition	Number of Captures
Lasiurus borealis	Female	Adult	Non-reproductive	1
Lasiurus borealis	Male	Adult	Non-reproductive	11
Lasiurus borealis	Male	Adult	Testes descended	1
Lasiurus borealis	Unknown	Unknown	Unknown	4
Eptesicus fuscus	Female	Adult	Pregnant	5
Eptesicus fuscus	Female	Adult	Lactating	7
Eptesicus fuscus	Male	Adult	Non-reproductive	5
Eptesicus fuscus	Male	Adult	Testes descended	1
Eptesicus fuscus	Unknown	Unknown	Unknown	3
Myotis leibii	Female	Adult	Lactating	1
Myotis leibii	Male	Adult	Non-reproductive	2

5.2 Acoustic Analyss

Results from the acoustic bat identification program suggest that fourteen species of bat are using the AOI. Most calls were identified as *L. borealis* followed by *L. seminolus* and *M. lucifugus*, then *M. grisescens, E. fuscus, P. subflavus*, and *N. humeralis*. A smaller proportion of calls were identified as *M. austroriparius*, *T. brasiliensis*, *M. septentrionalis*, *Lasionycteris noctivagans*, *M. leibii*, *C. rafinesquii*, and *L. cinereus* (Figure 1A). When the classifier was run including *M. sodalis*, calls were still classified to all fourteen aforementioned species in similar ratios, but some calls previously relegated to other species (likely *Myotis spp.*, *L. borealis*, *L. seminolus*, and/or *N. humeralis*) were reassigned to *M. sodalis* (Figure 1B). Caution should be used regarding the presence of *L. noctivagans* given the large overlap in call characteristic with big brown bats, which were very active throughout the AOI, and their rarity within the region. Similarly, the presence of *M. austroriparius* is unlikely given the lack of historic records in the county and the significant overlap in calls with other *Myotis* species which have been recorded in the area (i.e., little brown and eastern small-footed bats). Although included in the software as two distinct

options, the calls of *L. seminolus* and *L. borealis* are nearly always indistinguishable and, while their presence is possible given their confirmed presence within Oconee County, caution should be used attributing such a high proportion of the recorded calls to the less common *L. seminolus*. Full tables depicting auto identification of bat calls and calculated maximum-likelihood estimates are in Appendix C Table A3 and A4 for each species by site and night when run without and with *M. sodalis* respectively.

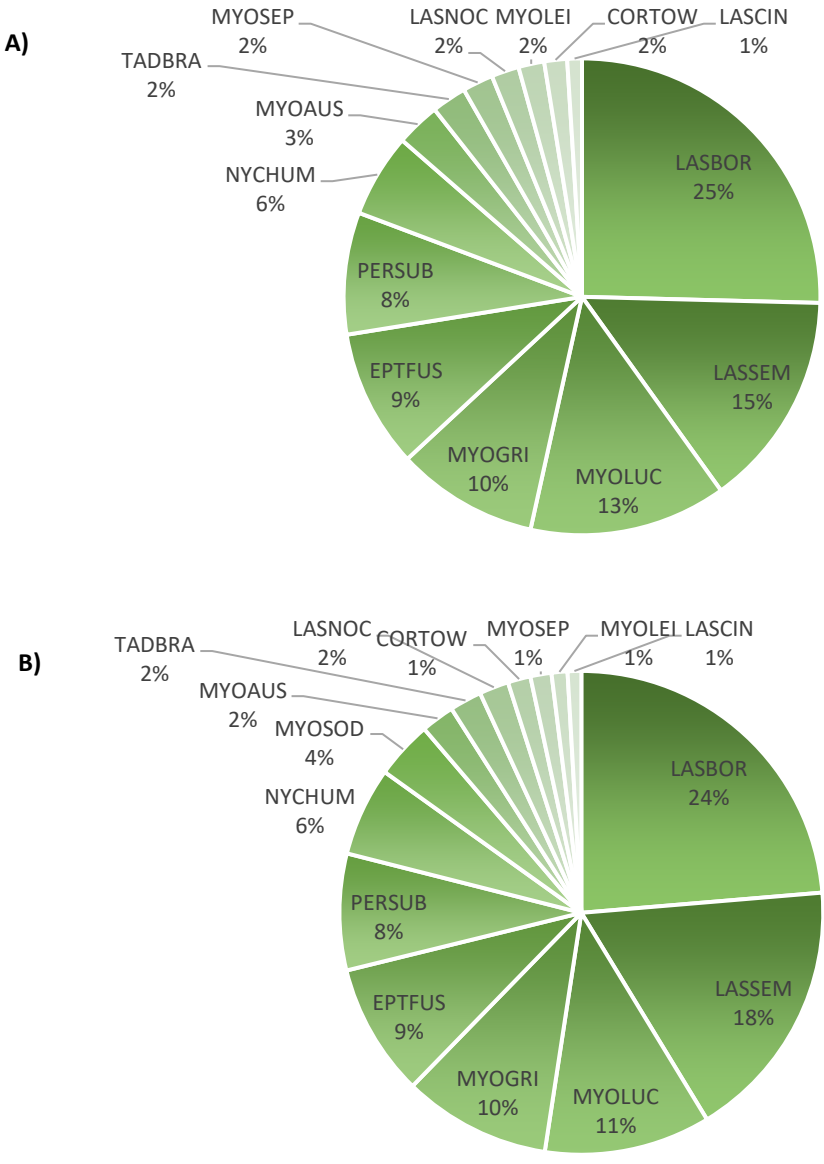

Figure 1. The proportion of total calls that were assigned to each species using the approved acoustic bat identification program, Kaleidoscope Pro 5.6.3, when run without (A) and with (B) *M. sodalis*. The approved acoustic bat identification program used the classifier Bats of North America 5.4.0 on the "-1 more Sensitive, Liberal" setting. The proportion of total calls are shown by species for the following bats: *Corynorhinus townsendii* (CORTOW), *Eptesicus fuscus* (EPTFUS), *Lasiurus borealis* (LASBOR), *Lasiurus cinereus* (LASCIN), *Lasiurus seminolus* (LASSEM), *Lasionycteris noctivagans* (LASNOC), *Myotis austroriparius* (MYOAUS), *M. grisescens* (MYOGRI), *M. leibii* (MYOLEI), *M. lucifugus* (MYOLUC), *M. septentrionalis* (MYOSEP), *Nycticeius humeralis* (NYCHUM), *Perimyotis subflavus* (PERSUB), *Tadarida brasiliensis* (TADBRA), and *M. sodalis* (MYOSOD) in B. Note that *Corynorhinus*

rafinesquii calls are indistinguishable from *C. townsendii* and are run under the same acronym (CORTOW) within Kaleidoscope, given that the AOI is far outside the known range of *C. townsendii*, we assume only *C. rafinesquii* are possible.

As per the USFWS Guidelines, the calls of all target species that emit high frequency calls which crossed the maximum-likelihood threshold given by the auto classifier were further reviewed/manually vetted through qualitative analysis by qualified biologist John Manuel, resulting in further analyses of calls from tricolored bat (*P. subflavus*; TCB), eastern small-footed bat (*M. leibii*), little brown bat (*M. lucifugus*), northern long-eared bat (*M. septentrionalis*), and gray bat (*M. grisescens*) as well as the Indiana bat (*M. sodalis*) when included. All high frequency calls were reviewed when they fell on a night with a target species deemed as likely present by the program, regardless of the species' MLE value.

Seventy-five (75) call sequences were identified as TCB at 11 different acoustic sites, caught on 23 separate detectors (Appendix C Table A5). For diagnostic characteristics, qualitative analyst John Manuel, looked for search phase call sequences (8-12 calls per second) with consistent characteristic frequencies of around 40 kHz with longer durations (approximately 8 milliseconds or greater) that remain flat throughout the main body of the call (Appendix C Figure A38). Calls that were manually vetted for TCB also took into consideration the diagnostic overlap of *Myotis* spp., *L. borealis*, and *N. humeralis*. Calls exhibiting undulation of characteristic frequencies were identified as *L. borealis* (Appendix C Figure 39) or *N. humeralis* given the combination of other identifying characteristics. Call sequences that exhibited undulation and lower slopes in shorter duration calls were labeled as *N. humeralis*.

Eighteen call sequences were identified as *M. lucifugus* at four (4) different acoustic sites on five (5) separate detectors (Appendix C Table A5). Diagnostic characteristics of the little brown bat were restricted to identifying search phase calls with consistent characteristic frequencies (Fc) between 38-39 kHz, inflections, and call durations greater than 7 milliseconds (Appendix C Figure A40). Calls were limited by these parameters to account for the diagnostic overlap of this species' echolocation call metrics with both *M. austroriparius, M. leibii,* and *M. sodalis*. Undulation of the Fc in a call sequence led to the labeling of the sequence as *L. borealis* or *N. humeralis*, again dependent on the combination of other identifying characteristics

A single call sequence was determined to be *M. grisescens* following qualitative analyses (Appendix C Table A5). Most of the calls that were auto assigned as gray bats were deemed to be *L. borealis* given the Fc undulations in nearly all the call sequences. Only the single call sequence at AS-36B exhibited consistent Fc>44 KHz with durations over five (5) milliseconds, and a sigmoidal curve with inflections at 50 kHz (Appendix C Figure A41).

The calls that were auto assigned as *M. septentrionalis* could not be definitively identified due to the quality of the available calls and the diagnostic overlap of characteristics with *L. borealis*, *M. lucifugus*, and *M. leibii*. Recordings did not exhibit definitive metrics of NLEB and were mostly restricted to feeding buzz and approach phase calls, rather than search phase calls where distinctive characteristics might be found. The available search phase calls that were analyzed did not reach frequencies that were high and steep enough to differentiate from other *Myotis* species. Similarly, calls that were auto assigned as *M. sodalis* could not be confirmed due to overlap in call characteristics with other potential *Myotis* species within the AOI

6.0 DISCUSSION

This study aimed to assess the presence or probable absence of federally and state-listed bat species within the proposed Bad Creek II Complex area in Oconee County, South Carolina, to comply with Section 7 Endangered Species Act requirements. The survey utilized both mist-netting (June 1st-14th) and acoustic surveys (June 1st-June 19th) to provide a comprehensive evaluation of bat species in the AOI. The following discussion interprets the results, highlights the implications, and suggests further actions based on the findings.

6.1 Summary of Findings

The mist-net surveys detected a total of 41 individual bats across three species—eastern red bats (*Lasiurus borealis*), big brown bats (*Eptesicus fuscus*), and eastern small-footed bats (*Myotis leibii*). Acoustic surveys auto identified calls from 15 bat species, and based on species ranges and previous surveys, 10 of the 15 species were deemed likely present (Table 2).

Table 2. Determination of likely presence for all bat species detected during acoustic survey given the manual review of calls, historic knowledge of species range, and previous surveys performed within the project area region.

Species	Likely presence
Eastern red bat (*Lasiurus borealis*)	High
Big brown bat (*Eptesicus fuscus*)	High
Rafinesque's big-eared (*Corynorhinus rafinesquii*)	High
Little brown bat (*Myotis lucifugus*)	High
Gray bat (*Myotis grisescens*)	High
Tricolored bat (*Perimyotis subflavus*)	High
Evening bat (*Nycticeius humeralis*)	High
Hoary bat (*Lasiurus cinereus*)	High
Eastern small-footed bat (*Myotis leibii*)	High
Brazillian [Mexican] free-tailed bat (*Tadarida brasiliensis*)	High
Silver-haired bat (*Lasionycteris noctivagans*)	Low
Seminole bat (*Lasiurus seminolus*)	Low
Southeastern bat (*Myotis austroriparius*)	Low
Northern long-eared bat (*Myotis septentrionalis*)	Low
Indiana bat (*Myotis sodalis*)	Low

The survey did not confirm the presence of either the northern long-eared (*M. septentrionalis*) or Indiana bat (*M. sodalis*), leading to a probable absence determination for these federally listed species. This result indicates that the AOI may not currently support these species, which agrees with records from previous bat surveys within the AOI – performed in 2021- and historical records within Oconee County also indicate the likely absence of this species (see 2021 Bat Survey Results[2] for details on these previous findings).

However, qualitative analyses confirmed that three target species -the federally endangered gray bat (*M. grisescens*), proposed endangered tricolored bat (*P. subflavus*), and the South Carolina species of concern little brown bat (*M. lucifugus)*- are likely present.

Gray Bat (*M. grisescens*): The acoustic surveys detected calls from gray bats, indicating their presence in the AOI. The gray bat was identified through a single call at one location. Records from previous bat

[2] ERM (2021). Appendix G: 2021 Bat Survey Report. In *Duke Energy: Bad Creek Pumped Storage Station*

surveys within the AOI – performed in 2021- did not detect this species while historical records within Oconee County detected a single call as well. These data might suggest that the area could be serving as a foraging ground or transient habitat for the species. The detection of gray bat calls highlights the need for careful consideration of habitat features, such as cave or mine roosting sites and nearby water bodies, which are essential for the survival of this species.

Tricolored Bat (*P. subflavus*): The presence of tricolored bat calls in the AOI indicates that this species is likely utilizing the habitat, primarily for foraging and possibly for roosting. The detection of 75 call sequences at 11 different sites underscores the importance of the AOI for this proposed federally endangered species. The findings suggest that the area provides suitable habitat features, such as canopy gaps and riparian corridors, which are critical for the tricolored bat's foraging and commuting activities. Results from previous bat surveys performed within the AOI in 2021 and historical records cited during a literature review of bat occurrences within Oconee County (see 2021 Bat Survey Results for details on these findings) also indicate the likely presence of this species.

Little Brown Bat (*M. lucifugus*): The identification of 18 call sequences from little brown bats at four different sites suggests that this species is also present and utilizing the AOI. This finding is consistent with the species' known habitat preferences for mature forests with abundant roosting and foraging resources. Records from previous bat surveys within the AOI – performed in 2021- and historical records within Oconee County also indicate the likely presence of this species.

Additional Species of Concern: In addition to the target species reviewed above, SC lists the following bats detected in the AOI as Species in Need of Management or of Concern: eastern small-footed (*M. leibii*), hoary (*Lasiurus cinereus*), big brown (*Eptesicus fuscus*), and Rafinesque's big-eared (*Corynorhinus rafinesquii*) bats. Three eastern small-footed bats were captured during these mist-netting surveys as well as during those performed in 2021 (see 2021 Bat Survey Report), confirming presence on the AOI. The hoary and Rafinesque's bats were detected during acoustic surveys. Given that the 2021 mist-net surveys of the AOI confirmed the presence of hoary bats with a capture (see 2021 Bat Survey Report), this species is likely still using the area as indicated by acoustics detections. Big brown bats were captured in both acoustic and mist-net surveys, in keeping with survey results from the 2021 Bat Survey Report. Rafinesque's big-eared bats were detected during acoustic surveys, aligning with the 2012 surveys performed on the AOI and historic records of the species during cave counts within the county - highlighted in the 2021 Bat Survey Report- which suggest their use of the area.

6.2 Habitat Quality and Implications

The quality of the summer roosting and foraging habitat within the AOI appears to be generally favorable for the tricolored bat and little brown bat, given the diversity of suitable habitat features identified during the survey. The mature pine-hardwood forests, riparian corridors, and forest openings observed in the AOI align with the habitat requirements for these species. The specific sites that confirmed presence of at least one of these protected or potentially future protected species are as follows: AS-4, AS-5, AS-6, AS-8, AS-12, AS-16, AS-19, AS-20, AS-22, AS-28, AS-32, AS-33, AS-34, AS-36, AS-37, BC-7, BC-11 (see Appendix A for locations).

6.3 Conclusion

The results of this survey provide valuable insights into the bat species utilizing the Bad Creek II Complex AOI. The likely presence of the gray, tricolored, and little brown bats highlights the ecological significance of the habitat, while the probable absence of the northern long-eared and Indiana bats suggests that, at least currently, they are not utilizing the AOI.

Bad Creek Pumped Storage presence/absence Acoustic and mist-net surveys for threatened & endangered bat species

APPENDIX A
Project Maps

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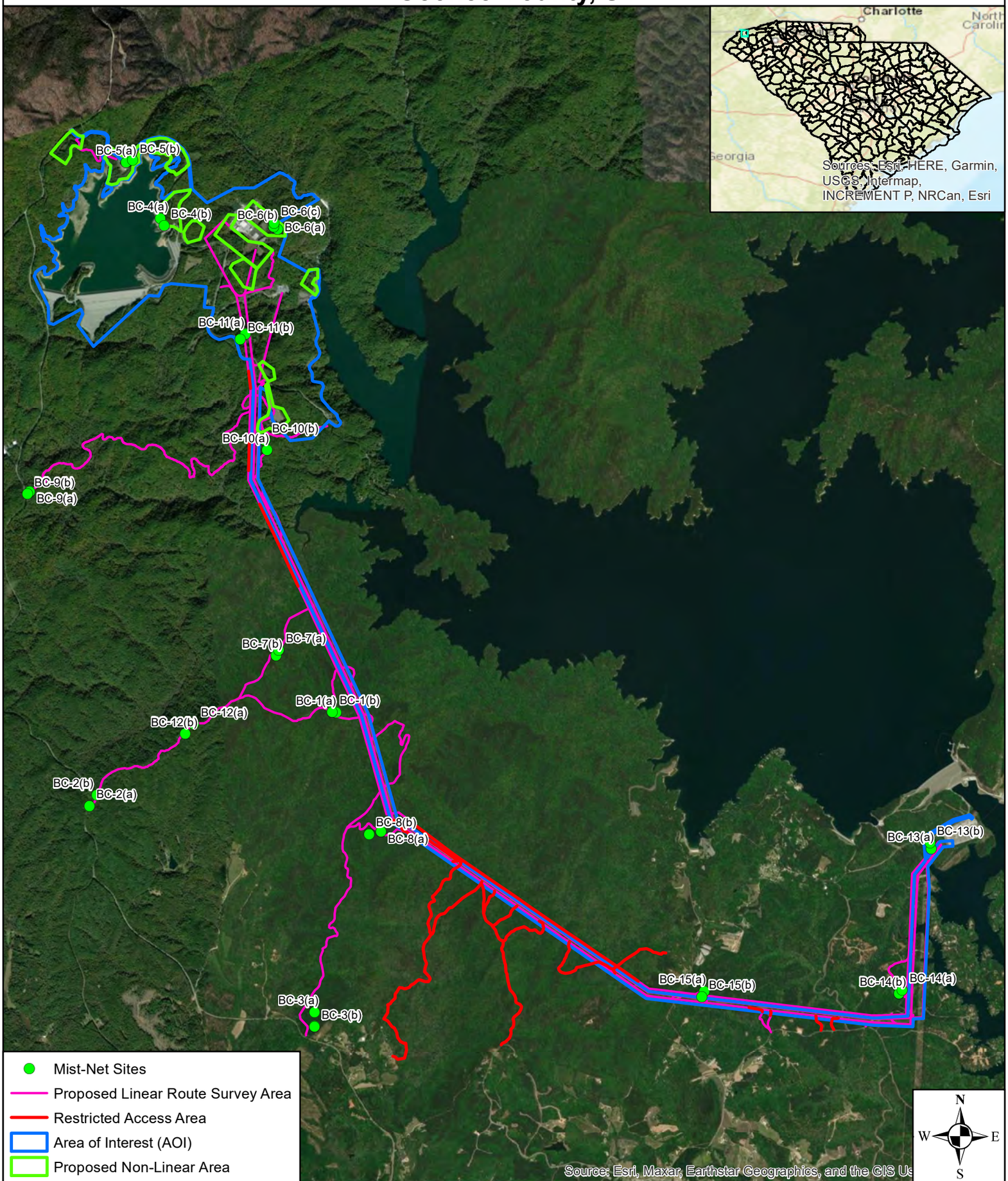
Bad Creek Pumped Storage
Mist-Net Survey Map
Oconee County, SC



Map provided by Biotope Forestry & Environmental, LLC. This map does not necessarily reflect the most current changes and was created for general purposes only.

Date Created: 07/16/2024

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BIOTOPE
FORESTRY & ENVIRONMENTAL, LLC

Bad Creek Pumped Storage
Mist-Net Site Map (BC-5)
Oconee County, SC

Scale 1:2,500

Map provided by Biotope Forestry & Environmental, LLC. This map does not necessarily reflect the most current changes and was created for general purposes only.

Date Created: 07/16/2024

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BIOTOPE
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Bad Creek Pumped Storage
Mist-Net Site Map (BC-4)
Oconee County, SC

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-6)
Oconee County, SC

BC-6(c)

BC-6(b)

BC-6(a)

Mist-Net Site
Proposed Linear Route Survey Area
Restricted Access Area
Area of Interest (AOI)
Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

N
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0 110 220 440 660 Feet

Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-11)
Oconee County, SC

BC-11(a)

BC-11(b)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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0 110 220 440 660 Feet

Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-10)
Oconee County, SC

BC-10(b)

BC-10(a)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-9)
Oconee County, SC

BC-9(a)

BC-9(b)

Mist-Net Site
Proposed Linear Route Survey Area
Restricted Access Area
Area of Interest (AOI)
Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-7)
Oconee County, SC

BC-7(a)

BC-7(b)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-12)
Oconee County, SC

BC-12(a)

BC-12(b)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-2)
Oconee County, SC

BC-2(b)

BC-2(a)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-1)
Oconee County, SC

BC-1(b)

BC-1(a)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-8)
Oconee County, SC

BC-8(a)

BC-8(b)

Mist-Net Site
Proposed Linear Route Survey Area
Restricted Access Area
Area of Interest (AOI)
Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-3)
Oconee County, SC

BC-3(a)

BC-3(b)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-15)
Oconee County, SC

BC-15(a)

BC-15(b)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-14)
Oconee County, SC

BC-14(a)

BC-14(b)

Mist-Net Site
Proposed Linear Route Survey Area
Restricted Access Area
Area of Interest (AOI)
Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Feet

Scale 1:2,500

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Bad Creek Pumped Storage
Mist-Net Site Map (BC-13)
Oconee County, SC

BC-13(b)

BC-13(a)

- Mist-Net Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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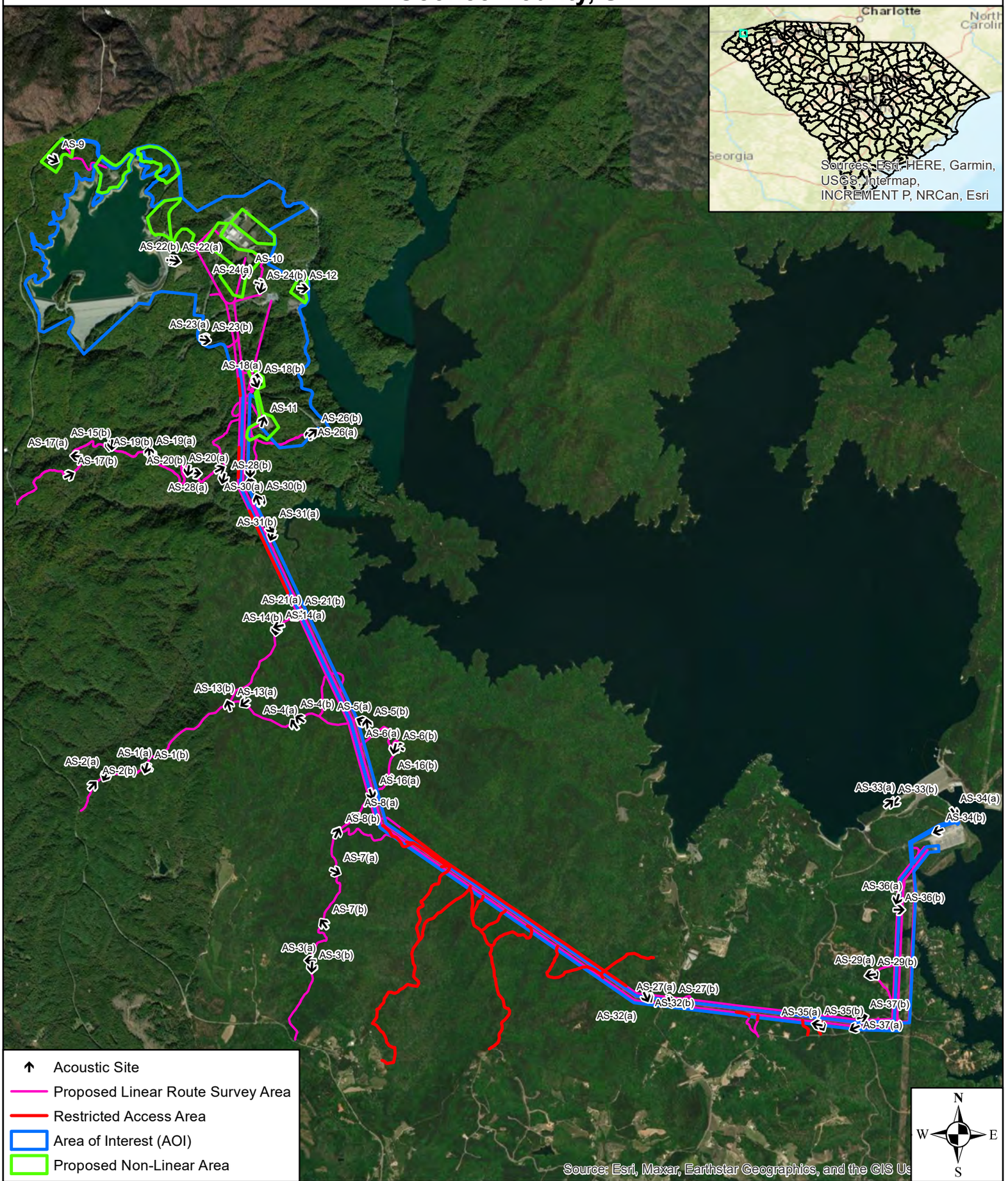
Bad Creek Pumped Storage
Acoustic Survey Map
Oconee County, SC



Scale 1:51,000

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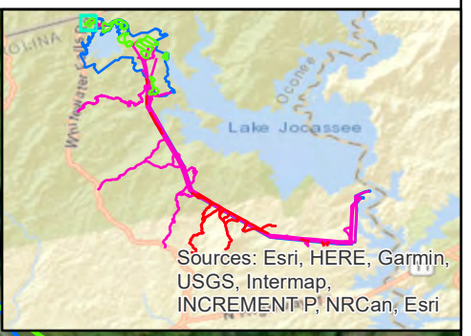
Bad Creek Pumped Storage
Acoustic Site Map (AS-9)
Oconee County, SC



AS-9

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Acoustic Site Map (AS-22)
Oconee County, SC

AS-22(b)

AS-22(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Acoustic Site Map (AS-10, AS-24)
Oconee County, SC

AS-10

AS-24(a)

AS-24(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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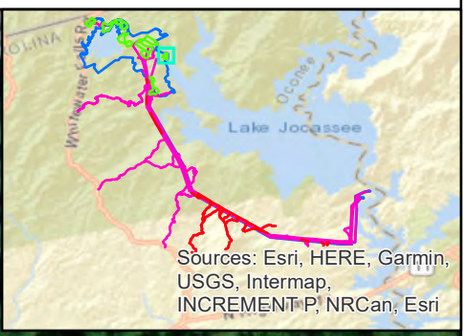
Bad Creek Pumped Storage
Acoustic Site Map (AS-12)
Oconee County, SC



AS-12

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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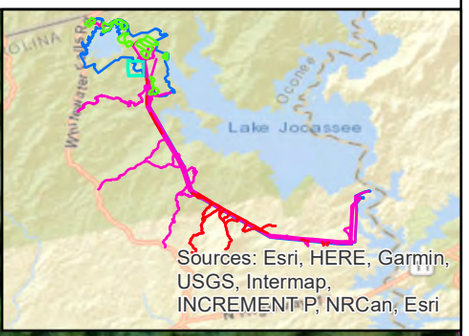
Bad Creek Pumped Storage
Acoustic Site Map (AS-23)
Oconee County, SC



AS-23(a)

AS-23(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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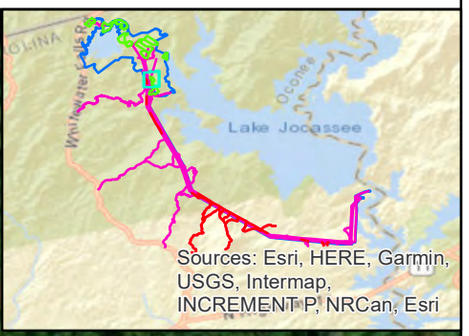
Bad Creek Pumped Storage
Acoustic Site Map (AS-18)
Oconee County, SC



AS-18(a)

AS-18(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Acoustic Site Map (AS-11)
Oconee County, SC

AS-11

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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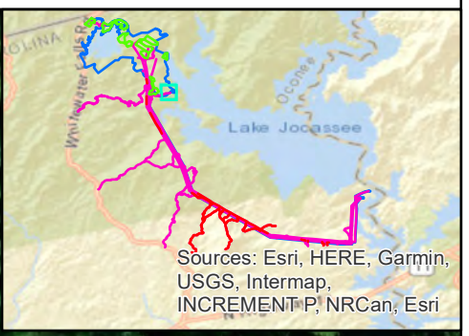
Bad Creek Pumped Storage
Acoustic Site Map (AS-26)
Oconee County, SC



AS-26(b)

AS-26(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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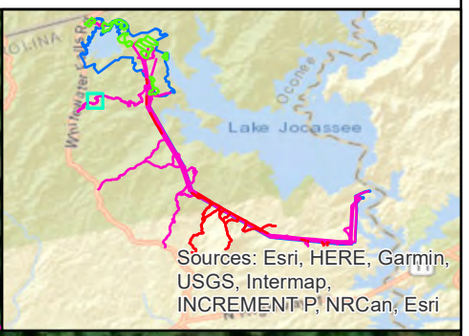
Bad Creek Pumped Storage
Acoustic Site Map (AS-17)
Oconee County, SC



AS-17(a)

AS-17(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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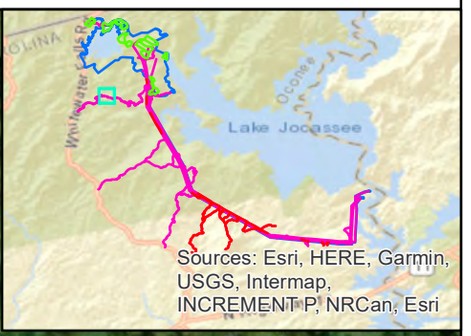
Bad Creek Pumped Storage
Acoustic Site Map (AS-15)
Oconee County, SC



AS-15(b)

AS-15(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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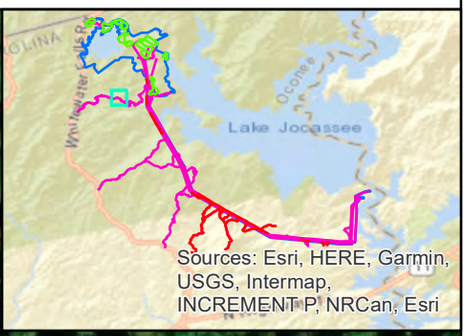
Bad Creek Pumped Storage
Acoustic Site Map (AS-19)
Oconee County, SC



AS-19(a)

AS-19(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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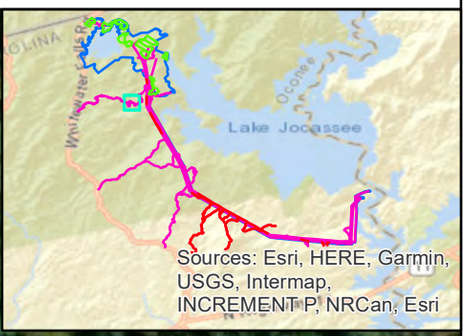
Bad Creek Pumped Storage
Acoustic Site Map (AS-20)
Oconee County, SC



AS-20(a)

AS-20(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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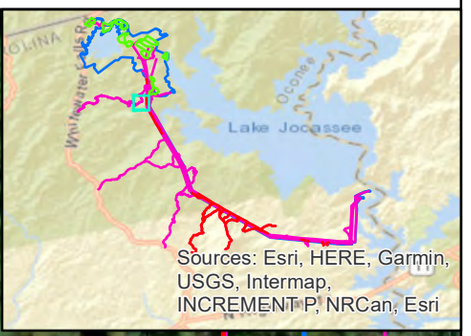
Bad Creek Pumped Storage
Acoustic Site Map (AS-28)
Oconee County, SC



AS-28(a)

AS-28(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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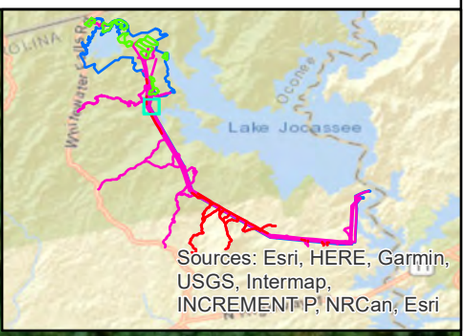
Bad Creek Pumped Storage
Acoustic Site Map (AS-25, AS-30)
Oconee County, SC



AS-25(b)

AS-25(a)

AS-30(b)

AS-30(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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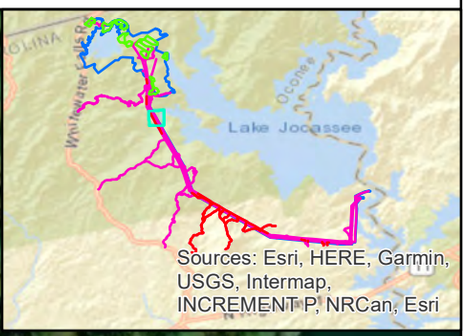
Bad Creek Pumped Storage
Acoustic Site Map (AS-31)
Oconee County, SC



AS-31(a)

AS-31(b)

Acoustic Site
Proposed Linear Route Survey Area
Restricted Access Area
Area of Interest (AOI)
Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Feet

Scale 1:2,500

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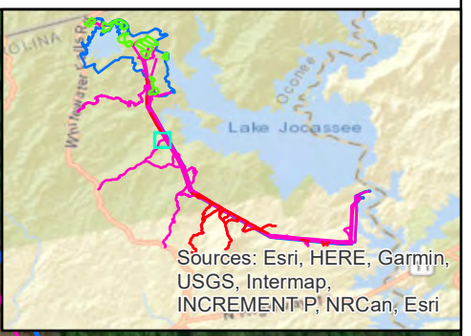
Bad Creek Pumped Storage
Acoustic Site Map (AS-14, AS-21)
Oconee County, SC



AS-21(a)

AS-21(b)

AS-14(a)

AS-14(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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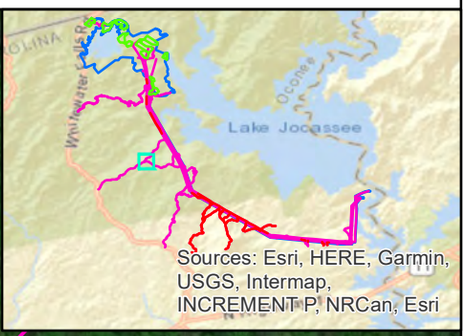
Bad Creek Pumped Storage
Acoustic Site Map (AS-13)
Oconee County, SC



AS-13(a)

AS-13(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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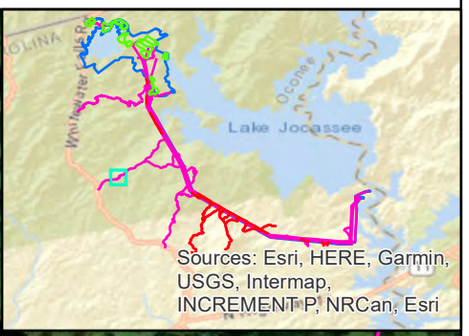
Bad Creek Pumped Storage
Acoustic Site Map (AS-1)
Oconee County, SC



AS-1(a)
AS-1(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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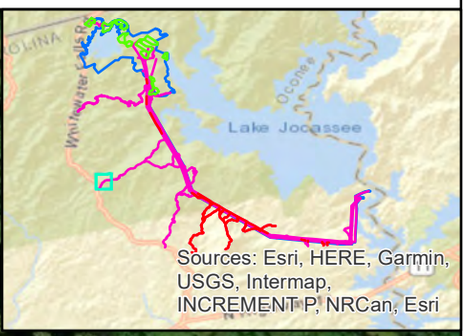
Bad Creek Pumped Storage
Acoustic Site Map (AS-2)
Oconee County, SC



AS-2(a)

AS-2(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Acoustic Site Map (AS-4)
Oconee County, SC

AS-4(b)

AS-4(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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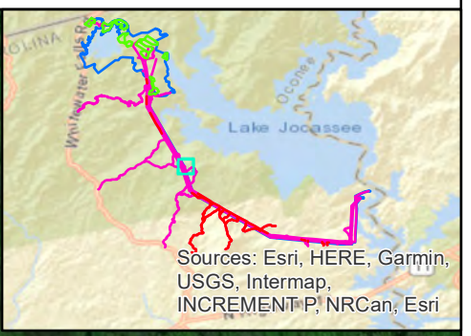
Bad Creek Pumped Storage
Acoustic Site Map (AS-5)
Oconee County, SC



AS-5(a)

AS-5(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Bad Creek Pumped Storage
Acoustic Site Map (AS-6)
Oconee County, SC

AS-6(a)

AS-6(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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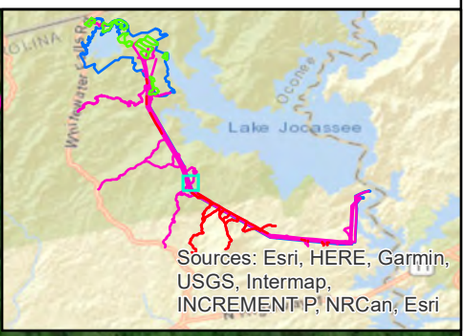
Bad Creek Pumped Storage
Acoustic Site Map (AS-16)
Oconee County, SC



AS-16(b)

AS-16(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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Bad Creek Pumped Storage
Acoustic Site Map (AS-8)
Oconee County, SC

AS-8(a)

AS-8(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Bad Creek Pumped Storage
Acoustic Site Map (AS-7)
Oconee County, SC

AS-7(a)

AS-7(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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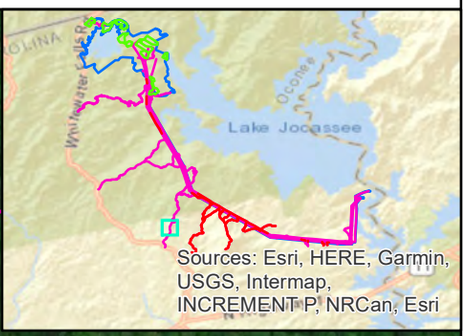
Bad Creek Pumped Storage
Acoustic Site Map (AS-3)
Oconee County, SC



AS-3(a)

AS-3(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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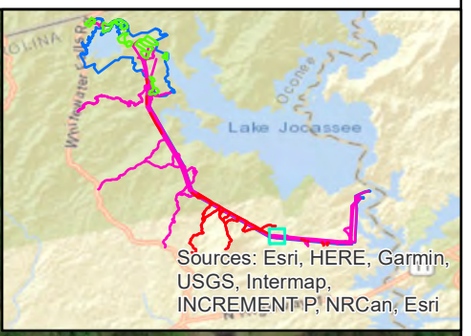
Bad Creek Pumped Storage
Acoustic Site Map (AS-27, AS-32)
Oconee County, SC



AS-32(b)
AS-32(a)
AS-27(a)
AS-27(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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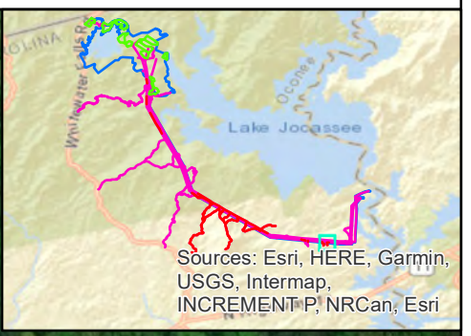
Bad Creek Pumped Storage
Acoustic Site Map (AS-35)
Oconee County, SC



AS-35(b)

AS-35(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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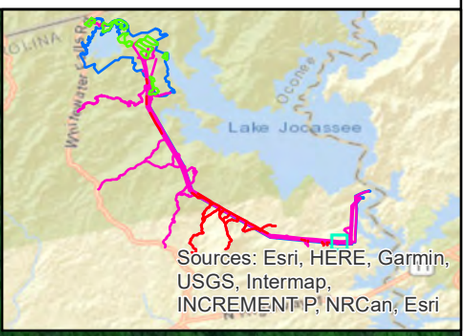
Bad Creek Pumped Storage
Acoustic Site Map (AS-37)
Oconee County, SC



AS-37(b)

AS-37(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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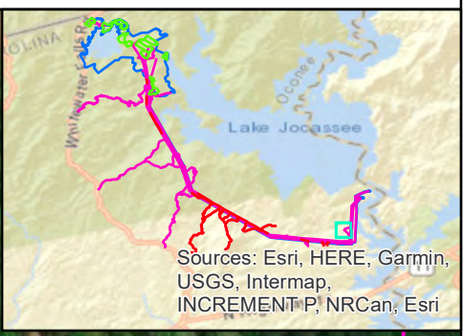
Bad Creek Pumped Storage
Acoustic Site Map (AS-29)
Oconee County, SC



AS-29(b)

AS-29(a)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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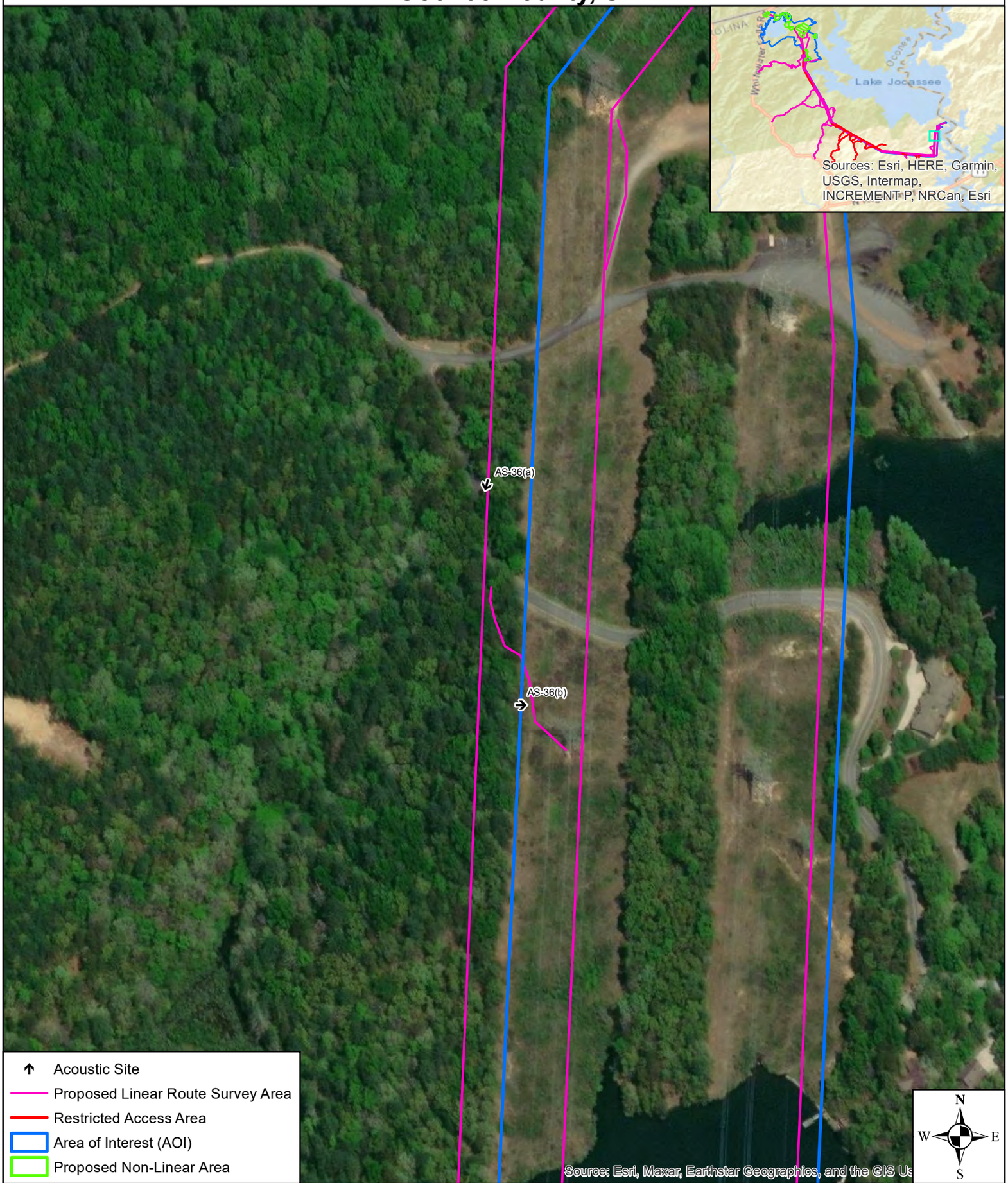
Bad Creek Pumped Storage
Acoustic Site Map (AS-36)
Oconee County, SC



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Bad Creek Pumped Storage
Acoustic Site Map (AS-34)
Oconee County, SC

AS-34(a)

AS-34(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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Scale 1:2,500

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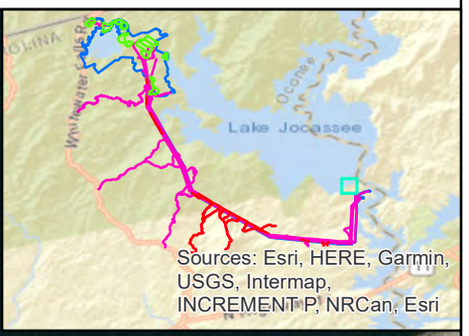
Bad Creek Pumped Storage
Acoustic Site Map (AS-33)
Oconee County, SC



AS-33(a)

AS-33(b)

- Acoustic Site
- Proposed Linear Route Survey Area
- Restricted Access Area
- Area of Interest (AOI)
- Proposed Non-Linear Area

Source: Esri, Maxar, Earthstar Geographics, and the GIS Us

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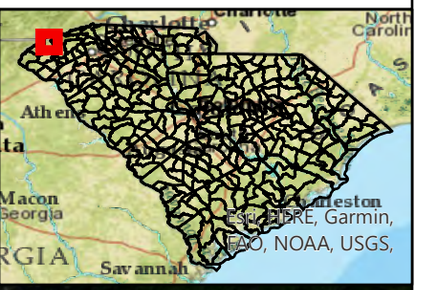
Bad Creek Pumped Storage
Bat Species of Concern (SOC) - Conservation Buffer Map
Oconee County, SC



AS-22(b) - PESU
AS-12 - PESU
BC-11(b) - MYLE
AS-19(a) - MYLU
AS-20(a) - PESU
AS-28(b) - PESU
BC-7(a)
AS-4(b) - PESU
AS-5(b) - MYLU
AS-6(a) - MYLU
AS-16(b) - MYLU
AS-8(a) - PESU
AS-33(b) - PESU
AS-33(a) - PESU
AS-34(a) - PESU
AS-34(b) - PESU
AS-36(b) - PESU & MYGR
AS-32(b) - PESU
AS-32(a) - PESU
AS-37(a) - PESU

- Confirmed SOC Presence - Net Sites
- Confirmed SOC Presence - Acoustic Sites
- Project AOI
- Proposed Linear Route Survey Area
- Proposed Non-Linear Area
- SOC 3 Mile Conservation Buffer

NC CGIA, Earthstar G

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BAD CREEK PUMPED STORAGE PRESENCE/ABSENCE ACOUSTIC AND MIST-NET SURVEYS FOR THREATENED & ENDANGERED BAT SPECIES

APPENDIX B
MIST-NET SITE & BAT PHOTOS

PRESENTED TO

ERIC MULARSKI
ENVIRONMENTAL SCIENCES & PLANNING MANAGER
HDR
440 SOUTH CHURCH STREET, SUITE 1200
CHARLOTTE, NC 28202-2075

BY

BIOTOPE FORESTRY & ENVIRONMENTAL
NACOGDOCHES, TX | CHATTANOOGA, TN

TABLE OF CONTENTS

1.0 MIST-NET SITE NET PHOTOS

A)

B)

Figure A1. Photos of BC-1 mist-net set A. Photos were taken from each side of the net while facing northwest (A) and southeast (B).

A)

B)

Figure A2. Photos of BC-1 mist-net set B. Photos were taken from each side of the net while facing south (A) and northwest (B).

A)

B)

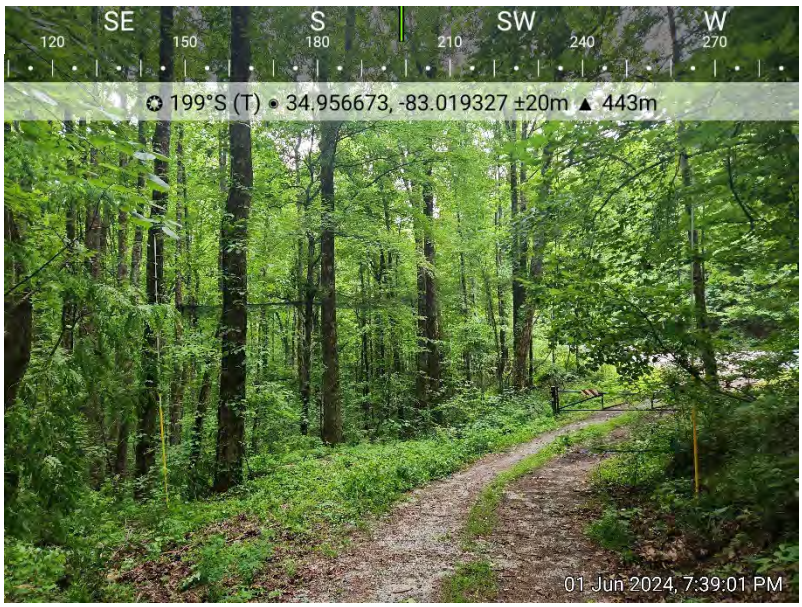

Figure A3. Photos of BC-2 mist-net set A. Photos were taken from each side of the net while facing northeast (A) and south (B).

A)

B)

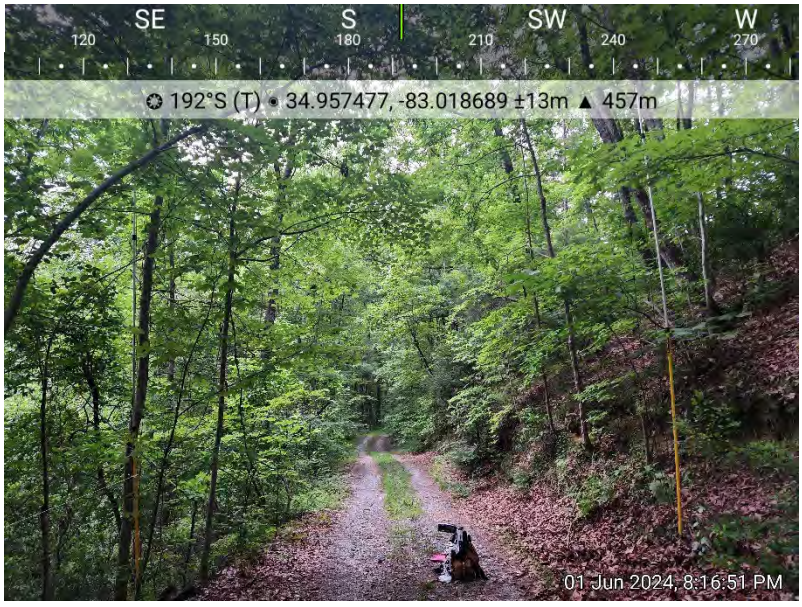

Figure A4. Photos of BC-2 mist-net set B. Photos were taken from each side of the net while facing north (A) and south (B).

A)

B)

Figure A5. Photos of BC-3 mist-net set A. Photos were taken from each side of the net while facing northwest (A) and southeast (B).

A)

B)

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A)

B)

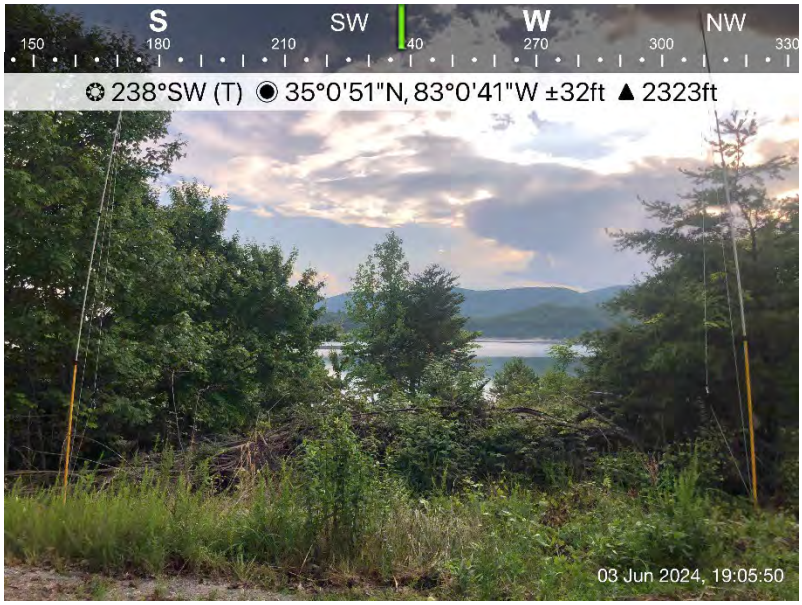

Figure A7. Photos of BC-4 mist-net set A. Photos were taken from each side of the net while facing northeast (A) and southwest (B).

A)

B)

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A)

B)

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A)

B)

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A)

B)

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A)

B)

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A)

B)

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A)

B)

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A)

B)

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A)

B)

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A)

B)

Figure A17. Photos of BC-8 mist-net set B. Photos were taken from each side of the net while facing east (A) and west (B).

A)

B)

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Figure A19. Photo of BC-9 mist-net set B. Photo was taken while facing west. A photo was not taken from the other side of the net due to the net being on the edge of a cliffside.

A)

B)

Figure A20. Photos of BC-10 mist-net set A. Photos were taken from each side of the net while facing south (A) and northwest (B).

A)

B)

Figure A21. Photos of BC-10 mist-net set B. Photos were taken from each side of the net while facing northwest (A) and southeast (B).

A)

B)

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A)

B)

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A)

B)

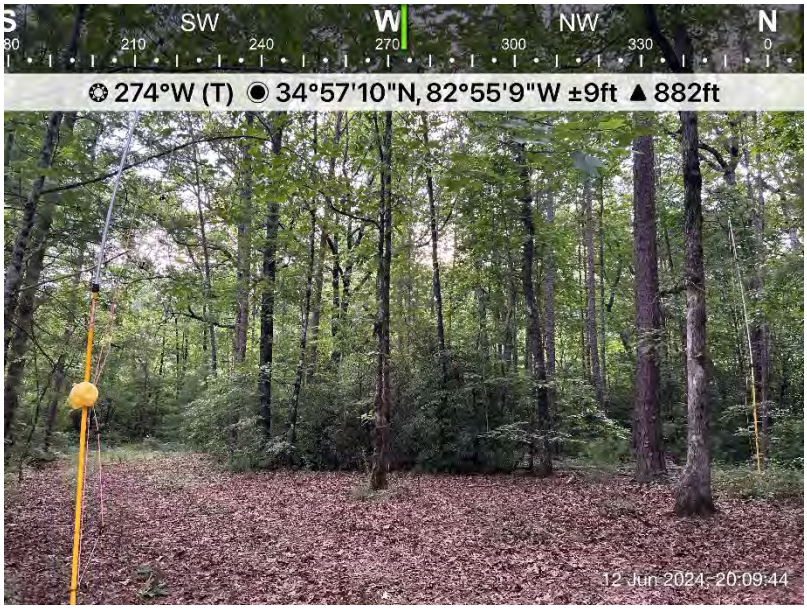
Figure A24. Photos of BC-12 mist-net set A. Photos were taken from each side of the net while facing northeast (A) and southwest (B).

A)

B)

Figure A25. Photos of BC-12 mist-net set B. Photos were taken from each side of the net while facing northeast (A) and southwest (B).

A)



B)

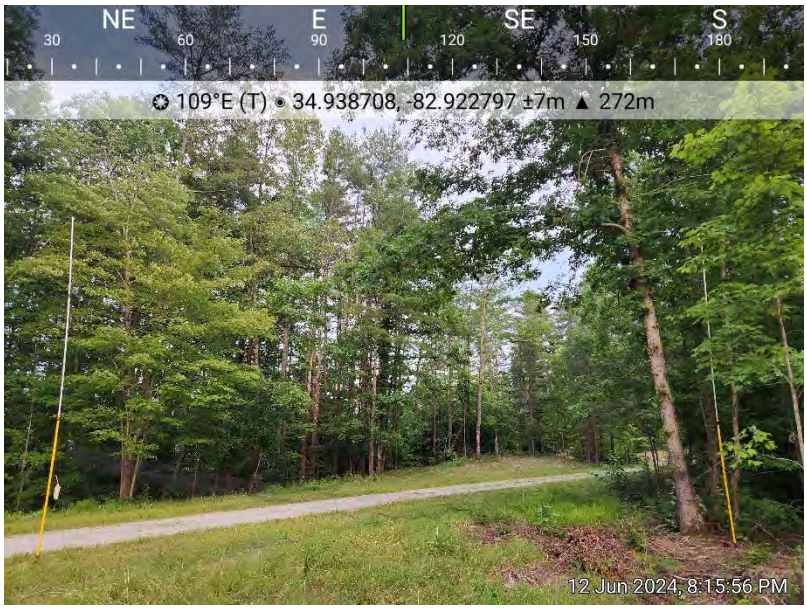
Figure A26. Photos of BC-13 mist-net set A. Photos were taken from each side of the net while facing west (A) and northeast (B).

A)

B)

Figure A27. Photos of BC-13 mist-net set B. Photos were taken from each side of the net while facing north (A) and south (B).

A)



B)

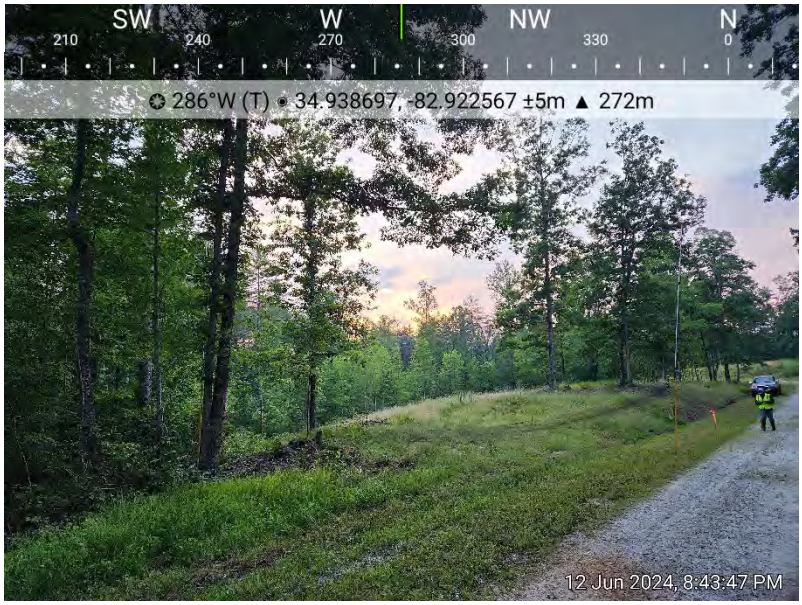


Figure A28. Photos of BC-14 mist-net set A. Photos were taken from each side of the net while facing east (A) and west (B).

A)

B)

Figure A29. Photos of BC-14 mist-net set B. Photos were taken from each side of the net while facing southeast (A) and south (B).

A)

B)

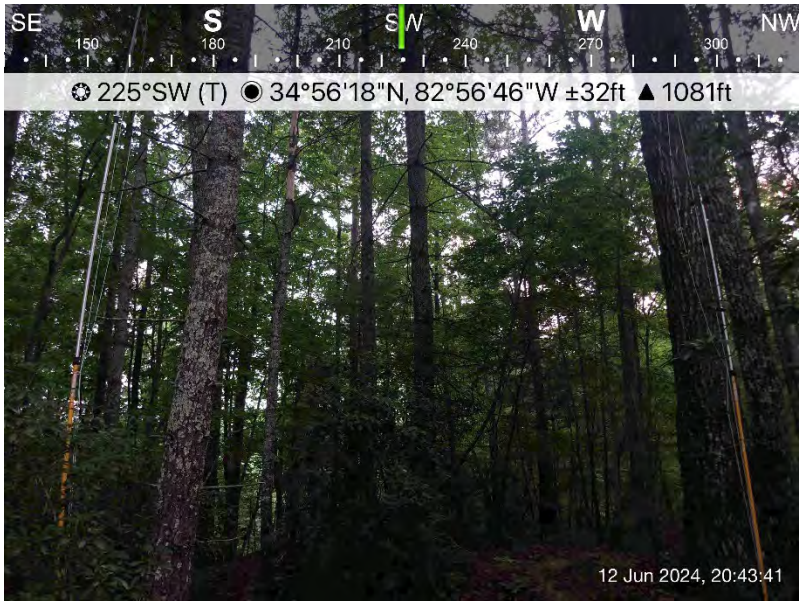


Figure A30. Photos of BC-15 mist-net set A. Photos were taken from each side of the net while facing northeast (A) and southwest (B).

A)

B)

Figure A31. Photos of BC-15 mist-net set B. Photos were taken from each side of the net while facing north (A) and south (B).

2.0 BAT PHOTOS

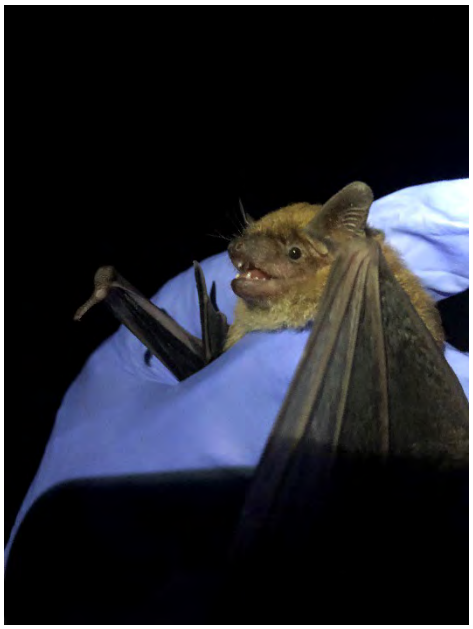


Figure A32. Photo of the first big brown bat (*Eptesicus fuscus*) captured on the Bad Creek Pumped Storage Project.

Figure A33. Photo of the first eastern red bat (*Lasiurus borealis*) captured on the Bad Creek Pumped Storage Project.

Figure A34. Photos of the eastern small-footed bat (*Myotis leibii*) captured at mist-net site BC-7 on the Bad Creek Pumped Storage Project. The black mask that is indicative of this species can be seen in (A) and the distinct keeled calcar is shown in (B).

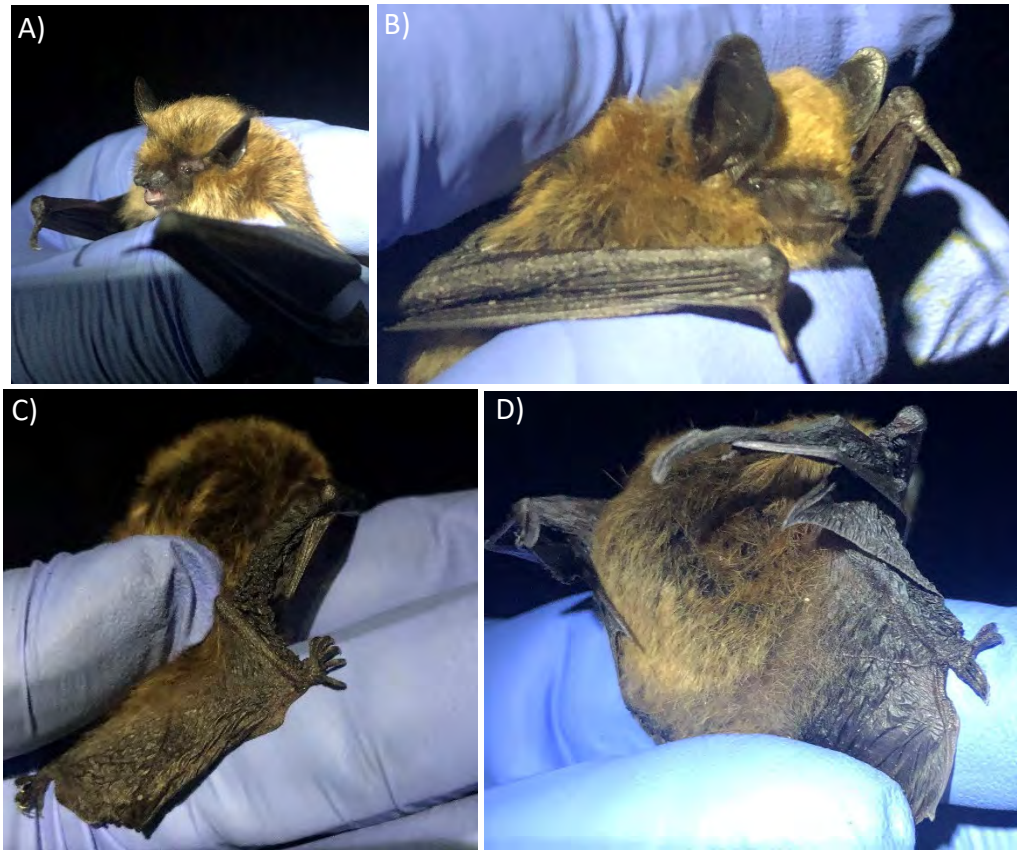
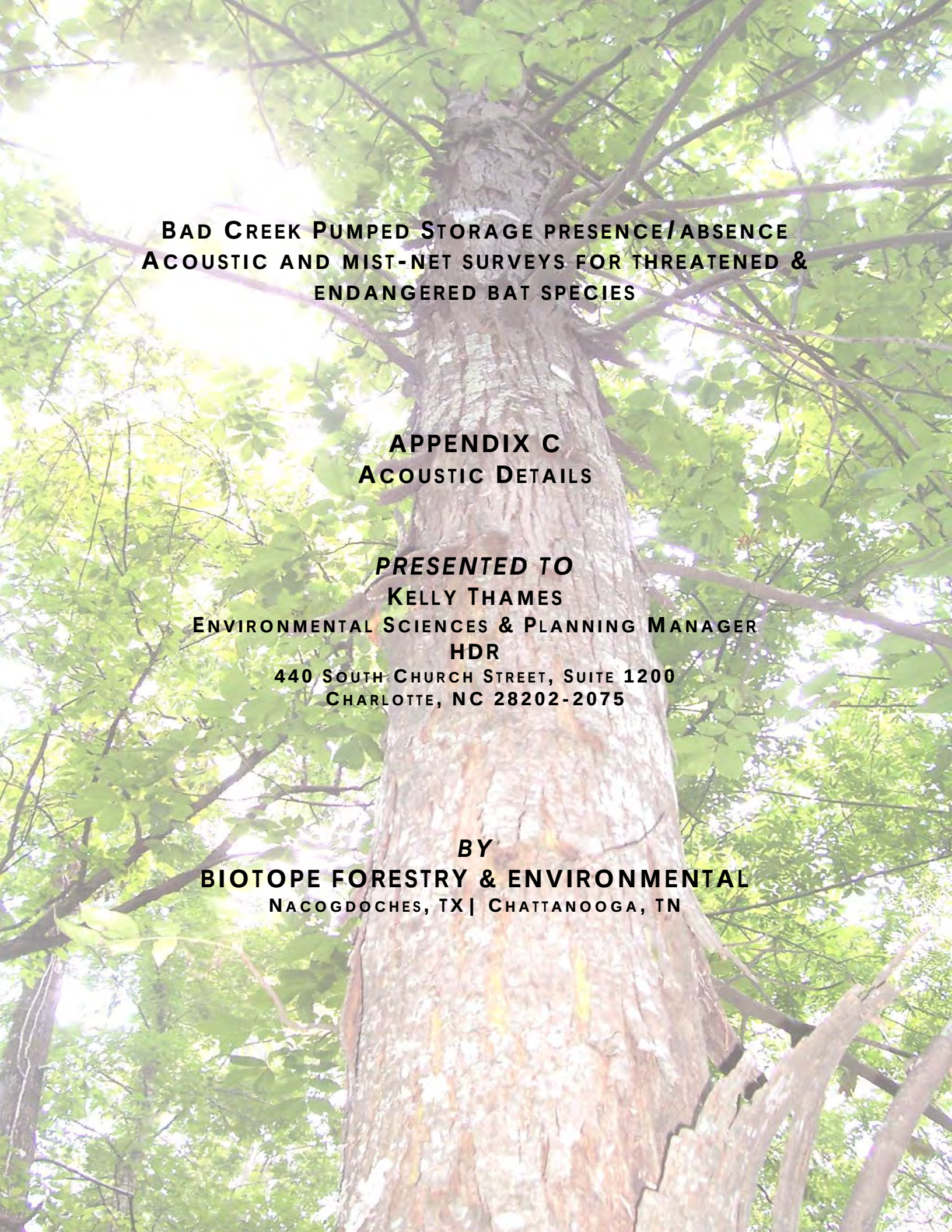


Figure A35. Photos of the two eastern small-footed bat (*Myotis leibii*) captured at mist-net site BC-11 on the Bad Creek Pumped Storage Project. The black mask indicative of this species and the keeled calcar respectively can be seen for the first (A, B) and second bat (C, D).



Bad Creek Pumped Storage presence/absence Acoustic and mist-net surveys for threatened & endangered bat species

APPENDIX C
Acoustic Details

PRESENTED TO

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TABLE OF CONTENTS

1.0 SUMMARY OF ACOUSTIC SURVEY SITES

Table A1. Summary table of all acoustic survey sites conducted on the Bad Creek II Complex Project area. The number in the site name indicates the site and, where more than one detector was deployed, the letter following indicates the specific detector. The location of every detector is given as well as the dates data were collected as well as the habitat type surveyed. Note that all sites located in the linear portion of the project area had two detectors while sites located in the nonlinear portion had a single detector deployed (AS-9-12).

Site Name	Site Location		Survey Dates	Habitat Type
	Latitude	*Longitude*		
AS-1-A	34.96090	-83.01177	June 1-2	Road corridor
AS-1-B	34.96081	-83.01183	June 1-2	Dry stream bed
AS-2-A	34.96006	-83.01672	June 1-2	Road corridor
AS-2-B	34.95905	-83.01821	June 1-2	Forest edge and trail corridor
AS-3-A	34.94194	-82.99206	June 1-2	Trail corridor
AS-3-B	34.94127	-82.99185	June 1-2	Trail corridor
AS-4-A	34.96521	-82.994104	June 5-6	Road corridor
AS-4-B	34.96581	-82.993524	June 5-6	Forest edge
AS-5-A	34.96560	-82.986063	June 5-6	Forest interior
AS-5-B	34.96530	-82.985421	June 5-6	Forest interior
AS-6-A	34.96298	-82.981576	June 5-6	Forest interior
AS-6-B	34.96286	-82.982057	June 5-6	Road corridor
AS-7-A	34.95070	-82.98908	June 5-6	Trail corridor
AS-7-B	34.94555	-82.99045	June 5-6	Trail corridor
AS-8-A	34.95608	-82.98679	June 5-6	Trail corridor
AS-8-B	34.95457	82.98892	June 5-6	Trail corridor
AS-9	35.02087	-83.023359	June 5-6, 8	Forest edge & puddle
AS-10	35.00973	-83.000206	June 5-6, 8	Road corridors intersection & puddle
AS-11	34.99510	-82.998106	June 5-6, 8	Forest edge & road corridor
AS-12	35.01630	-83.010653	June 5-6, 8	Forest edge & road corridor
AS-13-A	34.96705	-83.00197	June 8, 10	Forest edge
AS-13-B	34.96731	-83.000056	June 8, 10	Road corridors intersection
AS-14-A	34.97489	-82.996123	June 8, 10	Road corridor
AS-14-B	34.97451	-82.996321	June 8, 10	Road corridor
AS-15-A	34.99261	-83.01646	June 8, 10	Dry stream bed
AS-15-B	34.99270	-83.016147	June 8, 10	Trail corridor
AS-16-A	34.95836	-82.984832	June 8, 10	Forest edge
AS-16-B	34.95980	-82.982760	June 8, 10	Road corridor
AS-17-A	34.99160	-83.02049	June 13-14	Intersection of creek and trail
AS-17-B	34.98968	-83.021255	June 13-14	Trail corridor
AS-18-A	34.99936	-82.99892	June 11-12	Forest edge

Site Name	Site Location		Survey Dates	Habitat Type
	Latitude	*Longitude*		
AS-18-B	34.99891	-82.99896	June 11-12	Forest edge
AS-19-A	34.99201	-83.011710	June 11-12	Forest interior
AS-19-B	34.99180	-83.011465	June 11-12	Trail corridor
AS-20-A	34.99018	-83.006957	June 11-12	Forest interior
AS-20-B	34.98997	-83.006089	June 11-12	Trail corridor
AS-21-A	34.97606	-82.993618	June 11-12	Trail corridor
AS-21-B	34.97593	-82.994060	June 11-12	Forest edge & trail corridor
AS-22-A	35.01091	-83.008716	June 12-13	Forest edge
AS-22-B	35.01096	-83.009111	June 12-13	Forest edge
AS-23-A	35.00327	-83.00511	June 11-12	Forest edge
AS-23-B	35.00311	-83.00504	June 11-12	Forest edge & road corridor
AS-24-A	35.00867	-82.99857	June 11-12	Trail corridor
AS-24-B	35.00823	-82.99839	June 11-12	Forest interior
AS-25-A	34.98908	-82.99954	June 13-14	Forest interior
AS-25-B	34.99012	-82.99960	June 13-14	Trail corridor
AS-26-A	34.99389	-82.99246	June 13-14	Dry stream bed
AS-26-B	34.99400	-82.99209	June 13-14	Trail corridor
AS-27-A	34.93822	-82.94901	June 14-15	Trail corridor
AS-27-B	34.93802	-82.94887	June 14-15	Forest edge
AS-28-A	34.99037	-83.00322	June 13-14	Forest interior
AS-28-B	34.98944	-83.00278	June 13-14	Creek corridor
AS-29-A	34.94082	-82.92448	June 13-14	Forest edge
AS-29-B	34.94079	-82.92493	June 13-14	Trails intersection
AS-30-A	34.98725	-82.99828	June 18-19	Forest interior
AS-30-B	34.98738	-82.99866	June 18-19	Trail corridor
AS-31-A	34.98457	-82.99711	June 16-17	Trail corridor
AS-31-B	34.98383	-82.99693	June 16-17	Forest edge
AS-32-A	34.93844	-82.95148	June 16-17	Forest edge
AS-32-B	34.93851	-82.95178	June 16-17	Forest edge
AS-33-A	34.95788	-82.92210	June 16-17	Forest edge
AS-33-B	34.95773	-82.92280	June 16-17	Road corridor
AS-34-A	34.95684	-82.914983	June 16-17	Forest edge
AS-34-B	34.95500	-82.916898	June 16-17	Road corridor
AS-35-A	34.93573	-82.93078	June 18-19	Trail corridor
AS-35-B	34.93592	-82.93132	June 18-19	Forest edge
AS-36-A	34.94830	-82.92174	June 18-19	Trail corridor
AS-36-B	34.94724	-82.92153	June 18-19	Forest edge
AS-37-A	34.93553	-82.92680	June 18-19	Trail corridor & edge intersection
AS-37-B	34.93659	-82.92586	June 18-19	Forest interior

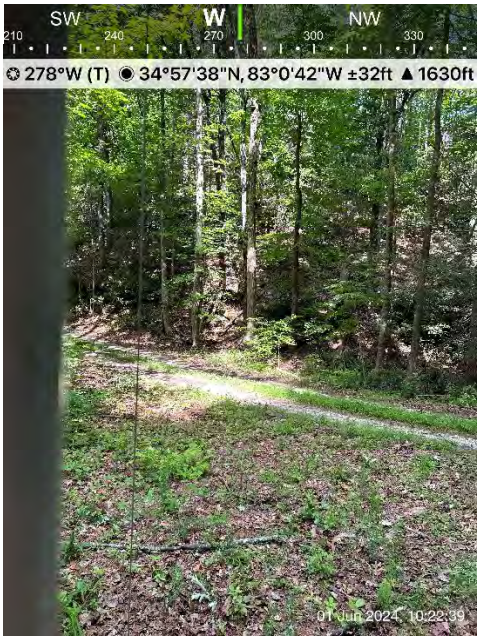
2.0 WEATHER DATA

Table A2. Summary table of the weather conditions concurrent with the collection of acoustic survey data on the Bad Creek II Complex Project area. The weather data were obtained from the nearest station to the project area, Greenville Spartanburg International Airport station, Greer, South Carolina. The sunrise and sunset, which dictate the period during which detectors collected data, are also reported for the collection nights.

Date	Sunset	Sunrise (Following morning)	Temperature Night High (°F)	Temperature Night Low (°F)	Wind Speed (mph)	Precipitation (In.)
6/1/2024	20:42	06:19	68	65	0-8	0.0
6/2/2024	20:42	06:19	70	65	0-6	0.0
6/5/2024	20:43	06:18	77	69	0-10	0.0
6/6/2024	20:44	06:18	76	69	0-6	0.0
6/8/2024	20:45	06:18	74	65	0-6	0.0
6/10/2024	20:46	06:18	73	60	0-7	0.0
6/11/2024	20:46	06:18	78	59	0-5	0.0
6/12/2024	20:47	06:18	78	65	0-3	0.0
6/13/2024	20:47	06:18	79	65	0-5	0.0
6/14/2024	20:47	06:18	82	69	0-5	0.0
6/16/2024	20:48	06:18	82	73	0-7	0.0
6/17/2024	20:48	06:18	82	71	0-9	0.0
6/18/2024	20:49	06:18	77	65	0-7	0.0
6/19/2024	20:49	06:19	76	62	0-7	0.0

3.0 ACOUSTIC SITE DETECTOR PHOTOS

A)



B)

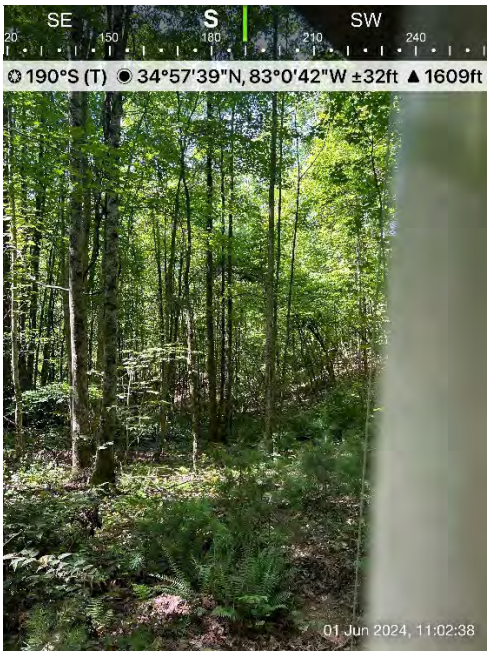


Figure A1. Photos of AS-1 acoustic site which consisted of two acoustic detectors A) AS1-A and B) AS1-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A2. Photos of AS-2 acoustic site which consisted of two acoustic detectors A) AS-2-A and B) AS-2-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

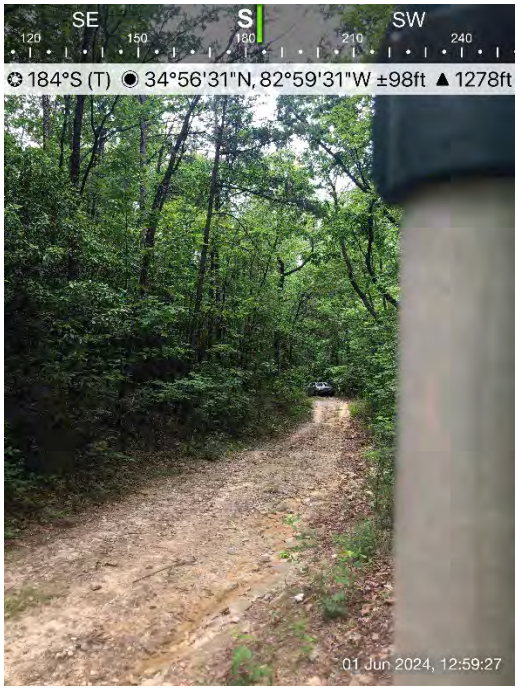


Figure A3. Photos of AS-3 acoustic site which consisted of two acoustic detectors A) AS-3-A and B) AS-3-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A4. Photos of AS-4 acoustic site which consisted of two acoustic detectors A) AS-4-A and B) AS-4-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A5. Photos of AS-5 acoustic site which consisted of two acoustic detectors A) AS-5-A and B) AS-5-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

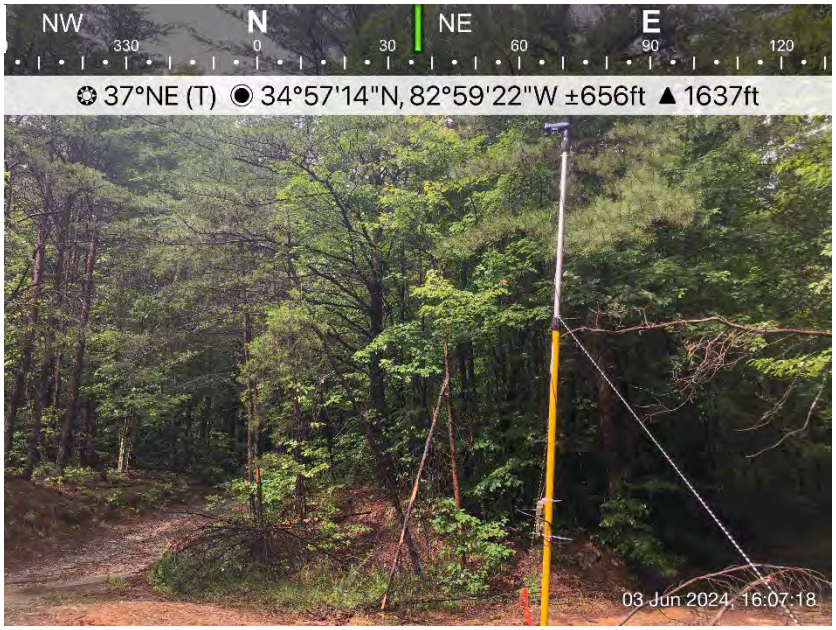
Figure A6. Photos of AS-6 acoustic site which consisted of two acoustic detectors A) AS-6-A and B) AS-6-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A7. Photos of AS-7 acoustic site which consisted of two acoustic detectors A) AS-7-A and B) AS-7-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)



B)

Figure A8. Photos of AS-8 acoustic site which consisted of two acoustic detectors A) AS-8-A and B) AS-8-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

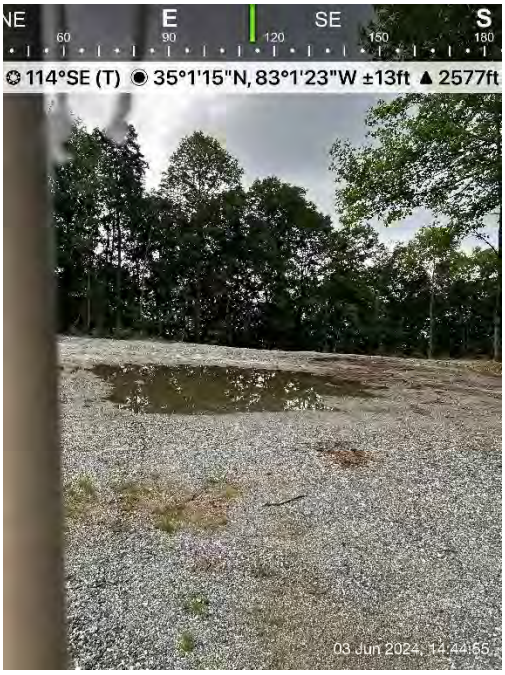


Figure A9. Photo of AS-9 acoustic site which consisted of one acoustic detector. The photo demonstrates the microphone orientation and the zone of detection for the detector deployed at the site.

Figure A10. Photo of AS-10 acoustic site which consisted of one acoustic detector. The photo demonstrates the microphone orientation and the zone of detection for the detector deployed at the site.

Figure A11. Photo of AS-11 acoustic site which consisted of one acoustic detector. The photo demonstrates the microphone orientation and the zone of detection for the detector deployed at the site.

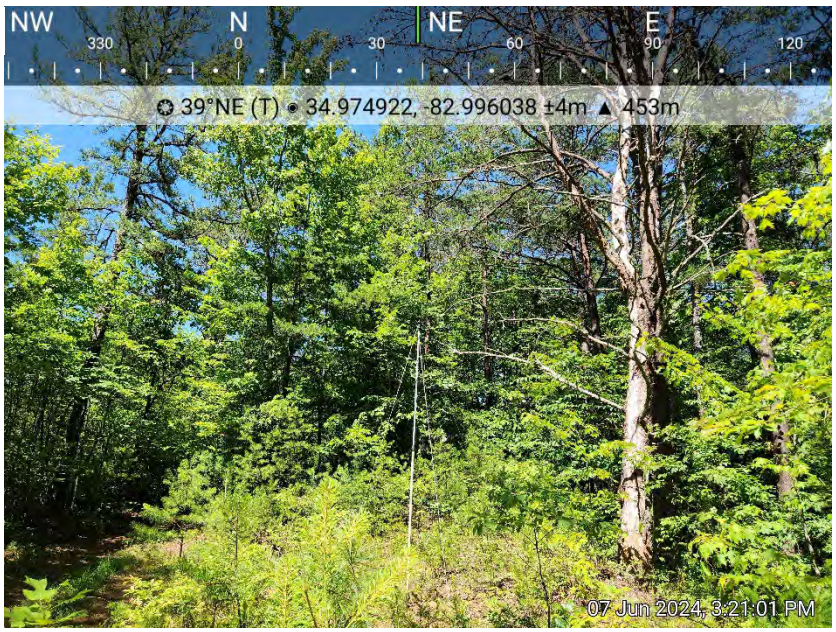
Figure A12. Photo of AS-12 acoustic site which consisted of one acoustic detector. The photo demonstrates the microphone orientation and the zone of detection for the detector deployed at the site.

A)

B)

Figure A13. Photos of AS-13 acoustic site which consisted of two acoustic detectors A) AS-13-A and B) AS-13-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

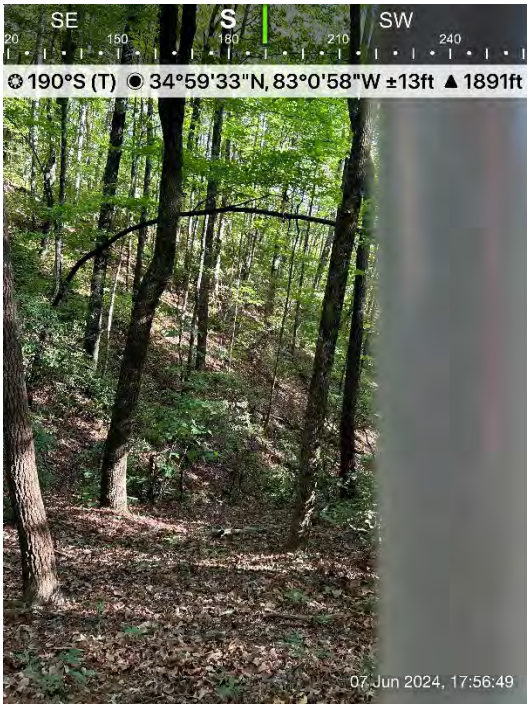
A)



B)

Figure A14. Photos of AS-14 acoustic site which consisted of two acoustic detectors A) AS-14-A and B) AS-14-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)



B)

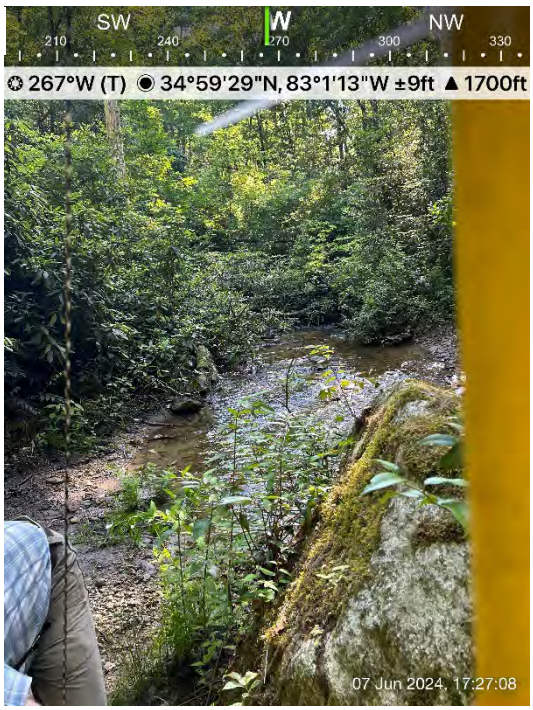
Figure A15. Photos of AS-15 acoustic site which consisted of two acoustic detectors A) AS-15-A and B) AS-15-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A16. Photos of AS-16 acoustic site which consisted of two acoustic detectors A) AS-16-A and B) AS-16-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)



B)

Figure A17. Photos of AS-17 acoustic site which consisted of two acoustic detectors A) AS-17-A and B) AS-17-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

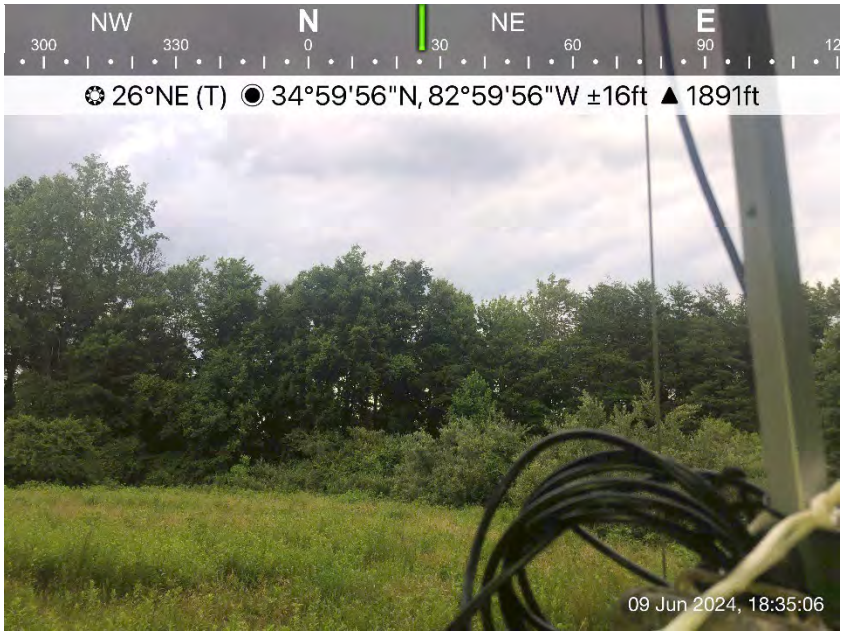


Figure A18. Photos of AS-18 acoustic site which consisted of two acoustic detectors A) AS-18-A and B) AS-18-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

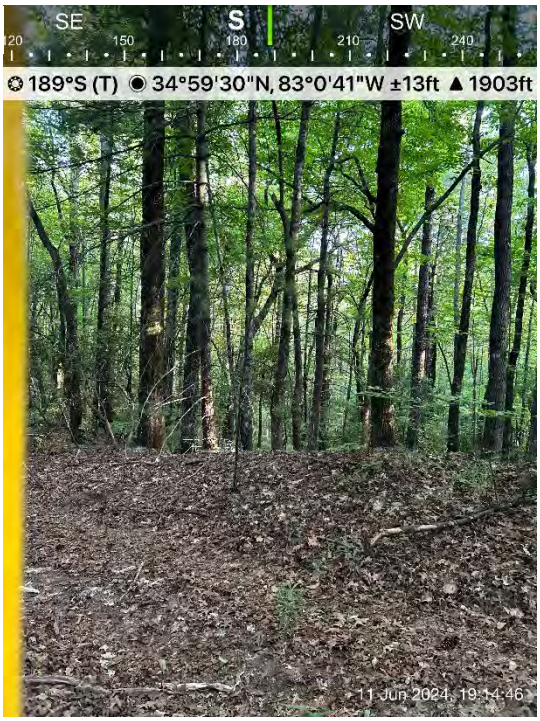
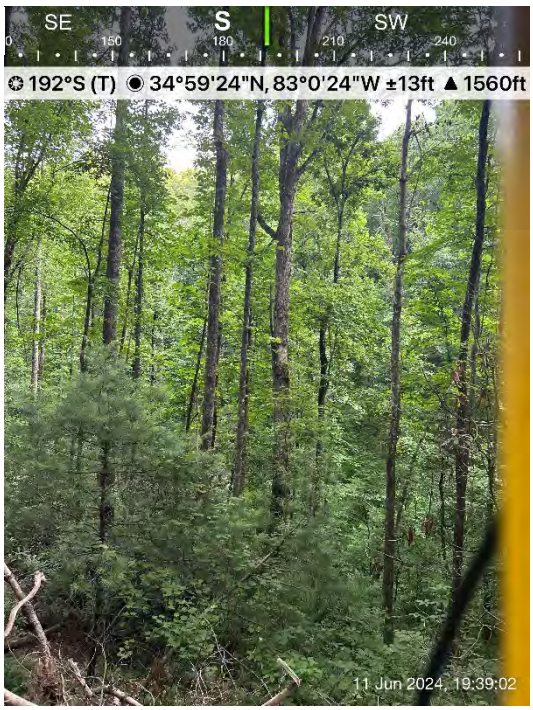


Figure A19. Photos of AS-19 acoustic site which consisted of two acoustic detectors A) AS-19-A and B) AS-19-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

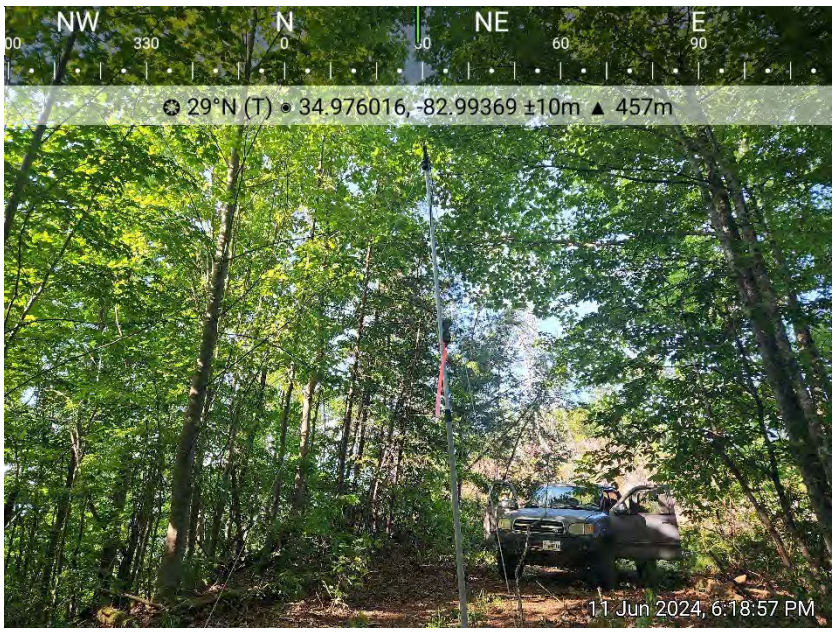
A)



B)

Figure A20. Photos of AS-20 acoustic site which consisted of two acoustic detectors A) AS-20-A and B) AS-20-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)



B)

Figure A21. Photos of AS-21 acoustic site which consisted of two acoustic detectors A) AS-21-A and B) AS-21-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A22. Photos of AS-22 acoustic site which consisted of two acoustic detectors A) AS-22-A and B) AS-22-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A23. Photos of AS-23 acoustic site which consisted of two acoustic detectors A) AS-23-A and B) AS-23-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A24. Photos of AS-24 acoustic site which consisted of two acoustic detectors A) AS-24-A and B) AS-24-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A25. Photos of AS-25 acoustic site which consisted of two acoustic detectors A) AS-25-A and B) AS-25-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

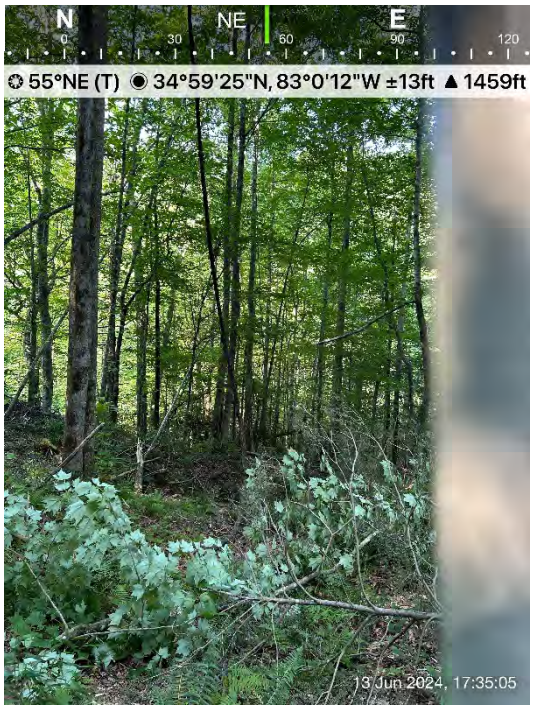
Figure A26. Photos of AS-26 acoustic site which consisted of two acoustic detectors A) AS-26-A and B) AS-26-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A27. Photos of AS-27 acoustic site which consisted of two acoustic detectors A) AS-27-A and B) AS-27-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)



B)

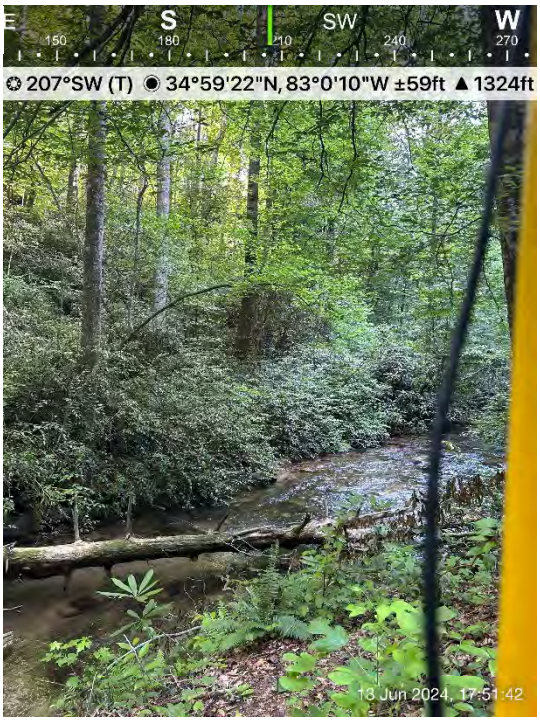


Figure A28. Photos of AS-28 acoustic site which consisted of two acoustic detectors A) AS-28-A and B) AS-28-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A29. Photos of AS-29 acoustic site which consisted of two acoustic detectors A) AS-29-A and B) AS-29-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A30. Photos of AS-30 acoustic site which consisted of two acoustic detectors A) AS-30-A and B) AS-30-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A31. Photos of AS-31 acoustic site which consisted of two acoustic detectors A) AS-31-A and B) AS-31-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A32. Photos of AS-32 acoustic site which consisted of two acoustic detectors A) AS-32-A and B) AS-32-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

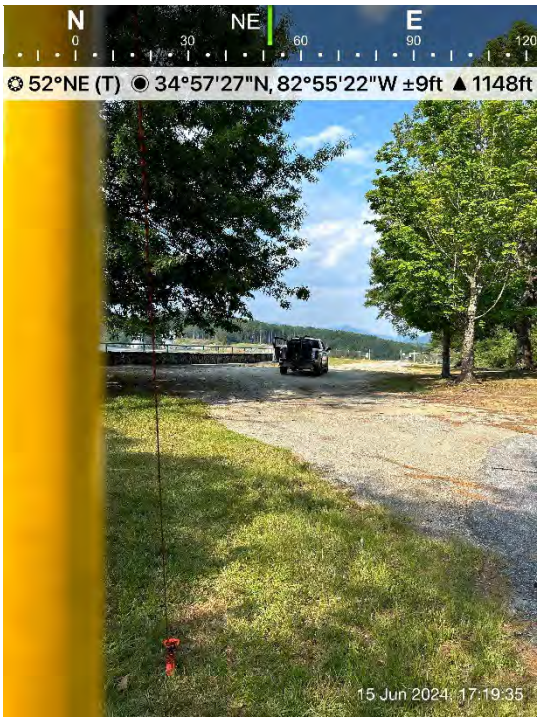
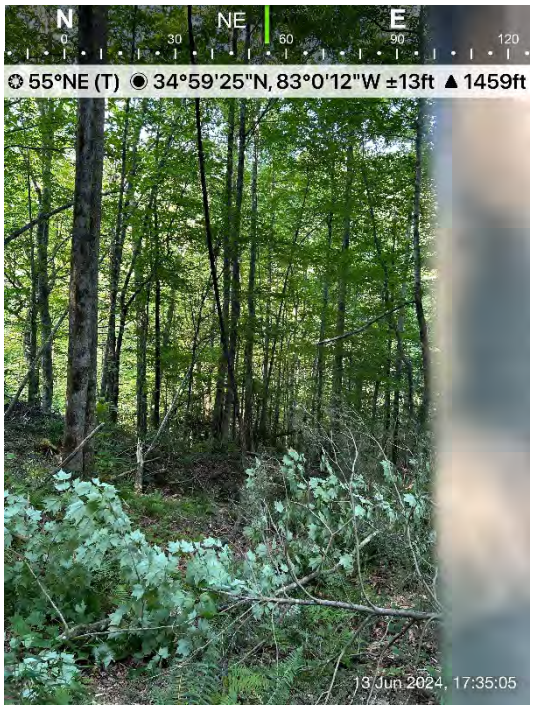


Figure A33. Photos of AS-33 acoustic site which consisted of two acoustic detectors A) AS-33-A and B) AS-33-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)



B)

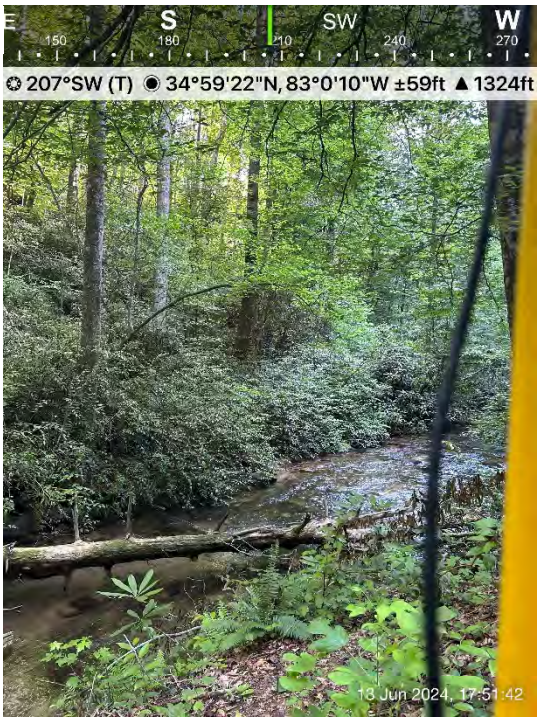


Figure A34. Photos of AS-34 acoustic site which consisted of two acoustic detectors A) AS-34-A and B) AS-34-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A35. Photos of AS-35 acoustic site which consisted of two acoustic detectors A) AS-35-A and B) AS-35-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

Figure A36. Photos of AS-36 acoustic site which consisted of two acoustic detectors A) AS-36-A and B) AS-36-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)

B)

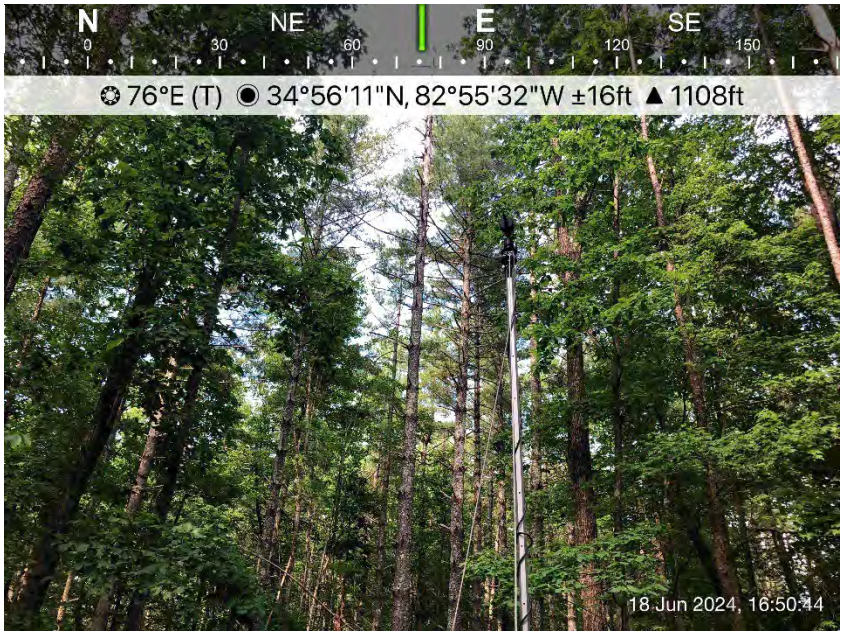


Figure A37. Photos of AS-37 acoustic site which consisted of two acoustic detectors A) AS-37-A and B) AS-37-B. Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

4.0 QUALITATIVE ANALYST

The credentials for John Manual, the wildlife biologist responsible for the qualitative analyses of the acoustic data, are given.

Resume

John M. Manuel
139 Rock Hill Rd
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(828) 712-4610

Work Experience

- **Currently—Biotope Forestry and Environmental, Wildlife Biologist III (3).** Responsible for performing mist-net surveys for threatened and endangered bat species as well as forest inventory and habitat assessments.
    - **Fall 2023—**Acoustic analysis for bat acoustic surveys for bats of the Carolinas.
    - **Summer 2023—**Pisgah, AL mist-net survey for *Perimyotis subflavus* and *Myotis lucifugus*. Many *Myotis grisescens* were handled and identified along with two *P. subflavus.* One *P. subflavus* was affixed with a transmitter. Located two *P. subflavus* roost trees.
    - **September 2022–** Indiana Bat Portal Searches in West Virginia and eastern Kentucky.
    - **June 2022-August 2022–** Northeast Ohio Regional Airport Bat Survey, Mill Creek Habitat Restoration Bat survey.
- **January 2021-December 2021—NC Forest Service, (Buncombe County) Assistant County Ranger.** Wildfire suppression, prescribed burning, forest management, forestation, urban forestry.
- **Spring/Summer 2021 Volunteer with Indiana State University and NCWRC**–Bat mist-netting surveys. Team lead for the application of radio transmitters to *Myotis grisescens*.
    - **April 2021-** Netting target bridges in Asheville area.
- **April 2020-July 2020–ISU Bat Center, Bat Technician.** Assisted with Joy O'Keefe and Joey Weber's gray bat project along French Broad River which included bridge inspections, acoustic station maintenance, and identification of gray bats and other species using acoustic analysis.
- **September 2018-December 2020—Biotope Forestry and Environmental, Forest Technician**. Forest Inventory for clients Campbell Global, F&W Forestry Services and American Forest Management in the coastal plain of the Carolinas, Florida, Mississippi, and Texas.
- **Summer of 2018—Ecological Engineering, Wildlife Technician.** Mist-net surveys for threatened and endangered bat species. Radio telemetry tracking of northern long-eared bats in Francis Marion NF (longleaf pine forest and swamp habitat). Identified the following bat species: *Myotis septentrionalis, Lasiurus borealis, Lasiurus seminolus, Nycticeius humeralis, Eptesicus fuscus, Perimyotis subflavus, and Tadarida brasiliensis.* Work also included surveying for host plants for various butterfly, skipper and moth species (various species of *Asclepius, Pontedaria, Pieris,* and *Gymnopogon ambiguus).*
- **May 2018—Ecological Solutions and Innovations, Forest Technician**. Forest health assessment and merchantable timber inventory.
- **April 2018—Biotope Forestry & Environmental, Forest Technician**. Clients included Campbell Global and American Forest Management. Attended Southeast Bat Diversity Network annual meeting, trained in acoustic analysis using Kaleidoscope and Sonobat.

- **Winter 2017-2018—Calyx Engineers and Consultants, Staff Scientist**. Mist-net surveys for threatened and endangered bat species in northeastern North Carolina. Radio telemetry tracking of northern long-eared bat. Study areas were North River Gamelands, Merchants Millpond State Park, and Great Dismal Swamp State Park. Identified the following bat species: *Myotis spetentrionalis, Myotis austroriparius, Myotis lucifugus, Lasiurus borealis, Corynorhinus rafinesquii,* and *Eptesicus fuscus.*
- **Fall 2017—Apogee Environmental, Bat Biologist (WV).** Fall portal netting and harp trapping old, abandoned coal mines near Mahan, WV. Identified *Myotis sodalis, Myotis leibii, and Eptesicus fuscus.*
- **Fall 2017—Borealis Biological, Bat technician**. Fall portal netting old, abandoned coal mines and adits near Man, WV. Identified *Myotis leibii.*
- **Summer and Fall 2014-2017—Apogee Environmental, Bat Biologist (WV, OH, PA, TN).** Summer mist-netting, radio telemetry, and acoustic surveys for threatened and endangered bat species. Identified *Myotis sodalis, Myotis leibii, Myotis septentrionalis, Lasionycteris noctivagans, Perimyotis subflavus, Eptesicus fuscus, Nycticeius humeralis, Lasiurus borealis, Lasiurus cinereus.* Applied transmitters to northern long-eared bats. WV permitted Bat Biologist, and Bat Identifier (BI) in PA. Set up acoustic detectors and helped with data management and learned the fundamentals of acoustic analysis of bat calls.
- **2013—Seasonal Park Technician at Chimney Rock State Park, NC.** Work included surveying and controlling invasive plant species, creating a blooming calendar of native wildflowers, outreach, and general park maintenance.
- **Fall 2010- Fall 2011—Duke Forest (Duke University), Forest Technician.** Work included the decadal forest inventory of the forest property (> 7,000 acres) using the double sampling method with a prism-point sampling technique. Prepared forests for timber sales and inspected logging operations. Invasive species control, trail maintenance, and grounds maintenance. Regularly used ArcGIS to make detailed sale area maps, and inventory maps.
- **Summer of 2010—Student Conservation Association, Trail Maintenance.** Trail restoration.

Education

Western Carolina University (Cullowhee, NC)—Bachelor's degree in Natural Resource Management with a concentration in Forest Management

Haywood Community College (Clyde, NC)—Associates of Applied Science in Forest Management Technology. Graduated magna cum laude.

Awards, Certificates, and Training

Federal Recovery Permit for bats (**ES81492B-1**)

2021 NWCG- S-212 Chainsaw Certification

2018-Workshop on using Sonobat and Kaleidoscope for acoustic analysis at Southeast Bat Diversity Network annual meeting in Roanoke, VA

2023-Vesper Bat Detection Services

- Echo 101: basics of bat echolocation, how to interpret echolocation calls and sonograms, identification metrics, and best practices for acoustic monitoring and manual vetting
- Acoustic Identification of Eastern Bats Parts 1 and 2

2012 Asheville-Buncombe Tech Community College – Welding Program (MIG and TIG)
2011 National Wildfire Coordinating Group – Introduction to Wildland Fire Behavior (S-190)
2011 National Wildfire Coordinating Group – Firefighter Training (S-130)
2011 National Wildfire Coordinating Group – Human Factors in the Wildland Fire Service (L-180)
2010 Council of Eastern Forest Technician Schools—Award for Superior Academic Achievement

References

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5.0 ACOUSTIC ANALYSES

5.1 Bat Identification Program Results

Table A3. Summary table of all bat calls and associated maximum likelihood estimate values assigned for each captured during acoustic surveys stratified by site and date which were compiled and processed with the approved acoustic bat identification program, Kaleidoscope Pro 5.6.3, to initially classify all bat calls to species when *Myotis sodalis* were NOT included in analyses. P-values that are less than 0.05 (denoted as bold in the table) indicate that presence is likely for the species in the column on that night the site was surveyed and, if species emit a high frequency call, these were targeted for subsequent qualitative vetting. The program used the classifier Bats of North America 5.4.0 on the "-1 more Sensitive, Liberal" setting. The number in the site name indicates the site and, where more than one detector was deployed, the letter following indicates the specific detector. The recordings are listed by species for the following bats: *Corynorhinus townsendii* (CORTOW), *Eptesicus fuscus* (EPTFUS), *Lasiurus borealis* (LASBOR), *Lasiurus cinereus* (LASCIN), *Lasionycteris noctivagans* (LASNOC), *Myotis austroriparius* (MYOAUS), *M. grisescens* (MYOGRI), *M. leibii* (MYOLEI), *M. lucifugus* (MYOLUC), *M. septentrionalis* (MYOSEP), *Nycticeius humeralis* (NYCHUM), *Perimyotis subflavus* (PERSUB), *Tadarida brasiliensis* (TADBRA). Note that *Corynorhinus rafinesquii* calls are indistinguishable from *C. townsendii* and are run under the same acronym (CORTOW) within Kaleidoscope, given that the AOI is far outside the known range of *C. townsendii*, we assume only *C. rafinesquii* are possible. Any recordings that could not be assigned to species by the program are included in the "NO ID" column while all recordings that were not indicative of a bat are listed in the "NOISE" column. Note that all raw data are shown, including calls that did not meet the maximum likelihood threshold to qualify as likely present.

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
AS-1-A	6/1/2024	CALLS		10	374	1	2		3	44	1	46	33	38	53		28	602
		MLE	1	**1.3E-06**	0	1	1	1	1	0	1	0.898922	0	1	1	1		
	6/2/2024	CALLS	1	1	3									2	1		11	68
		MLE	0.068799	0.16981	**0.01212**	1	1	1	1	1	1	1	1	1	0.97352	1		
AS-1-B	6/1/2024	CALLS	1	2	5							1			5		2	61
		MLE	0.113963	**0.027755**	**0.00032**	1	1	1	1	1	1	0.985902	1	1	**0.02781**	1		
	6/2/2024	CALLS		1	3									4	2		2	15
		MLE	1	0.168706	0.05016	1	1	1	1	1	1	1	1	0.6842318	0.64016	1		
AS-2-A	6/1/2024	CALLS	8	22	23	2	2		38	43	4	36	6		52	2	4	400
		MLE	**1.1E-06**	0	**7E-07**	0.99047	1	1	0	0	0.34594	0	1	1	0	1		
	6/2/2024	CALLS	3	7	114	2	5		55	92	4	127	2	1	180	2	20	61
		MLE	**0.007454**	**0.002275**	0	0.54852	0.35607	1	0	0	0.82158	0	1	1	0	0.87084		
AS-2-B	6/1/2024	CALLS		4	44	2		58		2		1		23	2	1	41	306
		MLE	1	**0.003894**	0	0.22993	1	0	1	1	1	1	1	1	1	0.96733		
	6/2/2024	CALLS		6	54	6	11	72		6		6	2	60	15	4	45	187
		MLE	1	0.142037	0	**0.00825**	**0.00939**	0	1	0.371428	1	1	0.337035	1	1	0.72604		
AS-3-A	6/1/2024	CALLS			19				9	88		7			18		2	365
		MLE	1	1	0	1	1	1	0.9016112	0	1	0.711756	1	1	**6.8E-06**	1		
	6/2/2024	CALLS		1	16				5	57	1	15			6		1	27
		MLE	1	0.176492	0	1	1	1	1	0	0.39338	**4.62E-05**	1	1	0.33055	1		
AS-3-B	6/1/2024	CALLS			16							12			21		6	373
		MLE	1	1	0	1	1	1	1	1	1	**0.001154**	1	1	0	1		
	6/2/2024	CALLS	1		18				3	1	1	21	3	11	18	1	4	85
		MLE	**0.030826**	1	0	1	1	1	0.3766588	1	0.70529	**1E-07**	0.884194	1	**0.0003**	0.13714		
AS-4-A	6/5/2024	CALLS			42		1			13		5		6	1	1	6	37
		MLE	1	1	0	1	0.6362	1	1	**3E-07**	1	1	1	1	1	0.42083		
	6/6/2024	CALLS		2	95	1		4	1	14	3	21		23	13		13	46
		MLE	1	0.069566	0	0.43519	1	1	1	**0.001275**	**0.02457**	0.200194	1	1	1	1		
AS-4-B	6/5/2024	CALLS	1	11	96	5	13	145	1	10	1	8		37	25	17	59	234
		MLE	1	**0.000454**	0	0.29323	**0.02105**	0	1	**0.010737**	0.36953	1	1	1	1	**3.5E-06**		
	6/6/2024	CALLS		7	114	6	14	200		19		16	1	70	24	7	66	238
		MLE	1	0.19229	0	**0.03793**	**0.00302**	0	1	**0.000962**	1	0.998218	1	1	1	0.19653		
AS-5-A	6/5/2024	CALLS			46		1		8	25		90	1	1	14		1	14

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
		MLE	1	1	0	1	0.20261	1	0.2846355	0	1	0	1	1	0.29577	1		
	6/6/2024	CALLS			97			1	13	41		123	3	2	30		1	14
		MLE	1	1	0	1	1	1	0.068882	0	1	0	1	1	0.05954	1		
AS-5-B	6/5/2024	CALLS			72			1	4	5		70	1	2	7		0	35
		MLE	1	1	0	1	1	1	0.4675504	0.736441	1	0	1	1	1	1		
	6/6/2024	CALLS	1		156			1	4	15		73	3		17		1	30
		MLE	**0.03487**	1	0	1	1	1	0.6991931	**0.009808**	1	0	1	1	1	1		
AS-6-A	6/5/2024	CALLS			12		3		6	3		8			2	2	2	70
		MLE	1	1	**1E-07**	1	0.14522	1	**0.0059202**	0.074072	1	**0.003178**	1	1	1	0.28203		
	6/6/2024	CALLS			68		5	2	2	7	1	28		8	5	4	16	112
		MLE	1	1	0	1	0.06155	1	0.9193067	0.106073	0.68695	**0.000003**	1	1	1	0.05219		
AS-6-B	6/5/2024	CALLS			171				2	11		113		5	11		5	27
		MLE	1	1	0	1	1	1	1	0.406983	1	0	1	1	1	1		
	6/6/2024	CALLS			202	1	2		2	8		52		4	18	1	12	34
		MLE	1	1	0	0.43244	0.35526	1	0.8616833	0.931261	1	**1.8E-06**	1	1	1	0.75278		
AS-7-A	6/5/2024	CALLS			55	1			3	42	1	6	2	2	51		2	31
		MLE	1	1	0	0.11519	1	1	1	0	0.38804	1	0.342578	1	0	1		
	6/6/2024	CALLS		1	51				4	10		8		1	24		1	19
		MLE	1	0.207337	0	1	1	1	0.0924682	**0.00022**	1	0.943069	1	1	**0.001**	1		
AS-7-B	6/5/2024	CALLS		3	12				14	47		17	1		2		1	22
		MLE	1	**0.004735**	**1.8E-05**	1	1	1	**0.0016619**	0	1	**1E-07**	1	1	1	1		
	6/6/2024	CALLS			16				11	27		22			5		0	36
		MLE	1	1	**5E-07**	1	1	1	**0.003149**	0	1	0	1	1	0.59211	1		
AS-8-A	6/5/2024	CALLS	1	17	14			9	4	20	1	47	5	8	19	5	5	70
		MLE	0.683084	0	**0.0005**	1	1	0.53322	0.7855612	0	0.90117	0	0.95868	1	**0.00025**	0.19958		
	6/6/2024	CALLS	2	18	66	1	7	3	13	20	1	44	2	1	89	2	1	98
		MLE	0.254041	0	0	1	0.57995	1	**0.0008166**	0	0.98835	0	1	1	0	1		
AS-8-B	6/5/2024	CALLS			115		3	1	1	8	1	18	1	1	20	1	3	38
		MLE	1	1	0	1	0.05938	1	1	0.253315	0.58848	0.336407	1	1	1	0.77337		
	6/6/2024	CALLS		3	93			1		10	1	21	1	5	13	1	4	22
		MLE	1	**0.013619**	0	1	1	1	1	**0.031998**	0.76218	**0.022153**	1	1	1	0.66278		
AS-9	6/5/2024	CALLS	1	3	8	4	6	5				2		6	2	1	6	33
		MLE	0.218987	0.380516	**5E-05**	**0.01182**	0.06126	0.62138	1	1	1	0.980958	1	1	1	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
	6/6/2024	CALLS			4		1	4			1	2		3	1		2	11
		MLE	1	1	**0.02089**	1	0.22613	0.40871	1	1	0.11045	0.595618	1	1	1	1		
	6/7/2024	CALLS			18			2	2			1		6	1		4	22
		MLE	1	1	0	1	1	1	0.1591749	1	1	1	1	1	1	1		
	6/8/2024	CALLS		3	15	2	2	5	1	1				3	1		9	29
		MLE	1	0.066605	0	0.16564	0.78975	1	0.4367191	0.92719	1	1	1	1	1	1		
AS-10	6/5/2024	CALLS	39		83		1	1	6	25		15	1	45	7		23	194
		MLE	0	1	0	1	0.20943	1	0.0819808	0	1	0.895701	1	1	1	1		
	6/6/2024	CALLS	10		99		8	2	3	64	3	29		68	8	2	22	246
		MLE	0	1	0	1	**0.00023**	1	1	0	0.05182	0.115539	1	1	1	0.76712		
	6/7/2024	CALLS	3	4	86			1	3	38	5	17		44	3		17	883
		MLE	**0.000578**	**0.001247**	0	1	1	1	1	0	**0.00013**	0.751165	1	1	1	1		
	6/8/2024	CALLS	5		97		3	1	3	156	3	16	2	45	12		34	217
		MLE	0	1	0	1	**0.00709**	1	1	0	**0.02961**	1	0.656854	1	1	1		
AS-11	6/5/2024	CALLS		15	12	2	1	2	1			2	1	3	6		0	67
		MLE	1	0	0	0.85187	1	1	0.4278933	1	1	0.999753	0.615653	1	0.31798	1		
	6/6/2024	CALLS		9	6	1		3				1		4	2		6	70
		MLE	1	**1E-07**	**0.00028**	0.96953	1	0.88698	1	1	1	1	1	1	0.99912	1		
	6/7/2024	CALLS		28	18	6	4		11		3	2		10	1		6	107
		MLE	1	0	0	0.18253	1	1	**0.0064991**	1	**0.04418**	1	1	1	1	1		
	6/8/2024	CALLS	3	19	1	1		1				1		1	1		3	53
		MLE	**0.027723**	0	0.44786	1	1	0.80637	1	1	1	0.63956	1	1	0.7519	1		
AS-12	6/5/2024	CALLS			31		1	346		2	2	1		18	15	11	19	144
		MLE	1	1	1	1	1	0	1	0.075881	**0.00263**	1	1	1	1	0		
	6/6/2024	CALLS			39		4	391		1	1			13	18	53	40	189
		MLE	1	1	0.95549	1	1	0	1	0.497321	**0.04364**	1	1	1	1	0		
	6/7/2024	CALLS			87	6	4	544				3		34	75	54	64	296
		MLE	1	1	**0.00011**	0.99925	1	0	1	1	1	1	1	1	**0.00094**	0		
	6/8/2024	CALLS			60	1	5	600	1			1		27	30	37	61	202
		MLE	1	1	1	1	1	0	0.1673944	1	1	1	1	1	1	0		
AS-13-A	6/8/2024	CALLS	20	71	77	22	77	149	1	14		3	1	63	4	13	73	284
		MLE	0	0	0	**0.00021**	0	0	1	**0.000005**	1	1	1	1	1	0.9865		
	6/10/2024	CALLS	29	138	8		2	17		1		1		3	2	2	6	165

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
		MLE	0	0	**0.00232**	1	1	**0.00065**	1	0.724865	1	1	1	1	1	1		
AS-13-B	6/8/2024	CALLS	5	5	51				3	9	1	19	9	5	36	1	5	92
		MLE	**2.6E-06**	**0.000297**	0	1	1	1	0.7565924	**0.002862**	0.85958	**0.003783**	**0.002831**	1	**1E-07**	0.8662		
	6/10/2024	CALLS	24	157	58		1		4	22	1	9	7	12	21		5	82
		MLE	0	0	0	1	1	1	0.6997494	0	0.76271	0.972915	**0.002392**	1	0.09562	1		
AS-14-A	6/11/2024	CALLS	1				1		2	4	3		12		1	4	1	68
		MLE	0.068989	1	1	1	0.99998	1	1	**0.000001**	0.05011	1	0	1	0.1474	**0.00217**		
	6/8/2024	CALLS	1	3	11		3	5	3	6	3	3	1	2	4	1	11	89
		MLE	0.21031	0.117395	**1E-07**	1	0.29012	1	0.8375147	0.000633	0.00515	0.859978	0.870493	1	0.89992	0.92029		
AS-14-B	6/8/2024	CALLS			11				6	5					26		0	19
		MLE	1	1	**4E-07**	1	1	1	**0.0067421**	**0.000401**	1	1	1	1	0	1		
	6/11/2024	CALLS							16	6	3		18		1		3	51
		MLE	1	1	1	1	1	1	**0.0003747**	0	0.34509	1	**2E-07**	1	0.24481	1		
AS-15-A	6/8/2024	CALLS								1		8		1			1	48
		MLE	1	1	1	1	1	1	1	0.345137	1	**1E-07**	1	0.785226	1	1		
	6/10/2024	CALLS			1				1			1	1	1			2	27
		MLE	1	1	0.42518	1	1	1	0.4249684	1	1	0.492827	0.569328	0.9562648	1	1		
AS-15-B	6/8/2024	CALLS		1	158		1		10	31	9	57	9	11	20		6	97
		MLE	1	0.600077	0	1	0.59799	1	0.7281359	0	**3.5E-05**	0	0.460451	1	1	1		
	6/10/2024	CALLS	1		48				3	7	16	17	9	3	14		3	31
		MLE	**0.020258**	1	0	1	1	1	1	**0.029508**	0	**0.001871**	**0.005017**	1	0.33834	1		
AS-16-A	6/8/2024	CALLS	2	300	50	19	48	9	4	1	1	5	1	7	4	12	20	96
		MLE	1	0	0	1	1	1	0.1138754	1	0.60801	1	1	1	1	1		
	6/10/2024	CALLS		71	20	4	2	1			1	5	2	6	7	2	6	106
		MLE	1	0	0	1	1	1	1	1	0.4297	0.590631	0.271693	1	0.58368	1		
AS-16-B	6/8/2024	CALLS		40	41	1	8	14	9	28		117		9	7	9	13	338
		MLE	1	0	0	1	1	1	0.311598	0	1	0	1	1	1	0.15997		
	6/10/2024	CALLS	2	7	10		1	11	1	3		57		4		2	1	485
		MLE	0.052334	**3.88E-05**	0.16307	1	1	**0.02572**	1	0.427582	1	0	1	1	1	0.54068		
AS-17-A	6/13/2024	CALLS	1	2	13		2	1	7	6	8	20	7	9	9		4	63
		MLE	0.148304	0.217629	**2.1E-06**	1	0.39735	1	0.7676576	**0.006376**	**6.3E-06**	0	0.106535	1	0.14804	1		
	6/14/2024	CALLS		3	12	1		1	5	2	2	14	1	10	7		8	58
		MLE	1	**0.007293**	**2.2E-06**	0.57667	1	1	0.1858361	0.677405	0.16399	**5.07E-05**	1	1	0.44426	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
AS-17-B	6/13/2024	CALLS			2					1					1		0	4
		MLE	1	1	**0.0212**	1	1	1	1	0.208146	1	1	1	1	0.70419	1		
	6/14/2024	CALLS			2					5		1					0	5
		MLE	1	1	0.05684	1	1	1	1	**2.1E-06**	1	0.643841	1	1	1	1		
AS-18-A	6/11/2024	CALLS		6	9	2	1	5	2	1				3			3	46
		MLE	1	**0.000144**	**1.1E-05**	0.34124	1	0.65235	0.170779	0.725373	1	1	1	1	1	1		
	6/12/2024	CALLS		10	9		2	6	1		1	1	1	5	3		3	71
		MLE	1	**3E-07**	**9.7E-06**	1	1	0.57132	0.9189325	1	0.24685	1	0.541917	1	0.99226	1		
AS-18-B	6/11/2024	CALLS		80	5	2	1	19	1	3		2	1	4	1	3	6	117
		MLE	1	0	0.19756	1	1	**1.1E-05**	0.6685528	**0.0121**	1	0.576923	0.614272	1	1	1		
	6/12/2024	CALLS		23	7	2	4	36		1		4	2		2	11	7	189
		MLE	1	0	0.20308	1	1	0	1	0.609203	1	0.123658	0.220404	1	1	**0.00106**		
AS-19-A	6/11/2024	CALLS			2				1	1	2	4	1	1			2	121
		MLE	1	1	0.21753	1	1	1	1	0.370745	0.02409	**0.005037**	0.810658	1	1	1		
	6/12/2024	CALLS			227					1		194	2	37		1	97	22
		MLE	1	1	0	1	1	1	1	1	1	0	1	1	1	0.06688		
AS-19-B	6/11/2024	CALLS			1				1	3	5	1	1		1		0	13
		MLE	1	1	0.38604	1	1	1	1	**0.000504**	**4E-06**	0.510781	0.641532	1	0.50615	1		
	6/12/2024	CALLS			1				4	1	2	2	2		2		0	22
		MLE	1	1	0.5999	1	1	1	0.296212	0.219708	0.08859	0.160076	0.54165	1	0.13625	1		
AS-20-A	6/11/2024	CALLS	1	1	36				7	15	17	8	41	3	7		0	200
		MLE	0.068941	0.197427	0	1	1	1	1	0	0	0.474855	0	1	0.99402	1		
	6/12/2024	CALLS			65				9	5	17	5	20	2	23		3	161
		MLE	1	1	0	1	1	1	1	0.306212	0	1	0	1	**0.02255**	1		
AS-20-B	6/11/2024	CALLS			21		1		3	26	2	2	1		4		0	93
		MLE	1	1	0	1	0.22547	1	0.9979038	0	**0.03309**	1	0.653597	1	0.97998	1		
	6/12/2024	CALLS			68					7		2		1	7		1	37
		MLE	1	1	0	1	1	1	1	0.050507	1	1	1	1	1	1		
AS-21-A	6/11/2024	CALLS	3	15	1		2		16	19		1	4		3		1	299
		MLE	**0.018621**	0	0.37509	1	1	1	**0.0000012**	0	1	0.999872	0.628241	1	**0.03584**	1		
	6/12/2024	CALLS	1	13	1		3	2	13	8			6	3	6	4	11	405
		MLE	0.630281	0	0.76833	1	1	0.54747	**0.0000098**	0	1	1	0.105143	1	**0.00318**	0.2537		
AS-21-B	6/11/2024	CALLS			2				8	15	2	4	2		1		0	208

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
		MLE	1	1	0.2736	1	1	1	**0.0492297**	0	0.17636	**0.033217**	0.887662	1	0.7693	1		
	6/12/2024	CALLS			2				5	9		1	1		3		0	20
		MLE	1	1	0.08449	1	1	1	**0.0219974**	0	1	0.914715	0.958671	1	0.07194	1		
AS-22-A	6/12/2024	CALLS		2	2	2			3	1	1	6			2		0	11
		MLE	1	0.073294	0.45061	0.08232	1	1	0.3533953	0.391779	0.38787	**0.000209**	1	1	0.27678	1		
	6/13/2024	CALLS		1	6				1	1	3	3	1		6		2	14
		MLE	1	0.169526	**0.00056**	1	1	1	1	0.533594	**0.00155**	0.265191	0.74992	1	**0.01625**	1		
AS-22-B	6/12/2024	CALLS		3	4	13	1	7	4	1	12	10	11	3	6	4	3	216
		MLE	1	0.459495	0.18485	0	1	0.08848	1	0.704434	0	**7.33E-05**	**3.21E-05**	1	0.06934	0.69755		
	6/13/2024	CALLS		5	8	2	4	11	2		9	11	10	7	13	4	5	79
		MLE	1	**0.030465**	**0.00911**	0.5856	0.61353	**0.03348**	1	1	**2E-07**	**0.000843**	**6.92E-05**	1	**0.00113**	0.13564		
AS-23-A	6/11/2024	CALLS	1	11	59		2		17	34	13	127	15	7	5		12	224
		MLE	0.550766	0	0	1	1	1	0.3636069	0	**3E-06**	0	0.886688	1	1	1		
	6/12/2024	CALLS	2	9	95		3	5	5	26	15	92	20	18	1	1	13	636
		MLE	0.089144	**1.15E-05**	0	1	0.87134	1	1	0	0	0	**0.011095**	1	1	1		
AS-23-B	6/11/2024	CALLS	2	7	115				33	42	39	210	25	4	5		9	69
		MLE	0.050312	**4.6E-06**	0	1	1	1	0.5193533	0	0	0	0.863181	1	1	1		
	6/12/2024	CALLS	1	10	110				22	52	18	203	9		3		8	69
		MLE	0.489934	0	0	1	1	1	0.6203136	0	0	0	1	1	1	1		
AS-24-A	6/11/2024	CALLS			5				2	2	5		2				0	182
		MLE	1	1	**5.2E-05**	1	1	1	1	**0.042718**	**1.5E-05**	1	0.169692	1	1	1		
	6/12/2024	CALLS	2						1	1	7		4		1		0	348
		MLE	**0.00031**	1	1	1	1	1	1	**0.03289**	**2E-07**	1	**0.004746**	1	0.14749	1		
AS-24-B	6/11/2024	CALLS	1														0	27
		MLE	**0.01761**	1	1	1	1	1	1	1	1	1	1	1	1	1		
	6/12/2024	CALLS											1				0	91
		MLE	1	1	1	1	1	1	1	1	1	1	0.141495	1	1	1		
AS-25-A	6/13/2024	CALLS		3	68				3	64	13	13	6	2	8	1	1	86
		MLE	1	**0.012084**	0	1	1	1	1	0	0	0.334861	**0.03283**	1	1	0.66549		
	6/14/2024	CALLS		1	192	1			7	64	7	57	5	13	22		6	218
		MLE	1	0.515137	0	0.16625	1	1	1	0	**0.00028**	0	0.997895	1	1	1		
AS-25-B	6/16/2024	CALLS	2	34	5				9	12	24	6	22	4	3	2	0	304
		MLE	0.410486	0	**0.00465**	1	1	1	1	0	0	**0.037608**	0	1	0.63245	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
	6/17/2024	CALLS		6	12		1		10	30	30	9	11	2	3	2	2	651
		MLE	1	**0.000252**	**1E-07**	1	1	1	1	0	0	**0.00529**	**0.00036**	1	0.94752	0.44925		
AS-26-A	6/13/2024	CALLS			1				5	3	2	2	1				0	78
		MLE	1	1	0.57329	1	1	1	0.1613646	**0.000872**	0.08843	0.111639	0.989715	1	1	1		
	6/14/2024	CALLS		1			1		17	8	1	3	4		3		2	210
		MLE	1	0.462393	1	1	0.62421	1	**0.000001**	0	0.96137	0.179963	0.793521	1	**0.00851**	1		
AS-26-B	6/13/2024	CALLS	1	4	3				1			1	1	1	3	1	1	378
		MLE	0.221599	**0.001422**	**0.01214**	1	1	1	0.4197247	1	1	0.886573	0.557336	1	0.18102	0.78752		
	6/14/2024	CALLS	11	5	15					3		9	1	1	16		6	482
		MLE	0	**0.000156**	0	1	1	1	1	0.136981	1	**0.011454**	0.984408	1	**1.6E-05**	1		
AS-27-A	6/14/2024	CALLS			1												0	3
		MLE	1	1	0.14124	1	1	1	1	1	1	1	1	1	1	1		
	6/16/2024	CALLS															0	4
		MLE	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
AS-27-B	6/14/2024	CALLS		18	41	1	7	11	7	5	1	18		25	6	2	10	127
		MLE	1	0	0	1	0.5514	1	**0.0219866**	0.433884	0.78021	**0.025515**	1	1	1	1		
	6/16/2024	CALLS		22	15	1	8	11	3	4		8	1	13	8	4	6	110
		MLE	1	0	**1E-07**	1	0.66421	0.32108	0.0934023	0.127567	1	0.171189	1	1	0.67444	0.76513		
AS-28-A	6/13/2024	CALLS			4				2								0	23
		MLE	1	1	**0.00042**	1	1	1	0.1523226	1	1	1	1	1	1	1		
	6/14/2024	CALLS			7				1			5		1	5		2	57
		MLE	1	1	**9.7E-05**	1	1	1	0.4620335	1	1	**0.046709**	1	1	0.10005	1		
AS-28-B	6/13/2024	CALLS					1	3	5		3	8	3	2	5	1	5	367
		MLE	1	1	1	1	0.63726	0.1437	0.2953616	1	**0.02511**	**6.8E-06**	0.519792	1	**0.00286**	0.41994		
	6/14/2024	CALLS		2	1			1	3		2	6	1	1	5	1	4	463
		MLE	1	0.058087	0.84874	1	1	0.75331	0.5135694	1	0.06395	**0.000782**	0.996629	1	**0.00637**	0.52777		
AS-29-A	6/13/2024	CALLS		7	37	3	1	26	2	75		16	3	20	8	3	12	146
		MLE	1	0.000176	0	0.21118	1	0.12835	1	0	1	0.097519	0.42133	1	1	0.39923		
	6/14/2024	CALLS	1	11	54	1	1	84	1	40		12		46	5	5	26	142
		MLE	0.555206	**2E-07**	0	1	1	0	1	0	1	0.896354	1	1	1	0.05569		
AS-29-B	6/13/2024	CALLS		19	14			7	1	13	1	7	1	6	6	1	13	136
		MLE	1	0	0	1	1	0.98195	1	0	0.30287	0.220722	0.88794	1	0.83456	1		
	6/14/2024	CALLS		31	21		1	12		3		5		7	3	1	34	77

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
		MLE	1	0	0	1	1	0.77611	1	0.443342	1	0.923184	1	1	1	1		
AS-30-A	6/18/2024	CALLS							1	1		2	1			1	1	69
		MLE	1	1	1	1	1	1	0.5052234	0.121101	1	**0.015967**	0.652992	1	1	0.17011		
	6/19/2024	CALLS									1			2			0	66
		MLE	1	1	1	1	1	1	1	1	0.05058	1	1	0.4812724	1	1		
AS-30-B	6/18/2024	CALLS		2	25		2		12	29	4	25	2	9	4	4	4	259
		MLE	1	0.432966	0	1	0.8547	1	0.0555017	0	**0.02384**	0	1	1	1	**0.01502**		
	6/19/2024	CALLS			63	3			10	31	1	22	6	9	8	1	7	235
		MLE	1	1	0	**0.00789**	1	1	**0.0249265**	0	0.94136	**0.000511**	0.334216	1	1	0.88293		
AS-31-A	6/16/2024	CALLS			6				2	20		4			1		0	38
		MLE	1	1	**0.00027**	1	1	1	0.9902302	0	1	0.138349	1	1	1	1		
	6/17/2024	CALLS			37		1		5	75	3	3	1		27		5	62
		MLE	1	1	0	1	0.21495	1	1	0	**0.00301**	1	0.763964	1	**5E-07**	1		
AS-31-B	6/16/2024	CALLS		1	10	44	21	8	1		1	3	1	8	6	26	11	270
		MLE	1	1	**2.1E-05**	0	0.42287	0.3281	0.9199127	1	0.2704	0.871264	0.684098	1	0.53115	**0.00014**		
	6/17/2024	CALLS		7	1	1	2	3				2		3	4	1	3	800
		MLE	1	**8.81E-05**	0.83762	0.90458	0.99049	0.26644	1	1	1	0.303198	1	1	**0.04298**	0.98204		
AS-32-A	6/16/2024	CALLS		11	42		10	28		11		5		2	12	4	12	278
		MLE	1	**0.000293**	0	1	**0.02624**	0.61842	1	**0.00052**	1	1	1	1	0.99674	0.58069		
	6/17/2024	CALLS		6	13		3	36	1	1		1		9	11	3	7	160
		MLE	1	**0.002877**	**0.00106**	1	0.78987	0	0.4346309	0.865998	1	1	1	1	0.13677	0.24724		
AS-32-B	6/16/2024	CALLS		2	7	1		3							4		8	46
		MLE	1	**0.043937**	**2.4E-05**	0.44586	1	1	1	1	1	1	1	1	0.35139	1		
	6/17/2024	CALLS		4	1					1		1		1	6		3	96
		MLE	1	**0.000754**	0.46679	1	1	1	1	0.209815	1	0.895169	1	1	**0.00055**	1		
AS-33-A	6/16/2024	CALLS		10	5	3	7	11			1			12	26	14	14	176
		MLE	1	**0.001685**	0.28876	0.90054	0.84317	**0.01019**	1	1	0.06748	1	1	1	0	**2.6E-06**		
	6/17/2024	CALLS		3	3	6	1	5		1	1		1	4	16	4	4	398
		MLE	1	0.214981	0.26883	**0.00145**	1	0.13758	1	0.389875	0.18195	1	0.297729	1	**1E-07**	0.21717		
AS-33-B	6/16/2024	CALLS	1	1	1				1	1		2			7		1	17
		MLE	0.069256	0.16703	0.75474	1	1	1	0.4676069	0.165351	1	0.360407	1	1	**2.7E-05**	1		
	6/17/2024	CALLS			4					1					3		3	1205
		MLE	1	1	**0.00062**	1	1	1	1	0.34916	1	1	1	1	0.18372	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	NYCHUM	PERSUB	TADBRA	NOID	NOISE
AS-34-A	6/16/2024	CALLS		10	3		4	13		1				8	33	2	1	99
		MLE	1	**8.2E-06**	0.88472	1	0.72773	**0.0004**	1	0.260664	1	1	1	1	0	0.85864		
	6/17/2024	CALLS		2	1			12						10	17	3	3	90
		MLE	1	0.197834	1	1	1	0.00078	1	1	1	1	1	1	0	0.0207		
AS-34-B	6/16/2024	CALLS												1	2		0	9
		MLE	1	1	1	1	1	1	1	1	1	1	1	0.7297132	**0.03924**	1		
	6/17/2024	CALLS													1		0	3
		MLE	1	1	1	1	1	1	1	1	1	1	1	1	0.14279	1		
AS-35-A	6/18/2024	CALLS	1	16	14		1		4	10		6	1		5	1	4	28
		MLE	0.641206	0	0	1	1	1	0.0832844	0	1	0.076247	0.999702	1	0.43272	1		
	6/19/2024	CALLS	1	53	8		2	1	4	7	1	4	1	1	1	2	2	30
		MLE	1	0	**3.5E-06**	1	1	1	0.2124614	**4.4E-06**	0.45793	0.164346	0.984823	1	1	1		
AS-35-B	6/18/2024	CALLS	30	43	7	1	1		2	6	2	2	1		3	3	6	270
		MLE	0	0	**1.4E-05**	1	1	1	0.9382807	**0.000011**	**0.03047**	0.724697	0.71598	1	0.47207	1		
	6/19/2024	CALLS	26	75	2	3	1		1	2		6	1	1		34	10	313
		MLE	0	0	0.32418	1	1	1	0.6601717	0.062317	1	**0.000198**	0.932039	1	1	0		
AS-36-A	6/18/2024	CALLS	1	10	1					1		2			2		0	9
		MLE	0.418698	0	0.57041	1	1	1	1	0.189449	1	0.13082	1	1	0.12817	1		
	6/19/2024	CALLS	2	13	2				1	1		1	1	1	2		1	6
		MLE	0.087915	0	0.06376	1	1	1	0.4823884	0.306054	1	0.794023	0.55255	1	0.37916	1		
AS-36-B	6/18/2024	CALLS		20	42	2		7	6	17		44	11	1	26	4	6	108
		MLE	1	0	0	0.98748	1	1	0.2658482	0	1	0	0.054663	1	**0.00018**	0.55531		
	6/19/2024	CALLS		4	36		5	5	1	13	1	43	6	16	24	3	8	88
		MLE	1	0.128293	0	1	0.13611	1	1	**5.11E-05**	0.9489	0	0.624578	1	**0.00289**	0.31425		
AS-37-A	6/18/2024	CALLS	2	24	4		7	8	2	4		1		4	14	8	10	189
		MLE	0.373639	0	0.11137	1	0.99556	**0.03529**	0.2630419	**0.0014**	1	1	1	1	**5.6E-06**	0.05777		
	6/19/2024	CALLS		33	6	1	3	2	2	2	1	1		2	5	2	6	40
		MLE	1	0	**7.8E-05**	1	1	1	0.6462497	0.169059	0.23322	1	1	1	0.18125	1		
AS-37-B	6/18/2024	CALLS		1	1										2		0	10
		MLE	1	0.166077	0.24209	1	1	1	1	1	1	1	1	1	0.11	1		
	6/19/2024	CALLS								1					1		0	4
		MLE	1	1	1	1	1	1	1	**0.033292**	1	1	1	1	0.14691	1		

Table A4. Summary table of all bat calls and associated maximum likelihood estimate values assigned for each captured during acoustic surveys stratified by site and date which were compiled and processed with the approved acoustic bat identification program, Kaleidoscope Pro 5.6.3, to initially classify all bat calls to species when *Myotis sodalis* were included in analyses. P-values that are less than 0.05 (denoted as bold in the table) indicate that presence is likely for the species in the column on that night the site was surveyed and, if species emit a high frequency call, these were targeted for subsequent qualitative vetting. The program used the classifier Bats of North America 5.4.0 on the "-1 more Sensitive, Liberal" setting. The number in the site name indicates the site and, where more than one detector was deployed, the letter following indicates the specific detector. The recordings are listed by species for the following bats: *Corynorhinus townsendii* (CORTOW), *Eptesicus fuscus* (EPTFUS), *Lasiurus borealis* (LASBOR), *Lasiurus cinereus* (LASCIN), *Lasionycteris noctivagans* (LASNOC), *Myotis austroriparius* (MYOAUS), *M. grisescens* (MYOGRI), *M. leibii* (MYOLEI), *M. lucifugus* (MYOLUC), *M. septentrionalis* (MYOSEP), *M. sodalis* (MYOSOD), *Nycticeius humeralis* (NYCHUM), *Perimyotis subflavus* (PERSUB), *Tadarida brasiliensis* (TADBRA). Note that *Corynorhinus rafinesquii* calls are indistinguishable from *C. townsendii* and are run under the same acronym (CORTOW) within Kaleidoscope, given that the AOI is far outside the known range of *C. townsendii*, we assume only *C. rafinesquii* are possible. Any recordings that could not be assigned to species by the program are included in the "NO ID" column while all recordings that were not indicative of a bat are listed in the "NOISE" column. Note that all raw data are shown, including calls that did not meet the maximum likelihood threshold to qualify as likely present.

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
AS-1-A	6/1/2024	CALLS		10	369	1	2		2	43	1	42	16	28	39	52		28	602
		MLE	1	**1.2E-06**	**0**	1	1	1	1	**0**	1	1	**3.21E-05**	**3E-07**	1	1	1		
	6/2/2024	CALLS	1	1	3										2	1		11	68
		MLE	0.0688285	0.169883	**0.01281**	1	1	1	1	1	1	1	1	1	1	0.97439	1		
AS-1-B	6/1/2024	CALLS	1	2	6									1		4		2	61
		MLE	0.1141086	**0.027787**	**1.6E-05**	1	1	1	1	1	1	1	1	0.306047	1	0.12422	1		
	6/2/2024	CALLS		1	3										5	1		2	15
		MLE	1	0.168538	0.07319	1	1	1	1	1	1	1	1	1	0.44295	0.99468	1		
AS-2-A	6/1/2024	CALLS	8	22	14	2	2		23	35	2	30	6	39		43	2	14	400
		MLE	**0.000001**	**0**	**0.00161**	0.99051	1	1	**2.14E-05**	**0**	1	**0**	1	**0**	1	**0**	1		
	6/2/2024	CALLS	3	7	77	2	5		41	85		90	1	113		150	2	38	61
		MLE	**0.0059567**	**0.002135**	**0**	0.54945	0.35732	1	**1.45E-05**	**0**	1	**0**	1	**0**	1	**0**	0.87132		
AS-2-B	6/1/2024	CALLS		4	43	2		58		2		1		1	23	2	1	41	306
		MLE	1	**0.003873**	**0**	0.22918	1	**0**	1	1	1	1	1	0.990933	1	1	0.964079		
	6/2/2024	CALLS		6	56	6	11	72	1	6		6	1		58	15	4	45	187
		MLE	1	0.141692	**0**	**0.00822**	**0.00936**	**0**	0.792131	0.317991	1	1	0.930729	1	1	1	0.723307		
AS-3-A	6/1/2024	CALLS			17				4	87		5		13		13		4	365
		MLE	1	1	**0**	1	1	1	1	**0**	1	1	1	**0**	1	**0.00082**	1		
	6/2/2024	CALLS		1	13				6	56		14		5		6		1	27
		MLE	1	0.174344	**7E-07**	1	1	1	0.964115	**0**	1	**0.000151**	1	0.289383	1	0.18668	1		
AS-3-B	6/1/2024	CALLS			12							16				20		7	373
		MLE	1	1	**3.1E-05**	1	1	1	1	1	1	**5.9E-06**	1	1	1	**0**	1		
	6/2/2024	CALLS	1		15				2	1	1	18	1	17	4	17	1	4	85
		MLE	**0.0252283**	1	**1E-07**	1	1	1	0.952186	0.998071	0.99987	**4.9E-06**	1	**6.3E-06**	1	**2E-05**	0.169551		
AS-4-A	6/5/2024	CALLS			39		1		1	16		5			5	1	1	6	37
		MLE	1	1	**0**	1	0.63619	1	1	**0**	1	1	1	1	1	1	0.420828		
	6/6/2024	CALLS		1	98	1	1	4		14	3	19		4	18	13		14	46
		MLE	1	0.599416	**0**	0.32254	0.79864	1	1	**0.001713**	0.08715	0.403595	1	0.845278	1	1	1		
AS-4-B	6/5/2024	CALLS	1	11	94	5	13	145	1	11	1	7		2	38	24	17	59	234
		MLE	1	**0.005554**	**0**	0.56009	0.13687	**0**	1	**0.003488**	0.41568	1	1	0.90811	1	1	**0.000002**		
	6/6/2024	CALLS		7	114	6	14	201		19		15	1	1	70	23	7	66	238
		MLE	1	0.203387	**0**	**0.04269**	**0.00356**	**0**	1	**0.011645**	1	0.994552	1	1	1	1	0.238579		
AS-5-A	6/5/2024	CALLS			39		1		8	24		92	1	5	1	15		1	14
		MLE	1	1	**0**	1	0.20029	1	0.236721	**0**	1	**0**	1	1	1	0.06905	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
	6/6/2024	CALLS			78			1	8	37		140	2	13	1	29		2	14
		MLE	1	1	**0**	1	1	1	0.829386	**0**	1	**0**	1	1	1	**0.00828**	1		
AS-5-B	6/5/2024	CALLS			70			1	3	6		73	1		1	7		0	35
		MLE	1	1	**0**	1	1	1	0.794189	0.39082	1	**0**	1	1	1	1	1		
	6/6/2024	CALLS	1		144			1	3	16		83	3	2		17		1	30
		MLE	**0.0176606**	1	**0**	1	1	1	0.984289	**0.002376**	1	**0**	1	1	1	1	1		
AS-6-A	6/5/2024	CALLS			9		3		3	4		13				2	2	2	70
		MLE	1	1	**9.2E-05**	1	0.1453	1	0.150383	**0.008892**	1	**1.1E-06**	1	1	1	0.9622	0.282194		
	6/6/2024	CALLS			59		5	2	1	7	1	36			8	7	4	16	112
		MLE	1	1	**0**	1	0.06156	1	1	0.091032	0.80187	**0**	1	1	1	1	0.052192		
AS-6-B	6/5/2024	CALLS			162				2	12		117		5	5	8		7	27
		MLE	1	1	**0**	1	1	1	1	0.187122	1	**0**	1	1	1	1	1		
	6/6/2024	CALLS			196	1	2		2	7		53		2	4	22	1	12	34
		MLE	1	1	**0**	0.43244	0.35526	1	0.77135	0.999364	1	**7.8E-06**	1	1	1	1	0.75278		
AS-7-A	6/5/2024	CALLS			46	1			1	46	1	5	1	8	2	48		6	31
		MLE	1	1	**0**	0.11519	1	1	1	**0**	0.92197	1	0.951468	**0.000734**	1	**0**	1		
	6/6/2024	CALLS		1	43				4	10		7		6	1	28		0	19
		MLE	1	0.20055	**0**	1	1	1	0.191512	**7.19E-05**	1	0.995417	1	**0.015276**	1	**3.5E-06**	1		
AS-7-B	6/5/2024	CALLS		3	10				10	45		11	1	10	1	4		2	22
		MLE	1	**0.004732**	**5.3E-06**	1	1	1	0.088965	**0**	1	**0.00246**	1	**0.001131**	1	0.50391	1		
	6/6/2024	CALLS			13				9	30		19		4	1	5		0	36
		MLE	1	1	**1.7E-06**	1	1	1	**0.036152**	**0**	1	**0**	1	0.888272	1	0.44436	1		
AS-8-A	6/5/2024	CALLS	1	17	12			9	4	21	1	17	4	36	5	18	5	5	70
		MLE	0.671796	**0**	**2.6E-05**	1	1	0.57882	1	**0**	1	**0.001243**	0.748561	**0**	1	**8.1E-05**	0.199464		
	6/6/2024	CALLS	2	18	51	1	7	3	9	21	1	35	2	25	1	90	2	2	98
		MLE	0.2488745	**0**	**0**	1	0.58048	1	0.09858	**0**	1	**3.2E-06**	1	**8E-07**	1	**0**	1		
AS-8-B	6/5/2024	CALLS			106		3	1		9	1	24	1	1		22	1	4	38
		MLE	1	1	**0**	1	0.05938	1	1	0.137354	0.83489	**0.032299**	1	1	1	0.78143	0.773367		
	6/6/2024	CALLS		3	88			1		9	1	20	1	6	5	12	1	6	22
		MLE	1	**0.01339**	**0**	1	1	1	1	0.06355	0.9404	**0.031871**	1	0.38547	1	1	0.663148		
AS-9	6/5/2024	CALLS	1	3	8	4	6	5				1		1	6	2	1	6	33
		MLE	0.2191115	0.380169	**4.2E-05**	**0.01182**	0.06127	0.541184	1	1	1	1	1	0.479724	1	1	1		
	6/6/2024	CALLS			4		1	4			1	1		1	3	1		2	11
		MLE	1	1	**0.01591**	1	0.22617	0.41158	1	1	0.29566	0.9907	1	0.611591	1	1	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
	6/7/2024	CALLS			20			2	2			1			4	1		4	22
		MLE	1	1	**0**	1	1	1	0.155188	1	1	1	1	1	1	1	1		
	6/8/2024	CALLS		3	15	2	2	5	1	1					3	1		9	29
		MLE	1	0.066604	**0**	0.16564	0.78975	1	0.43355	0.926362	1	1	1	1	1	1	1		
AS-10	6/5/2024	CALLS	39		75		1	1	5	27		18	1	1	45	6		27	194
		MLE	**0**	1	**0**	1	0.21522	1	0.286507	**0**	1	0.509076	1	1	1	1	1		
	6/6/2024	CALLS	10		97		8	2	2	66	3	29		2	67	6	2	24	246
		MLE	**0**	1	**0**	1	**0.00023**	1	1	**0**	0.06631	0.154401	1	1	1	1	0.767119		
	6/7/2024	CALLS	3	4	83			2	4	37	6	16		2	43	3		18	883
		MLE	**0.0005693**	**0.00124**	**0**	1	1	1	1	**0**	**1.9E-05**	0.89829	1	1	1	1	1		
	6/8/2024	CALLS	5		95		3	1	3	157	3	15	2	1	46	11		35	217
		MLE	**0**	1	**0**	1	**0.00836**	1	1	**0**	**0.03251**	1	0.61563	1	1	1	1		
AS-11	6/5/2024	CALLS		15	12	2	1	2	1			2	1		3	6		0	67
		MLE	1	**0**	**0**	0.85188	1	1	0.414757	1	1	1	0.618959	1	1	0.32016	1		
	6/6/2024	CALLS		9	6	1		3				1		1	4	2		5	70
		MLE	1	**1E-07**	**0.00028**	0.9693	1	0.887618	1	1	1	1	1	0.451866	1	0.99905	1		
	6/7/2024	CALLS		28	19	6	4		9		2	2		3	9	1		6	107
		MLE	1	**0**	**0**	0.18252	1	1	**0.019855**	1	0.22802	1	1	0.27794	1	1	1		
	6/8/2024	CALLS	3	19	1	1		1				1			1	1		3	53
		MLE	**0.0276621**	**0**	0.43161	1	1	0.811069	1	1	1	0.697333	1	1	1	0.75432	1		
AS-12	6/5/2024	CALLS			31		1	346		2	2	1			18	15	11	19	144
		MLE	1	1	1	1	1	**0**	1	0.067617	**0.00678**	1	1	1	1	1	**0**		
	6/6/2024	CALLS			39		4	391		1	1				13	18	53	40	189
		MLE	1	1	1	1	1	**0**	1	0.545505	0.05715	1	1	1	1	1	**0**		
	6/7/2024	CALLS			87	6	4	544				2		1	34	75	54	64	296
		MLE	1	1	**8.2E-05**	0.99924	1	**0**	1	1	1	1	1	1	1	**0.00054**	**0**		
	6/8/2024	CALLS			60	1	5	601	1			1			26	30	37	61	202
		MLE	1	1	1	1	1	**0**	0.153087	1	1	1	1	1	1	1	**0**		
AS-13-A	6/8/2024	CALLS	20	71	76	22	77	149	1	14		3	1		63	5	13	73	284
		MLE	**0**	**0**	**0**	**0.00125**	**0**	**0**	1	**4.7E-06**	1	1	1	1	1	1	1		
	6/10/2024	CALLS	29	138	8		2	17		1		1			3	2	2	6	165
		MLE	**0**	**0**	**0.00234**	1	1	**0.000555**	1	0.720644	1	1	1	1	1	1	1		
AS-13-B	6/8/2024	CALLS	5	5	45				4	9	1	25	8	4	5	32	1	5	92
		MLE	**0.0000025**	**0.00029**	**0**	1	1	1	0.473012	**0.002231**	0.86998	**3.8E-06**	**0.047893**	1	1	**5E-07**	0.866511		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
	6/10/2024	CALLS	25	157	51		1		4	21	1	13	6	1	13	22		6	82
		MLE	**0**	**0**	**0**	1	1	1	0.668074	**0**	0.74286	0.36315	**0.025909**	1	1	**0.02886**	1		
AS-14-A	6/11/2024	CALLS	1				1		2	4	3		12			1	4	1	68
		MLE	0.0689894	1	1	1	0.99998	1	1	**0.000001**	**0.04133**	1	**0**	1	1	0.14786	**0.002175**		
	6/8/2024	CALLS	1	3	10		3	5	3	5	3	2	2	1	2	5	1	11	89
		MLE	0.2099595	0.117224	**3E-07**	1	0.29021	1	0.881194	**0.003276**	**0.00833**	1	0.300052	0.997331	1	0.59827	0.920251		
AS-14-B	6/8/2024	CALLS			12				6	5						25		0	19
		MLE	1	1	**0**	1	1	1	**0.006461**	**0.000559**	1	1	1	1	1	**0**	1		
	6/11/2024	CALLS							15	6	3		17	4		1		1	51
		MLE	1	1	1	1	1	1	**0.001708**	**0**	0.28941	1	**6E-07**	0.436637	1	0.23707	1		
AS-15-A	6/8/2024	CALLS								1		7		3				0	48
		MLE	1	1	1	1	1	1	1	0.318169	1	**1.1E-06**	1	0.384736	1	1	1		
	6/10/2024	CALLS			1				1			1		1	1			2	27
		MLE	1	1	0.40495	1	1	1	0.469029	1	1	0.573736	1	0.490761	0.957441	1	1		
AS-15-B	6/8/2024	CALLS		1	150		1		9	31	8	57	9	7	11	23		6	97
		MLE	1	0.598318	**0**	1	0.59834	1	0.815646	**0**	**0.00018**	**0**	0.402643	1	1	1	1		
	6/10/2024	CALLS	1		45				3	7	13	18	8	5	3	14		4	31
		MLE	**0.0175606**	1	**0**	1	1	1	1	**0.024616**	**0**	**0.000503**	**0.010354**	1	1	0.25953	1		
AS-16-A	6/8/2024	CALLS	2	300	48	19	48	9	3	1	1	6		2	8	3	12	21	96
		MLE	1	**0**	**0**	1	1	1	0.391834	1	0.52519	1	1	0.70764	1	1	1		
	6/10/2024	CALLS		71	20	4	2	1				5	2		6	6	2	8	106
		MLE	1	**0**	**0**	1	1	1	1	1	1	0.743945	0.229502	1	1	0.81008	1		
AS-16-B	6/8/2024	CALLS		40	39	1	8	13	8	26		95		31	9	4	9	13	338
		MLE	1	**0**	**0**	1	1	1	0.671701	**0**	1	**0**	1	**0.00313**	1	1	0.160013		
	6/10/2024	CALLS	2	7	11		1	11	1	5		46		7	4		2	2	485
		MLE	**0.0473368**	**3.92E-05**	**0.02693**	1	1	0.056255	1	**0.034573**	1	**0**	1	1	1	1	0.540527		
AS-17-A	6/13/2024	CALLS	1	2	11		2	1	6	6	5	20	5	8	9	8		5	63
		MLE	0.1405987	0.216932	**3.7E-05**	1	0.39753	1	0.668179	**0.005344**	**0.00789**	**0**	0.437908	0.325948	1	0.19556	1		
	6/14/2024	CALLS		3	10	1		1	4	2	2	13	1	4	9	8		8	58
		MLE	1	**0.007196**	**3.4E-05**	0.577	1	1	0.423663	0.597762	0.20204	**0.000141**	1	0.679458	0.997233	0.15871	1		
AS-17-B	6/13/2024	CALLS			2					1						1		0	4
		MLE	1	1	**0.0217**	1	1	1	1	0.208125	1	1	1	1	1	0.70532	1		
	6/14/2024	CALLS			2					5				1				0	5
		MLE	1	1	**0.01963**	1	1	1	1	**1.4E-06**	1	1	1	0.177495	1	1	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
AS-18-A	6/11/2024	CALLS		6	8	2	1	4	2	1				1	3			4	46
		MLE	1	**0.000144**	**3E-05**	0.34126	1	0.762394	0.214849	0.697137	1	1	1	0.46431	1	1	1		
	6/12/2024	CALLS		10	9		2	6	1		1		1	1	5	3		3	71
		MLE	1	**3E-07**	**2.3E-05**	1	1	0.45936	0.9531	1	0.30223	1	0.525627	0.803988	1	0.982	1		
AS-18-B	6/11/2024	CALLS		80	4	2	1	19	1	3		2	1		4	1	3	7	117
		MLE	1	**0**	0.41246	1	1	**4.7E-06**	0.669127	**0.00734**	1	0.545489	0.619374	1	1	1	1		
	6/12/2024	CALLS		23	7	2	4	36		1		4	2			2	11	7	189
		MLE	1	**0**	0.18939	1	1	**0**	1	0.603308	1	0.177667	0.202311	1	1	1	**0.001062**		
AS-19-A	6/11/2024	CALLS			2				1	1	1	2		4	1			2	121
		MLE	1	1	0.0948	1	1	1	0.998617	0.33103	0.52273	0.360376	1	**0.028671**	1	1	1		
	6/12/2024	CALLS			226					1		195	1	5	34		1	96	22
		MLE	1	1	**0**	1	1	1	1	1	1	**0**	1	1	1	1	0.107123		
AS-19-B	6/11/2024	CALLS							1	3	5	1	1	1		1		0	13
		MLE	1	1	1	1	1	1	1	**7.88E-05**	**2.3E-05**	0.392119	0.500763	0.996997	1	0.16867	1		
	6/12/2024	CALLS							4	2	2	1	2	1		2		0	22
		MLE	1	1	1	1	1	1	0.364175	**0.003779**	0.08938	0.605018	0.451672	0.932475	1	**0.02803**	1		
AS-20-A	6/11/2024	CALLS	1	1	38				7	15	17	7	33	8	2	7		0	200
		MLE	0.0675685	0.198804	**0**	1	1	1	1	**0**	**0**	0.714132	**0**	0.643744	1	0.99928	1		
	6/12/2024	CALLS			68				9	5	15	4	20	3	2	20		3	161
		MLE	1	1	**0**	1	1	1	1	0.338956	**0**	1	**0**	1	1	0.14291	1		
AS-20-B	6/11/2024	CALLS			20		1		3	26	1	2	1	3		3		0	93
		MLE	1	1	**0**	1	0.22539	1	0.966016	**0**	0.53072	1	0.720218	0.103137	1	1	1		
	6/12/2024	CALLS			65					8		1			1	9		2	37
		MLE	1	1	**0**	1	1	1	1	**0.014454**	1	1	1	1	1	1	1		
AS-21-A	6/11/2024	CALLS	3	15			2		16	16		1	4	1		4		3	299
		MLE	**0.0186094**	**0**	1	1	1	1	**1.2E-06**	**0**	1	1	0.66989	0.907148	1	**0.00091**	1		
	6/12/2024	CALLS	1	13	2		3	2	8	11	1		5	3	3	4	4	11	405
		MLE	0.6302469	**0**	0.22669	1	1	0.65685	**0.024235**	**0**	0.80871	1	0.073396	0.163527	1	0.1004	0.253607		
AS-21-B	6/11/2024	CALLS			2				7	15	1	2	2	4		1		0	208
		MLE	1	1	0.09954	1	1	1	0.059297	**0**	0.7858	0.60873	0.796111	**0.044559**	1	0.75481	1		
	6/12/2024	CALLS			1				4	8		2	1	1		3		1	20
		MLE	1	1	0.60614	1	1	1	0.067483	**0**	1	0.337948	0.955555	0.791284	1	**0.02835**	1		
AS-22-A	6/12/2024	CALLS		2	2	2			2	1		3		6		1		0	11
		MLE	1	0.073418	0.1615	0.08231	1	1	0.413383	0.347534	1	0.136566	1	**0.001559**	1	0.73517	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
	6/13/2024	CALLS		1	6				1	1	2		1	3		6		3	14
		MLE	1	0.16935	**2.6E-05**	1	1	1	1	0.476357	0.08462	1	0.503773	0.115788	1	**0.01366**	1		
AS-22-B	6/12/2024	CALLS		3	4	13	1	7	4	1	12	5	7	9	3	6	4	3	216
		MLE	1	0.459746	0.09188	**0**	1	0.102108	1	0.650821	**0**	0.10981	**0.001709**	**0.041714**	1	0.06587	0.697538		
	6/13/2024	CALLS		5	8	3	4	11	2		8	9	5	7	7	13	4	5	79
		MLE	1	**0.033786**	**0.00621**	0.22411	0.67904	**0.035604**	1	1	**1.2E-05**	**0.013023**	**0.045104**	0.160394	1	**0.00111**	0.181228		
AS-23-A	6/11/2024	CALLS	1	11	46		2		13	34	10	138	13	12	10	2		11	224
		MLE	0.5094777	**0**	**0**	1	1	1	0.631851	**0**	**0.00035**	**0**	1	1	1	1	1		
	6/12/2024	CALLS	2	9	81		3	4	6	26	11	102	16	12	17	1	1	14	636
		MLE	0.0791531	**1.11E-05**	**0**	1	0.87192	1	1	**0**	**1.2E-05**	**0**	0.205554	1	1	1	1		
AS-23-B	6/11/2024	CALLS	2	7	67				16	43	2	197	19	116	5	3		14	69
		MLE	**0.0315601**	**3.9E-06**	**0**	1	1	1	0.847216	**0**	1	**0**	1	**0**	1	1	1		
	6/12/2024	CALLS	1	10	69				9	53	2	220	9	49	1	2		11	69
		MLE	0.4171441	**0**	**0**	1	1	1	1	**0**	1	**0**	1	0.112749	1	1	1		
AS-24-A	6/11/2024	CALLS			6				1	1	5		2	1				0	182
		MLE	1	1	**7.2E-06**	1	1	1	1	0.420785	**2.9E-05**	1	0.078737	0.999989	1	1	1		
	6/12/2024	CALLS	2						1	1	7		4			1		0	348
		MLE	**0.0003101**	1	1	1	1	1	1	**0.032872**	**2E-07**	1	**0.002556**	1	1	0.14796	1		
AS-24-B	6/11/2024	CALLS	1															0	27
		MLE	**0.0176095**	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
	6/12/2024	CALLS												1				0	91
		MLE	1	1	1	1	1	1	1	1	1	1	1	0.135716	1	1	1		
AS-25-A	6/13/2024	CALLS		3	62				3	67	11	15	5	5	2	6	1	2	86
		MLE	1	**0.011763**	**0**	1	1	1	1	**0**	**0**	0.081857	0.105101	0.864895	1	1	0.666114		
	6/14/2024	CALLS		1	189	1			8	64	5	47	4	16	9	22		9	218
		MLE	1	0.51168	**0**	0.16671	1	1	0.997342	**0**	0.05113	**3.59E-05**	1	0.056261	1	1	1		
AS-25-B	6/16/2024	CALLS	2	34	5				7	11	20	6	18	11	4	3	2	0	304
		MLE	0.4096712	**0**	**0.00406**	1	1	1	1	**0**	**0**	0.066629	**0**	0.107309	1	0.62884	1		
	6/17/2024	CALLS		6	11		1		10	31	21	7	5	17	2	3	2	2	651
		MLE	1	**0.000251**	**1E-07**	1	1	1	1	**0**	**0**	0.12648	0.120925	**0.000484**	1	0.90469	0.449282		
AS-26-A	6/13/2024	CALLS							4	2	2	3		1				2	78
		MLE	1	1	1	1	1	1	0.469168	**0.009352**	0.0574	**0.006282**	1	0.989117	1	1	1		
	6/14/2024	CALLS		1			1		11	7		1	3	5		3		8	210
		MLE	1	0.462393	1	1	0.62421	1	**0.000094**	**0**	1	0.990889	0.750168	**0.003482**	1	**0.00517**	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
AS-26-B	6/13/2024	CALLS	1	4	3				1			1	1		1	3	1	1	378
		MLE	0.2213095	**0.001422**	**0.01056**	1	1	1	0.404362	1	1	0.934015	0.566908	1	1	0.18351	0.787509		
	6/14/2024	CALLS	11	5	14					2		8	1	1	1	17		7	482
		MLE	**0**	**0.000156**	**0**	1	1	1	1	0.411321	1	**0.030909**	0.962165	1	1	**2.6E-06**	1		
AS-27-A	6/14/2024	CALLS			1													0	3
		MLE	1	1	0.14437	1	1	1	1	1	1	1	1	1	1	1	1		
	6/16/2024	CALLS																0	4
		MLE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
AS-27-B	6/14/2024	CALLS		18	40	1	7	11	4	5	1	17		3	25	6	2	12	127
		MLE	1	**0**	**0**	1	0.5514	1	0.284828	0.421773	0.67247	**0.047677**	1	0.959145	1	1	1		
	6/16/2024	CALLS		22	14	1	8	11	4	2		7	2	1	12	8	4	8	110
		MLE	1	**0**	**2E-07**	1	0.66429	0.279202	**0.029777**	0.709372	1	0.266746	0.793419	1	1	0.58811	0.7651		
AS-28-A	6/13/2024	CALLS			3				2					1				0	23
		MLE	1	1	**0.00293**	1	1	1	0.196564	1	1	1	1	0.27906	1	1	1		
	6/14/2024	CALLS			7				1			4			1	5		3	57
		MLE	1	1	**2.8E-05**	1	1	1	0.42612	1	1	0.217547	1	1	1	0.10039	1		
AS-28-B	6/13/2024	CALLS					1	3	5		2	5	1	7	2	3	1	6	367
		MLE	1	1	1	1	0.63724	0.142917	0.207991	1	0.34234	**0.007594**	1	**0.006114**	1	**0.04692**	0.419952		
	6/14/2024	CALLS		2	1			1	1		1	3	1	8	1	4	1	3	463
		MLE	1	0.058189	0.6451	1	1	0.79242	0.998273	1	0.81488	0.243572	0.879427	**0.000167**	1	**0.02374**	0.527739		
AS-29-A	6/13/2024	CALLS		7	35	3	1	27	3	74		16	3		20	8	3	13	146
		MLE	1	**0.000175**	**0**	0.21136	1	0.065626	1	**0**	1	0.186311	0.355368	1	1	1	0.399554		
	6/14/2024	CALLS	1	11	53	1	1	84	1	40		13			46	5	5	26	142
		MLE	0.5597161	**2E-07**	**0**	1	1	**0**	1	**0**	1	0.958249	1	1	1	1	0.056213		
AS-29-B	6/13/2024	CALLS		19	12			6	2	12	2	6		1	7	7	1	14	136
		MLE	1	**0**	**1E-07**	1	1	0.958646	1	**0**	**0.03303**	0.450296	1	1	1	0.51484	1		
	6/14/2024	CALLS		31	20		1	12		3		5			7	4	1	34	77
		MLE	1	**0**	**0**	1	1	0.773398	1	0.445893	1	1	1	1	1	1	1		
AS-30-A	6/18/2024	CALLS							1	1		1	1	1			1	1	69
		MLE	1	1	1	1	1	1	0.557984	0.082934	1	0.301369	0.585677	0.547977	1	1	0.170111		
	6/19/2024	CALLS									1				2			0	66
		MLE	1	1	1	1	1	1	1	1	0.08027	1	1	1	0.480958	1	1		
AS-30-B	6/18/2024	CALLS		2	17		2		9	32	3	15	2	23	5	3	4	5	259
		MLE	1	0.428335	**0**	1	0.85521	1	0.380613	**0**	0.5683	**0.000612**	1	**0**	1	1	**0.015055**		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
	6/19/2024	CALLS			49	3			8	29	1	15	2	27	11	7	1	8	235
		MLE	1	1	**0**	**0.00789**	1	1	0.2737	**0**	1	0.117679	1	**0**	1	1	0.88292		
AS-31-A	6/16/2024	CALLS			4				1	21		5		1		1		0	38
		MLE	1	1	**0.01504**	1	1	1	1	**0**	1	**0.024885**	1	0.965677	1	0.95408	1		
	6/17/2024	CALLS			35		1		3	73	3	2	1	2		30		7	62
		MLE	1	1	**0**	1	0.21413	1	1	**0**	**0.00907**	1	0.724677	0.817044	1	**0**	1		
AS-31-B	6/16/2024	CALLS		1	10	44	21	8	1			2	1	2	8	6	26	11	270
		MLE	1	1	**1.5E-05**	**0**	0.42286	0.295342	0.553275	1	1	1	0.66009	0.238431	1	0.52043	**0.000138**		
	6/17/2024	CALLS		7	1	1	2	3				2			3	4	1	3	800
		MLE	1	**8.81E-05**	0.82371	0.9046	0.99052	0.270458	1	1	1	0.366889	1	1	1	**0.04351**	0.982067		
AS-32-A	6/16/2024	CALLS		11	40		10	28		12		6			2	12	4	12	278
		MLE	1	**0.000294**	**0**	1	**0.02648**	0.531711	1	**9.85E-05**	1	1	1	1	1	0.98568	0.585907		
	6/17/2024	CALLS		6	13		3	36		1		1		1	9	11	3	7	160
		MLE	1	**0.002883**	**0.00103**	1	0.79105	**0**	1	0.902241	1	1	1	0.641808	1	0.13892	0.247608		
AS-32-B	6/16/2024	CALLS		2	7	1		3								4		8	46
		MLE	1	**0.043938**	**2.5E-05**	0.44588	1	1	1	1	1	1	1	1	1	0.35342	1		
	6/17/2024	CALLS		4	2					1				1		6		3	96
		MLE	1	**0.000754**	0.09998	1	1	1	1	0.206671	1	1	1	0.262454	1	**0.00055**	1		
AS-33-A	6/16/2024	CALLS		10	5	3	7	11			1				12	26	14	14	176
		MLE	1	**0.001684**	0.30657	0.90053	0.84317	**0.009875**	1	1	0.09596	1	1	1	1	**0**	**2.6E-06**		
	6/17/2024	CALLS		3	3	6	1	5		1	1			1	4	16	4	4	398
		MLE	1	0.21498	0.27459	**0.00145**	1	0.136583	1	0.395456	0.25243	1	1	0.705152	1	**1E-07**	0.217172		
AS-33-B	6/16/2024	CALLS	1	1	1				1	1		1				8		1	17
		MLE	0.0686514	0.167102	0.65905	1	1	1	0.440761	0.127376	1	0.952502	1	1	1	**4.6E-06**	1		
	6/17/2024	CALLS			4					1						3		3	1205
		MLE	1	1	**0.00065**	1	1	1	1	0.349182	1	1	1	1	1	0.18479	1		
AS-34-A	6/16/2024	CALLS		10	3		4	13		1					8	33	2	1	99
		MLE	1	**8.2E-06**	0.89926	1	0.72791	**0.00038**	1	0.254699	1	1	1	1	1	**0**	0.85886		
	6/17/2024	CALLS		2	1			12							10	17	3	3	90
		MLE	1	0.197859	1	1	1	**0.000767**	1	1	1	1	1	1	1	**0**	**0.020699**		
AS-34-B	6/16/2024	CALLS													1	2		0	9
		MLE	1	1	1	1	1	1	1	1	1	1	1	1	0.729745	**0.03881**	1		
	6/17/2024	CALLS														1		0	3
		MLE	1	1	1	1	1	1	1	1	1	1	1	1	1	0.14319	1		

Site Name	Date Deployed	Metric	CORTOW	EPTFUS	LASBOR	LASCIN	LASNOC	LASSEM	MYOAUS	MYOGRI	MYOLEI	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB	TADBRA	NoID	NOISE
AS-35-A	6/18/2024	CALLS	1	16	14		1		3	10		6	1			5	1	5	28
		MLE	0.6398073	**0**	**0**	1	1	1	0.244251	**0**	1	0.130399	0.982295	1	1	0.43459	1		
	6/19/2024	CALLS	1	53	8		2	1	4	7	1	4	1		1	1	2	2	30
		MLE	1	**0**	**1.7E-06**	1	1	1	0.193448	**4.1E-06**	0.47044	0.239021	0.984501	1	1	1	1		
AS-35-B	6/18/2024	CALLS	30	43	8	1	1		2	6	2	3	1			3	3	4	270
		MLE	**0**	**0**	**1.8E-06**	1	1	1	0.923077	**0.000022**	**0.03474**	0.494014	0.756611	1	1	0.56996	1		
	6/19/2024	CALLS	26	75	1	3	1		1	2		7	1		1		34	10	313
		MLE	**0**	**0**	0.81613	1	1	1	0.659651	**0.045127**	1	**1.99E-05**	0.960599	1	0.959169	1	**0**		
AS-36-A	6/18/2024	CALLS	1	10	1					1		2				2		0	9
		MLE	0.4179115	**0**	0.51439	1	1	1	1	0.180796	1	0.166107	1	1	1	0.12784	1		
	6/19/2024	CALLS	2	13	2				1	1		1	1		1	2		1	6
		MLE	0.0877712	**0**	0.05724	1	1	1	0.470661	0.303887	1	0.852059	0.561887	1	1	0.38199	1		
AS-36-B	6/18/2024	CALLS		20	30	2		7	6	14		44	11	15	1	23	4	9	108
		MLE	1	**0**	**0**	0.98758	1	1	0.353324	**6E-07**	1	**0**	0.086716	0.106422	1	**8.6E-05**	0.555148		
	6/19/2024	CALLS		4	32		5	5	2	13		38	6	13	15	21	3	8	88
		MLE	1	0.127657	**0**	1	0.13624	1	1	**1.77E-05**	1	**0**	0.594663	0.113525	1	**0.00818**	0.314287		
AS-37-A	6/18/2024	CALLS	2	24	4		7	8	1	4		1	1		4	14	8	10	189
		MLE	0.3736314	**0**	0.11482	1	0.99556	**0.034521**	0.729962	**0.001404**	1	1	0.522262	1	1	**5.7E-06**	0.057767		
	6/19/2024	CALLS		33	6	1	3	2	2	2	1	1			2	5	2	6	40
		MLE	1	**0**	**7.3E-05**	1	1	1	0.637534	0.168483	0.23521	1	1	1	1	0.18257	1		
AS-37-B	6/18/2024	CALLS		1	1											2		0	10
		MLE	1	0.166116	0.24483	1	1	1	1	1	1	1	1	1	1	0.11049	1		
	6/19/2024	CALLS								1						1		0	4
		MLE	1	1	1	1	1	1	1	**0.033282**	1	1	1	1	1	0.14729	1		

5.2 Qualitative Analysis Results

Table A5. Summary table of target species that were indicated as likely by the bat identification program, Kaleidoscope Pro 5.6.3, and associated qualitative determinations. All identification of target species with high frequency calls that were at a site where at least one was deemed likely present by the auto identification program, indicated by a maximum likelihood value less than 0.05, subsequently underwent qualitative analyses by a qualified bat biologist. The following target species with high frequency calls were deemed likely present by the auto identifier: *Myotis grisescens* (MYOGRI), *M. lucifugus* (MYOLUC), *M. septentrionalis* (MYOSEP), *Perimyotis subflavus* (PERSUB), *M. sodalis* (MYOSOD). The result and justification when necessary are given for the qualitative determination as well as the total number of confirmed calls across each night at each site, as well as project totals.

Site Name	Unit ID and Date Deployed	Auto Identification of Target Species without MYSO	Auto Identification of Target Species with MYSO	Qualitative Determination of Target Species	Number of Confirmed Calls
AS-1-A	SN637040 2024-06-01	MYOGRI, MYOSEP, PERSUB	MYOGRI, MYOSEP, MYOSOD, PERSUB	PERSUB, MYOSEP, MYOGRI are Lasiurine with undulating characteristic frequencies (Fc). MYOSOD sequences overlap with other myotis species	0
AS-1-B	SN637043 2024-06-01	PERSUB		PERSUB are identified as LASBOR	0
AS-2-A	SN637043 2024-06-03	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, MYOSOD, PERSUB	PERSUB and MYOGRI recordings are LASBOR. MYOLUC and MYOSOD calls were not distinguishable from the overlapping Myotis species	0
	SN637043 2024-06-04	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, MYOSOD, PERSUB	PERSUB not definitive enough from overlapping LASBOR and Myotis spp. and LASBOR. MYOLUC and MYOSOD calls are too short, not distinguishable from MYOLEI, MYOSEP, MYOAUS. MYOGRI are Lasiurine.	0
AS-2-B	SN637043 2024-06-06	PERSUB	PERSUB	PERSUB are Lasiurine and NYCHUM	0
AS-3-A	SN637043 2024-06-07	MYOGRI, PERSUB	MYOGRI, MYOSOD, PERSUB	PERSUB are LASBOR. MYOGRI calls short sequences are LASBOR. MYOSOD sequences overlap with other myotis species	0
	SN637043 2024-06-08	MYOGRI, MYOLUC	MYOGRI, MYOLUC	MYOGRI calls too short, low quality and LASBOR-like. MYOLUC is identified as 40KMyo unverifiable Myotis spp.	0
AS-3-B	SN637043 2024-06-09	MYOLUC, PERSUB	MYOLUC, PERSUB	PERSUB AND MYOLUC calls are LASBOR and unverifiable Myotis spp.	0
	SN637043 2024-06-10	MYOLUC, PERSUB	MYOLUC, MYOSOD, PERSUB	PERSUB AND MYOLUC calls are LASBOR and unverifiable Myotis spp. MYOSOD sequences overlap with other myotis species	0
AS-4-A	SN637043 2024-06-11	MYOGRI	MYOGRI	MYOGRI similar to LASBOR	0
	SN637043 2024-06-12	MYOGRI, PERSUB	MYOGRI, PERSUB	PERSUB and MYOGRI calls indistinguishable from LASBOR	0
AS-4-B	SN637043 2024-06-13	MYOGRI, PERSUB	MYOGRI, PERSUB	**PERSUB confirmed**	1 PERSUB
	SN637043 2024-06-14	MYOGRI, PERSUB	MYOGRI, PERSUB	PERSUB are LASBOR	0
AS-5-A	SN637043 2024-06-15	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, PERSUB	MYOLUC, PERSUB and MYOGRI are LASBOR	0
	SN637043 2024-06-16	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, PERSUB	MYOGRI and PERSUB are LASBOR. MYOLUC are indistinguishable and Myotis spp.	0
AS-5-B	SN637043 2024-06-17	MYOLUC	MYOLUC	**MYOLUC confirmed.** PERSUB are LASBOR	1 MYOLUC
	SN637043 2024-06-18	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, PERSUB	MYOGRI and PERSUB are LASBOR**. MYOLUC confirmed**	2 MYOLUC
AS-6-A	SN637043 2024-06-19	MYOLUC	MYOGRI, MYOLUC	**MYOLUC confirmed**	1 MYOLUC
	SN637043 2024-06-20	MYOLUC	MYOLUC	MYOLUC appear to be LASBOR	0
AS-6-B	SN637043 2024-06-21	MYOLUC, PERSUB	MYOLUC	MYOLUC and PERSUB appear to be LASBOR	0
	SN637043 2024-06-22	MYOLUC, PERSUB	MYOLUC, PERSUB	PERSUB are LASBOR	0
AS-7-A	SN637043 2024-06-23	MYOGRI, PERSUB	MYOGRI, MYOSOD, PERSUB	PERSUB and MYOGRI are LASBOR. MYOSOD overlap with other Myotis spp.	0
	SN637043 2024-06-24	MYOGRI, PERSUB	MYOGRI, MYOSOD, PERSUB	MYOGRI and PERSUB are LASBOR. MYOSOD overlap with Myotis spp.	0
AS-7-B	SN637043 2024-06-25	MYOGRI, MYOLUC	MYOGRI, MYOLUC, MYOSOD	MYOLUC, MYOGRI are LASBOR or an overlapping Myotis spp. MYOSOD sequences overlap with other myotis species	0
	SN637043 2024-06-26	MYOGRI, MYOLUC	MYOGRI, MYOLUC	MYOLUC, MYOGRI are LASBOR.	0
AS-8-A	SN637043 2024-06-27	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, MYOSOD, PERSUB	MYOLUC, MYOSOD indistinguishable. PERSUB AND MYOGRI overlap with LASBOR.	0
	SN637043 2024-06-28	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, MYOSOD, PERSUB	**PERSUB CONFIRMED.** MYOGRI, MYOLUC, and MYOSOD are LASBOR or overlapping with Myotis spp.	1 PERSUB
AS-8-B	SN637043 2024-06-29	PERSUB	MYOLUC, PERSUB	PERSUB are LASBOR	0
	SN637043 2024-06-30	MYOGRI, MYOLUC, PERSUB	MYOLUC, PERSUB	MYOGRI,PERSUB are LASBOR	0
AS-10	SN637050 2024-06-05	MYOGRI	MYOGRI	MYOGRI are LASBOR or indistinguishable from overlapping species	0
	SN637050 2024-06-06	MYOGRI	MYOGRI	MYOGRI are LASBOR or indistinguishable from overlapping species	0
	SN637050 2024-06-07	MYOGRI	MYOGRI	MYOGRI are LASBOR.	0
	SN637050 2024-06-08	MYOGRI, PERSUB	MYOGRI, PERSUB	MYOGRI AND PERSUB are LASBOR or indistinguishable from overlapping species	0
AS-12	SN637052 2024-06-05	PERSUB	PERSUB	**PERSUB confirmed**	1 PERSUB
	SN637052 2024-06-06	PERSUB	PERSUB	**PERSUB confirmed**	2 PERSUB
	SN637052 2024-06-07	PERSUB	PERSUB	**PERSUB confirmed**	1 PERSUB
	SN637052 2024-06-08	PERSUB	PERSUB	**PERSUB confirmed**	6 PERSUB
AS-13-A	SN637021 2024-06-08	MYOGRI	MYOGRI	MYOGRI are LASBOR	0
AS-13-B	SN637045 2024-06-08	MYOGRI, MYOLUC, MYOSEP, PERSUB	MYOGRI, MYOLUC, MYOSEP, PERSUB	MYOGRI AND MYOLUC and PERSUB lasiurian and lower quality calls. MYOSEP not good enough quality to differentiate from other Myotis spp.	0
	SN637045 2024-06-10	MYOGRI, PERSUB	MYOGRI, MYOSEP, PERSUB	MYOGRI and PERSUB are lasiurine. MYOSEP calls are lower quality, indistinguishable from MYOLEI/MYOLUC.	0
AS-14-A	SN637021 2024-06-11	MYOGRI, MYOSEP	MYOGRI, MYOSEP	MYOGRI are Lasiurine. MYOSEP not distinguishale from MYOLEI and curvilinear.	0
	SN637049 2024-06-08	MYOGRI	MYOGRI	MYOGRI are LASBOR	0
AS-14-B	SN637044 2024-06-08	MYOGRI, PERSUB	MYOGRI, PERSUB	PERSUB recordings wer low quality. MYOGRI calls are Lasiurine.	0
	SN637045 2024-06-11	MYOGRI, MYOSEP	MYOGRI, MYOSEP	MYOGRI recordings are Lasiurine. MYOSEP are indistinguishable from MYOLEI/MYOLUC.	0

Site Name	Unit ID and Date Deployed	Auto Identification of Target Species without MYSO	Auto Identification of Target Species with MYSO	Qualitative Determination of Target Species	Number of Confirmed Calls
AS-15-A	SN637020 2024-06-08	MYOLUC	MYOLUC	MYOLUC short sequences unidentifiable.	0
AS-15-B	SN440578 2024-06-08	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, PERSUB	MYOLUC and MYOGRI indistinguishable from LASBOR and Myotis spp. PERSUB are LASBOR	0
	SN440578 2024-06-10	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, MYOSEP, PERSUB	MYOLUC and MYOGRI indistinguishable from LASBOR and Myotis spp. PERSUB are LASBOR	0
AS-16-B	SN637040 2024-06-08	MYOGRI, MYOLUC	MYOGRI, MYOLUC, MYOSOD	MYOGRI, MYOLUC and MYOSOD indistinguishable from overlapping species	0
	SN637040 2024-06-10	MYOLUC	MYOGRI, MYOLUC	**MYOLUC confirmed**	3 MYOLUC
AS-17-A	SN440578 2024-06-13	MYOGRI, MYOLUC	MYOGRI, MYOLUC	MYOLUC and MYOGRI indistinguishable from overlapping species	0
	SN440578 2024-06-14	MYOLUC	MYOLUC	MYOLUC indistinguishable from overlapping species	0
AS-17-B	SN637020 2024-06-14	MYOGRI	MYOGRI	MYOGRI and MYOLUC recordings are Lasurine	0
AS-18-B	SN637052 2024-06-11	MYOGRI	MYOGRI		0
AS-19-A	SN637020 2024-06-11	MYOLUC	MYOSOD	MYOLUC lower quality calls (feeding buzz and approach calls)	0
	SN637020 2024-06-12	MYOLUC	MYOLUC	**MYOLUC confirmed.** MYOSOD sequences overlap with other myotis species	11 MYOLUC
AS-19-B	SN440578 2024-06-11		MYOGRI	MYOGRI calls are LASBOR	0
	SN440578 2024-06-12		MYOGRI, PERSUB	MYOGRI and PERSUB are LASBOR	0
AS-20-A	SN637019 2024-06-11	MYOGRI, MYOSEP		MYOSEP not identifiable. Did not reach 118kHz. MYOGRI areLASBOR.	0
	SN637019 2024-06-12	MYOSEP, PERSUB	MYOSEP, PERSUB	**PERSUB confirmed.** MYOSEP not identifiable. Did not reach 118kHz (in moderate clutter).	1 PERSUB
AS-20-B	SN620359 2024-06-11	MYOGRI	MYOGRI	MYOGRI and MYOLUC calls were short sequences, identified as LASBOR	0
	SN620359 2024-06-12		MYOGRI	MYOGRI are LASBOR-like	0
AS-21-A	SN637049 2024-06-11	MYOGRI, PERSUB	MYOGRI, PERSUB	MYOGRI are LASBOR-like	0
	SN637049 2024-06-12	MYOGRI, PERSUB	MYOGRI	MYOGRI and PERSUB are LASBOR.	0
AS-21-B	SN637044 2024-06-11	MYOGRI, MYOLUC	MYOGRI, MYOSOD	MYOGRI and MYOLUC were short sequences with undulation identified as LASBOR	0
	SN637044 2024-06-12	MYOGRI	MYOGRI, PERSUB	MYOGRI and PERSUB are LASBOR.	0
AS-22-A	SN637045 2024-06-12		MYOSOD	MYOLUC are indistinguishable from overlapping Myotis spp.	0
	SN637045 2024-06-13		PERSUB	PERSUB calls are LASBOR.	0
AS-22-B	SN637021 2024-06-12	MYOLUC, MYOSEP	MYOSEP, MYOSOD	MYOLUC, MYOSOD calls overlap with other Myotis spp. MYOSEP calls overlap with MYOLEI.	0
	SN637021 2024-06-13	MYOLUC, MYOSEP, PERSUB	MYOLUC, MYOSEP, PERSUB	**PERSUB confirmed.** MYOLUC calls overlap with other Myotis spp. MYOSEP calls overlap with MYOLEI.	7 PERSUB
AS-23-A	SN637050 2024-06-11	MYOGRI, MYOLUC	MYOGRI, MYOLUC	MYOGRI, MYOLUC calls overlap with other species	0
	SN637050 2024-06-12	MYOGRI, MYOLUC, MYOSEP	MYOGRI, MYOLUC	MYOGRI, MYOLUC, MYOSEP calls all overlap with other species	0
AS-23-B	SN637042 2024-06-11	MYOGRI, MYOLUC	MYOGRI, MYLUC, MYOSOD	MYOGRI, MYOLUC and MYOSOD calls overlap with other species.	0
	SN637042 2024-06-12	MYOGRI, MYOLUC	MYOGRI, MYOLUC	MYOGRI, MYOLUC and MYOSOD calls overlap with other species.	0
AS-24-A	SN637040 2024-06-11	MYOGRI		MYOGRI calls are overlapping with characteristics of other species	0
	SN637040 2024-06-12	MYOGRI, MYOSEP	MYOGRI, MYOSEP	MYOSEP AND MYOGRI calls are overlapping with characteristics of other species	0
AS-25-A	SN637042 2024-06-13	MYOGRI, MYOSEP	MYOGRI	MYOSEP AND MYOGRI are lower quality recordings with traits that overlap with other species.	0
	SN637042 2024-06-14	MYOGRI, MYOLUC	MYOGRI, MYOLUC, PERSUB	PERSUB, MYOLUC, AND MYOGRI are lower quality recordings with metrics that overlap with other species.	0
AS-25-B	SN637040 2024-06-16	MYOGRI, MYOLUC, MYOSEP	MYOGRI, MYOSEP	MYOGRI and MYOSEP calls overlap with LASBOR and other Myotis species.	0
	SN637040 2024-06-17	MYOGRI, MYOLUC, MYOSEP	MYOGRI, MYOSOD	MYOGRI, MYOLUC, MYOSOD and MYOSEP calls overlap with LASBOR and other Myotis species.	0
AS-26-A	SN637027 2024-06-13	MYOGRI	MYOGRI, MYOLUC	MYOGRI calls are not distinguishable from LASBOR	0
	SN637027 2024-06-14	MYOGRI, PERSUB	MYOGRI, MYOSOD	PERSUB calls not distinguishable from LASBOR and other overlapping species	0
AS-26-B	SN637052 2024-06-14	MYOLUC, PERSUB	MYOLUC, PERSUB	MYOSEP and PERSUB calls are Lasiurine	0
AS-27-B	SN637050 2024-06-14	MYOLUC	MYOLUC	MYOLUC are LASBOR	0
AS-28-A	SN620359 2024-06-14	MYOLUC		MYOLUC are LASBOR	0
AS-28-B	SN637019 2024-06-13	MYOLUC, PERSUB	MYOLUC, MYOSOD, PERSUB	**PERSUB confirmed.** MYOLUC and MYOSOD calls are not able to distinguished from overlapping species	2 PERSUB
	SN637019 2024-06-14	MYOLUC, PERSUB	MYOSOD, PERSUB	**PERSUB confirmed.** MYOLUC and MYOSOD calls are not able to distinguished from overlapping species	2 PERSUB
AS-29-A	SN637049 2024-06-13	MYOGRI		MYOGRI calls aren't definitive enough, appear Lasiurine.	0
	SN637049 2024-06-14	MYOGRI		MYOGRI calls aren't definitive enough, appear Lasiurine.	0

Site Name	Unit ID and Date Deployed	Auto Identification of Target Species without MYSO	Auto Identification of Target Species with MYSO	Qualitative Determination of Target Species	Number of Confirmed Calls
AS-29-B	SN637044 2024-06-13	MYOGRI	MYOGR	MYOGRI calls were Lasiurine	0
AS-30-A	SN637040 2024-06-18	MYOLUC		MYOLUC calls not definitive enough, appear Lasiurine.	0
AS-30-B	SN637052 2024-06-18	MYOGRI, MYOLUC	MYOGRI, MYOLUC, MYOSOD	MYOGRI are Lasiurine. MYOLUC and MYOSOD calls are not definitive enough	0
	SN637052 2024-06-19	MYOGRI, MYOLUC	MYOGRI, MYOSOD	MYOGRI are Lasiurine. MYOLUC and MYOSOD calls are not definitive enough	0
AS-31-A	SN637042 2024-06-16	MYOGRI	MYOGRI, MYOLUC	MYOGRI and MYOLUC calls are LASBOR	0
	SN637042 2024-06-17	MYOGRI, PERSUB	MYOGRI, PERSUB	MYOGRI AND PERSUB calls are LASBOR.	0
AS-31-B	SN637052 2024-06-17	PERSUB	PERSUB	PERSUB are LASBOR	0
AS-32-A	SN637049 2024-06-16	MYOGRI, PERSUB	MYOGRI, PERSUB	MYOGRI calls are LASBOR**. PERSUB confirmed**	20 PERSUB
	SN637049 2024-06-17	PERSUB		**PERSUB confirmed.**	5 PERSUB
AS-32-B	SN637044 2024-06-17	PERSUB	PERSUB	**PERSUB confirmed**	4 PERSUB
AS-33-A	SN440578 2024-06-16	PERSUB	PERSUB	**PERSUB confirmed**	2 PERSUB
	SN440578 2024-06-17	PERSUB	PERSUB	**PERSUB confirmed**	4 PERSUB
AS-33-B	SN637020 2024-06-16	PERSUB	PERSUB	**PERSUB confirmed.**	3 PERSUB
AS-34-A	SN637019 2024-06-16	PERSUB	PERSUB	**PERSUB confirmed**	1 PERSUB
	SN637019 2024-06-17	PERSUB	PERSUB	**PERSUB confirmed**	1 PERSUB
AS-34-B	SN620359 2024-06-16	PERSUB	PERSUB	**PERSUB confirmed**	2 PERSUB
AS-35-A	SN637044 2024-06-18	MYOGRI	MYOGRI	MYOGRI calls are Lasiurine	0
	SN637044 2024-06-19	MYOGRI	MYOGRI	MYOGRI calls are Lasiurine	0
AS-35-B	SN637049 2024-06-18	MYOGRI	MYOGRI	MYOGRI calls are Lasiurine	0
	SN637049 2024-06-19	MYOLUC	MYOGRI, MYOLUC	MYOLUC not definitive enough. Overlap with other Myotis spp and PERSUB. MYOSOD calls overlap with other Myotis species.	0
AS-36-B	SN637019 2024-06-18	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, PERSUB	**PERSUB confirmed.** MYOGRI appeared Lasiurine, MYOLUC not definitive enough.	3 PERSUB
	SN637019 2024-06-19	MYOGRI, MYOLUC, PERSUB	MYOGRI, MYOLUC, PERSUB	**MYOGRI and PERSUB confirmed. MYOLUC not definitive enough**	1 MYOGRI, 2 PERSUB
AS-37-A	SN440578 2024-06-18	MYOGRI, PERSUB	MYOGRI, PERSUB	**PERSUB confirmed.** MYOGRI calls appear Lasiurine.	4 PERSUB
AS-37-B	SN637020 2024-06-19	MYOGRI	MYOGRI	MYOGRI appears to be Lasiurine	0
All sites					75 PERSUB 18 MYLU 1 MYGR

5.3 Representative Calls

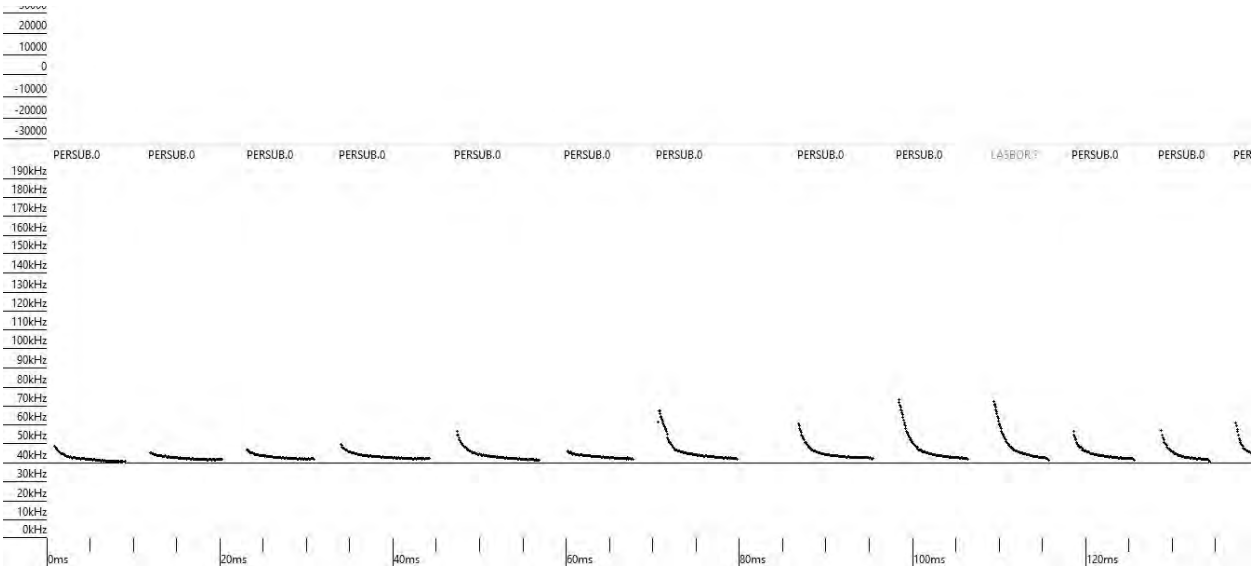

Figure A38. Representative photo of a PESU call from the detector at acoustic site AS-12. Calls exhibit low, "flat" slopes consistently at or just above 40 kHz. This screen capture shows the calls in compressed-time view.

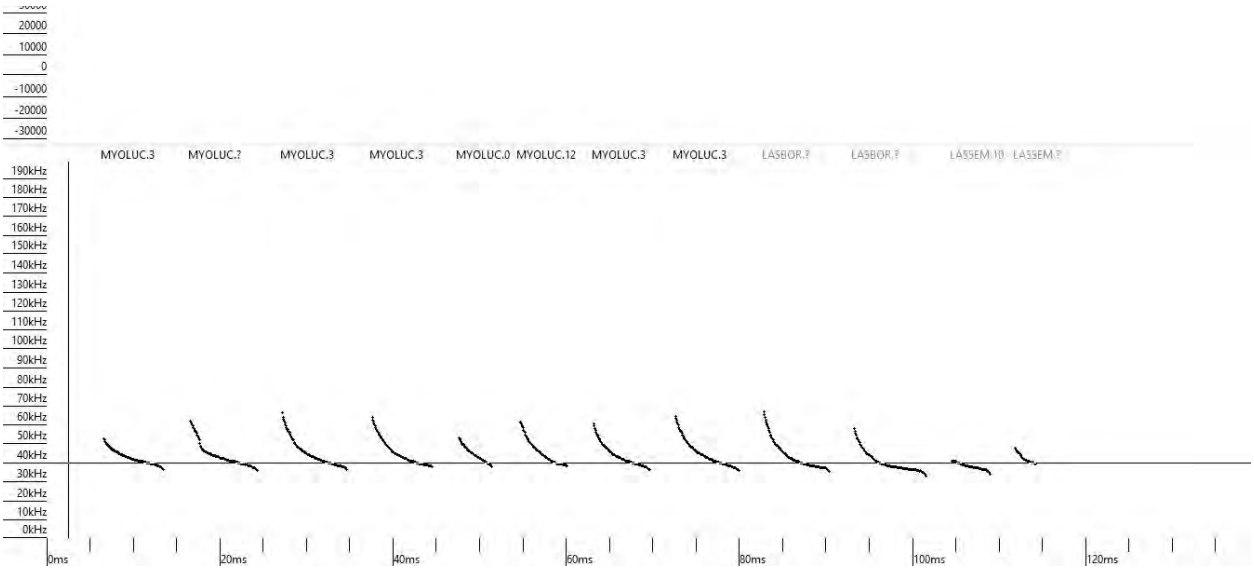

Figure A39. Representative photo of a MYLU call from acoustic site AS-19, detector A. Note the search phase call shows characteristic frequencies (Fc) consistently between 38-39 kHz, inflections, and call durations greater than 7 milliseconds. This screen capture shows the calls in compressed-time view.

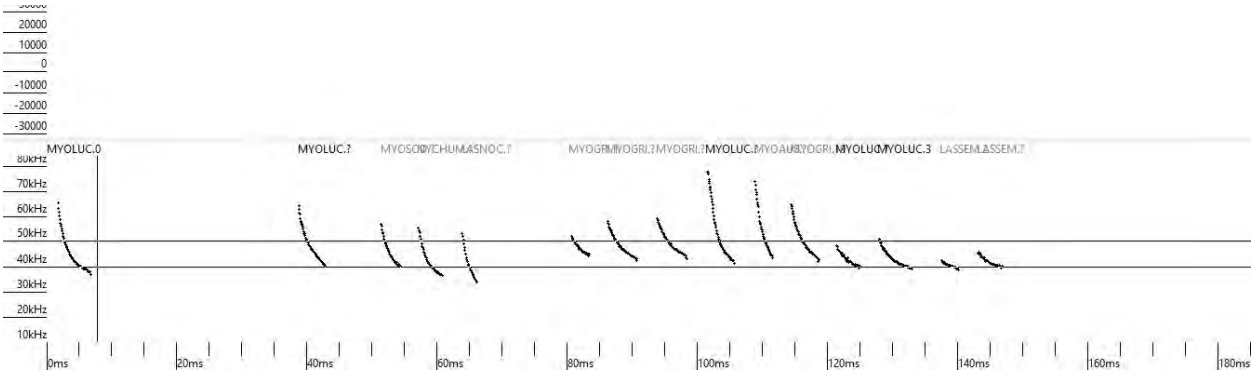

Figure A40. Representative photo of a call auto identified as a MYLU call but deemed to be a LABO upon qualitative analysis. Note the clear undulations, the rise and fall of the frequencies which is not consistent with MYLU call characteristics. This screen capture shows the calls in compressed-time view.

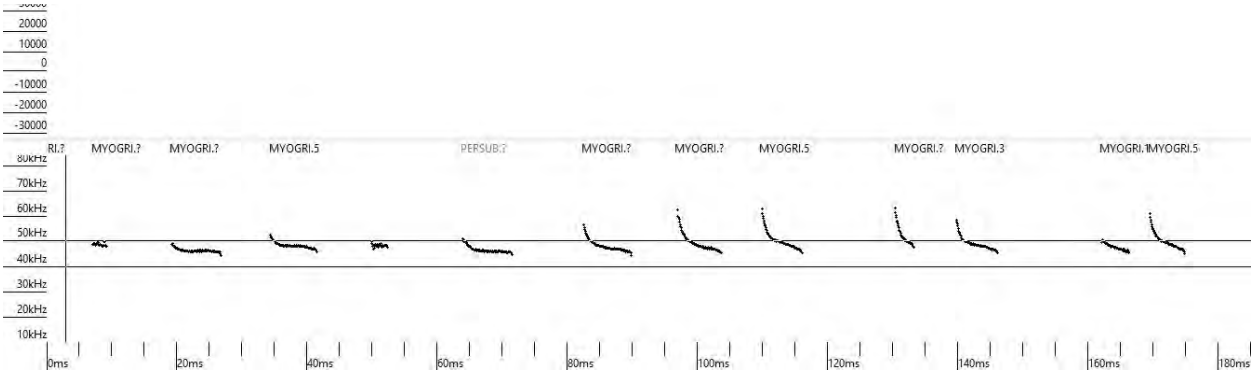

Figure A41. Representative photo of a MYGR call from acoustic site AS-36, detector B. Note how the call exhibits consistent Fc>44 KHz with durations near five (5) milliseconds, and a sigmoidal curve with inflections at 50 kHz. This screen capture shows the calls in compressed-time view.

BAD CREEK PUMPED STORAGE PRESENCE/ABSENCE ACOUSTIC AND MIST-NET SURVEYS FOR THREATENED & ENDANGERED BAT SPECIES

APPENDIX D
COMPLETED MIST-NET DATASHEETS

PRESENTED TO

ERIC MULARSKI
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BY

BIOTOPE FORESTRY & ENVIRONMENTAL
NACOGDOCHES, TX | CHATTANOOGA, TN

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	2	2024	Bad Creek Pumped Storage	BC-1	SC	Oconee	Upland forest
Biologists:	Jay Deatherage, Jose Mata						

Roost Potential	
Rank:	Low
Roost Type(s):	Live/Dead
Description:	Healthy forested area with minimal snags.

Water Source	
Type:	Road Ruts
Distance (m):	5

Habitat Types	
Forest:	Mixed D/C
Age:	Mixed Y/M
Upland / Lowland:	Mixed U/L
Other Habitats:	Corridor
	Edge

Canopy Species		
DBH Range:	Large (cm)	Small (cm)
	45	25
Percent >40cm DBH:	5	
Closure:	Open-Moderate	

Acer saccharum

Liriodendron tulipifera

Pinus strobus

Subcanopy Species	
Type:	Saplings
Clutter:	Open-Moderate

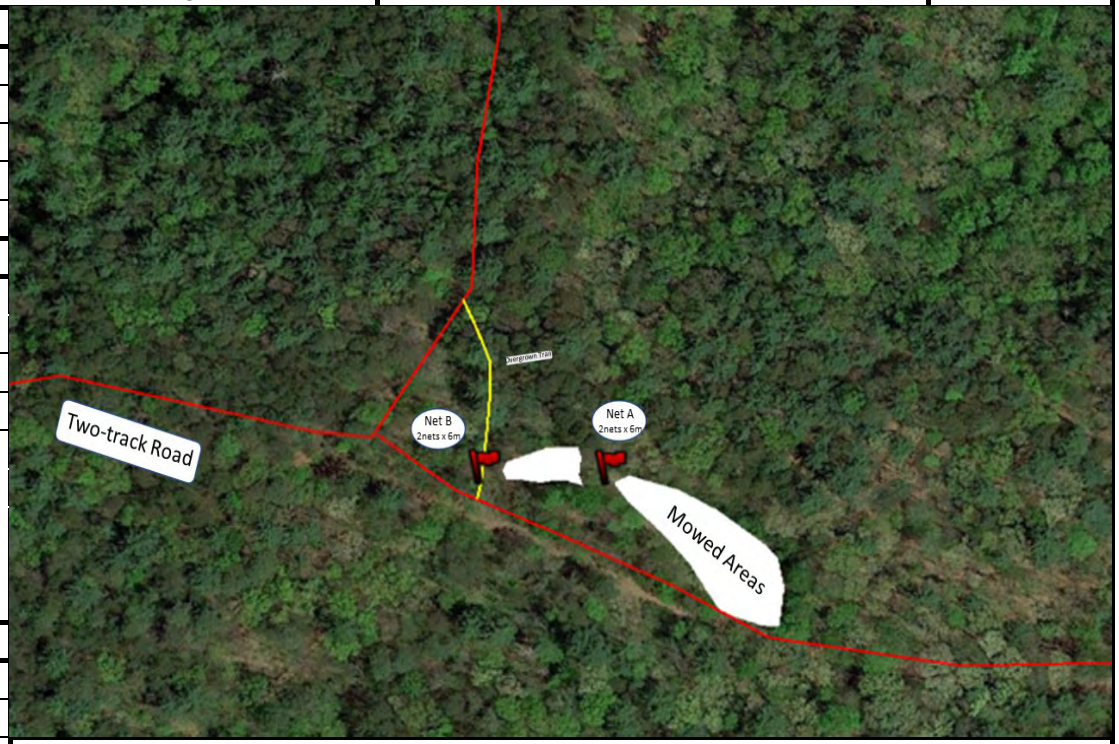
Acer saccharum

Liriodendron tulipifera

Quercus rubra

Oxydendrum arboreum

Site Sketch ↑N



Habitat Description

Predominantly mature forest with diverse canopy structure, along mountain ridge. Net A - Two mowed clearings with a small corridor between them. Net placed where east clearing meets corridor. Net B - Narrow, short corridor directly off of USFS road. Net placed inside corridor.

BAT CAPTURES

Project #:	2024-0079174	**Project Name:**	Bad Creek Pumped Storage
Date:	06/01/24	**Site Name:**	BC-1
State:	SC	**County:**	Oconee
Biologists:	Jay Deatherage, Jose Mata		

Description of Net Sets:

Net A placed inbetween two grassy clearings, in a short corridor, where the north clearing meets the corridor. Net B placed in a tight corridor that spurs off of a USFS road.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	34.965818	-82.990382	2030	0145	62.40	
B	6	5.2	34.965889	-82.990851	2040	0155		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2041	20.0	0	3	
2111	18.0	1-3	3	
2141	18.0	1-3	3	
2211	17.0	0	3	
2241	17.0	1-3	3	
2311	17.0	1-3	3	
2341	17.0	1-3	3	
0011	17.0	1-3	3	
0041	17.0	1-3	3	
0111	17.0	1-3	3	
0141	16.0	1-3	3	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	2148	*Lasiurus borealis*	*LABO*	A	M	TD	40.0	11.0	2.5	0	–	–	Y	BC1_LABO
2	A	2215	*Lasiurus borealis*	*LABO*	–	–	–	–	–	–	–	–	–	N	
3	B	2242	*Lasiurus borealis*	*LABO*	A	M	N	40.0	12.0	1.0	0	–	–	N	

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/02/24	Site Name:	BC-1
State:	SC	County:	Oconee
Biologists:	Jay Deatherage, Jose Mata		

Description of Net Sets:

Net A placed inbetween two grassy clearings, in a short corridor, where the north clearing meets the corridor. Net B placed in a tight corridor that spurs off of a USFS road.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	2.6	34.96582	-82.99038	2030	0145	31.20	
B	6	2.6	34.96589	-82.99085	2040	0155		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2042	20.0	0	2	
2112	18.0	0	2	
2142	18.0	0	2	
2212	18.0	0	2	
2242	18.0	0	2	
2312	18.0	0	2	
2342	18.0	1-3	2	
0012	18.0	1-3	2	
0042	17.0	1-3	2	
0012	17.0	1-3	2	
0042	17.0	1-3	5	Light drizzle off and on from 0130-0142

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
			No bats	*NOBATS*											NO CAPTURES

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	1	2024	Bad Creek Pumped Storage	BC-2	SC	Oconee	Upland forest
Biologists:	Eli Corwin, Luke Carey						

Roost Potential	
Rank:	Moderate
Roost Type(s):	Live/Dead
Description:	Cavities and Exfoliating bark in live and decaying trees

Water Source	
Type:	Stream
Distance (m):	1000

Site Sketch ↑N

Habitat Types	
Forest:	Mixed D/C
Age:	Mixed Y/M
Upland / Lowland:	Mixed U/L
Other Habitats:	Corridor
	Edge

Canopy Species		
DBH Range:	Large (cm)	Small (cm)
	57	10
Percent >40cm DBH:	30	
Closure:	Closed	

Lirodendron tulipifera
Acer rubrum
Pinus strobus
Quercus montana
Quercus alba

Subcanopy Species	
Type:	Saplings
Clutter:	Moderate

Liquidambar styraciflua
Oxydendrum arboreum
Acer rubrum
Robinia pseudoacacia

Habitat Description

Habitat at the site includes a mixed hardwood and pine upland forest with lots of potential roosts in both mature and decaying trees. There is dense canopy cover along the gravel road corridor that runs the middle of the site.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/01/24	Site Name:	BC-2
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Luke Carey		

Description of Net Sets:

Net A is set trapping a corridor along a gravel road that intersects highway 130. Net B is set along a gravel road corridor with canopy cover. Net B is at an intersection of an opening in the forester corridor that leads to an ephemeral stream.

Net	Length (m)	Height (m)	Latitude (Degree Decimals)	Longitude (Degree Decimals)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	34.95651	-83.01974	2041	0141	78.00	
B	6	5.2	34.95759	-83.01886	2041	0141		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2041	20.0	0	3	
2111	18.0	1-3	3	
2141	18.0	1-3	3	
2211	17.0	0	3	
2241	17.0	1-3	3	
2311	17.0	1-3	3	
2341	17.0	1-3	3	
0011	17.0	1-3	3	
0041	17.0	1-3	3	
0111	17.0	1-3	3	
0141	17.0	1-3	3	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	B	2054	*Lasiurus borealis*	*LABO*	A	M	N	40.0	10.5	2	0	–	–	Y	BC2_LABO
2	B	2120	*Lasiurus borealis*	*LABO*	–	–	–	–	–	3.0	-	–	–	–	Escaped net
3	B	2145	*Lasiurus borealis*	*LABO*	A	M	N	41.0	12.0	2.5	0	–	–	N	
4	B	2201	*Lasiurus borealis*	*LABO*	A	M	N	36.0	11.5	2.5	0	–	–	N	

BAT CAPTURES

Project #:	2024-0079174	**Project Name:**	Bad Creek Pumped Storage
Date:	06/02/24	**Site Name:**	BC-2
State:	SC	**County:**	Oconee
Biologists:	Eli Corwin, Luke Carey		

Description of Net Sets:

Net A is set trapping a gravel road with corridor that intersects highway 130. Net B is set along a gravel road corridor with canopy cover. Net B is at an intersection of an opening in the forester corridor that leads to an ephemeral stream.

Net	Length (m)	Height (m)	Latitude (Degree Decimals)	Longitude (Degree Decimals)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	34.956513	-83.019738	2042	0142	78.00	
B	6	5.2	34.957589	-83.018855	2042	0142		

Time (0000 h)	Temp (^oC)	Wind (mph)	Sky Code	Comments
2042	21.0	0	2	
2112	20.0	0	2	
2142	20.0	0	3	
2212	19.0	1-3	3	
2242	19.0	1-3	2	
2312	19.0	1-3	2	
2342	18.0	0	2	
0012	18.0	0	1	
0042	18.0	0	3	
0112	18.0	1-3	3	
0142	18.0	1-3	3	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band # / color	Transmitter #	Photo(s)	Comments
			No bats	*NOBATS*											NO CAPTURES

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	1	2024	Bad Creek Pumped Storage	BC-3	SC	Oconee	Upland forest
Biologists:	John Manuel, Josh Householder						

Roost Potential	
Rank:	Moderate
Roost Type(s):	Live/Dead
Description:	Moderate frequency of snags, crevices, cavities present.

Water Source		
	Type:	Stream
	Distance (m):	500

Habitat Types	
Forest:	Mixed D/C
Age:	Mature Stand
Upland/Lowland:	Mixed U/L
Other Habitats:	Corridor

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	40	15
% >40cm DBH:	3	
Closure:	Moderate-Closed	

Acer rubrum
Liriodendron tulipifera
Pinus strobus
Pinus virginiana
Quercues coccinea

Subcanopy Species	
Type:	Saplings
Clutter:	Moderate

Oxydendrum arboreum
Prunus serotina
Cornus florida
Carya tomentosa

Site Sketch ↑N

Habitat Description

Mature mixed pine/hardwood stand, approximately 60-80 years old. Two track trail, Tater Hill Rd, running through it along a ridge. Corridor connects to State Highway 130. Moderate level of clutter.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/01/24	Site Name:	BC-3
State:	SC	County:	Oconee
Biologists:	John Manuel, Josh Householder		

Description of Net Sets:

Two nets set up on a two-track trail off of SC Highway 130 that runs up a ridge to Tater Hill. Mature mixed hardwood-pine forest. Creek 330 meters away.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	34.936380	-82.992790	2041	0145	78.00	
B	9	5.2	34.934960	-82.992760	2041	0145		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2041	20.0	0	3	
2111	18.0	1-3	3	
2141	18.0	1-3	3	
2211	17.0	0	3	
2241	17.0	1-3	3	
2311	17.0	1-3	3	
2341	17.0	1-3	3	
0011	17.0	1-3	3	
0041	17.0	1-3	3	
0111	17.0	1-3	3	
0141	17.0	1-3	3	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	2355	*Lasiurus borealis*	*LABO*	A	M	N	38.0	11.0	2.5	0	–	–	Y	BC3_LABO

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/02/24	Site Name:	BC-3
State:	SC	County:	Oconee
Biologists:	John Manuel, Josh Householder		

Description of Net Sets:

Two nets set up on a two-track trail off of SC Highway 130 that runs up a ridge to Tater Hill. Mature mixed hardwood-pine forest. Creek 330 meters away.

Net	Length (m)	Height (m)	Latitude Degree Decimals	Longitude (Degree Decimals)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	34.93638	-82.99279	2040	0142	31.20	
B	9	5.2	34.93496	-82.99276	2040	0142	46.80	

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2042	23.0	0	2	
2142	23.0	0	2	
2142	23.0	0	2	
2212	23.0	0	2	
2242	21.0	0	2	
2312	20.0	0	2	
2342	18.0	0	0	
0012	18.0	0	0	
0042	17.0	0	1	
0012	17.0	0	1	
0142	17.0	0	1	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	B	2300	*Eptesicus fuscus*	*EPFU*	A	F	L	51.0	22.0	2	0	–	–	N	BC3_EPFU

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	5	2024	Bad Creek Pumped Storage	BC-4	SC	Oconee	Upland forest
Biologists:	John Manuel, Alexander Green						

Roost Potential	
Rank:	Low
Roost Type(s):	Live/Dead
Description:	Low frequency of snags.

Water Source		
Type:	Other	
Distance (m):	15	

Site Sketch ↑N

Habitat Types	
Forest:	Mixed D/C
Age:	Mixed Y/M
Upland/Lowland:	Upland
Other Habitats:	Corridor
	Edge

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	25	10
% >40cm DBH:	0	
Closure:	Open-Moderate	

Acer rubrum
Pinus virginiana
Pinus rigida
Robinia pseudoacacia
Oxydendrum arboreum

Subcanopy Species	
Type:	Saplings
Clutter:	Moderate

Robinia pseudoacacia
Acer rubrum
Oxydendrum arboreum
Quercus rubra

Habitat Description

A gravel road spans the edge of Bad Creek Reservoir and a 20-30 year old mixed pine-hardwood forest. Abundance of riprap sized gravel rocks and a large dam near by.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/05/24	Site Name:	BC-4
State:	SC	County:	Oconee
Biologists:	John Manuel, Alexander Green		

Description of Net Sets:

Net A was set up on an edge beside the road. Net B was set perpendicular on a two-track road on the edge of the reservoir. 20-30 year old forest.

Net	Length (m)	Height (m)	Latitude (Degree Decimal)	Longitude (Degree Decimals)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	35.01426	-83.01173	2044	0143	78.00	
B	6	5.2	35.01355	-83.01126	2044	0143		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2043	24	0	2	
2113	21	1-3	2	
2143	21	1-3	1	
2213	21	1-3	0	
2243	20	0	0	
2313	20	1-3	0	
2343	19	1-3	0	
0013	19	4-7	0	
0043	19	4-7	0	
0113	18	1-3	0	
0143	18	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/06/24	Site Name:	BC-4
State:	SC	County:	Oconee
Biologists:	John Manuel, Alexander Green		

Description of Net Sets:

Net A was set up on an edge beside the road. Net B was set perpendicular on a two-track road on the edge of the reservoir. 20-30 year old forest.

Net	Length (m)	Height (m)	Latitude (Degree Decimal)	Longitude (Degree Decimals)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	35.01426	-83.01173	2044	0144	78.00	
B	6	5.2	35.01355	-83.01126	2044	0144		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2044	23	1-3	1	
2114	22	1-3	1	
2144	22	1-3	0	
2214	21	4-7	0	
2244	21	1-3	0	
2314	20	1-3	0	
2344	20	1-3	0	
0014	19	4-7	0	
0044	18	1-3	0	
0114	18	1-3	0	
0144	18	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	5	2024	Bad Creek Pumped Storage	BC-5	SC	Oconee	Upland forest
Biologists:	Eli Corwin, Jose Mata						

Roost Potential	
Rank:	Moderate
Roost Type(s):	Live/Dead
Description:	Roosts include sloughing bark and cavities in both live and dead trees

Water Source	
Type:	Other
Distance (m):	150

Habitat Types	
Forest:	Mixed D/C
Age:	Mixed Y/M
Upland/Lowland:	Upland
Other Habitats:	Corridor
	Pond

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	50	25
% >40cm DBH:	15	
Closure:	Moderate-Closed	

Liriodendron tulipifera

Quercus rubra

Pinus strobus

Magnolia tripetala

Robinia psuedoacacia

Subcanopy Species	
Type:	Saplings
Clutter:	Moderate

Acer rubrum

Liriodendron tulipifera

Robinia psuedoacacia

Quercus rubra

Site Sketch ↑N

Habitat Description

The site area is in a semi-mature upland hardwood/pine upland forest. There is an empty field and a large reservoir seperated by the forested stand. Net A is set closing off a tight corridor that connects the open field to a road and more hardwood forest. Net B is set trapping a corridor trail between the open field and reservoir

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/05/24	Site Name:	BC-5
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Jose Mata		

Description of Net Sets:

The site area is in a semi-mature upland hardwood/pine upland forest. There is an empty field and a large reservoir seperated by the forested stand. Net A is set closing off a tight corridor that connects the open field to a road and more hardwood forest. Net B is set trapping a corridor trail between the open field and reservoir

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	35.01977	-83.01582	2043	0143	78.00	
B	6	5.2	35.01994	-83.01507	2043	0143		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2043	24.0	0	2	
2113	21.0	1-3	2	
2143	21.0	1-3	1	
2213	21.0	1-3	0	
2243	20.0	0	0	
2313	20.0	1-3	0	
2343	19.0	4-7	0	
0013	19.0	4-7	0	
0043	19.0	4-7	0	
0013	18.0	1-3	0	
0143	18.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/06/24	Site Name:	BC-5
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Jose Mata		

Description of Net Sets:

The site area is in a semi-mature upland hardwood/pine upland forest. There is an empty field and a large reservoir seperated by the forested stand. Net A is set closing off a tight corridor that connects the open field to a road and more hardwood forest. Net B is set trapping a corridor trail between the open field and reservoir

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	35.019770	-83.015824	2044	0144	78.00	
B	6	5.2	35.019944	-83.015070	2044	0144		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2044	23.0	0	1	
2114	22.0	1-3	1	
2144	22.0	1-3	0	
2214	21.0	0	0	
2244	21.0	0	0	
2314	20.0	0	0	
2344	20.0	0	0	
0014	19.0	0	0	
0044	18.0	1-3	0	
0114	18.0	0	0	
0144	18.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	5	2024	Bad Creek Pumped Storage	BC-6	SC	Oconee	Upland forest
Biologists:	Jay Deatherage, Josh Householder						

Roost Potential	
Rank:	Low
Roost Type(s):	Dead
Description:	Few dead trees near site

Water Source		
	Type:	River
	Distance (m):	570

Site Sketch ↑N

Habitat Types	
Forest:	Deciduous
Age:	Young Stand
Upland/Lowland:	Upland
Other Habitats:	Corridor
	Other

Canopy Species

DBH Range:	Large (cm)	Small (cm)
	25	10
% >40cm DBH:	0	
Closure:	Open-Moderate	

Quercus acutissima

Robinia pseudoacacia

Pinus strobus

Subcanopy Species

Type:	Saplings/Branches
Clutter:	Open-Moderate

Quercus acutissima

Acer saccharum

Oxydendrum arboreum

Habitat Description

Predominantly 15-20 years old *Quercus acutissima* monoculture with hiking trail.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/05/24	Site Name:	BC-6
State:	SC	County:	Oconee
Biologists:	Jay Deatherage, Josh Householder		
Description of Net Sets:			
Net A placed across tight corridor (hiking trail). Net B placed in forest interior opening. Net C placed across very narrow and short corridor where the hiking trail has a steep elevation rise.			

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2043	20.0	0	1	
2113	20.0	0	2	
2143	20.0	0	2	
2213	19.0	0	2	
2243	20.0	0	0	
2313	20.0	0	0	
2343	20.0	1-3	2	
0013	20.0	1-3	2	
0043	19.0	1-3	2	
0113	19.0	0	0	
0143	19.0	0	0	

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	35.013237	-82.997708	2035	0140	72.80	
B	6	5.2	35.013526	-82.998164	2040	0145		
C	4	2.6	35.013855	-82.998151	2045	0150		

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/06/24	Site Name:	BC-6
State:	SC	County:	Oconee
Biologists:	Jay Deatherage, Josh Householder		

Description of Net Sets:

Net A placed across tight corridor (hiking trail). Net B placed in forest interior opening. Net C placed across very narrow and short corridor where the hiking trail has a steep elevation rise.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	35.01324	-82.99771	2035	0140	72.80	
B	6	5.2	35.01353	-82.99816	2040	0145		
C	4	2.6	35.01386	-82.99815	2045	0150		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2044	22.0	1-3	3	
2114	20.0	0	1	
2144	20.0	1-3	0	
2214	19.0	1-3	0	
2244	19.0	1-3	0	
2314	18.0	1-3	0	
2344	19.0	1-3	0	
0014	19.0	1-3	0	
0044	19.0	1-3	0	
0114	19.0	1-3	0	
0144	19.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	8	2024	Bad Creek Pumped Storage	BC-7	SC	Oconee	Upland forest
Biologists:	Eli Corwin, Jose Mata						

Roost Potential	
Rank:	High
Roost Type(s):	Live/Dead
Description:	Many open crevices in live and dead trees

Water Source		
	Type:	Stream
	Distance (m):	200

Site Sketch ↑N

Habitat Types	
Forest:	Mixed D/C
Age:	Mixed Y/M
Upland/Lowland:	Upland
Other Habitats:	Corridor
	Other

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	57	25
% >40cm DBH:	25	
Closure:	Moderate-Closed	

Pinus strobus
Acer rubrum
Pinus virginiana
Quercus montana
Liriodendron tulipifera

Subcanopy Species	
Type:	Saplings/Shrubs
Clutter:	Open-Moderate

Tsuga canadensis
Acer rubrum
Pinus strobus
Carya sp.

Habitat Description

BC-7 is located along a ridge in a mixed aged hardwood/pine forest. There are many potential roosts around in both live and standing dead trees. Net A is set trapping along a tight corridor that runs the ridgeline. Net B is set in an opening in the forest interior that has thick canopy cover.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/08/24	Site Name:	BC-7
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Jose Mata		

Description of Net Sets:

Net A is set trapping along a tight corridor that runs the ridgeline. Net B is set in an opening in the forest understory that has thick canopy cover.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	34.97193	-82.99730	2045	0145	78.00	
B	9	5.2	34.97136	-82.99759	2045	0145		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2045	22.0	0	0	
2115	21.0	0	0	
2145	21.0	0	0	
2215	20.0	0	0	
2245	20.0	0	0	
2315	19.0	0	0	
2345	19.0	0	0	
0015	19.0	0	0	
0045	19.0	1-3	0	
0115	19.0	1-3	0	
0145	19.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/11/24	Site Name:	BC-7
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Jose Mata		

Description of Net Sets:

Net A is set trapping along a tight corridor that runs the ridgeline. Net B is set in an opening in the forest understory that has thick canopy cover.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	34.97193	-82.99730	2046	0146	78.00	
B	9	5.2	34.97136	-82.99759	2046	0146		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2046	22.0	0	0	
2116	21.0	0	0	
2146	21.0	0	0	
2216	20.0	0	0	
2246	19.0	0	0	
2316	19.0	0	0	
2346	19.0	0	0	
0016	18.0	0	0	
0046	18.0	0	0	
0016	18.0	0	0	
0146	18.0	0	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	0142	*Myotis leibii*	*MYLE*	A	M	N	32.0	4.8	4.5	0	–	–	Y	BC7_MYLE(1-3)

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	11	2024	Bad Creek Pumped Storage	BC-8	SC	Oconee	Upland forest
Biologists:	John Manuel, Alexander Green						

Roost Potential	
Rank:	Moderate
Roost Type(s):	Live/Partial
Description:	Snags present. trees with exfoliating bark and crevices/holes present.

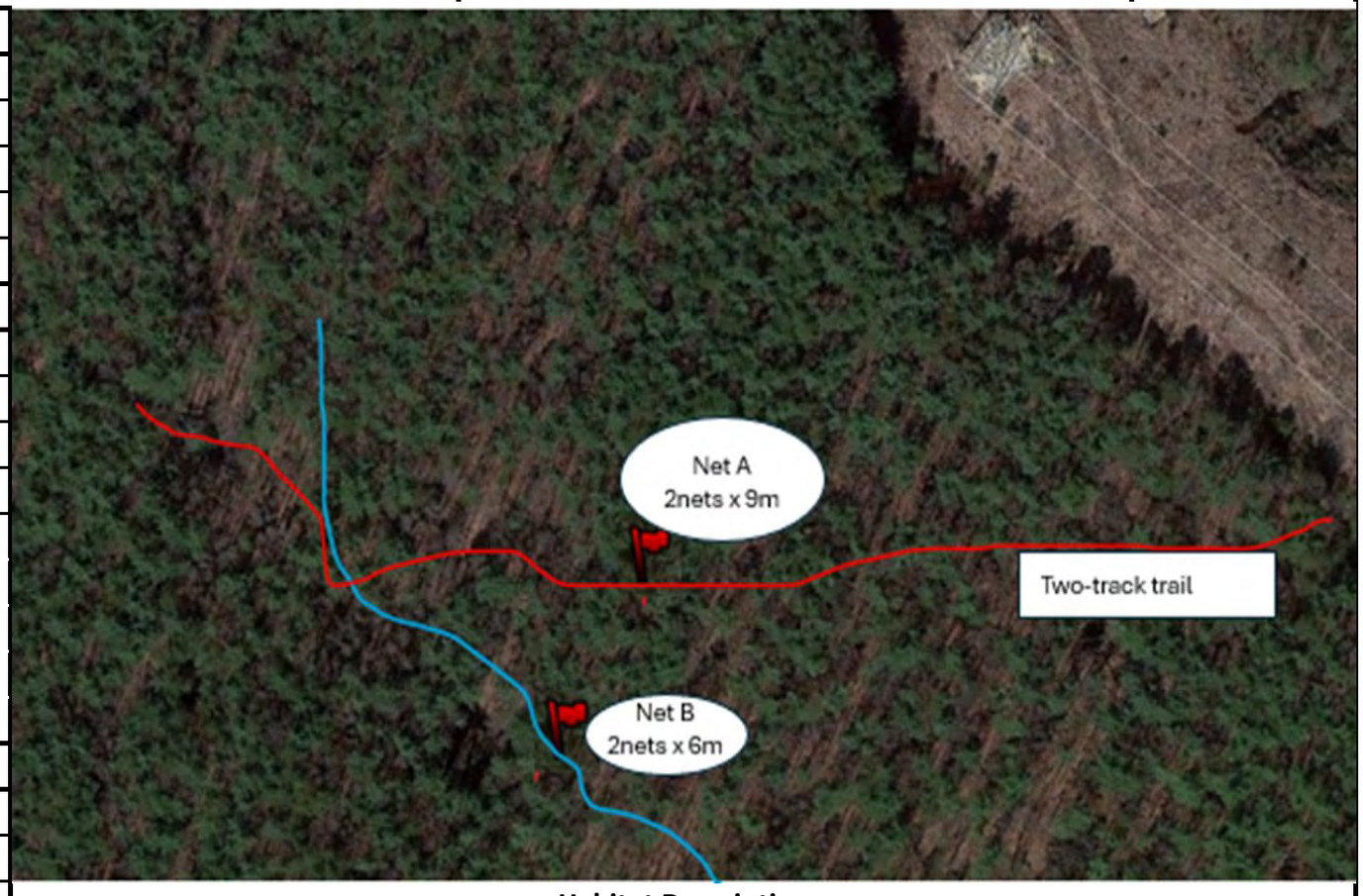
Water Source	
Type:	Stream
Distance (m):	10

Habitat Types	
Forest:	Mixed D/C
Age:	Mature Stand
Upland/Lowland:	Upland
Other Habitats:	Corridor
	Stream

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	40	7
% >40cm DBH:	5	
Closure:	Closed	
Pinus strobus		
Pinus rigida		
Acer rubrum		
Liriodendron tulipifera		
Nyssa sylvatica		

Subcanopy Species	
Type:	Saplings
Clutter:	Open-Moderate
Acer rubrum	
Oxydendrum arboreum	
Pinus strobus	
Pinus virginiana	

Site Sketch ↑N



Habitat Description

Mature mixed pine/hardwood forest, about 40-50 years old. Small stream present, a spring running underground. Corridor leads to a powerline ROW.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/08/24	Site Name:	BC-8
State:	SC	County:	Oconee
Biologists:	John Manuel, Alexander Green		

Description of Net Sets:

Double-high 9m net set up over a two-track trail (extension of Tater Hill Rd) through a mature mixed pine/hardwood forest. Double-high 6m net set up in a drainage area (spring running .5m under the ground) as an interior net. Trail leads to powerline ROW.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	34.95415	-82.98500	2045	0145	78.00	
B	6	5.2	34.95389	-82.98540	2045	0145		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2045	24.0	1-3	1	
2115	23.0	1-3	1	
2145	23.0	0	0	
2215	22.0	0	0	
2245	21.0	1-3	0	
2315	21.0	1-3	1	
2345	21.0	1-3	1	
0015	21.0	0	1	
0045	21.0	0	1	
0115	21.0	0	0	
0145	21.0	0	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	2120	*Lasiurus borealis*	*LABO*	A	M	N	41.0	10.0	1.5	0	–	–	N	
2	A	2200	*Lasiurus borealis*	*LABO*	A	M	N	40.0	12.0	2.0	0	–	–	N	

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/10/24	Site Name:	BC-8
State:	SC	County:	Oconee
Biologists:	John Manuel, Alexander Green		

Description of Net Sets:

9 meter net set up along a corridor (two-track trail) leading to a powerline ROW. 6 meter interior net set up in a drainage area off the trail. Small spring running underground.

Net	Length (m)	Height (m)	Latitude (Degree Decimal	Longitude (Degree Decimals)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	34.95415	-82.98500	2040	0146	78.00	
B	6	5.2	34.95389	-82.98540	2040	0146		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2046	23.0	0	2	
2116	23.0	0	2	
2146	21.0	0	2	
2216	18.0	0	1	
2246	18.0	0	1	
2316	18.0	0	0	
2346	18.0	1-3	0	
0016	18.0	1-3	1	
0046	17.0	1-3	1	
0016	17.0	1-3	1	
0146	17.0	1-3	1	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	2320	*Eptesicus fuscus*	*EPFU*	A	F	L	46.0	20.0	3.0	0	–	–	Y	

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	8	2024	Bad Creek Pumped Storage	BC-9	SC	Oconee	Upland forest
Biologists:	Jay Deatherage, Luke Carey						

Roost Potential	
Rank:	High
Roost Type(s):	Dead
Description:	Abundant snags adjacent to nets.

Water Source	
Type:	Stream
Distance (m):	160

Site Sketch ↑N

Habitat Types	
Forest:	Mixed D/C
Age:	Mature Stand
Upland/Lowland:	Upland
Other Habitats:	Corridor
	Edge

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	50	25
% >40cm DBH:	5	
Closure:	Open-Moderate	

Liriodendron tulipifera

Pinus strobus

Subcanopy Species	
Type:	Saplings/Branches
Clutter:	Moderate-Closed

Acer saccharum

Oxydendrum aboreum

Habitat Description

Upland hardwood/pine mixed forest. Nets place along two-track road, Net A on tight corridor and Net B on edge of road where a forest opening is sourrounded by snags.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/08/24	Site Name:	BC-9
State:	SC	County:	Oconee
Biologists:	Jay Deatherage, Luke Carey		

Description of Net Sets:

Net A placed across tight corridor on atv trail. Net B placed along edge of atv trail, where a forest edge gap was present.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	4	5.2	34.98734	-83.02709	2035	0150	83.20	
B	12	5.2	34.98712	-83.027384	2040	0155		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2045	20.0	1-3	0	
2115	20.0	1-3	0	
2145	20.0	0	0	
2215	19.0	0	0	
2245	19.0	0	0	
2315	19.0	0	0	
2345	19.0	0	0	
0015	18.0	0	0	
0045	18.0	1-3	0	
0015	18.0	1-3	0	
0145	18.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/11/24	Site Name:	BC-9
State:	SC	County:	Oconee
Biologists:	Jay Deatherage, Luke Carey		

Description of Net Sets:

Net A placed across tight corridor on atv trail. Net B placed along edge of atv trail, where a forest edge gap was present.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	4	5.2	34.98734	-83.02709	2035	0150	83.20	
B	12	5.2	34.98712	-83.027384	2040	0155		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2046	22.0	0	0	
2116	20.0	0	0	
2146	19.0	0	0	
2216	19.0	1-3	0	
2246	18.0	1-3	0	
2316	18.0	1-3	0	
2346	18.0	1-3	0	
0016	18.0	1-3	0	
0046	18.0	1-3	0	
0016	18.0	1-3	0	
0046	18.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

HABITAT DESCRIPTION

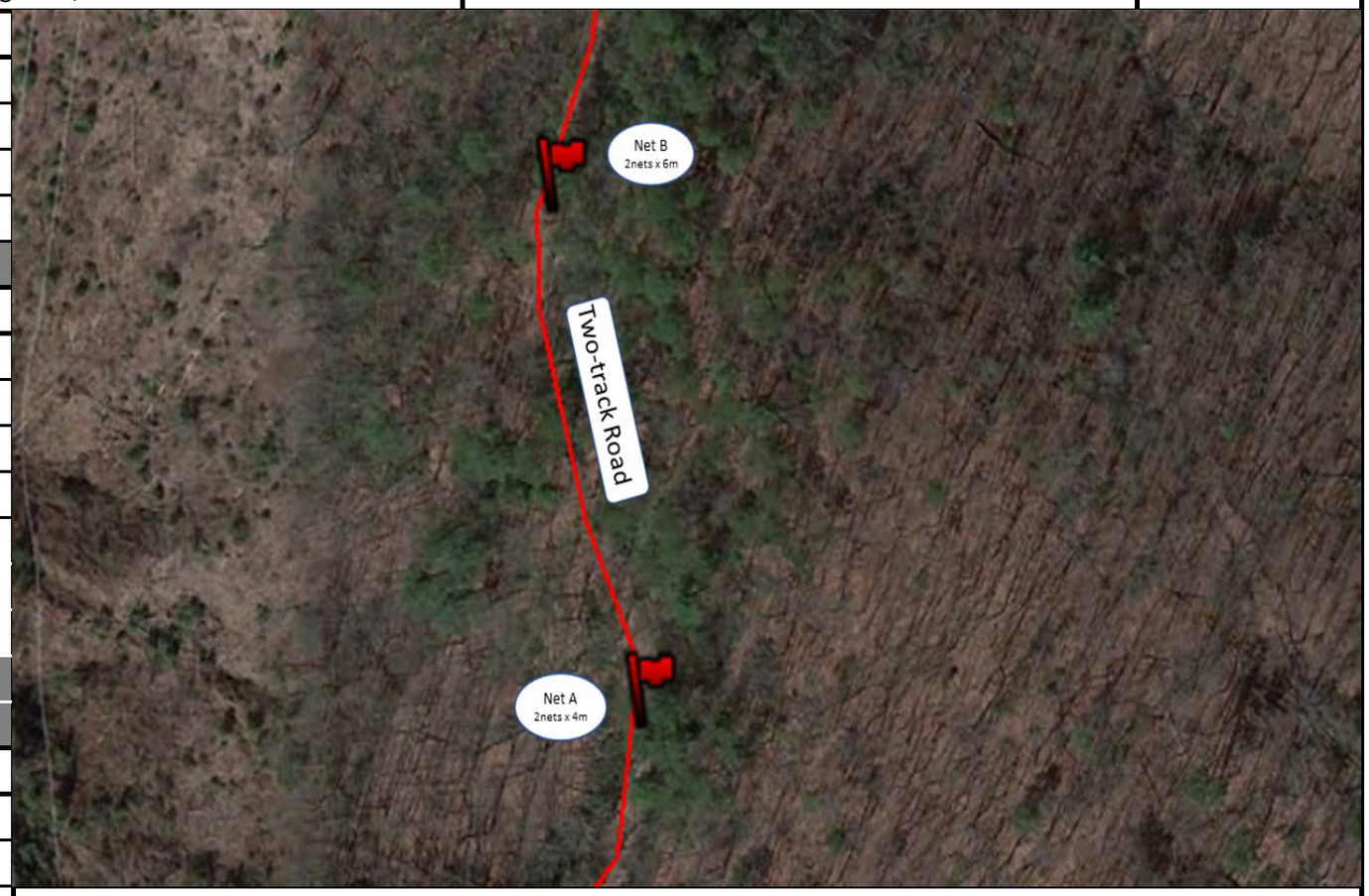
Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	10	2024	Bad Creek Pumped Storage	BC-10	SC	Oconee	Upland forest
Biologists:	Jay Deatherage, Luke Carey						

Roost Potential		Water Source		
Rank:	High		**Type:**	Other
Roost Type(s):	Dead		**Distance (m):**	800
Description:	Scattered snags along road, inbetween nets	**Site Sketch**		↑N

Habitat Types	
Forest:	Mixed D/C
Age:	Mature Stand
Upland/Lowland:	Upland
Other Habitats:	Corridor

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	50	30
% >40cm DBH:	8	
Closure:	Moderate-Closed	
Pinus strobus		
Acer saccharum		
Quercus coccinea		

Subcanopy Species	
Type:	Saplings/Branches
Clutter:	Moderate-Closed
Liriodendron tulipifera	
Nyssa sylvatica	
Acer saccharum	



Habitat Description
Upland mixed forest habitat along side of mountain. Snags are abundant.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/10/24	Site Name:	BC-10
State:	SC	County:	Oconee
Biologists:	Jay Deatherage, Luke Carey		

Description of Net Sets:

Both nets placed along two-track forest trail, in areas that had a good corridor. Steep slope on both sides of road.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	4	5.2	34.99157	-82.99883	2035	0155	52.00	
B	6	5.2	34.99253	-82.999058	2040	0200		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2046	23.0	1-3	0	
2116	21.0	1-3	0	
2146	20.0	1-3	0	
2216	20.0	1-3	0	
2246	20.0	1-3	0	
2316	19.0	1-3	0	
2346	20.0	1-3	0	
0016	19.0	1-3	0	
0046	19.0	1-3	0	
0116	19.0	1-3	0	
0146	19.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	B	2150	*Lasiurus borealis*	*LABO*	–	–	–	–	–	–	–	–	–	N	Escaped net
2	A	2150	*Lasiurus borealis*	*LABO*	A	F	N	41.0	12.0	0.5	1	–	–	N	
3	B	2233	*Eptesicus fuscus*	*EPFU*	A	M	TD	44.0	15.0	3.0	0	–	–	N	
4	A	2233	*Eptesicus fuscus*	*EPFU*	–	–	–	–	–	4.0	–	–	–	N	Escaped net
5	B	2355	*Eptesicus fuscus*	*EPFU*	A	F	L	45.0	17.3	2.0	0	–	–	N	
6	A	0019	*Eptesicus fuscus*	*EPFU*	A	F	L	44.0	17.0	1.0	0	–	–	N	
7	B	0131	*Eptesicus fuscus*	*EPFU*	A	M	N	45.0	13.5	2.0	0	–	–	N	

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/14/24	Site Name:	BC-10
State:	SC	County:	Oconee
Biologists:	Jay Deatherage, Luke Carey		

Description of Net Sets:

Both nets placed along two-track forest trail, in areas that had a good corridor. Steep slope on both sides of road.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	4	5.2	34.99157	-82.99883	2035	0150	52.00	
B	6	5.2	34.99253	-82.99905	2040	0155		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2047	25.0	1-3	0	
2116	25.0	1-3	0	
2147	24.0	1-3	0	
2217	24.0	1-3	0	
2247	24.0	1-3	0	
2317	23.0	1-3	0	
2347	23.0	1-3	0	
0017	25.0	1-3	0	
0047	25.0	1-3	0	
0117	25.0	1-3	0	
0147	23.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	10	2024	Bad Creek	BC-11	SC	Oconee	Upland forest
Biologists:	John Manuel, Alexander Green						

Roost Potential	
Rank:	High
Roost Type(s):	Live/Dead
Description:	Abundance of large trees, snags and smaller maples with cavities.

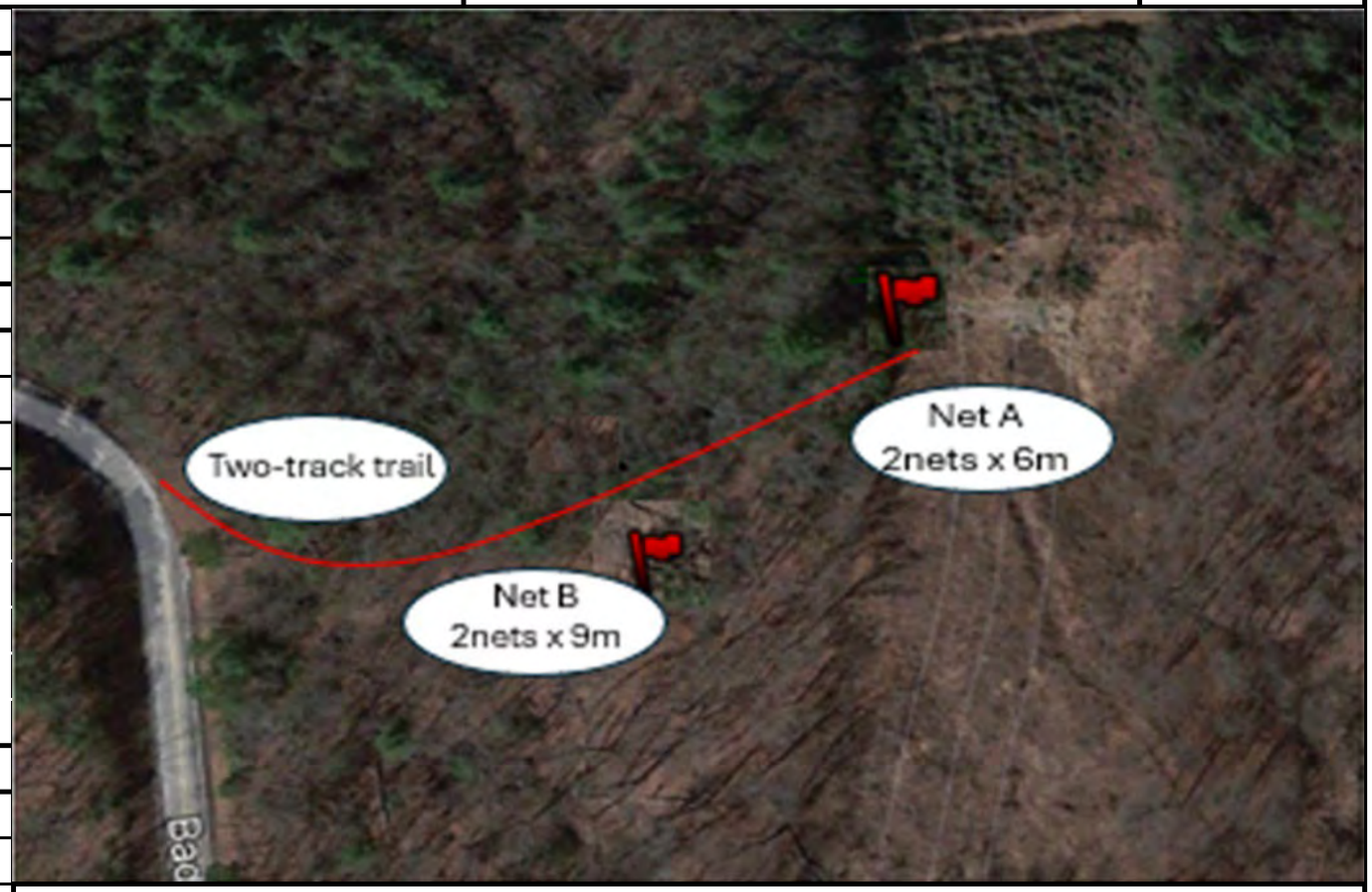
Water Source		
Type:	Stream	
Distance (m):	350 m	

Habitat Types	
Forest:	Deciduous
Age:	Mature Stand
Upland/Lowland:	Upland
Other Habitats:	Corridor
	Other

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	45	7
% >40cm DBH:	20	
Closure:	Closed	
Quercus montana		
Acer rubrum		
Nyssa sylvatica		
Quercus coccinea		
Fagus grandifolia		

Subcanopy Species	
Type:	Saplings/Shrubs
Clutter:	Moderate
Kalmia latifolia	
Acer rubrum	
Oxydendrum arboreum	
Pinus strobus	

Site Sketch ↑N



Habitat Description

Mature forest on a ridge top with a large rounded rock outcropping downslope to the east. Mix of larger oaks, maples and beeches with an understory mainly composed of young maples and mountain laurel. Corridor is fit for a 6m or 9 m net, 100 meters long connecting Bad Creek Rd and a Powerline ROW.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/10/24	Site Name:	BC-11
State:	SC	County:	Oconee
Biologists:	John Manuel, Alexander Green		

Description of Net Sets:

6 meter net set up along a smaller corridor (two-track trail) leading to a powerline ROW. 9 meter interior net set up in a dry drainage area off the trail up slope from a large rock outcropping.

Net	Length (m)	Height (m)	Latitude (Degree Decimal)	Longitude (Degree Decimals)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	35.00244	-83.00206	2046	0146	78.00	
B	9	5.2	35.00292	-83.00149	2046	0146		

Time (0000 h)	Temp (^oC)	Wind (mph)	Sky Code	Comments
2046	23.0	0	2	
2116	23.0	0	2	
2146	21.0	0	2	
2216	18.0	0	0	
2246	17.0	0	1	
2316	17.0	0	1	
2346	17.0	0	1	
0016	16.0	0	1	
0046	16.0	0	1	
0116	16.0	0	0	
0146	16.0	0	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	B	2110	*Lasiurus borealis*	*LABO*	A	M	N	39.0	11.0	2.5	0	–	–	N	
2	B	2140	*Myotis leibii*	*MYLE*	A	M	N	31.0	5.0	1.0	0	–	–	N	
3	B	2143	*Lasiurus borealis*	*LABO*	A	M	N	41.0	12.0	2.0	0	–	–	N	
4	B	2215	*Myotis leibii*	*MYLE*	A	F	L	34.0	6.5	3.0	0	–	–	N	

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/14/24	Site Name:	BC-11
State:	SC	County:	Oconee
Biologists:	John Manuel, Alexander Green		

Description of Net Sets:

6 meter net set up along a smaller corridor (two-track trail) leading to a powerline ROW. 9 meter interior net set up in a dry drainage area off the trail up slope from a large rock outcropping.

Net	Length (m)	Height (m)	Latitude Degree Decimal	Longitude (Degree Decimals)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	35.00244	-83.00206	2047	0147	78.00	
B	9	5.2	35.00292	-83.00149	2047	0147		

Time (0000 h)	Temp (^oC)	Wind (mph)	Sky Code	Comments
2047	28.0	0	2	
2117	27.0	0	2	
2147	25.0	1-3	2	
2217	23.0	4-7	0	
2247	23.0	4-7	1	
2317	23.0	1-3	1	
2347	22.0	1-3	0	
0017	22.0	1-3	0	
0047	21.0	1-3	0	
0118	21.0	1-3	0	
0148	21.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	14	2024	Bad Creek Pumped Storage	BC-12	SC	Oconee	Upland forest
Biologists:	Eli Corwin, Jose Mata						

Roost Potential	
Rank:	Moderate
Roost Type(s):	Live/Dead
Description:	Many open crevices in live and dead trees

Water Source	
Type:	Stream
Distance (m):	200

Site Sketch ↑N

Habitat Types	
Forest:	Mixed D/C
Age:	Mixed Y/M
Upland/Lowland:	Upland
Other Habitats:	Edge
	Corridor

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	53	24
% >40cm DBH:	30	
Closure:	Moderate-Closed	

Pinus strobus

Liriodendron tulipifera

Pinus virginiana

Quercus rubra

Carya spp.

Subcanopy Species	
Type:	Saplings/Shrubs
Clutter:	Open-Moderate

Acer rubrum

Pinus virginiana

Robinia psuedoacacia

Rhododendron spp.

Habitat Description

Site BC-12 is set on a ridgeline with a clearing. The area surrounding clearing is mixed aged upland pine/decidous forest. There is a tight corridor along a gravel road that net-B is set on. Net A is set in the clearing at a pinch point with top coverage from large Red Oak branches.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/10/24	Site Name:	BC-12
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Jose Mata		

Description of Net Sets:

Net A is set trapping a grass field with top and side coverage at the net location. Net B is set closing off a small corridor along a gravel road.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	12	5.2	34.96464	-83.00737	2046	0146	93.60	
B	6	5.2	34.96367	-83.00837	2046	0146		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2046	22.0	0	1	
2116	21.0	1-3	1	
2146	20.0	0	1	
2216	19.0	1-3	1	
2246	19.0	0	0	
2316	18.0	0	0	
2346	18.0	1-3	0	
0016	17.0	0	0	
0046	16.0	1-3	0	
0116	16.0	0	0	
0146	16.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	2115	*Lasiurus borealis*	*LABO*	A	M	N	40.0	14.0	2	0	–	–	N	
2	A	2210	*Eptesicus fuscus*	*EPFU*	A	F	L	46.0	20.0	2.0	0	–	–	N	
3	A	2210	*Eptesicus fuscus*	*EPFU*	A	M	N	45.0	16.1	2.5	0	–	–	N	
4	A	2247	*Eptesicus fuscus*	*EPFU*	A	F	PR	47.0	22.0	2.0	0	–	–	N	
5	A	2247	*Eptesicus fuscus*	*EPFU*	A	F	L	45.0	17.0	2.0	0	–	–	N	
6	A	2247	*Eptesicus fuscus*	*EPFU*	A	F	PR	46.0	22.5	2.5	0	–	–	N	
7	A	2247	*Eptesicus fuscus*	*EPFU*	A	M	N	46.0	17.0	2.0	0	–	–	N	
8	A	2305	*Eptesicus fuscus*	*EPFU*	A	F	PR	48.0	23.0	3.0	0	–	–	N	
9	A	0049	*Eptesicus fuscus*	*EPFU*	A	F	L	48.0	20.0	1.0	0	–	–	N	

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/14/24	Site Name:	BC-12
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Jose Mata		

Description of Net Sets:

Net A is set trapping a grass field with top and side coverage at the net location. Net B is set closing off a small corridor along a gravel road.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	12	5.2	34.96464	-83.00737	2047	0147	93.60	
B	6	5.2	34.96367	-83.00837	2047	0147		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2047	26.0	0	1	
2117	25.0	0	1	
2147	24.0	1-3	0	
2217	23.0	1-3	0	
2247	23.0	1-3	0	
2317	23.0	0	0	
2347	22.0	1-3	0	
0017	21.0	0	0	
0047	21.0	0	0	
0117	21.0	1-3	0	
0147	21.0	0	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	2304	*Lasiurus borealis*	*LABO*	A	M	N	40.0	12.0	2.5	0	–	–	N	

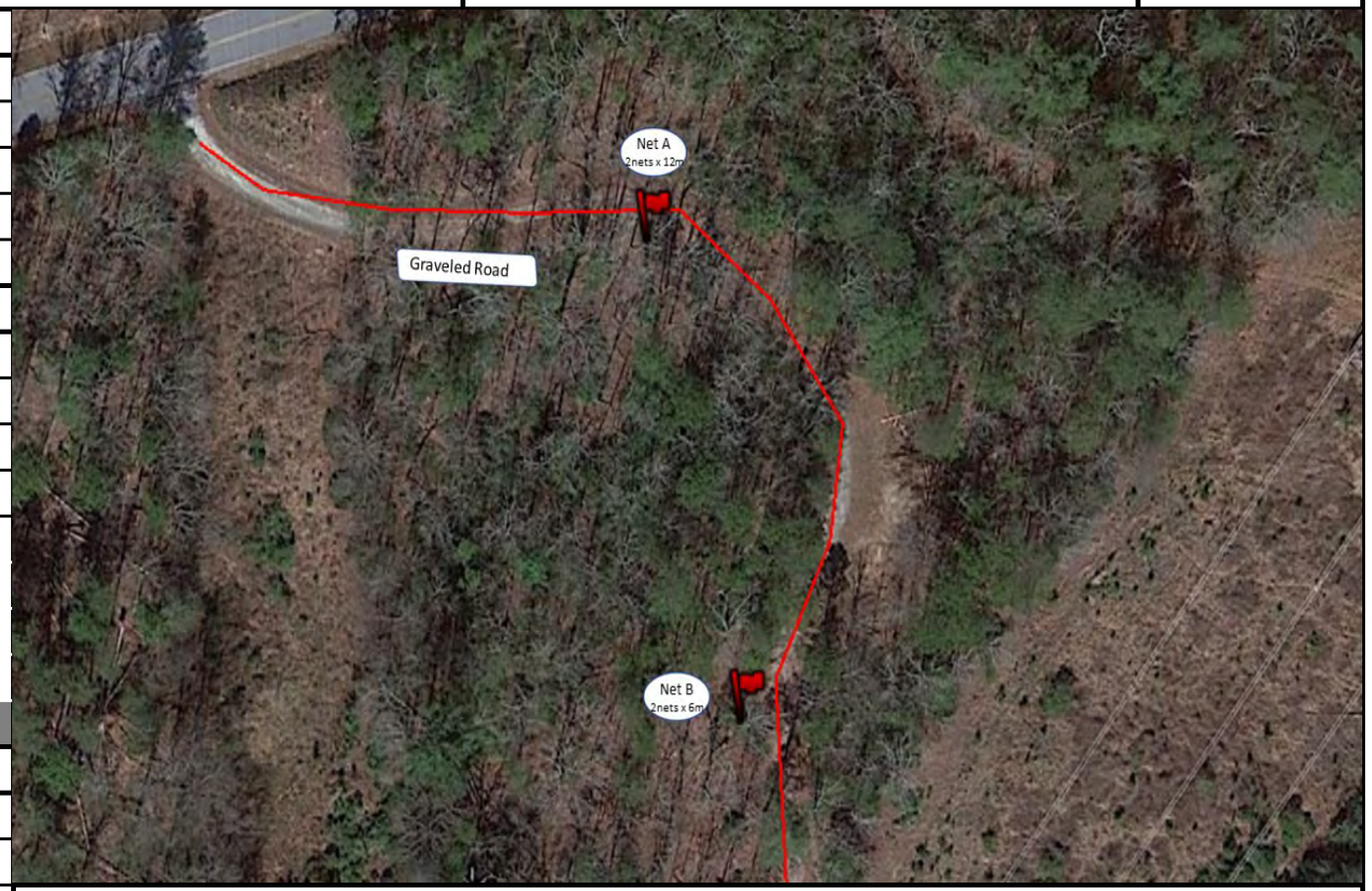
HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	12	2024	Bad Creek Pumped Storage	BC-13	SC	Oconee	Bottomland forest
Biologists:	Jay Deatherage, Luke Carey						

Roost Potential	
Rank:	Moderate
Roost Type(s):	Dead
Description:	A few dead conifers around site

Water Source	
Type:	Other
Distance (m):	200

Site Sketch ↑N



Habitat Types	
Forest:	Mixed D/C
Age:	Mature Stand
Upland/Lowland:	Mixed U/L
Other Habitats:	Corridor
	Edge

Canopy Species

DBH Range:	Large (cm)	Small (cm)
	45	25
% >40cm DBH:	3	
Closure:	Moderate-Closed	

Pinus echinata

Liriodendron tulipifera

Quercus alba

Quercus coccinea

Subcanopy Species

Type:	Saplings/Branches
Clutter:	Moderate-Closed

Pinus echinata

Liriodendron tulipifera

Acer saccharum

Habitat Description

Mixed upland/lowland forest, near Lake Jocassee. Gravel road with a dry, ephemeral drainage corridor on edge of road (Net A), and two parallel interior corridors with Net B placed across both.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/12/24	Site Name:	BC-13
State:	SC	County:	Oconee
Biologists:	Jay Deatherage, Luke Carey		

Description of Net Sets:

Net A - 12m X 2 placed across wide corridor that includes atv trail and an adjacent, small interior corridor. Net B - 6m X 2 placed across edge of gravel road and dry drain that runs downhill.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	12	5.2	34.95726	-82.91936	2035	0150	93.60	
B	6	5.2	34.95333	-82.91952	2040	0155		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2047	23.0	1-3	1	
2117	23.0	1-3	1	
2147	23.0	1-3	1	
2217	22.0	1-3	1	
2247	22.0	1-3	1	
2317	22.0	1-3	1	
2347	22.0	1-3	1	
0017	22.0	1-3	1	
0047	20.0	1-3	1	
0117	20.0	1-3	1	
0147	20.0	1-3	1	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	B	2216	*Eptesicus fuscus*	*EPFU*	A	M	N	50.0	17.0	2	0	–	–	N	
2	B	2315	*Eptesicus fuscus*	*EPFU*	–	M	–	–	–	–	–	–	–	–	ESCAPED NET

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pump Storage
Date:	06/13/24	Site Name:	BC-13
State:	SC	County:	Oconee
Biologists:	Jay Deatherage & Luke Carey		

Description of Net Sets:

Net A - 12m X 2 placed across wide corridor that includes atv trail and an adjacent, small interior corridor. Net B - 6m X 2 placed across edge of gravel road and dry drain that runs downhill.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	12	5.2	34.95276	-82.91936	2040	0150	93.60	
B	6	5.2	34.95333	-82.91952	2045	0155		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2047	26.0	1-3	1	
0024	24.0	1-3	1	
2147	24.0	1-3	2	
2217	24.0	1-3	2	
2247	23.0	1-3	2	
2317	23.0	1-3	1	
2347	23.0	1-3	1	
0017	23.0	1-3	0	
0047	22.0	1-3	0	
0117	22.0	1-3	0	
0147	22.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	12	2024	Bad Creek Pumped Storage	BC-14	SC	Oconee	Upland forest
Biologists:	Eli Corwin, Jose Mata						

Roost Potential	
Rank:	High
Roost Type(s):	Live/Dead
Description:	Many open crevices in live and dead trees

Water Source		
	Type:	Stream
	Distance (m):	125

Site Sketch ↑N

Habitat Types	
Forest:	Mixed D/C
Age:	Mixed Y/M
Upland/Lowland:	Upland
Other Habitats:	Edge
	Corridor

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	45	15
% >40cm DBH:	10	
Closure:	Open-Moderate	
Pinus strobus		
Acer rubrum		
Quercus alba		
Liriodendron tulipifera		
Quercus stellata		

Subcanopy Species	
Type:	Saplings/Branches
Clutter:	Open-Moderate
Rhododendron carolinianum	
Faagus grandifolia	
Acer rubrum	
Quercus Alba	

Habitat Description

Site BC-14 is in a mixed aged upland hardwood/conifer forest adjacent to an open sparsely treed field. Net A is set on an outside corner of the forest edge stretching into the field. Net B is set along a dry creekbed with corridor

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/13/24	Site Name:	BC-14
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Jose Mata		

Description of Net Sets:

Net A is set trapping the edge of grass field with top and side coverage at the net location. Net B is set closing off a small corridor along a dry creek bed in the forest interior.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	12	5.2	34.93884	-82.92274	2047	0147	93.60	
B	6	5.2	34.93852	-82.92315	2047	0147		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2047	26.0	0	1	
2117	25.0	1-3	1	
2147	24.0	0	3	
2217	24.0	0	1	
2247	24.0	0	1	
2317	23.0	0	0	
2347	23.0	0	0	
0017	22.0	0	0	
0047	22.0	0	0	
0117	22.0	0	0	
0147	21.0	0	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/12/24	Site Name:	BC-14
State:	SC	County:	Oconee
Biologists:	Eli Corwin, Jose Mata		

Description of Net Sets:

Net A is set trapping the edge of grass field with top and side coverage at the net location. Net B is set closing off a small corridor along a dry creek bed in the forest interior.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	12	5.2	34.93884	-82.92274	2047	0147	93.60	
B	6	5.2	34.93852	-82.92315	2047	0147		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2047	24.0	0	1	
2117	23.0	0	1	
2147	23.0	0	0	
2217	23.0	0	0	
2247	22.0	0	0	
2317	22.0	0	0	
2347	22.0	0	0	
0017	22.0	0	0	
0047	21.0	0	0	
0117	21.0	0	0	
0147	21.0	0	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	2115	*Eptesicus fuscus*	*EPFU*	A	M	N	47.0	16.0	4	0	–	–	N	
2	A	2210	*Eptesicus fuscus*	*EPFU*	A	–	–	–	–	–	0	–	–	N	Escaped Net
3	A	2349	*Eptesicus fuscus*	*EPFU*	A	F	PR	46.0	20.0	2.0	0	–	–	N	
4	A	2349	*Eptesicus fuscus*	*EPFU*	A	F	PR	46.0	18.0	2.0	0	–	–	N	

HABITAT DESCRIPTION

Month:	Day:	Year:	Project Name:	Site:	State:	County:	Habitat Type:
6	13	2024	Bad Creek	BC-15	SC	Oconee	Upland forest
Biologists:	John Manuel, Alexander Green						

Roost Potential	
Rank:	High
Roost Type(s):	Live/Partial
Description:	Large trees with dead limbs present, a lot of cavities present.

Water Source	
Type:	Stream
Distance (m):	100

Site Sketch ↑N

Habitat Types	
Forest:	Deciduous
Age:	Mature Stand
Upland/Lowland:	Upland
Other Habitats:	Corridor

Canopy Species		
DBH Range:	**Large (cm)**	**Small (cm)**
	50	7
% >40cm DBH:	15	
Closure:	Moderate-Closed	

Quercus rubra
Liriodendron tulipifera
Nyssa sylvatica
Pinus rigida
Acer rubrum

Subcanopy Species	
Type:	Saplings/Shrubs
Clutter:	Moderate-Closed

Kalmia latifolia
Pinus rigida
Pinus strobus
Acer rubrum

Habitat Description

Upland mature forest with a two track trail running along the ridgeline. Forest had a high level of clutter in the understory. Powerline ROW nearby and McKinney Creek was as well.

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek
Date:	06/12/24	Site Name:	BC-15
State:	SC	County:	Oconee
Biologists:	John Manuel, Alexander Green		

Description of Net Sets:

6m double-high net set up over a small corridor leading downhill to a creek. 9m double-high net set up over a corridor leading to a powerline ROW.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	6	5.2	34.93863	-82.94636	2047	0147	78.00	
B	9	5.2	34.93812	-82.94662	2047	0147		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2047	23.0	0	0	
2117	23.0	0	1	
2147	23.0	0	0	
2217	22.0	1-3	0	
2247	21.0	1-3	1	
2317	21.0	1-3	1	
2347	21.0	1-3	1	
0017	21.0	1-3	1	
0047	20.0	0	1	
0117	20.0	1-3	1	
0147	20.0	1-3	1	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1			*No bats*	*NOBATS*											NO CAPTURES

BAT CAPTURES

Project #:	2024-0079174	Project Name:	Bad Creek Pumped Storage
Date:	06/13/24	Site Name:	BC-15
State:	SC	County:	Oconee
Biologists:	John Manuel, Alexander Green		

Description of Net Sets:

6m double-high net set up over a small corridor leading downhill to a creek. 9m double-high net set up over a corridor leading to a powerline ROW.

Net	Length (m)	Height (m)	Latitude (DD)	Longitude (DD)	Time Up (0000 h)	Time Down (0000 h)	Total Net Area (m^2)	Comments
A	9	5.2	34.93863	-82.94636	2048	0148	78.00	
B	6	5.2	34.93812	-82.00000	2048	0148		

Time (0000 h)	Temp (°C)	Wind (mph)	Sky Code	Comments
2048	23.0	0	1	
2118	23.0	0	1	
2148	22.0	0	0	
2218	22.0	1-3	0	
2248	21.0	1-3	0	
2318	21.0	1-3	0	
2348	21.0	1-3	0	
0018	21.0	0	0	
0048	20.0	1-3	0	
0118	20.0	1-3	0	
0148	20.0	1-3	0	

Capture	Net	Time (0000 h)	Species	Code	Age (A/J)	Sex (M/F)	Repro (PR/L/PL/ TD/N)	RFA (mm)	Mass (g)	Height in Net (m)	Wing (0 - 3)	Band #/ color	Transmitter #	Photo(s)	Comments
1	A	0030	*Lasiurus borealis*	*LABO*	–	–	–	–	–	–	–	–	–	–	Escaped Net

BAD CREEK PUMPED STORAGE PRESENCE/ABSENCE ACOUSTIC AND MIST-NET SURVEYS FOR THREATENED & ENDANGERED BAT SPECIES

APPENDIX E
COMPLETED ACOUSTIC DATASHEETS

PRESENTED TO

ERIC MULARSKI
ENVIRONMENTAL SCIENCES & PLANNING MANAGER
HDR
440 SOUTH CHURCH STREET, SUITE 1200
CHARLOTTE, NC 28202-2075

BY

BIOTOPE FORESTRY & ENVIRONMENTAL
NACOGDOCHES, TX | CHATTANOOGA, TN

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/1/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-1
Date Retrieved:	6/3/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637040	Anabat Express	Titley	Omnidirectional	Factory
B	637043	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	4.0	295	0	34.96090	-83.01177	Zero Crossing
B	3.0	4.0	196	0	34.96081	-83.01183	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	-	
Roost Potential:	Moderate	
Roost Types:	Dead	
Water Source	**Type:**	Stream
	Distance (m):	350

Habitat Description

AS-1a deployed in mature forest against forest edge on large road turnout, facing 295° towards road and turnout opening. AS-1b deployed in same forested stand as AS-1a, facing 196° downhill along dry stream bed.

Canopy Species

Large (cm):	46	**Small(cm):**	15	**Type:**	Saplings/Branches
Percent > 40cm DBH:	5			**Clutter:**	Open-Moderate
Closure:	Open-Moderate				
Liquidambar styraciflua					
Tsuga canadensis					
Pinus strobus					
Acer saccharum					
Quercus coccinea					

Subcanopy Species

Liquidambar styraciflua
Acer saccharum
Tsuga canadensis

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/1/2024	**Project Name:**	Bad Creek	**Site ID:**	AS-2
Date Retrieved:	6/3/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637044	Anabat Express	Titley	Directional	Factory
B	637045	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	208	0	34.96006	-83.01672	Zero Crossing
B	4.0	3.0	43	0	34.95905	-83.01821	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Edge	
Roost Potential:	High	
Roost Types:	Live/Partial	
Water Source	**Type:**	Stream
	Distance (m):	800

Habitat Description

Mixed upland hardwood forest with gravel road running along ridgeline.
Detector A set along corridor facing intersecting trails that lead to open field.
Detector B set in open field edge line with adjacent corridor flyway

Canopy Species

Large (cm):	55	**Small(cm):**	15	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	15			**Clutter:**	Open-Moderate
Closure:	Open-Moderate				
Liriodendron tulipifera					
Acer rubrum					
Quercus rubra					
Quercus montana					
Pinus strobus					

Subcanopy Species

Pinus virginiana
Acer rubrum
Rhododendron carolinianum
Liquidambar styraciflua
Oxydendrum arboreum
Kalmia latifolia

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/1/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-3
Date Retrieved:	6/3/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Josh Householder	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637020	Titley	Titley	Directional	Factory
B	637019	Titley	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	6.0	270	0	34.94194	-82.99206	Zero Crossing
B	3.5	5.0	184	0	34.94205	82.99192	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	-	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	330

Habitat Description

Mixed pine-hardwood forest along a ridge with a two-track trail running along the ridge. Forest approximately 60-80years old. Creek 300 meters away. Abundance of saplings and shrubs in the understory.

Canopy Species

Large (cm):	45	**Small(cm):**	8	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	10			**Clutter:**	Moderate
Closure:	Moderate-Closed			*Sassafras albidum*	
Quercus montana				*Quercus rubra*	
Pinus virginiana				*Robinia pseudoacacia*	
Acer rubrum				*Prunus serotina*	
Quercus coccinea				*Pinus virginiana*	
Liriodendron tulipifera					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-4
Date Retrieved:	6/7/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637049	Anabat Express	Titley	Directional	Factory
B	637021	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	325	0	34.96521	-82.99410	Zero Crossing
B	3.0	3.0	304	0	34.96617	-82.99305	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Edge	
	Corridor	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	850

Habitat Description

Site AS-4 is located in an open field surrounded by mixed hardwood/Pine forest. There is a corridor around a gravel road running adjacent to the site. Detector A is set to detect over corridor and into edge habitat of the field. Detector B is set along the edge of the field.

Canopy Species

Large (cm):	55	**Small(cm):**	20	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	10			**Clutter:**	Open
Closure:	Open			*Acer rubrum*	
Liriodendron tulipifera				*Oxydendrum arboreum*	
Acer rubrum				*Kalmia latifolia*	
Quercus rubra				*Quercus montana*	
Quercus montana				*Quercus stellata*	
Quercus alba				*Rhododendron carolinianum*	

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-5
Date Retrieved:	6/7/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637044	Anabat Express	Titley	Directional	Factory
B	637045	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	294	0	34.96552	-82.986024	Zero Crossing
B	3.5	3.0	353	0	34.96530	-82.985421	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Edge	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	700

Habitat Description

Site AS-5 is located in a forest opening adjacent to corridor that leads to a powerline ROW. There is a corridor around a gravel road running through the site. Detector A is set to detect in a forest opening adjacent to a gravel road corridor. This corridor leads to open field with ample edge habitat. Detector B is set to detect along a possible NLEB flyway going along a ravine. B is detecting across the gravel road corridor.

Canopy Species

Large (cm):	55	**Small(cm):**	25	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	10			**Clutter:**	Open
Closure:	Moderate				
Liriodendron tulipifera					
Quercus rubra					
Pinus strobus					
Quercus alba					
Carya sp.					

Subcanopy Species

Rhododendron carolinianum
Pinus virginiana
Oxydendrum arboreum
Pinus strobus
Acer rubrum
Kalmia latifolia

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-6
Date Retrieved:	6/7/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637040	Anabat Express	Titley	Omnidirectional	Factory
B	637043	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	3.0	297	0	34.96298	-82.981576	Zero Crossing
B	3.5	3.0	194	0	34.96286	-82.982057	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	525

Habitat Description

Site AS-6. Unit A is set in forest interior with open mid/understory within a mixed upland Hardwood/Pine forest. There is a corridor around a gravel road running through the site with detector B set pointing down the length of the corridor. There is a possible flyway in a ravine cutting through the corridor and interior opening where both units are deployed.

Canopy Species

Large (cm):	65	**Small(cm):**	10	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	45			**Clutter:**	Open-Moderate
Closure:	Closed				
Quercus rubra					
Liriodendron tulipifera					
Pinus strobus					
Quercus alba					
Carya spp.					

Subcanopy Species

Liquidambar styraciflua
Pinus virginiana
Oxydendrum arboreum
Pinus strobus
Acer rubrum
Kalmia latifolia

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-7
Date Retrieved:	6/7/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637019	Titley	Titley	Omnidirectional	Factory
B	637020	Titley	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	4.0	114	0	34.95070	-82.98908	Zero Crossing
B	3.0	4.0	324	0	34.94555	-82.99045	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Stream	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	300

Habitat Description

Mixed pine-hardwood forest along a ridge with a two-track trail running along the ridge. Forest approximately 40-60 years old. Creek 300 meters away. Abundance of saplings and shrubs in the understory.

Canopy Species

Large (cm):	35	**Small(cm):**	15	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	2			**Clutter:**	Moderate
Closure:	Moderate-Closed				
Pinus virginiana					
Acer rubrum					
Pinus strobus					
Robinia pseudoacacia					
Quercus velutina					

Subcanopy Species

Sassafras albidum
Acer rubrum
Rhododendron maximum
Pinus virginiana
Oxydendrum arboreum
Quercus rubra

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek	**Site ID:**	AS-8
Date Retrieved:	6/7/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	620359	Titley	Titley	Omnidirectional	Factory
B	440578	Titley	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	4.0	45	0	34.95608	-82.98679	Zero Crossing
B	3.5	3.0	25	0	34.95457	-82.98892	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	-	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	350

Habitat Description

Mixed pine-hardwood forest along a ridge with a two-track trail running along the ridge. Forest approximately 40 years old. Creek 300 meters away. Abundance of saplings and shrubs in the understory.

Canopy Species

Large (cm):	30	**Small(cm):**	16	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	2			**Clutter:**	Moderate
Closure:	Moderate-Closed			*Robinia pseudoacia*	
Pinus virginiana				*Oxydendrum arboreum*	
Pinus strobus				*Pinus virginiana*	
Acer rubrum				*Acer rubrum*	
Prunus serotina				-	
Robinia pseudoacacia				-	

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek Pump Storage	**Site ID:**	AS-9
Date Retrieved:	6/9/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Josh Householder	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637042	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	5.0	116	0	35.02087	-83.01173	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Edge	
	-	
Roost Potential:	Low	
Roost Types:	Dead	
Water Source	**Type:**	Puddle
	Distance (m):	8

Habitat Description

Graveled lot adjacent to mature forest. Unit deployed along edge, facing large puddle formed from recent rains.

Canopy Species

Large (cm):	50	**Small(cm):**	8	**Type:**	Saplings/Branches
Percent > 40cm DBH:	5			**Clutter:**	Open-Moderate
Closure:	Open-Moderate			*Acer saccharum*	
Acer saccharum				*Liriodendron tulipifera*	
Liriodendron tulipifera				*Acer rubrum*	

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-10
Date Retrieved:	6/9/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Josh Householder	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637050	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	2.5	35	0	35.00973	-83.00021	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	-	
Roost Potential:	Moderate	
Roost Types:	Dead/Partial	
Water Source	**Type:**	Puddle
	Distance (m):	6

Habitat Description

End of road where three corridors meet. Deployed facing towards corridor intersection and puddles.

Canopy Species

Large (cm):	64	**Small(cm):**	25	**Type:**	Saplings/Branches
Percent > 40cm DBH:	25			**Clutter:**	Moderate-Closed
Closure:	Moderate			*Acer saccharum*	
Acer saccharum				*Oxydendrum arboreum*	
Quercus coccinea				*Acer rubrum*	
Liriodendron tulipifera					
Pinus strobus					

Subcanopy Species

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-11
Date Retrieved:	6/9/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Josh Householder	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637027	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	12.0	17	0	34.99510	-82.99811	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Edge	
	Corridor	
Roost Potential:	Low	
Roost Types:	Dead/Partial	
Water Source	**Type:**	Road Ruts
	Distance (m):	5

Habitat Description

Cleared area with a gravel road traveling along forest edge. Detector deployed in open area, parallel to edge facing towards canopy entrance (where road enters forest).

Canopy Species

Large (cm):	50	**Small(cm):**	20	**Type:**	Saplings/Branches
Percent > 40cm DBH:	15			**Clutter:**	Moderate-Closed
Closure:	Moderate-Closed			*Acer saccharum*	
Acer saccharum				*Robinia pseudoacacia*	
Liriodendron tulipifera				*Oxydendrum arboreum*	
Robinia pseudoacacia					

Subcanopy Species

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/3/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-12
Date Retrieved:	6/9/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Josh Householder	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637052	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	4.0	94	0	35.00831	-82.99342	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mixed Y/M	
Upland/Lowland:	Mixed U/L	
Other Habitats:	Edge	
	Corridor	
Roost Potential:	Moderate	
Roost Types:	Dead	
Water Source	**Type:**	Other
	Distance (m):	60

Habitat Description

Deployed on edge of mature forest where industrial area meets the lake. Deployed facing 94° towards industrial area and lake. Corridor entrance is directly next to detector.

Canopy Species

Large (cm):	45	**Small(cm):**	15	**Type:**	Saplings/Branches
Percent > 40cm DBH:	20			**Clutter:**	Moderate-Closed
Closure:	Moderate			*Acer rubrum*	
Liriodendron tulipifera				*Cornus florida*	
Querus coccinea				*Nyssa sylvatica*	

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/7/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-13
Date Retrieved:	6/11/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637021	Anabat Express	Titley	Omnidirectional	Factory
B	637045	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	3.0	342	0	34.96705	-83.00197	Zero Crossing
B	3.5	3.0	234	0	34.96731	-83.00006	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Edge	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:** Stream	
	Distance (m): 100	

Habitat Description

Acoustic site was set in a mixed hardwood/pine forest with lots of potential roosts in both living and dead trees. Site A was set up in an open field detecting along edge habitat. Site B was set within a corridor opening at an intersetion of two gravel roads.

Canopy Species

Large (cm):	51	**Small(cm):**	20	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	15			**Clutter:**	Open
Closure:	Open-Moderate			*Acer rubrum*	
Pinus strobus				*Rhododendron carolinianum*	
Liriodendron tulipifera				*Kalmia latifolia*	
Quercus montana				*Pinus virginiana*	
Quercus rubra				*Oxydendrum arboreum*	
Quercus alba				*Carya spp.*	

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/7/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-14
Date Retrieved:	6/11/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637049	Anabat Express	Titley	Omnidirectional	Factory
B	637044	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	3.0	257	0	34.97489	-82.996123	Zero Crossing
B	3.5	3.0	186	0	34.97451	-82.996321	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Corridor	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	100

Habitat Description

Acoustic units are set along a ridge road that leads to an open ROW. The forest surrounding the ridge road has many mature trees with high roost potential. Units were deployed in areas with minimal clutter along flyways.

Canopy Species

Large (cm):	50	**Small(cm):**	25	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	15			**Clutter:**	Open-Moderate
Closure:	Open-Moderate			*Tsuga canadensis*	
Pinus strobus				*Acer rubrum*	
Acer rubrum				*Oxydendrum arboreum*	
Pinus virginiana				*Faagus grandifolia*	
Quercus montana				*Magnolia tripetala*	
Quercus rubra				*Pinus strobus*	

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/7/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-15
Date Retrieved:	6/11/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637020	Anabat Express	Titley	Directional	Factory
B	440578	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	4.0	185	0	34.99261	-83.01646	Zero Crossing
A	3.5	4.0	183	0	34.99270	-83.01615	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	365

Habitat Description

AS-15a deployed off of ATV trail, facing 185° towards forested drain/corridor. AS-15b deployed along curve of ATV trail, facing 183° towards ATV trail corridor.

Canopy Species

Large (cm):	60	**Small(cm):**	20	**Type:**	Saplings/Branches
Percent > 40cm DBH:	15			**Clutter:**	Open-Moderate
Closure:	Moderate-Closed			*Acer saccharum*	
Liriodendron tulipifera				*Nyssa sylvatica*	
Pinus strobus					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/7/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-16
Date Retrieved:	6/11/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637043	Anabat Express	Titley	Directional	Factory
B	637040	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	8.0	160	0	34.95836	-82.98483	Zero Crossing
B	3.0	4.0	221	0	34.95980	-82.98276	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Young Stand	
Upland/Lowland:	Upland	
Other Habitats:	Edge	
	Corridor	
Roost Potential:	Moderate	
Roost Types:	Dead	
Water Source	**Type:**	Stream
	Distance (m):	475

Habitat Description

Detector A deployed along edge of ROW and forested area, facing along edge. Detector B deployed along small turnout along gravel USFS road, facing towards forested corridor entrance.

Canopy Species

Large (cm):	45	**Small(cm):**	3	**Type:**	Saplings/Branches
Percent > 40cm DBH:	2			**Clutter:**	Open-Moderate
Closure:	Closed			*Nyssa sylvatica*	
Pinus strobus				*Pinus strobus*	
Liriodendron tulipifera					

Subcanopy Species

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/13/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-17
Date Retrieved:	6/15/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	440578	Anabat Express	Titley	Omnidirectional	Factory
B	637020	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	4.0	274	0	34.99160	-83.02049	Zero Crossing
B	3.0	4.0	65	0	34.98968	-83.02126	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Stream	
	Corridor	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	5

Habitat Description

AS-17a deployed at intersection of Howard Creek and ATV trail, facing creek at an angle so that both the creek and creek corridor are sampled. AS-17b deployed along edge of of ATV trail facing towards widest section of trail.

Canopy Species

Large (cm):	45	**Small(cm):**	25	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	5			**Clutter:**	Moderate-Closed
Closure:	Open-Moderate			*Kalmia latifolia*	
Pinus strobus				*Liriodendron tulipifera*	
Betula nigra				*Acer saccharum*	
Liquidambar styraciflua					

Subcanopy Species

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/11/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-18
Date Retrieved:	6/13/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	63027	Anabat Express	Titley	Omnidirectional	Factory
B	63052	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	4.0	3.0	10	0	34.99936	-82.99892	Zero Crossing
B	4.0	3.0	156	0	34.99891	-82.99896	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Pasture	
	Edge	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	350

Habitat Description

Open field near a powerline ROW, about 1-2 acres in size, surrounded by mature hardwood forest. A paved road, Bad Creek Rd, is to the east. Rock outcroppings with crevices also present relatively close by.

Canopy Species

Large (cm):	45	**Small(cm):**	8	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	10			**Clutter:**	Open
Closure:	Open			*Oxydendrum arboreum*	
Quercus montana				*Acer rubrum*	
Nyssa sylvatica				*Robinia pseudoacacia*	
Acer rubrum				*Quercus velutina*	
Robinia pseudoacacia					
Pinus rigida					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/11/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-19
Date Retrieved:	6/13/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637020	Anabat Express	Titley	Directional	Factory
B	440578	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	4.0	0	90	34.99201	-83.01171	Zero Crossing
B	3.5	4.0	176	0	34.99180	-83.01146	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	High	
Roost Types:	Dead	
Water Source	**Type:**	Stream
	Distance (m):	555

Habitat Description

AS-19a deployed in small forest interior opening, facing up. AS-19b deployed on edge of corridor (ATV trail) facing 176°.

Canopy Species

Large (cm):	50	**Small(cm):**	30	**Type:**	Saplings/Branches
Percent > 40cm DBH:	2			**Clutter:**	Moderate-Closed
Closure:	Moderate-Closed			*Acer saccharum*	
Quercus montana				*Oxydendrum arboreum*	
Pinus strobus					
Quercus coccinea					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/11/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-20
Date Retrieved:	6/13/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637019	Anabat Express	Titley	Omnidirectional	Factory
B	620359	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	5.0	189	0	34.99108	-83.00696	Zero Crossing
B	3.5	5.0	92	0	34.98997	-83.00609	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Edge	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	405

Habitat Description

AS-20a deployed along ATV trail, facing towards forest interior gap/edge. AS-20b deployed along ATV trail, facing towards corridor.

Canopy Species

Large (cm):	55	**Small(cm):**	35	**Type:**	Saplings/Branches
Percent > 40cm DBH:	25			**Clutter:**	Open-Moderate
Closure:	Open-Moderate			*Liriodendron tulipifera*	
Cary tomentosa				*Acer saccharum*	
Quercus alba					
Pinus strobus					
Quercus coccinea					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/11/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-21
Date Retrieved:	6/13/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637049	Anabat Express	Titley	Omnidirectional	Factory
B	637044	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	3.0	33	0	34.97606	-82.99362	Zero Crossing
B	3.5	3.0	228	0	34.97593	-82.99406	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Edge	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	205

Habitat Description

Site AS-21 is set along a ridgeline flyway that follows a dirt road. The road meanders along the ridge top leading to an open ROW with high voltage lines. Detector A is located in a wide spot in the road with microphone facing down the pathway. Detector B is set within the road corridor facing towards the open ROW.

Canopy Species

Large (cm):	61	**Small(cm):**	20	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	20			**Clutter:**	Open-Moderate
Closure:	Open-Moderate			*Acer rubrum*	
Pinus strobus				*Pinus virginiana*	
Liriodendron tulipifera				*Rhododendron spp.*	
Acer rubrum				*Kalmia latifolia*	
Quercus alba				*Quercus stellata*	
Pinus virginiana				*Quercus rubra*	

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/12/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-22
Date Retrieved:	6/14/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637045	Anabat Express	Titley	Directional	Factory
B	637021	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	3.0	100	0	35.01091	-83.00872	Zero Crossing
B	3.5	3.0	98	0	35.01096	-83.00911	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Edge	
	Corridor	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Pond
	Distance (m):	50

Habitat Description

Acoustic units are set in an upland forest with corridors that run between dam built of boulders and an open field. Unit A is set within an open trail that leads to a larger field. Unit B is set detecting along the edge of the forest.

Canopy Species

Large (cm):	53	**Small(cm):**	20	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	15			**Clutter:**	Open-Moderate
Closure:	Open-Moderate				
Liriodendron tulipifera					
Acer rubrum					
Pinus strobus					
Quercus montana					
Quercus rubra					

Subcanopy Species

Pinus virginiana
Acer rubrum
Oxydendrum arboreum
Faagus grandifolia
Magnolia tripetala
Pinus strobus

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/11/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-23
Date Retrieved:	6/13/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637050	Anabat Express	Titley	Omnidirectional	Factory
B	637042	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	295	0	35.00327	-83.00511	Zero Crossing
B	3.0	3.0	98	0	35.00311	-83.00504	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	-	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	200

Habitat Description

Mature hardwood forest near a substation. Corridor running through it, a two-track trail, running beside a dry ephemeral drainage.

Canopy Species

Large (cm):	48	**Small(cm):**	18	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	30			**Clutter:**	Moderate
Closure:	Moderate-Closed				

Subcanopy Species

Acer rubrum
Quercus rubra
Kalmia latifolia

Liriodendron tulipifera
Juglans nigra
Acer rubrum
Quercus alba
Quercus coccinea

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/11/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-24
Date Retrieved:	6/13/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637040	Anabat Express	Titley	Omnidirectional	Factory
B	637043	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	110	0	35.00867	-82.99857	Zero Crossing
B	3.0	3.0	195	0	35.00823	-82.99839	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	300

Habitat Description

Mature deciduous forest with a corridor (two-track trail) running through it. Unit A was placed on the corridor, Unit B was placed in a gap in the interior of the forest.

Canopy Species

Large (cm):	50	**Small(cm):**	9	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	40			**Clutter:**	Moderate
Closure:	Closed				
Quercus rubra					
Fagus grandifolia					
Acer rubrum					
Quercus alba					
Liriodendron tulipifera					

Subcanopy Species

Kalmia latifolia
Acer rubrum
Oxydendrum arboreum

ACCOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/13/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-25
Date Retrieved:	6/18/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637042	Anabat Express	Titley	Directional	Factory
B	637040	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	4.0	350	0	34.98908	-82.99954	Zero Crossing
B	3.0	4.0	180	0	34.99012	-82.99960	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	150

Habitat Description

Mature pine-hardwood forest with a corridor running parallel to a powerline along a ridge above Lake Jocassee. Spring head somewhat close, 150 meters.

Canopy Species

Large (cm):	50	**Small(cm):**	9	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	25			**Clutter:**	Moderate
Closure:	Closed				
Acer rubrum					
Quercus coccinea					
Quercus velutina					
Nyssa sylvatica					
Pinus rigida					

Subcanopy Species

Kalmia latifolia
Pinus strobus
Acer rubrum

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/13/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-26
Date Retrieved:	6/15/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637027	Anabat Express	Titley	Directional	Factory
B	637052	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	350	0	34.99389	-82.99246	Zero Crossing
B	3.0	3.0	50	0	34.99400	-82.99209	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Pond
	Distance (m):	200

Habitat Description

Mature hardwood forest with an open to moderatley cluttered understory and midstory. Dry ephemeral drainage running through the acoustic site. Paved Road leading to Lake Jocassee. Corridor, an old trail is where Unit B is located, Unit A is located in a gap in the forest.

Canopy Species

Large (cm):	55	**Small(cm):**	10	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	40			**Clutter:**	Open-Moderate
Closure:	Closed			*Oxydendrum arboreum*	
Quercus alba				*Acer rubrum*	
Acer rubrum				*Pinus virginiana*	
Quercus coccinea				*Kalmia latifolia*	
Nyssa sylvatica				*Rhododendron maximum*	
Liriodendron tulipifera					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/14/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-27
Date Retrieved:	6/16/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637043	Anabat Express	Titley	Directional	Factory
B	637050	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	85	0	34.93822	-82.94901	Zero Crossing
B	3.0	3.0	160	0	34.93802	-82.94887	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Edge	
Roost Potential:	Moderate	
Roost Types:	Live/Partial	
Water Source	**Type:**	Stream
	Distance (m):	200

Habitat Description

Mature mixed hardwood/pine forest adjacent to a powerline ROW. Shrubs and saplings clutter the understory. McKinney Creek is within a half a mile, but due to safety reasons was inaccessible..

Canopy Species

Large (cm):	45	**Small(cm):**	8	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	15			**Clutter:**	Moderate-Closed
Closure:	Closed				
Liriodendron tulipifera					
Quercus velutina					
Quercus rubra					
Pinus rigida					
Pinus strobus					

Subcanopy Species

Kalmia latifolia
Pinus strobus
Acer rubrum
Robinia pseudoacacia
Oxydendrum arboreum

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/13/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-28
Date Retrieved:	6/15/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	620359	Anabat Express	Titley	Directional	Factory
B	637019	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	62	0	34.99037	-83.00322	Zero Crossing
B	3.0	3.0	195	0	34.98944	-83.00278	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Mixed U/L	
Other Habitats:	Corridor	
	Stream	
Roost Potential:	High	
Roost Types:	Dead	
Water Source	**Type:**	Stream
	Distance (m):	5

Habitat Description

Mature mixed hardwood/pine forest adjcacent to Howard Creek. AS-28a placed inside forest interior corridor that spurs off of ATV trail, facing towards ATV trail. AS-28b deployed on creek bank facing towards open canopy area over creek.

Canopy Species

Large (cm):	60	**Small(cm):**	35	**Type:**	Saplings/Branches
Percent > 40cm DBH:	15			**Clutter:**	Open-Moderate
Closure:	Moderate-Closed			*Liriodendron tulipifera*	
Liriodendron tulipifera				*Liquidambar styraciflua*	
Acer saccharum				*Carpinus caroliniana*	
Pinus strobus					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/13/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-29
Date Retrieved:	6/15/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Eli Corwin		**Deployment Biologists:**	Eli Corwin, Jose Mata	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637044	Anabat Express	Titley	Directional	Factory
B	637049	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	3.0	143	0	34.94082	-82.92448	Zero Crossing
B	3.5	3.0	260	0	34.94079	-82.92493	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Edge	
	Corridor	
Roost Potential:	Moderate	
Roost Types:	Live/Dead	
Water Source	**Type:**	Pond
	Distance (m):	175

Habitat Description

Acoustic units are set in an upland forest that has been partially cleared for driveways and home building sites. There is lots of edge habitat and open forest interior in the area. Unit A was deployed along the edge of a field that is an open flyway and eventually leads to a lake. Unit B was set at an intersection of grass roads that connect small corridors and lead to larger fields.

Canopy Species

Large (cm):	60	**Small(cm):**	25	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	30			**Clutter:**	Open-Moderate
Closure:	Open-Moderate				
Liriodendron tulipifera					
Pinus strobus					
Quercus alba					
Quercus montana					
Quercus rubra					

Subcanopy Species

Quercus rubra
Acer rubrum
Quercus alba
Faagus grandifolia
Rhododendron spp.
Pinus strobus

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/18/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-30
Date Retrieved:	6/20/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	SN637040	Anabat Express	Titley	Omnidirectional	Factory
B	SN637052	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	30	0	34.98725	-82.99828	Zero Crossing
B	3.0	3.0	340	0	34.98738	-82.99866	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Stream	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	100

Habitat Description

Mature forest on a ridge uphill from a cove with a presence of eastern hemlock and a spring leading to Lake Jocassee. Corridor is a two-track trail running through the forest occasionally intersecting with trails off the powerline ROW.

Canopy Species

Large (cm):	50	**Small(cm):**	9	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	30			**Clutter:**	Moderate
Closure:	Closed				
Acer rubrum					
Tsuga canadensis					
Pinus strobus					
Quercus coccinea					
Nyssa sylvatica					

Subcanopy Species

Kalmia latifolia
Pinus strobus
Acer rubrum
Carya tomentosa
Quercus rubra

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/15/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-31
Date Retrieved:	6/18/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637042	Anabat Express	Titley	Omnidirectional	Factory
B	637052	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	145	0	34.98457	-82.99711	Zero Crossing
B	3.0	3.0	200	0	34.98383	-82.99693	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Edge	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	200

Habitat Description

Mature hardwood forest with a corridor (two-track trail) running parallel to a powerline ROW. Lake Jocassee is just down hill 500m.

Canopy Species

Large (cm):	50	**Small(cm):**	10	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	30			**Clutter:**	Moderate
Closure:	Moderate-Closed				
Acer rubrum					
Liriodendron tulipifera					
Nyssa sylvatica					
Quercus coccinea					
Quercus velutina					

Subcanopy Species

Kalmia latifolia
Acer rubrum
Quercus rubra

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/15/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-32
Date Retrieved:	6/18/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637049	Anabat Express	Titley	Omnidirectional	Factory
B	637044	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	4.0	3.0	145	0	34.93844	-82.95148	Zero Crossing
B	4.0	3.0	155	0	34.93851	-82.95178	Zero Crossing

Habitat Types

Forest:	Deciduous	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	-	
Roost Potential:	High	
Roost Types:	Live/Dead	
Water Source	**Type:**	Stream
	Distance (m):	200

Habitat Description

Mature pine-hardwood, highly cluttered forest to the north of the powerline ROW. Units are placed in a field and near a small stream.

Canopy Species

Large (cm):	50	**Small(cm):**	10	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	30			**Clutter:**	Moderate
Closure:	Moderate-Closed				
Acer rubrum					
Liriodendron tulipifera					
Pinus strobus					
Pinus virginiana					
Quercus velutina					

Subcanopy Species

Kalmia latifolia
Acer rubrum
Quercus rubra

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/15/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-33
Date Retrieved:	6/18/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637020	Anabat Express	Titley	Directional	Factory
B	440578	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	5.0	218	0	34.99037	-83.00322	Zero Crossing
B	3.0	3.0	50	0	34.98944	-83.00278	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Mixed U/L	
Other Habitats:	Corridor	
	Other	
Roost Potential:	Low	
Roost Types:	Dead	
Water Source	**Type:**	Other
	Distance (m):	30

Habitat Description

AS-33a deployed facing parallel with edge between forest and mowed/cleared area directly adjacent to Lake Jocassee. AS-33b deployed next to Lake Jocassee shoreline facing towards lake and small corridor.

Canopy Species

Large (cm):	60	**Small(cm):**	30	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	5			**Clutter:**	Closed
Closure:	Moderate-Closed			*Acer rubrum*	
Robinia pseudoacacia				*Carya cordiformis*	
Acer rubrum					
Liriodendron tuplipifera					
Quercus rubra					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/15/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-34
Date Retrieved:	6/18/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	Jay Deatherage		**Deployment Biologists:**	Jay Deatherage, Luke Carey	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637019	Anabat Express	Titley	Omnidirectional	Factory
B	620359	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.5	5.0	145	0	34.95684	-82.91498	Zero Crossing
B	3.5	5.0	250	0	34.95500	-82.91690	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mixed Y/M	
Upland/Lowland:	Upland	
Other Habitats:	Edge	
	-	
Roost Potential:	Low	
Roost Types:	Live/Partial	
Water Source	**Type:**	Other
	Distance (m):	40

Habitat Description

AS-34a deployed between forest edge and concrete road directly adjacent to Lake Jocassee, facing slight curve in road. AS-34b deplyed on mowed area adjacent to forest edge and ROW, facing parallel with edge.

Canopy Species

Large (cm):	45	**Small(cm):**	30	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	2			**Clutter:**	Moderate-Closed
Closure:	Moderate-Closed			*Acer rubrum*	
Quercus rubra				*Robinia pseudoacacia*	
Liriodendron tulipifera					
Liquidambar sytraciflua					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/18/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-35
Date Retrieved:	6/20/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	637049	Anabat Express	Titley	Omnidirectional	Factory
B	637044	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	4.0	149	0	34.93573	-82.93078	Zero Crossing
B	3.0	4.0	281	0	34.93592	-82.93132	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	Moderate	
Roost Types:	Live/Partial	
Water Source	**Type:**	Stream
	Distance (m):	300

Habitat Description

30-40 year old pine-hardwood forest with a powerline ROW running through the middle of it. Unit A is placed on a forested corridor leading to the powerline ROW. Unit B is placed on the edge of a field.

Canopy Species

Large (cm):	45	**Small(cm):**	6	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	10			**Clutter:**	Moderate-Closed
Closure:	Open-Moderate			*Pinus virginiana*	
Pinus virginiana				*Oxydenrdrum arboreum*	
Pinus taeda				*Acer rubrum*	
Acer rubrum					
Liriodendron tulipifera					
Pinus rigida					

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/18/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-36
Date Retrieved:	6/20/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel, Alexander Green	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	620359	Anabat Express	Titley	Directional	Factory
B	637019	Anabat Express	Titley	Omnidirectional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	4.0	196	0	34.94830	-82.92174	Zero Crossing
B	3.0	4.0	90	0	34.94724	-82.92153	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	Moderate	
Roost Types:	Live/Partial	
Water Source	**Type:**	Stream
	Distance (m):	300

Habitat Description

30-40 year old pine-hardwood forest with a powerline ROW running through the middle of it. Unit A is placed on a forested corridor leading to the powerline ROW. Unit B is placed on the edge of the powerline ROW and a small forest trail.

Canopy Species

Large (cm):	45	**Small(cm):**	6	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	10			**Clutter:**	Moderate-Closed
Closure:	Open-Moderate				
Pinus virginiana					
Pinus taeda					
Acer rubrum					
Liriodendron tulipifera					
Pinus rigida					

Subcanopy Species

Pinus virginiana
Oxydenrdrum arboreum
Acer rubrum

ACOUSTIC SITE DATA SHEET

Site Information

Date Deployed:	6/18/2024	**Project Name:**	Bad Creek Pumped Storage	**Site ID:**	AS-37
Date Retrieved:	6/20/2024	**State:**	SC	**County:**	Oconee
Selection Biologists:	John Manuel		**Deployment Biologists:**	John Manuel	

Detector Information

Unit ID	Serial #	Detector Brand/Model	Microphone Brand/Model	Microphone Type	Type of Weatherproofing
A	440578	Anabat Express	Titley	Omnidirectional	Factory
B	637020	Anabat Express	Titley	Directional	Factory

Microphone Deployment

Unit ID	Height (m)	Distance (m)	Horizontal (°)	Vertical (°)	Latitude (DD)	Longitude (DD)	Call Collection
A	3.0	3.0	246	0	34.93553	-82.92680	Zero Crossing
B	3.0	3.0	76	0	34.93659	-82.92586	Zero Crossing

Habitat Types

Forest:	Mixed D/C	
Age:	Mature Stand	
Upland/Lowland:	Upland	
Other Habitats:	Corridor	
	Other	
Roost Potential:	Moderate	
Roost Types:	Live/Partial	
Water Source	**Type:**	Stream
	Distance (m):	300

Habitat Description

30-40 year old pine-hardwood forest with a powerline ROW running through the middle of it. Unit A is placed on the junction of a corridor and an edge. Unit B is placed in a gap in the canopy in the forest interior.

Canopy Species

Large (cm):	45	**Small(cm):**	6	**Type:**	Saplings/Shrubs
Percent > 40cm DBH:	10			**Clutter:**	Moderate-Closed
Closure:	Open-Moderate				
Pinus virginiana					
Pinus taeda					
Acer rubrum					
Liriodendron tulipifera					
Pinus rigida					

Subcanopy Species

Pinus virginiana
Oxydenrdrum arboreum
Acer rubrum

Bad Creek Pumped Storage presence/absence Acoustic and mist-net surveys for threatened & endangered bat species

APPENDIX F
USFWS Approved Study Plan

PRESENTED TO

Eric Mularski
Environmental Sciences & Planning Manager
HDR
440 South Church Street, Suite 1200
Charlotte, NC 28202-2075

BY

BIOTOPE FORESTRY & ENVIRONMENTAL
Nacogdoches, TX | Chattanooga, TN

U.S. Fish and Wildlife Service

Study Plan Form for Bat Surveys and Monitoring (v. 2.1)[1]

PROJECT & SURVEY INFORMATION

Project Name: Bad Creek II Power Complex

Proposed Survey Start Date: May 2024

Project Proponent's Name (e.g., client/company/institution): Duke Energy

Project Location: State(s): South Carolina

County(s): Oconee

Latitude: 35.008647

Longitude: -83.004316

REQUIRED: Attach or provide links to Google Earth® KMZ files (preferred) and/or shapefiles (mapping must show project boundaries, impacted forest habitat (if known) and all proposed survey sites)
Files are attached: Yes ☑ No ☐
File Links: _____

Project Summary. In the space provided below, please provide a description of the proposed action, including any activities that will permanently or temporarily alter the current environment and existing habitat features.

See attached.

CONTACT INFORMATION

Project Manager/Primary Point of Contact (POC): James McRacken (Duke Energy)

Phone: 980.875.5279

Field Survey Crew Leader (if different from POC): Dylan Brooks (Biotope)

Cell Phone: 704.996.8671

Institution/Company Name: Duke Energy

Mailing Address: 1339 Hagers Ferry Road (MG03A3) Huntersville, NC 28078

POC Email Address: james.mcracken@duke-energy.com

USFWS Sec. 10(a)(1)(A) Permit No.(s) (if applicable): TE-81492B-1, TE88227B-1

State Permit No.(s) (if applicable): To be acquired. Awaiting approval

[1] Unless otherwise directed by the Service, surveyors may complete this fillable form, in lieu of a traditional narrative format, and submit it (and supporting files) to the Ecological Services Field Office in the state(s) where the work is to be completed (https://www.fws.gov/our-facilities). Use of this form is not a requirement at this time. Our goal is to improve pre-survey coordination and to expedite the Field Office review and approval process. Please submit your study plan at least 15 working days in advance of your proposed survey start date. Suggestions for improving this document may be sent to R4_Bat_Survey_Guidance@fws.gov.

Have project proponents been informed that abiding by protective time-of-year restrictions (where available) may be sufficient to avoid take of federally listed bats and (in some cases) may negate the need for a bat survey? Yes☑ No☐

Have project proponents been informed that the Service does not require presence/probable absence surveys for federally listed species and that presence can be assumed in a project area containing suitable habitat? Yes☑ No☐

Will this survey be conducted on private or public lands? *(Check both if applicable)*: Private☑ Public☑

Has permission of all necessary landowners/managing agencies been obtained? Yes☑ No☐

If no, explain: _____

Does this project have a federal nexus[2]? Yes☑ No☐ Unsure☐

If yes, explain: FERC (No.2740) Relicensing and USACE Section 404 Individual Permit

IPaC[3] Consultation Code (if applicable): 2024-0079174

Purpose of Survey: Official P/A Survey☑ Research☐ Monitoring☐
Educational Outreach/Training Other: _____

Survey Target Species: Indiana bat (IBAT)☐ Northern long-eared bat (NLEB)☑
Tricolored bat (TCB)☑ Other: Gray Bat

Has a Phase-1 Habitat Assessment* of the project area been conducted? Yes☑ No☐
If yes, how was the habitat assessment conducted? Field☑ Desktop☑ Combo☑
*(*if available, attach a written report)*

Is suitable habitat[4] present (or assumed present) for all "target" species? Yes☑ No☐

If no, explain: _____

Does this project fall within the outer-tier[5] of any "target" species known home range? Yes☐ No☑ Unsure☐

If yes, which species: _____

Project Configuration

Is this project **linear** (>1 km in total length)? Yes☑ No☐ Combo☐ Unsure☐

If yes, how many 1-km sections containing suitable IBAT/NLEB habitat will be impacted? 45

Is this project **non-linear**? Yes☑ No☐ Combo☐ Unsure☐

If yes, how many acres of suitable IBAT/NLEB habitat is in the overall project area? 179.3

If yes, how many acres of suitable IBAT/NLEB habitat will be directly impacted/cleared? 179.3

PROPOSED METHODS & SURVEY LEVEL OF EFFORT[6]

ACOUSTICS

Total number of detector sites proposed to be surveyed: 37 Number of detector nights/site: linear-4, nonlinear-3

[2] A project or action that is carried out, authorized, funded, and/or permitted by a federal agency.
[3] https://ipac.ecosphere.fws.gov/
[4] See Appendix A of the Guidelines regarding suitable habitat definitions.
[5] See Appendix G of the Guidelines if you are unclear what the out-tier of a known range includes.
[6] Survey level of effort (acoustic or netting) must be spread over at least two calendar nights/survey site.

Total number of detector nights for entire survey: 144

Total proposed number of calendar nights to complete the entire survey: 12

Detector(s) (Brand, Model): Anabat Express Microphone(s): directional ☑ omnidirectional ☑

Recording Format: Full Spectrum ☑ Zero-Crossing ☐

FWS-Approved[7] Acoustic Bat ID Software: KPro vers. 5.6.3 KPro Classifier, NA vers. 5.4 BCID vers.____
Other Candidate Programs (e.g., Sonobat) vers.: _____

Species to be included for automatic software ID classification analysis:

EPFU☑ CORA☑ COTO☐ LABO☑ LACI☑ LANO☑ LASE☑ TABR☑ MYCI☐ MYEV☑ MYGR☑ MYLU☑
MYLE☑ MYSE☑ MYSO☐ MYTH☐ MYVO☐ NYHU☑ PESU☑ Others: MYAU

Will qualitative analysis (i.e., manual vetting) be used? Yes☑ No☐ Unsure☐

Name(s) of qualified biologist(s) conducting qualitative/manual identifications (attach resume or link with qualifications):
Dylan Brooks, John Manuel, Patrick Eli Corwin (resumes attached)

MIST-NETTING

Total number of net sites to be surveyed: 15 Total number of net nights/site: 4, one site with 5

Total number of net nights for entire survey (No. of sites X No. of net nights/site): 61

Total proposed number of calendar nights to complete the entire survey: 10 (3 teams)

A) Maximum number of net set-ups that will be operated/checked (10-min interval) on a given calendar night at a given survey site: 3
B) Minimum Number of personnel present to operate/check X (see A) net set-ups on a given site: 2
C) Proposed Staffing Rate (A divided by B): 1.5

Staffing Rate

Number of Section 10-permitted biologists per net site (or state-permitted in USFWS R5): 1

Do you propose to band bats? Yes☐ No☑

If yes, please answer the following:

What species will be banded? COTO☐ MYGR☑ MYLU☑ MYSE☑ MYSO☐ PESU☑
Others:_____ All captured bats:
If banding *Myotis* sp. or PESU, specify band size: _____
Describe your proposed bands (color and letter-numbers) and banding scheme: _____
Will banding pliers be used? Yes☐ No☐

Will any biological samples be collected from captured bats (e.g., guano, hair, swab, wing punch)? Yes☐ No☑

If yes, explain: _____

Name of institution or facility to conduct DNA analysis: _____

RADIO-TRACKING

Will any bats be radio-tagged and tracked? Yes☐ No☑

[7] https://www.fws.gov/media/automated-acoustic-bat-id-software-programs

If yes, please answer following:

Which species will be radio-tagged? _____
Name of USFWS Section 10 permitted biologist(s) who will apply transmitter(s): _____
Make/model and approximate weight of transmitter(s) to be used: _____
Manufacturer date and estimated life-span of transmitters to be used: _____
Frequency range (MHz) of transmitters (e.g., 150.xxx or 172.xxx): _____
If radio-tracking multiple targeted bats/species, what criteria will be used in selecting which bats will be tracked?
_____
Will all radio-tagged bats be tracked (min. of 4-hrs. search effort/day) to their diurnal roosts for the minimum recommended period of 7 days? Yes☐ No☐
If no, explain: _____
Will night-time foraging data/telemetry be collected? Yes☐ No☐
Glue used for attaching transmitters: Type: Latex-based Surgical Cement Name: Ostobond
Manufacturer: Montreal Ostomy Product Other: _____

EMERGENCE SURVEYS

After diurnal roost sites of radio-tagged bats are identified, will emergence surveys be conducted at each identified roost (assuming landowner permission is obtained)? Yes☐ No☐

If yes, how many emergence surveys/roost? _____

Have you identified a small number (e.g., ≤10) of potentially suitable roost trees* that you propose to conduct emergence surveys for? Yes☐ No☐

*(*If yes, provide photographs of each tree documenting that all of the tree can be observed by the surveyor along with coordinates (lat/long and/or KML/shapefile) of all trees to be surveyed.)*

POTENTIAL HIBERNACULA SURVEYS

Are you aware of any known hibernacula used by the target species within the project area itself or nearby?

Yes☐ No☑ Unknown☐

If yes or unknown, list sites or explain: _____

Has your desktop analysis identified any natural or man-made features that could be used as a hibernaculum by any of the target bat species? Yes☐ No☐ Unknown☐

If yes, underground features (e.g., caves, mines, tunnels, bunkers, cisterns) present: Yes☐ No☐
If yes, above-ground features* (e.g., crawl spaces) present: Yes☐ No☐
If unknown, explain: _____

Are you requesting approval of a field survey for potential hibernacula at this time? Yes*☐ No☐
*(*If yes, attach a separate narrative explaining how the project area(s) will be surveyed for potential hibernacula.)*

Are you submitting the results of a Phase 1 Habitat Assessment of potentially suitable hibernacula identified from field surveys? Yes*☐ No☐
*(*If yes, provide a Phase 1 Habitat Assessment Data Sheet for each potential hibernaculum/portal(s)[8] identified to be surveyed.)*

BRIDGE & CULVERT ASSESSMENTS

Will any bridges or culverts be surveyed for bat presence? Yes☐ No☑

If yes, please answer the following:

[8] If multiple cave entrances/portals, please list all locations.

Structure type(s) (check all that apply): Bridge☐ Culvert☐ Other☐
If "other", explain: _____

Survey methodology for structure(s) (check all that apply):
Visual inspection☐ Guano collection☐ Emergence survey☐ Acoustics*☐
Mist-net*☐ Harp-trap*☐ Other _____
*(*Due to site-specific conditions of structures, coordination with the local USFWS Field Office and appropriate state agency(ies) is necessary before proceeding with these survey methodologies)*

Will guano be collected and analyzed to confirm species ID? Yes☐ No☐
If "yes", name of institution/entity performing analysis: _____

ADDITIONAL SURVEY INFORMATION[9]

Will the proposed bat survey deviate from the current version of the USFWS Survey Guidelines?[10] Yes☐ No☑

If yes, provide justification for any departures or modifications to the guidelines (if applicable) below:

I hereby acknowledge that the information being provided to the Service is accurate and complete as of today's date.

Signature: _____ Date (*Original*): 5/7/2024

Date (*Revised*): 5/24/2024

[9] Attach additional pages to this form, if needed.

[10] Proposed surveys deviating from the current Range-wide IBAT & NLEB Survey Guidelines will only be accepted with a thoroughly described justification. Coordinate with your local USFWS Field Office (https://www.fws.gov/our-facilities) for acceptable modifications.

********FOR U.S. FISH AND WILDLIFE SERVICE USE ONLY**********

United States Department of the Interior

Fish and Wildlife Service

Generic ES Field Office

Street Address

General Office Phone:

SITE-SPECIFIC AUTHORIZATION - BAT WORK

Our Field Office has reviewed your study plan and found it to contain sufficient information for our approval. When signed, this statement serves as your site-specific authorization to conduct the proposed activities at the specified locations included in the attached Study Plan Form and supporting files and must be carried with your federal permit when conducting work for this project. All activities must be carried out with strict adherence to permit conditions and authorizations specified in your federal permit as well as your state permit(s) (if needed). The section 10(a)(1)(A) permit authorizing the activities must remain with the surveyor at all times. This authorization is not valid if you have not obtained permission from the owner of the lands where activities will occur.

For federal permit reporting purposes, please use the appropriate USFWS bat survey data spreadsheet, available on the IBAT and NLEB Summer Survey Guidance website[1]. To mitigate the risk of humans transmitting viruses (e.g., SARS-CoV-2) to bats or viral transmission from bats to humans, the U.S. Fish and Wildlife Service requests anyone directly handling or working in close proximity to bats follow current guidelines prepared by the CDC[2] and IUCN Bat Specialist Group[3] in addition to the following the standard WNS decontamination protocols[4].

If the work expands beyond the scope of your original study plan or if there are adverse effects to bats that were not anticipated, cease all survey and/or research activities, and contact this office prior to continuing. Additionally, if a federally listed bat is captured, this USFWS Field Office must be notified within 48 hours with information regarding species, sex, age, and whether or not the bat has a transmitter attached.

Field Office POC: _____

email: _____ phone:_____

☐ **Authorized as Proposed**

☐ **Authorized with Conditions** (see below)

You are authorized to proceed provided that the following adjustment(s) and/or conditions are met.

☐ **Not Authorized.**

Comments:

Signature & Date:

NOTE: Please check the appropriate box above before signing/locking the document.

[1] https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines
[2] https://www.cdc.gov/healthypets/covid-19/wildlife.html
[3] https://www.iucnbsg.org/uploads/6/5/0/9/6509077/amp_recommendations_for_researchers_final.pdf
[4] https://www.whitenosesyndrome.org/mmedia-education/national-wns-decontamination-protocol-u-s

Project Summary

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Project Purpose and Summary

Duke Energy's Bad Creek Pump Storage Project (Bad Creek or Project), FERC Project No. 2740, is located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee, licensed as part of the Duke Energy Keowee-Toxaway (KT) Hydroelectric Project (FERC Project No. 2503), serves as the lower reservoir. The structures and features included in the Bad Creek Project License include the upper reservoir and dams, inlet/outlet structures in the upper and lower reservoirs, water conveyance system, underground powerhouse, tailrace tunnels, transmission facilities, and an approximately 9.25-mile-long transmission line corridor extending from Bad Creek to the KT Project's Jocassee switchyard.

The Project is operated by Duke Energy under the terms of an Original License issued by the FERC on August 1, 1977, as subsequently amended. The Original License for the existing Project expires on July 31, 2027, therefore the Project is currently undergoing relicensing through the FERC Integrated Licensing Process (ILP) for continued operation of the Project over the new 40 to 50-year license term.

Given the need for additional significant energy storage and renewable energy generation across Duke Energy's service territories over the Project's new license term, Duke Energy is evaluating opportunities to add pumping and generating capacity at the Project. Additional energy storage and generation capacity could be developed by constructing a new power complex (including a new underground powerhouse) adjacent to the existing Bad Creek Powerhouse. Construction of the 1,400-MW Bad Creek II Power Complex (Bad Creek II Complex) is, therefore, an alternative relicensing proposal presently being evaluated by Duke Energy.

The relicensing for the Project which included the proposal for the Bad Creek II Complex was initiated in February 2022 with the filing of the Pre-Application Document. Throughout the relicensing, various state and federal government resource agencies, Indian Tribes, non-governmental organizations, and other interested parties (stakeholders) have been consulted for identification of potential resources areas of interest and informational needs. In consideration of the New License, formal consultation under Section 106 of the National Historic Preservation Act (NHPA) and Section 7 of the Environmental Species Act will be initiated.

If Duke Energy decides to pursue the Bad Creek II Complex and obtains all necessary regulatory approvals for construction, the period for construction of the Bad Creek II Complex is expected to span approximately 7 years. Assuming commencement of construction shortly following the New FERC License issuance by July 2027, the Bad Creek II Complex is expected to be fully in service in 2034.

Purpose of Survey

Construction of the proposed Bad Creek II Complex will require the removal of trees, potentially impacting suitable habitat for state and federally protected bats. Mist-net surveys and acoustic surveys will be used to assess the presence/probable absence (P/A) of the federally proposed tricolored bat (*Perimyotis subflavus*) and federally endangered northern long-eared bat (*Myotis septentrionalis;* NLEB) as well as state listed species of concern known to be present in Oconee

County, including little brown bat (*Myotis lucifugus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii),* tricolored bat, hoary bat (*Lasiurus cinereus*), and gray bat (*Myotis grisescens).* The project area is in the seasonal range (non-coastal area) for the NLEB and tricolored bat. The survey will follow the 2024 Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines.[1]

Existing Habitats

The Project Area is located in the Blue Ridge ecoregion with upland areas that support mixed hardwoods-pine forests including species as Virginia pine, short-leaf pine, pitch pine, white pine, chestnut oak, scarlet oak, northern red oak, black oak, and hickories. Mountain laurel and rhododendron are common understory species. Riparian areas and ravines and steep slopes adjacent to stream channels in forested areas and support hardwood forests that contain tulip poplar, red maple, white oak, northern red oak, American beech, and sweetgum with common understory species that include eastern hemlock, rhododendron, mountain laurel, birch, sourwood, black cherry, doghobble, sassafras, spicebush, and huckleberry.

Suitable summer habitat for NLEB including potential roost trees and snags as well as foraging and commuting habitats are located throughout the Project Area. Existing suitable tricolored bat roost, forage, and travel habitat found in the Project Area included a variety of forested habitats, riparian corridors, and adjacent non-forested habitats including open areas, shrub lands including existing right of ways, and access roads through existing forested areas.

The potential impact area contains suitable summer habitat, as outlined by 2024 USFWS guidelines, that require bat surveys according to linear and non-linear project protocols since tree clearing needs to take place during the restricted cutting timeframes.

Proposed Impact Areas

Spoil Areas: Excavation required for construction of the Bad Creek II Complex will result in a significant quantity of earth and rock (or "spoil") material (4.4 million cubic yards) to be generated. Duke Energy is presently evaluating a range of upland areas within the FERC Project Boundary and/or on property owned by Duke Energy adjacent to the Project Boundary for spoil of excavated earth and additional rock (spoil areas). Construction of the proposed Bad Creek II Complex infrastructure and selected spoil areas will require vegetative clearing. Spoil area alternatives are currently under evaluation and not all spoil alternatives detailed in the attached Google Earth® KMZ files or in Table 1 will be utilized. Some potential spoil areas are within the existing footprint of spoil areas created for the original Project. A vegetative restoration plan will be developed and implemented for the spoil areas following construction.

Temporary Access Road: Duke Energy is proposing the development of a temporary access road (Fisher Knob access road) to provide an alternate route to the Fisher Knob residential community during Bad Creek II Complex construction. The proposed road will be constructed of mostly gravel and will begin at Whitewater Road and traverse approximately 3.7 miles (5.9 km) to the Fisher Knob community.

[1] Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines | FWS.gov

New Transmission Line: Duke Energy currently owns or maintains under a property easement all lands that would be required for construction of the Bad Creek II Complex. A portion of the transmission line corridor is currently maintained under a property easement and additional lands may be required to accommodate the corridor for the proposed 9.3 mile (14.9 km) new Whitewater 525kV transmission line. Approximately 15.03 miles (24.2 km) of access road has been identified to serve as construction and maintenance access for the proposed transmission line.

Table 1 represents the linear and non-linear project components along with proposed acres of forested areas to be cleared by potential project activities.

Table 1. Areas of Direct Impacts (Clearing)

Linear		
Description	**Length in miles (km)**	**Acres to be Directly Impacted/Cleared**
Whitewater525 kV Line	9.3 (14.9)	192 (assuming new 200-foot wide right-of way to be cleared in non-hazardous areas)
Fisher Knob Access Road	3.7 (5.9)	11.4 (assuming 16-foot-wide access road)
Proposed Transmission Access Roads	15 (24.2)	29.3 (assuming 5 feet on either side of the existing road will be trimmed/cleared for construction access)
Total:	**28 (45)**	**232.7**
Non-Linear		
Bad Creek II Power Complex Infrastructure		
Upper Reservoir I/O Structure		8.76
Vertical Shaft		8.96
Transformer Yard		6.49
525kV Switchyard		15.04
Former Construction Yard		8.39
Lower Reservoir I/O Structure		5.86
Lower Reservoir Laydown Yard		10.19
Proposed Spoil Areas Alternatives		
Spoil Area B		22.70
Spoil Area C		9.9
Spoil Area D		10.76
Spoil Area G		10.47
Spoil Area I		8.56
Spoil Area J		14.46
Spoil Area K		17.57
Spoil Area L		16.5
Spoil Area M		4.7
Total Acres:		**179.31 (rounded up to 246 to calculate LOE)**

Spatial Data

The attached Google Earth® KMZ files include:

- Bad Creek FERC Project Boundary – Red polygon
- Spoil Area Alternative Sites – Purple polygon
- Proposed Forest Clearing Areas – Red transparent polygon
- Proposed Access Roads – Gray polyline
- U.S. Forest Service Property – Green transparent polygon
- Fisher Knob Access Road – Yellow polyline
- Proposed new 525kV Transmission and Right-of-Way – Red polyline (transmission centerline) and yellow polygon (new 525kV right-of-way)
- Bat Habitat Assessment Notes – Save the KMZ locally to hard drive and click on purple dots to view the photographs and notes.
- Bat Survey Linear Areas – Red Polyline = Limited Access; Potentially dangerous access for surveys or areas that are currently privately owned. These areas account for approximately 9.3 miles (15 km) or 33 percent of the total linear areas to be impacted by the proposed project. Green polyline = Accessible areas.
- Potential Bat Survey Monitoring Locations – Yellow = Mist net and acoustic. Green dots = Acoustic only.
- Bat Survey Locations from 2021 ERM Bat Survey – Orange triangles = Acoustic Site Locations. Green triangles = Mist Nest Site Locations

Survey Level of Effort and Proposed Methods

The Level of Effort calculations are based on the 2024 USFWS Range-wide Indiana Bat & Northern Long-eared Bat Survey Guideline's (USFWS Guidelines) Table 2. Summary of Current Limit of Effort's (LOE) for Indiana bat (IBAT) and NLEB and in Appendix I: Calculating LOE for a Combined Acoustic and Mist-Netting Survey Pilot Guidance. The USFWS Guidelines state that non-linear projects located in the seasonally active NLEB range require ten net nights per 123 acres of summer suitable habitat while linear projects require four net nights per kilometer of suitable summer habitat within a square kilometer block around the line median.

Based on field reconnaissance site visits, it is estimated that approximately 30 percent of the linear and non-linear project areas are suitable for mist-net set-ups but more conducive for acoustic set-ups. Table 2 (below) represents the LOE percentages based on the USFWS Guidelines.

Table 2. LOE Calculation

Linear

Suitability	**0%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
Net Nights	0	18	36	54	72	90	108	126	144	162	180
Suitability	**100%**	**90%**	**80%**	**70%**	**60%**	**50%**	**40%**	**30%**	**20%**	**10%**	**0%**
Acoustic Nights	180	162	144	126	108	90	72	54	36	18	0

Non-linear

Suitability	**0%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
Net Nights	0	2	4	6	8	10	12	14	16	18	20
Suitability	**100%**	**90%**	**80%**	**70%**	**60%**	**50%**	**40%**	**30%**	**20%**	**10%**	**0%**
Acoustic Nights	28	26	23	20	17	14	12	9	6	3	0

As listed in Table 1, the desktop analysis of the Project Area includes approximately 45 km of linear habitat and 179.3 acres of non-linear habitat to be potentially impacted. The minimum USFWS effort LOE will be satisfied by a combined survey approach with 60 mist-net nights and 144 acoustic nights. Duke Energy proposes to add 10 acoustic detector nights as a buffer to account for any potential technical issues, totaling 154 acoustic nights. Qualitative call identification (manual vetting) will be included as part of the acoustic monitoring analysis as necessary. Table 3 represents the proposed combined LOE monitoring.

Table 3. Proposed Combined LOE Monitoring

Linear						**Non-Linear**					
Mist-Netting			**Acoustic**			**Mist-Netting**			**Acoustic**		
Net Sites	Net Nights	Calander Nights/Site	Acoustic Sites	Acoustic Nights	Calendar Nights	Net Sites	Net Nights	Calander Nights/Site	Acoustic Sites	Acoustic Nights	Calendar Nights
12	60	2	33	132	2	3	12	2	4	12	3

The study plan proposed by Duke Energy's consultant, Biotope Forestry & Environmental (Biotope), proposes to survey 12 linear mist-net sites and three non-linear mist-net sites, where two mist-nets will be deployed on the first night and second night, totaling four net nights over two calendar nights to give 48 and 12 net nights within each area respectively. To satisfy the acoustic efforts, 33 linear acoustic sites are proposed, each to be surveyed using two detectors over two calendar nights, totaling 132 detector nights. Four non-linear acoustic sites, each to be surveyed using one detector over three calendar nights, totaling 12 detector nights.

Mist-nets will be deployed for two calendar nights within impact areas. Nets will be opened prior to sunset and left open for a minimum of five hours post sunset under appropriate weather conditions. For all bats captured, general demographic data will be collected including sex, age (adult or juvenile), weight, right forearm length, reproductive condition, and general appearance. Biologists will assess each bat for evidence of white-nose syndrome. All appropriate mist-netting survey protocols (USFWS Guidelines Appendix B) will be followed.

Acoustic detectors will be deployed at each site prior to sunset on night one and record for the minimum desired calendar nights under appropriate weather conditions. For each day with a weather delay as outlined in USFWS Guidelines, the acoustic detector(s) will be deployed an

additional calendar night. Following the completion of the field work at each acoustic detector site, data will be compiled and processed using Wildlife Acoustics Kaleidoscope software. If any target species calls are flagged during this process, the data will be manually vetted by an experienced biologist to confirm the presence of these species on the project area.

Acoustic monitors are also proposed to be placed at a rock shelter identified during the Cultural Resources Survey as well as near the entrance to the existing Project's powerhouse access tunnel as recommended by the S.C. Department of Natural Resources.

Proposed Field Survey Schedule

- May 29, 2024 through June 21, 2024

USFWS IPaC and NLEB Technical Assistance Letter

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218

In Reply Refer To: 04/18/2024 19:02:18 UTC
Project Code: 2024-0079174
Project Name: Bad Creek II Power Complex (P-2740)

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
(843) 727-4707

PROJECT SUMMARY

Project Code: 2024-0079174
Project Name: Bad Creek II Power Complex (P-2740)
Project Type: Power Gen - Hydropower - FERC
Project Description: The proposed Bad Creek II Complex would consist of a new inlet/outlet structure in the existing upper reservoir, water conveyance system, underground powerhouse, powerhouse access tunnels, lower reservoir inlet/outlet structure, switchyard, transformer yard, and transmission line. No modifications to the existing upper and lower reservoirs would be required for the Bad Creek II Complex other than construction of an upper reservoir inlet/outlet structure within the Bad Creek Reservoir and a lower reservoir inlet/outlet structure within Lake Jocassee. Currently licensed operating bands in both reservoirs would not be modified.

The Bad Creek II Complex powerhouse would include four new, variable-speed pump-turbine units with a combined installed generating capacity of 1,400 MW. With both powerhouses generating, full drawdown of the upper reservoir (i.e., 160 ft) will require approximately 11.4 hours, and full refill of the reservoir will require approximately 13 hours. In this manner, the addition of the Bad Creek II Complex introduces more capacity and generation into the power grid during a shorter period of time, which could increase the number of pumping-generating cycles per year, in turn increasing annual generation from the Project. Historical average annual generation since the Project began operation in 1992 is 1,954,292 MW-hours (MWh). While annual generation for a pumped storage project is solely dependent upon how the station is used to supplement/integrate with the Duke Energy power grid, assuming the same utilization factor for the existing Project and a total Project installed capacity of 2,800 MW, the annual generation for the Bad Creek Project, with the Bad Creek II Complex added, would increase to an estimated 4,886,000 MWh, an increase of 2,932,000 MWh per year.

Duke Energy is proposing the development of a temporary access road (Fisher Knob access road) to provide an alternate route to the Fisher Knob residential community during the Bad Creek II Complex construction. The proposed gravel road will begin at Whitewater Road and traverse approximately 3.7 miles/5.9 kilometers to the Fisher Knob community. Surface waters along the route have been identified and qualitatively evaluated as part of the FERC relicensing studies. Surface waters will be bridged, and no permanent or temporary impacts are anticipated. Road construction is anticipated to begin in the Spring 2026 and the road will be decommissioned following project construction.

If Duke Energy decides to pursue the Bad Creek II Complex and obtains

all necessary regulatory approvals for construction, the period for construction of the Bad Creek II Complex is expected to span approximately 7 years. Assuming commencement of construction shortly following the New FERC License issuance by July 2027, the Bad Creek II Complex is expected to be fully in service in 2034.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@34.9773504,-82.9937585164285,14z

Counties: Oconee County, South Carolina

ENDANGERED SPECIES ACT SPECIES

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
Small Whorled Pogonia *Isotria medeoloides* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened
Smooth Coneflower *Echinacea laevigata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3473	Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

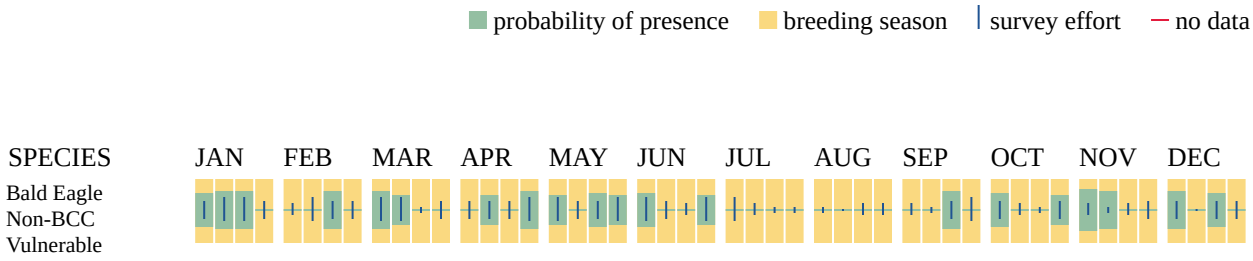
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Chuck-will's-widow *Antrostomus carolinensis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9604	Breeds May 10 to Jul 10
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10

NAME	BREEDING SEASON
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

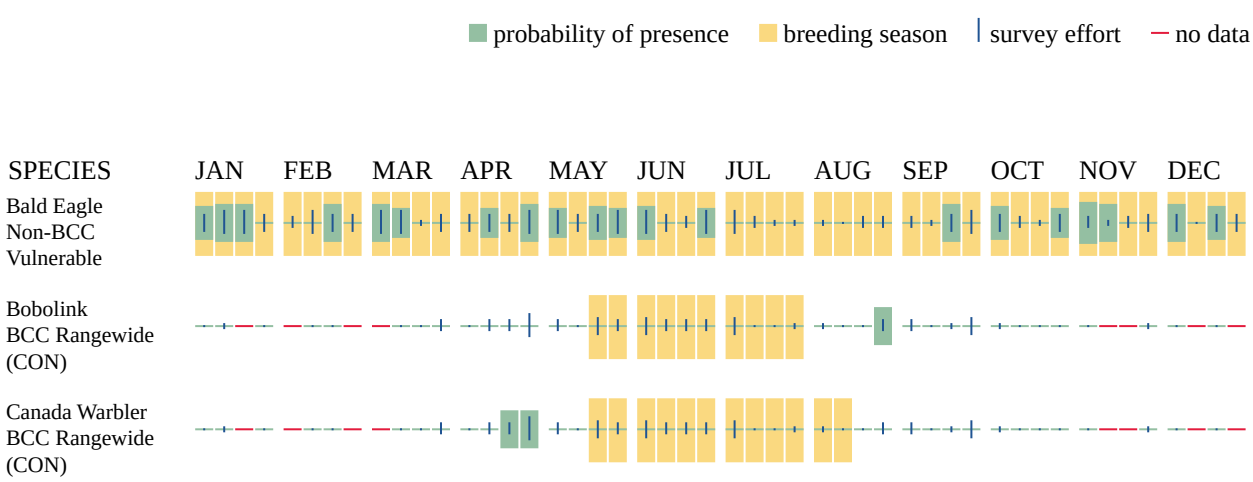
Probability of Presence (■)

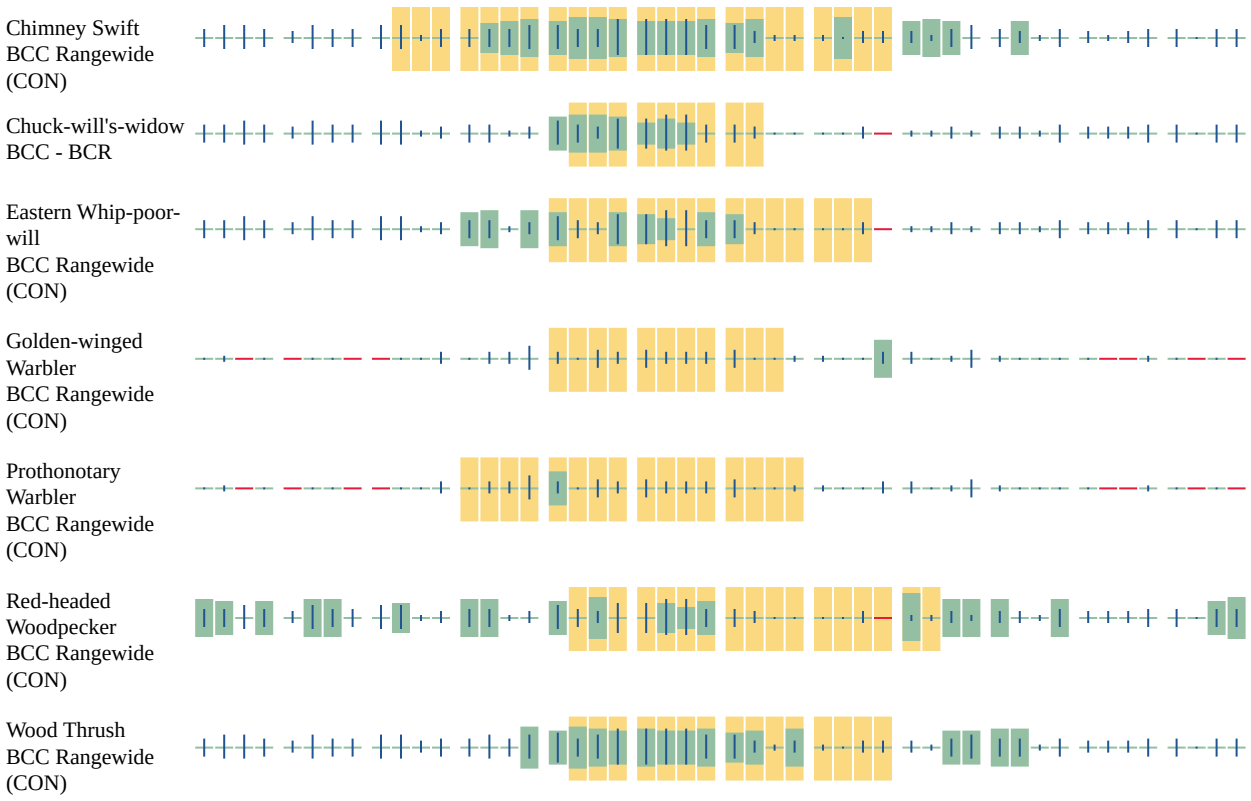
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- PEM1A

FRESHWATER POND

- PUBHx
- PUBFx
- PUSCh
- PUBHh

RIVERINE

- R4SBC
- R3UBH
- R5UBH

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A

LAKE

- L2USAh
- L1UBHh

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Eric Mularski
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City: Charlotte
State: NC
Zip: 28202
Email eric.mularski@hdrinc.com
Phone: 7049736878

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Energy Regulatory Commission

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218

In Reply Refer To: 04/18/2024 19:26:29 UTC
Project code: 2024-0079174
Project Name: Bad Creek II Power Complex (P-2740)

Federal Nexus: yes
Federal Action Agency (if applicable): Federal Energy Regulatory Commission

Subject: Technical assistance for 'Bad Creek II Power Complex (P-2740)'

Dear Eric Mularski:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on April 18, 2024, for 'Bad Creek II Power Complex (P-2740)' (here forward, Project). This project has been assigned Project Code 2024-0079174 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project. **Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (Dkey), invalidates this letter.**

Determination for the Northern Long-Eared Bat

Based on your IPaC submission and the standing analysis for the Dkey, your project has reached the determination of "May Affect" the northern long-eared bat.

Next Steps

Your action may qualify for the Interim Consultation Framework for the northern long-eared bat. To determine if it qualifies, review the Interim Consultation Framework posted here https://www.fws.gov/library/collections/interim-consultation-framework-northern-long-eared-bat. If you

determine it meets the requirements of the Interim Consultation Framework, follow the procedures outlined there to complete section 7 consultation.

If your project does **not** meet the requirements of the Interim Consultation Framework, please contact the South Carolina Ecological Services for further coordination on this project. Further consultation or coordination with the Service is necessary for those species or designated critical habitats with a determination of “May Affect”.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Candidate
- Small Whorled Pogonia *Isotria medeoloides* Threatened
- Smooth Coneflower *Echinacea laevigata* Threatened
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered

You may coordinate with our Office to determine whether the Action may cause prohibited take of the species listed above.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Bad Creek II Power Complex (P-2740)

2. Description

The following description was provided for the project 'Bad Creek II Power Complex (P-2740)':

> The proposed Bad Creek II Complex would consist of a new inlet/outlet structure in the existing upper reservoir, water conveyance system, underground powerhouse, powerhouse access tunnels, lower reservoir inlet/outlet structure, switchyard, transformer yard, and transmission line. No modifications to the existing upper and lower reservoirs would be required for the Bad Creek II Complex other than construction of an upper reservoir inlet/outlet structure within the Bad Creek Reservoir and a lower reservoir inlet/outlet structure within Lake Jocassee. Currently licensed operating bands in both reservoirs would not be modified.
>
> The Bad Creek II Complex powerhouse would include four new, variable-speed pump-turbine units with a combined installed generating capacity of 1,400 MW. With both powerhouses generating, full drawdown of the upper reservoir (i.e., 160 ft) will require approximately 11.4 hours, and full refill of the reservoir will require approximately 13 hours. In this manner, the addition of the Bad Creek II Complex introduces more capacity and generation into the power grid during a shorter period of time, which could increase the number of pumping-generating cycles per year, in turn increasing annual generation from the Project. Historical average annual generation since the Project began operation in 1992 is 1,954,292 MW-hours (MWh). While annual generation for a pumped storage project is solely dependent upon how the station is used to supplement/integrate with the Duke Energy power grid, assuming the same utilization factor for the existing Project and a total Project installed capacity of 2,800 MW, the annual generation for the Bad Creek Project, with the Bad Creek II Complex added, would increase to an estimated 4,886,000 MWh, an increase of 2,932,000 MWh per year.
>
> Duke Energy is proposing the development of a temporary access road (Fisher Knob access road) to provide an alternate route to the Fisher Knob residential community during the Bad Creek II Complex construction. The proposed gravel road will begin at Whitewater Road and traverse approximately 3.7 miles/5.9 kilometers to the Fisher Knob community. Surface waters along the route have been identified and qualitatively evaluated as part of the FERC relicensing studies. Surface waters will be bridged, and no permanent or temporary impacts are anticipated. Road construction is anticipated to begin in the Spring 2026 and the road will be decommissioned following project construction.

If Duke Energy decides to pursue the Bad Creek II Complex and obtains all necessary regulatory approvals for construction, the period for construction of the Bad Creek II Complex is expected to span approximately 7 years. Assuming commencement of construction shortly following the New FERC License issuance by July 2027, the Bad Creek II Complex is expected to be fully in service in 2034.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@34.9773504,-82.9937585164285,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of "may affect" for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. Does any component of the action involve construction or operation of wind turbines?

   Note: For federal actions, answer 'yes' if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

3. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Yes

4. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

5. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   No

6. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No

7. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   Yes

8. Is FERC reviewing the proposed action under the Natural Gas Act, in whole or in part?

   No

9. Have you determined that your proposed action will have no effect on the northern long-eared bat? Remember to consider the effects of any activities that would not occur but for the proposed action.

   If you think that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, answer "No" below and continue through the key. If you have determined that the northern long-eared bat does not occur in your project's action area and/or that your project will have no effects whatsoever on the species despite the potential for it to occur in the action area, you may make a "no effect" determination for the northern long-eared bat.

   Note: Federal agencies (or their designated non-federal representatives) must consult with USFWS on federal agency actions that may affect listed species [50 CFR 402.14(a)]. Consultation is not required for actions that will not affect listed species or critical habitat. Therefore, this determination key will not provide a consistency or verification letter for actions that will not affect listed species. If you believe that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, please answer "No" and continue through the key. Remember that this key addresses only effects to the northern long-eared bat. Consultation with USFWS would be required if your action may affect another listed species or critical habitat. The definition of Effects of the Action can be found here: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

   No

10. [Semantic] Is the action area located within 0.5 miles of a known northern long-eared bat hibernaculum?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered

    No

11. Does the action area contain any caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating northern long-eared bats?

    Yes

12. Have you conducted, or will you conduct, a voluntary Phase 1 habitat assessment for potentially suitable hibernacula in accordance with the guidance in Appendix H of the USFWS' current Range-wide Indiana bat and Northern long-eared bat Survey Guidelines?

    Note: The survey guidelines can be found at: https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    No

13. Will the proposed action result in the cutting or other means of knocking down, bringing down, or trimming of any trees suitable for northern long-eared bat roosting?

    Note: Suitable northern long-eared bat roost trees are live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities.

    Yes

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

412

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the inactive (hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

206

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the active (non-hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

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Will all potential northern long-eared bat (NLEB) roost trees (trees ≥3 inches diameter at breast height, dbh) be cut, knocked, or brought down from any portion of the action area greater than or equal to 0.1 acre? If all NLEB roost trees will be removed from multiple areas, select 'Yes' if the cumulative extent of those areas meets or exceeds 0.1 acre.

Yes

Enter the extent of the action area (in acres) from which all potential NLEB roost trees will be removed. If all NLEB roost trees will be removed from multiple areas, entire the total extent of those areas. Round up to the nearest tenth of an acre.

412

For the area from which all potential northern long-eared bat (NLEB) roost trees will be removed, on how many acres (round to the nearest tenth of an acre) will trees be allowed to regrow? Enter '0' if the entire area from which all potential NLEB roost trees are removed will be developed or otherwise converted to non-forest for the foreseeable future.

256.3

Will any snags (standing dead trees) ≥3 inches dbh be left standing in the area(s) in which all northern long-eared bat roost trees will be cut, knocked down, or otherwise brought down?

No

Will all project activities by completed by April 1, 2024?

No

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Eric Mularski
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LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Energy Regulatory Commission
Name: Sarah Salazar
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Phone: 2025026863

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Biotope Resumes

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Resume

Education

2011 Haywood Community College
- Associate in Applied Science: Fisheries and Wildlife Management Technology

2015 Western Carolina University
- Bachelor of Science: Natural Resource Conservation and Management

Background

Mr. Brooks has more than 12 years of project experience in ecological and environmental services. In that time, he has conducted ecological field investigations on a variety of different projects including habitat assessments as well as endangered species surveys for various natural resource extraction companies. Much of Mr. Brooks' experience is comprised of presence/absence surveys for threatened and endangered bat species (*Myotis sodalis and Myotis septentrionalis*). The majority of Mr. Brooks' experience has been as a team leader and/or permitted biologist on site. Mr. Brooks has held a **Federal Recovery Permit (ES81492B-1)** to collect *M. sodalis* and *M. septentrionalis* since 2014 and has held state permits in MD, MN, PA, WV, IA, OH, MI, IL, IN, VA, TN, NC, SC, GA, AR, MS, and TX.

Qualification and Experience with Bats

Mr. Brooks is knowledgeable and experienced in the application of the following equipment and techniques as they relate to the detection, capture, and handling of bat species:

- Bat handling (species level identification and various physical measurements)
- Mist-net site selection, set up, and operation
- Harp trap site selection, set up, and operation
- Radio telemetry
- Estimated 4,000 contact hours performing surveys for listed bats
- Application of split-ring metal forearm identification bands
- Reichard's Wing Damage Index Scoring
- Suitability assessments for both summer and winter bat habitat
- Acoustical monitoring and call analysis
- Autumn portal/cave evaluations and surveys
- White-nose syndrome disinfection protocols
- Collecting swab and tissue samples

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Identified Bat Species

- Indiana bat (*Myotis sodalis*)
- Northern long-eared bat (*Myotis septentrionalis*)
- Gray bat (*Myotis grisescens*)
- Eastern small-footed bat (*Myotis leibii*)
- Little brown bat (*Myotis lucifugus*)
- Silver-haired bat (*Lasionycteris noctivagans*)
- Tricolored bat (*Perimyotis subflavus*)
- Evening bat (*Nycticeius humeralis*)
- Hoary bat (*Lasiurus cinereus*)
- Eastern red bat (*Lasiurus borealis*)
- Big brown bat (*Eptesicus fuscus*)
- Southeastern myotis (*Myotis austroriparius*)
- Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)

Indiana Bat (*Myotis sodalis*) Experience

- Captured and processed approximately 34 *Myotis sodalis*
- Placed radio transmitters on 13 *Myotis sodalis*
- Conducted approximately 2,500 hours of radio-telemetry (night time foraging and roost tree locations) for the Indiana bat (*Myotis sodalis*)

Northern Long-eared Bat (*Myotis septentrionalis*) Experience

- Captured and processed approximately 325 *Myotis septentrionalis*
- Placed radio-transmitters on 36 *Myotis septentrionalis*
- Conducted approximately 4,200 hours of radio-telemetry (night time foraging and roost tree locations) for the Northern long-eared bat (*Myotis septentrionalis*)

Gray Bat (*Myotis grisescens*) Experience

- Captured and processed 7 *Myotis grisescens*
- No radio-transmitters were placed on *Myotis grisescens* since their roosts were known to be caves near project area
- No radio-telemetry was required for this species for the purposes of these studies

Tricolored Bat (*Perimyotis subflavus*) Experience

- Captured and processed approximately 400 *Perimyotis subflavus*
- Placed radio-transmitters on 1 *Perimyotis subflavus*
- Conducted approximately 50 hours of radio-telemetry (diurnal roost tree locations) for the tricolored bat (*Perimyotis subflavus*)

Project Experience

- **Project Manager** – Allegheny National Forest Bat Survey Project**:** 2023. Mist-net and structure survey for the federally endangered Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), the proposed federally endangered tricolored bat (*Perimyotis subflavus*), and the little brown bat (*Myotis lucifugus*) throughout the Allegheny National Forest in Pennsylvania.

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- **Project Manager** – TVA Pumped Storage-Rorex Creek Project: 2023. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), gray bat (*Myotis* grisescens) the proposed federally endangered tricolored bat (*Perimyotis subflavus*), and the little brown bat (*Myotis lucifugus*) in Jackson County, Alabama.

- **Project Manager** – Hillsboro Solar Project: 2023. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), the proposed federally endangered tricolored bat (*Perimyotis subflavus*), and the little brown bat (*Myotis lucifugus*) in Lawrence County, Alabama.

- **Project Manager** – Trifecta Solar Project: 2023. Mist-net survey for the federally endangered northern long-eared bat (*Myotis septentrionalis*) and the little brown bat (*Myotis lucifugus*) in Choctaw County, Mississippi.

- **Project Manager** – Stamey Solar Project: 2023. Mist-net survey for the proposed federally endangered tricolored bat (*Perimyotis subflavus*) in Darlington County, South Carolina.

- **Project Manager** – Blackfin Pipeline Project: 2023. Mist-net survey for the proposed federally endangered tricolored bat (*Perimyotis subflavus*) throughout multiple counties in eastern Texas.

- **Project Manager** – Navigator Carbon Sequestration Pipeline Project**:** 2022. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) as well as the proposed federally endangered tricolored bat (*Perimyotis subflavus*) throughout multiple counties in eastern Illinois.

- **Project Manager** – Chester Solar Farm Bat Survey: 2022. Mist-net survey for the federally endangered northern long-eared bat (*Myotis septentrionalis*) for a proposed solar farm in Chester, VA.

- **Project Manager** – Timberwolf Wind Energy Project: 2021. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat for the proposed Timberwolf Wind Project in Fillmore County, Minnesota.

- **Project Manager** – Prairie Creek Wind Energy Project: 2021. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) in Blackford County, IN.

- **Project Manager** – Mobley to Majorsville: 2018. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area in Wheeling, WV.

- **Project Manager** – Brues to Glendale: 2018. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area in Wheeling, WV.

- **Project Manager –** EASTERN NORTH CAROLINA NORTHERN LONG-EARED BAT RESEARCH STUDY: 2017-2019. A survey used to determine the habitat preferences and distribution of the federally threatened northern long-eared bat (*Myotis septentrionalis*) in North Carolina, further document fall/winter activity, and develop greater understanding of winter habitat use and behavior in the region.

- **Project Manager –** DIAMOND TRAIL WIND ENERGY PROJECT: 2017. A summer survey and winter habitat assessment for the federally threatened northern long-eared bat (*Myotis*

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septentrionalis) on Invenergy property in multiple counties throughout central Iowa

- **Project Manager –** CLEAN LINE AND PLAINS PIPELINE: 2016. A linear summer survey for the federally endangered Indiana bat (*Myotis sodalis)* and threatened northern long-eared bat (*Myotis septentrionalis*) near known maternity colony trees, Multiple counties throughout eastern Arkansas.

- **Project Manager –** NEW KENT BAT SURVEY: 2016. A summer survey and winter habitat assessment for the federally threatened northern long-eared bat (*Myotis septentrionalis)* on military land in New Kent County, VA.

- **Project Manager** - ROVER PIPELINE: 2015. A linear summer survey for the federally endangered Indiana bat (*Myotis sodalis)* and threatened northern long-eared bat (*Myotis septentrionalis*) near known maternity colony trees, Multiple counties throughout Ohio and West Virginia.

- **Project Manager** – SUNOCO TETRATECH PIPELINE: 2014. A linear summer survey for the federally endangered Indiana bat (*Myotis sodalis*), eastern small-footed bat (*Myotis leibii*) and northern long eared bat (*Myotis septentrionalis*) near known maternity colony trees, Multiple counties throughout southern Pennsylvania.

- **Project Manager** – AMEI COAL MINING: 2014. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area in Wallace, WV.

- **Project Manager** – WILLIAMS PIPELINE: 2013. A linear summer survey for the federally endangered Indiana bat (*Myotis sodalis*) and northern long eared bat (*Myotis septentrionalis*) near known maternity colony trees, Multiple counties in western PA.

- **Project Manager** – BLACK CASTLE MINING COMPANY: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) near known maternity colony trees, Boone County, WV.

- **Project Manager** – REPUBLIC ENERGY CORPORATION: 2013. A summer, spring, and fall survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near a known colony, Fayette & Kanawha Counties, WV (Application No. S-3010-11).

- **Project Manager** – COAL RIVER MINING: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis)* at a proposed surface mine project area in Kanwaha County, WV.

- **Project Manager** – CARDNO MM&A: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis)* at a proposed surface mine area in Raleigh County, WV.

- **Project Manager** – BANDMILL COAL CORPORATION: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis)* at a proposed surface mine in Logan County, WV.

- **Project Manager** – NATIONAL RESOURCES: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis)* at a proposed surface mine in Wyoming and McDowell County, WV.

- **Project Manager** – ALPHA NATURAL RESOURCES: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) near known

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maternity colony trees, Boone County, WV.

- **Project Manager** – ALPHA NATURAL RESOURCES: 2012. A summer, spring, and fall survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near a known colony, Fayette & Kanawha Counties, WV.
- **Project Manager** – MARSHALL MILLER: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed fine coal refuse disposal facility near Wyoming, Wyoming County, WV.
- **Project Manager** – ALPHA NATURAL RESOURCES: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near Stollings, Logan County, WV.
- **Project Manager** – ALPHA NATURAL RESOURCES: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near Peytona, Boone County, WV.
- **Biologist** – MARFORK COAL COMPANY: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed coal surface mine near Colcord, Raleigh County, WV.
- **Biologist** – ALPHA NATURAL RESOURCES: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) near known maternity colony trees, Boone County, WV.
- **Biologist** – ALPHA NATURAL RESOURCES: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near Cabin Creek, Kanawha County, WV.
- **Wildlife Technician** – ALPHA NATURAL RESOURCES: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed Browns Branch Surface Mine near Bandytown, Boone County, WV.
- **Wildlife Technician** – MARSHALL MILLER: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed Toney Fork West Surface Mine near Lorado, Boone and Logan Counties, WV.
- **Wildlife Technician** – ALPHA NATURAL RESOURCES: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed Mt. McGuire Surface Mine near Hickory Camp Branch, Fayette County, WV.

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References

Harriet Richardson Seacat
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Ecosystem Planning and Restoration
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Mary Gilmore
Technical Bat Lead
EnviroScience, Inc
Personal Cell: (304)533-0999
mgilmore@enviroscienceinc.com

Eli Corwin

Ecologist
1402 Houston St.
Lufkin, TX 75904
corwine123@gmail.com

Background

Mr. Corwin has more than 10 years of project experience in ecological and environmental services. In that time, he has conducted and managed ecological field investigations on a variety of different projects from large and small transportation as well as endangered species surveys for various natural resource extraction companies. Much of Mr. Corwin's experience is comprised of presence/absence surveys for threatened and endangered bat species (*Myotis sodalis, M. septentrionalis, M. grisescens, Perimyotis subflavus*). Currently, Mr. Corwin has conducted approximately 400 summer mist-net surveys and 90 fall portal surveys; most of which Mr. Corwin has been the team leader and/or permitted biologist on site. Furthermore, Mr. Corwin is experienced in the application of split-ring metal arm bands and radio transmitters to listed bat species as well as the subsequent radio telemetry.

Vascular Plants of the Eastern United States

Mr. Corwin has completed numerous classes pertaining to the identification of flora of the eastern United States, including field botany, plant physiology, plant morphology, wetland ecology, plant ecology, and forest ecology. Furthermore, he has conducted ecological field investigations on a variety of projects that have provided him a solid foundation for identifying vascular plants of the eastern United States including site assessments and biological inventories, natural resource extraction and transportation, and transmission line installation.

Qualification and Experience with Bats

Mr. Corwin is knowledgeable and experienced in the application of the following equipment and techniques as they relate to the detection, capture, and handling of bat species:

- Bat handling (species level identification and various physical measurements)
- Mist-net site selection, set up, and operation
- Harp trap site selection, set up, and operation
- Radio telemetry
- Estimated 4700 contact hours performing surveys for listed bat species
- Application of split-ring metal forearm identification bands
- Application of radio-transmitters
- Reichard's Wing Damage Index Scoring used for characterizing wing condition of bats affected by white-nose syndrome
- Suitability assessments for both summer and winter bat habitat
- Acoustical monitoring and call analysis
- Hibernacula surveys
- White-nose Syndrome disinfection protocols

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FORESTRY & ENVIRONMENTAL, LLC

Indiana Bat (*Myotis sodalis*) Experience

- Captured and processed 26 *Myotis sodalis*
- Placed radio transmitters on 4 *Myotis sodalis*
- Conducted approximately 300 hours of radio telemetry (night time foraging and roost tree locations) for *Myotis sodalis*

Northern Long-eared Bat (*Myotis septentrionalis*) Experience

- Captured and processed approximately 37 *Myotis septentrionalis*
- Placed radio transmitters on one *Myotis septentrionalis*
- Conducted 150 hours of radio telemetry (roost tree locations) for the Northern Long-Eared Bat (*Myotis septentrionalis*)

Gray Bat (*Myotis grisescens*) Experience

- Captured and processed and/or identified 39 *Myotis grisescens*

Tricolored Bat (*Perimyotis subflavus*) Experience

- Captured and processed and/or identified approximately 15 *Perimyotis subflavus*
- Placed radio transmitters on 1 *Perimyotis subflavus*
- Conducted 140 hours of radio telemetry (roost tree locations) for Tricolored bats.

Qualifications and Experience with Ecological & Environmental Services

Mr. Corwin's field and natural history skills include a variety of taxa and disciplines from:

- Herbaceous and woody vegetation identification
- Federal and state listed threatened and endangered species surveys
- Habitat assessments
- Geographic Information Systems
- Geospatial Analysis
- Acoustic Survey Techniques and Data Analysis

Selected Project Experience

West Virginia

- Habitat assessment survey for the proposed Pennsylvania Pipeline Project
- Mist-net survey for the Federally Endangered Indiana Bat for Black Castle Surface Mine in Boone County, WV
- Mist-net survey for the Federally Endangered Indiana Bat for Long Branch Surface Mine in Kanawha and Fayette Counties, WV
- Hibernacula survey for the Federally Endangered Indiana Bat for Long Branch Surface Mine in Kanawha and Fayette Counties, WV
- Mist-net survey for the Federally Endangered Indiana Bat for Marfork Surface Mine in Raleigh County, WV
- Mist-net survey for threatened and endangered bats on the Rover Pipeline throughout West Virginia

Ohio

- Wetland survey for the proposed Pennsylvania Pipeline Project throughout Ohio
- Mist-net survey for threatened and endangered bats on the Rover Pipeline throughout Ohio
- Mist-net survey for threatened and endangered bats on the The Greenery Bat Survey (Lewis Field)
- Mist-net survey for threatened and endangered bats on the Johnstown Bat Survey

Pennsylvania

- Habitat assessment for the Federally Endangered Indiana Bat for the proposed Pennsylvania Pipeline Project

Arkansas

- Mist-net survey for threatened and endangered bats on the Clean-Line Transmission Line Project throughout Arkansas

Illinois

- Mist-net survey for threatened and endangered bats for the Country Mark Pipeline in Marion County, IL

Kansas

- Mist-net survey for threatened and endangered bat species at a U.S. Army Corps of Engineers facility in Johnson County, Kansas

Missouri

- Mist-net survey to determine bat community composition at multiple Army National Guard facilities in Missouri

Tennessee

- Mist-net survey to determine bat community composition at multiple Tennessee Army National Guard facilities in Tennessee and Georgia

Georgia

- Mist-net survey to determine bat community composition at multiple Tennessee Army National Guard facilities in Tennessee and Georgia

North Carolina

- Mist-net survey for threatened and endangered bat species on Eastern Band of Cherokee lands for the Eastern Band of Cherokee Wildlife Division in Cherokee County, North Carolina

South Carolina

- Mist-net survey for all bat species on conservation easement properties in coastal South Carolina

Virginia

- Mist-net survey for threatened and endangered bat species on the Chester Solar Technology Park Project in Chesterfield County

Alabama

- Mist-net survey for threatened and endangered bat species on the TVA Pumped Storage

project in Jackson County
- Mist-net survey for threatened and endangered bat species on the Loves Good-Hope project in Cullman County
- Mist-net survey for threatened and endangered bat species on the Hillsboro Solar project in Lawrence County

Mississippi
- Mist-net survey for threatened and endangered bat species on the Trifecta Project in Choctaw County

Texas
- Mist-net survey for threatened and endangered bat species on the Blackfin Bat Surveys Project in Haller and Waldin Counties

Permits

- Has held state permits in has held state permits in PA, MO, WV, AL, OH, VA, TN, NC, SC, GA, AR, KS, IL, MS, and TX.
- Pennsylvania Qualified Bat Surveyor
- USFWS Native Endangered Species Recovery (**ES81492B-1**)

Education

University of North Carolina at Wilmington
Bachelor of Science: Major Geography, Minor Geospatial Technology

Jay B Deatherage

President - Owner
6332 FM 2259
Nacogdoches TX 75961
(936) 553-0739
Biotope.for.env@gmail.com

Resume

Summary

Mr. Deatherage has more than 12 years of project experience in natural resources management and consulting. Mr. Deatherage's bat research has entailed presence/absence surveys for threatened and endangered bat species (*Myotis sodalis, Myotis grisescens, Perimyotis subflavus, Myotis lucifugus,* and *Myotis septentrionalis*) on various projects. Mr. Deatherage is experienced in habitat assessments, radio tracking for both forage and roost tree data, emergence counts, portal assessment and exclusion, and acoustic surveys. Furthermore, Mr. Deatherage is experienced in the application of split-ring metal forearm bands and radio transmitters to listed bat species. He currently holds a **Federal Recovery Permit (ES88227B-1**) to collect *M. sodalis* and *M. septentrionalis* and has held state permits in WV, IA, AL, OH, IL, PA, MS, TX, NC, and VA.

Qualifications and Experience with Bats

Mr. Deatherage is knowledgeable and experienced in the application of the following equipment and techniques as they relate to the detection, capture, and handling of bat species:

- Bat handling (species level identification and various physical measurements)
- Mist-net site selection, set up, and operation
- Harp trap site selection, set up, and operation
- Radio telemetry
- Application of split-ring metal forearm identification bands
- Reichard's Wing Damage Index Scoring
- Suitability assessments for both summer and winter bat habitat
- Acoustical monitoring and call analysis
- Autumn portal/cave evaluations and surveys
- White-nose syndrome disinfection protocols
- Collecting swab and tissue samples

Identified Bat Species

- Indiana Bat (*Myotis sodalis*)
- Northern Long-eared Bat (*Myotis septentrionalis*)
- Eastern Small-footed Bat (*Myotis leibii*)
- Little Brown Bat (*Myotis lucifugus*)
- Gray bat (*Myotis grisescens*)

- Southeastern Myotis (*Myotis austroriparius*)
- Silver-haired Bat (*Lasionycteris noctivagans*)
- Tricolored Bat (*Perimyotis subflavus*)
- Evening Bat (*Nycticeius humeralis*)
- Hoary Bat (*Lasiurus cinereus*)
- Eastern Red Bat (*Lasiurus borealis*)
- Big Brown Bat (*Eptesicus fuscus*)
- Seminole Bat *(Lasiurus seminolus)*
- Rafinesque's Big-Eared Bat *(Corynorhinus rafinesquii)*

Selected Project Experience

Pennsylvania

- **Project Manager** – ALLEGHENY NATIONAL FOREST BAT SURVEY PROJECT: 2023. A summer mist-net and structure survey for *M. sodalis, M. grisescens, M. lucifugus, P. subflavus*, and *M. septentrionalis* throughout the Allegheny National Forest.

Alabama

- **Project Manager** – TVA ROREX PUMPED STORAGE PROJECT: 2023. A summer mist-net survey for *M. sodalis, M. grisescens, M. lucifugus, P. subflavus*, and *M. septentrionalis* on future TVA property in Jackson County.

- **Project Manager** – COVIA HOLDINGS, LLC MINING PROJECT: 2022. A summer mist-net survey for *M. sodalis* and *M. septentrionalis* on Covia property in Tuscaloosa County.

Iowa

- **Project Manager** - DIAMOND TRAIL WIND ENERGY PROJECT: 2017. A summer mist-net survey for *M. sodalis* and *M. septentrionalis* on Invenergy property in multiple counties throughout central Iowa.

Virginia

- **Lead Biologist** – Chester Solar Project: 2022. *M. septentrionalis* summer mist-net survey on project area for a proposed solar farm in Chester County.

West Virginia

- **Project Manager** – APPALACHIAN POWER: 2021. *M. sodalis* summer mist-net survey for a proposed transmission line through Wyoming and Raleigh Counties.
- **Project Manager** – APPALACHIAN POWER: 2021. *M. sodalis* summer mist-net survey for a proposed coal mine expansion in Logan County.
- **Project Manager** - REPUBLIC ENERGY, INC: 2012. *M. sodalis* summer, spring, and fall surveys, and winter habitat assessment on a proposed coal mine in Kanawha and Fayette Counties
- **Project Manager** - MARSHAL MILLER**:** 2012. *M. sodalis* summer mist-net survey and winter habitat assessment on a proposed coal refuse site located in Wyoming and Logan Counties, WV.
- **Project Manager** - MARFORK COAL COMPANY: 2012. *M. sodalis* summer mist-net survey and winter habitat assessment on a proposed coal mine in Raleigh County, WV.
- **Project Manager** - ALPHA NATURAL RESOURCES: 2012. *M. sodalis* summer mist-net survey and winter habitat assessment on a proposed coal mine in Boone and Logan Counties, WV.
- **Lead Biologist** - ALPHA NATURAL RESOURCES: 2011. *M. sodalis* summer mist-net survey and winter habitat assessment on three proposed coal mines in Boone County, WV.

Education and Professional Trainings

- Stephen F. Austin State University
    - Bachelor of Science in Forest Wildlife Management 2011

Kentucky Bat Working group workshop for bat handling and identification
Texas Accredited Forester

Resume

John M. Manuel
139 Rock Hill Rd
Asheville, NC 28803
jmmanuel6@gmail.com
(828) 712-4610

Work Experience

- **Currently—Biotope Forestry and Environmental, Wildlife Biologist III (3).** Responsible for performing mist-net surveys for threatened and endangered bat species as well as forest inventory and habitat assessments.
    - **Fall 2023—**Bat acoustic analysis for projects located throughout the Carolinas.
    - **Summer 2023—**Mist-net survey for *Perimyotis subflavus* and *Myotis lucifugus* in northeastern Alabama. Many *Myotis grisescens* were handled and identified along with two *P. subflavus.* One *P. subflavus* was affixed with a transmitter. I located two roosts located for *P. subflavus* on this project.
    - **September 2022–** Indiana Bat Portal Searches in West Virginia and eastern Kentucky.
    - **June 2022-August 2022–** Northeast Ohio Regional Airport Bat Survey, Mill Creek Habitat Restoration Bat survey.
- **January 2021-December 2021—NC Forest Service, (Buncombe County) Assistant County Ranger.** Wildfire suppression, prescribed burning, forest management, forestation, urban forestry.
- **Spring/Summer 2021 Volunteer with Indiana State University and NCWRC**–Bat mist-netting surveys. Team lead for the application of radio transmitters to *Myotis grisescens*.
    - **April 2021-** Netting target bridges in Asheville area.
- **April 2020-July 2020–ISU Bat Center, Bat Technician.** Assisted with Joy O'Keefe and Joey Weber's gray bat project along French Broad River which included bridge inspections, acoustic station maintenance, and identification of gray bats and other species.
- **September 2018-December 2020—Biotope Forestry and Environmental, Forest Technician**. Forest Inventory for clients Campbell Global, F&W Forestry Services and American Forest Management in the coastal plain of the Carolinas, Florida, Mississippi, and Texas
- **Summer of 2018—Ecological Engineering, Wildlife Technician.** Mist-net surveys for threatened and endangered bat species. Radio telemetry tracking of northern long-eared bats in Francis Marion NF (longleaf pine forest and swamp habitat). Identified the following bat species: *Myotis septentrionalis, Lasiurus borealis, Lasiurus seminolus, Nycticeius humeralis, Eptesicus fuscus, Perimyotis subflavus, and Tadarida brasiliensis.* Work also included surveying for host plants for various butterfly, skipper and moth species (various species of *Asclepius, Pontedaria, Pieris,* and *Gymnopogon ambiguus).*
- **May 2018—Ecological Solutions and Innovations, Forest Technician**. Forest health assessment and merchantable timber inventory.
- **April 2018—Biotope Forestry & Environmental, Forest Technician**. Clients included Campbell Global and American Forest Management

- **Winter 2017-2018—Calyx Engineers and Consultants, Staff Scientist**. Mist-net surveys for threatened and endangered bat species in northeastern North Carolina. Radio telemetry tracking of northern long-eared bat. Study areas were North River Gamelands, Merchants Millpond State Park, and Great Dismal Swamp State Park. Identified the following bat species: *Myotis spetentrionalis, Myotis austroriparius, Myotis lucifugus, Lasiurus borealis, Corynorhinus rafinesquii,* and *Eptesicus fuscus.*
- **Fall 2017—Apogee Environmental, Bat Biologist (WV).** Fall portal netting and harp trapping old, abandoned coal mines near Mahan, WV. Identified *Myotis sodalis, Myotis leibii, and Eptesicus fuscus.*
- **Fall 2017—Borealis Biological, Bat technician**. Fall portal netting old, abandoned coal mines and adits near Man, WV. Identified *Myotis leibii.*
- **Summers and Falls 2014-2017—Apogee Environmental, Bat Biologist (WV).** Summer mist netting and radio telemetry tracking of Indiana bats. Worked in PA, OH, TN, and GA as a technician. Identified *Myotis sodalis, Myotis leibii, Myotis septentrionalis, Lasionycteris noctivagans, Perimyotis subflavus, Eptesicus fuscus, Nycticeius humeralis, Lasiurus borealis, Lasiurus cinereus.* Applied transmitters to northern long-eared bats many times. WV permitted Bat Biologist, and Bat Identifier (BI) in PA.
- **2013—Seasonal Park Technician at Chimney Rock State Park, NC.** Work included surveying and controlling invasive plant species, creating a blooming calendar of native wildflowers, outreach, and general park maintenance.
- **Fall 2010- Fall 2011—Duke Forest (Duke University), Forest Technician.** Work included the decadal forest inventory of the forest property (> 7,000 acres) using the double sampling method with a prism-point sampling technique. Prepared forests for timber sales and inspected logging operations. Invasive species control, trail maintenance, and grounds maintenance. Regularly used ArcGIS to make detailed sale area maps, and inventory maps.
- **Summer of 2010—Student Conservation Association, Trail Maintenance Worker.** Trail restoration.

Education

Western Carolina University (Cullowhee, NC)—Bachelor's degree in Natural Resource Management with a concentration in Forest Management
Haywood Community College (Clyde, NC)—Associates of Applied Science in Forest Management Technology. Graduated magna cum laude.

Awards, Certificates, and Training

Federal Recovery Permit for bats (**ES81492B-1**)
2021 NWCG- S-212 Chainsaw Certification
2018-Workshop on using Sonobat and Kaleidoscope at SBDN in Roanoke, VG
2012 Asheville-Buncombe Tech Community College – Welding Program (MIG and TIG)
2011 National Wildfire Coordinating Group – Introduction to Wildland Fire Behavior (S-190)
2011 National Wildfire Coordinating Group – Firefighter Training (S-130)

2011 National Wildfire Coordinating Group – Human Factors in the Wildland Fire Service (L-180)
2011 National Wildfire Coordinating Group – Pack Test
2010 Council of Eastern Forest Technician Schools—Award for Superior Academic Achievement

References

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Dottie Brown
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Stephanie R Penk

Wildlife Biologist

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Sylva NC 28779

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biotopefe.info@gmail.com

Resume

Summary

Dr. Penk has 11 years of experience working in the environmental services field. During that time, she has quickly distinguished herself as a capable and competent biologist, swiftly building her credentials and confidence in endangered species surveys for *Myotis sodalis* and *Myotis septentrionalis*. At this point in her career Dr. Penk has performed approximately 265 mist-net surveys, two thirds of which she acted as the team lead. For three summer net season's Dr. Penk managed the mist-netting and telemetry effort on a variety of projects across Pennsylvania, West Virginia, Ohio, Virginia, Illinois, Minnesota, Arkansas, Maryland, and Iowa. In 2016, Dr. Penk received her independent Qualified Bat Surveyor permit from the Pennsylvania Game commission as well as her West Virginia state endangered species collection permit. She has since received a **Federal Recovery Permit (ES 81353B-1)** to capture *Myotis sodalis* and *Myotis septentrionalis* with mist-nets. She has continued to work seasonally performing mist-net surveys as a lead biologist nearly every summer since 2016, maintaining her surveying skills and continuing to collect state permits as her experience broadens (e.g., TN, AL, VA, NC, PA, MN, IA, IL, AR, MD, VA, KY, OH, TX).

Qualifications and Experience with Bats

Dr. Penk is experienced in the use of the following equipment and techniques as they relate to the detection, capture, and handling of bats including federally protected species:

- Bat handling and identification of Eastern U.S bat species and others
    - *Myotis sodalis*, *Myotis septentrionalis*, *Myotis lucifugus*, *Myotis leibii*, *Myotis austroriparius*, *Nycticeius humeralis*, *Perimyotis subflavus*, *Eptesicus fuscus*, *Lasiurus borealis*, *Lasiurus cinereus*, *Lasionycteris noctivagans, Dobsonia beauforti*, *Pteropus hypomelanus*
- Determining sex, age, and necessary measurements of bats
- Suitable survey site selection
- Mist-net set up and operation
- Harp trap set up and operation
- Radio telemetry; foraging and roost tree locating
- Analysis of telemetry data using LOAS programs
- Transmitter application
- Application of split-ring metal and celluloid identification bands
- Wing Damage Index Scoring
- Bat habitat assessments
- Acoustic monitor placement and data analysis

- White-nose Syndrome decontamination protocols
- Wing swab collection

Indiana Bat (*Myotis sodalis*) Experience

- Captured and processed 27 *Myotis sodalis* (Mist-net and harp trapping)
- Personally placed 3 radio transmitters on *Myotis sodalis*; assisted with 1
- Conducted approximately 160 hours of radio telemetry (nighttime foraging and roost tree locations) for the Indiana Bat
- Performed over 25 emergence counts on known *Myotis sodalis* roost trees
- Performed mist-net site reconnaissance

Northern Long-eared Bat (*Myotis septentrionalis*) Experience

- Captured and processed an estimated 101 *Myotis septentrionalis*; 66 as the team lead
- Personally placed 14 radio transmitters on *Myotis septentrionalis*; assisted with 14
- Conducted over 420 hours of radio telemetry to determine roost tree locations
- Performed approximately 120 emergence counts on said roost trees
- Performed mist-net site reconnaissance; yielded high rate of *Myotis septentrionalis* captures

Selected Project Experience

Pennsylvania

- Mist-net survey for the Federally Endangered Indiana Bat, northern long-eared bat, tricolored bat, and little brown bat for the proposed Pennsylvania Pipeline Project throughout Pennsylvania.
- Mist-net survey for the Federally Endangered Indiana Bat for the proposed Pennsylvania Pipeline Project throughout Pennsylvania.
- Project manager for US Forest Service inventory of bats in Allegheny National Forest using mist-nets on forest sites as well as innovative traps for structure emergence surveys.

Ohio

- Habitat Assessment for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Rover Pipeline throughout Ohio.
- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Rover Pipeline throughout Ohio.
- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Dr. No Well Pad in Monroe County, Ohio.
- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Valenka-2 Well Pad in Monroe County, Ohio.

West Virginia

- Habitat Assessment for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Rover Pipeline throughout West Virginia.
- Mist-net survey for the Federally Endangered Indiana Bat for Long Branch Surface Mine in Kanawha and Raleigh Counties, West Virginia.

- Mist-net survey for the Federally Endangered Indiana Bat for Blue Pennant Surface Mine in Boone and Raleigh Counties, West Virginia.
- Habitat Assessment for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Inception Gas Pipeline in Harrison County, West Virginia.

Maryland

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Terrapin Hills Wind Project in Garrett County, Maryland.

Minnesota

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Timberwolf Wind Project in Fillmore County, Minnesota.

North Carolina

- Mist-net survey for long term monitoring of bat species with the Eastern Band of Cherokee Fish and Wildlife service in Cherokee, North Carolina.
- Mist-net survey for northern long-eared bat research project on National game lands in Camden, North Carolina.

Virginia

- Mist-net survey for the Federally Endangered northern long-eared bat for the RAYTHEON project conducted with the US Navy in New Kent, Virginia.
- Mist-net survey for the Federally Endangered northern long-eared bat for the Chester Solar Project conducted with a private energy firm in Chester, Virginia.

Illinois

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Navigator HGP project across from Springfield to Quincy, Illinois. Tricolored bats included as a target species.

Indiana

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Prairie Creek Windfarm Project in Blackford County, Indiana.

Iowa

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Diamond Trail Wind Project in Iowa County, Iowa.

Education and Professional Trainings

- University of Guelph, Guelph ON, Canada
    - Bachelor of Science Honors, Major: Wildlife Biology
    - Graduated with Distinction 2012
- University of Toronto, Toronto ON, Canada
    - PhD graduate March 2022
    - Department of Ecology and Evolutionary Biology
        - Emphasis on mathematical modeling in ecology

Consultation

From:	Crutchfield Jr., John U
To:	Olds, Melanie J; Elizabeth Miller
Cc:	Stuart, Alan Witten; Mularski, Eric; Fletcher, Scott T; Kulpa, Sarah; McCarney-Castle, Kerry; Salazar, Maggie
Subject:	Bad Creek Relicensing - Draft Bat Study Plan (REQUEST REVIEW)
Date:	Wednesday, May 8, 2024 1:12:34 PM
Attachments:	image001.png
Importance:	High

Melanie and Elizabeth:

Per our previous discussions regarding construction activities of Bad Creek II Complex, please find attached the draft Bad Creek Bat Study Plan. The draft study plan and kmz files can be accessed at the following SharePoint link for your review and comment:

Bad Creek_Bat Study Plan_May 2024

As you are aware, the summer bat survey season begins on May 15 so Duke Energy respectfully requests an expedited review by your respective agencies (comments by Friday, May 24, if possible).

Once we receive comments from your agencies, we will finalize the study plan and send to the Wildlife & Botanical Resources Committee members and copy FERC.

Please let Alan or me know if you have any questions.

Thanks,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From:	dylan.biotope
To:	Troutman, Lindsey C
Cc:	Jennifer Kindel; Mularski, Eric; Fletcher, Scott T; McRacken Jr., James A.; Emily Kearse; Will Dillman; Olds, Melanie J
Subject:	Re: [EXTERNAL] Re: Dylan Brooks and Subpermittees SCP Renewal for Bats
Date:	Friday, May 10, 2024 2:33:01 PM
Attachments:	image001.png BadCreek_BatStudyPlanPackage_20240508.pdf

Hey Lindsey,

Thanks for the quick response. I hope all has been well with you since we last spoke. That is correct, our Federal Recovery Permits already have gray bats listed in the species we are allowed to survey/handle. However, I figured I would CC everyone involved with the study plan compilation in case the study plan needed to be edited in addition to the edits required for our SCDNR permit.

I have attached the current study plan developed by Duke Energy and HDR. Eric, correct me if I'm wrong, but I believe it was submitted to USFWS on 05/08/24. Do you happen to have an anticipated wait timeline on the review and/or approval of proposed study plans in SC currently? I'm just curious because if you think it will be approved by or on May 15th, I would go ahead and put the wheels in motion to start mobilizing the teams that have a significant commute to the project area.

Again, thank you all for your diligence in reviewing these materials so quickly. It is greatly appreciated and I will remain available if there is anything I can do to assist in the process.

Dylan Brooks
Vice President | Owner

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Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Fri, May 10, 2024 at 2:14 PM Troutman, Lindsey C <lindsey_troutman@fws.gov> wrote:

> Hi Dylan,
>
> It sounds as though the FWS permitting process for purposeful take of gray bats has already been completed for yourself and your sub subpermittees, is that correct? If so, no further documentation is needed on our end.
>
> Thanks,
>
> Lindsey

Lindsey Troutman

Wildlife Biologist (Recovery)

U.S. Fish and Wildlife Service

South Atlantic-Gulf Region (Region 4)

South Carolina Ecological Services Field Office

176 Croghan Spur Road, Suite 200

Charleston, SC 29407

Direct Phone Line: 843-509-1189

Lindsey_Troutman@fws.gov

M-F 7:00AM – 3:30PM ET

From: Dylan Brooks <dylan.biotope@gmail.com>
Sent: Friday, May 10, 2024 1:53 PM
To: Jennifer Kindel <KindelJ@dnr.sc.gov>; Mularski, Eric <eric.mularski@hdrinc.com>; scott.fletcher <scott.fletcher@duke-energy.com>; McRacken Jr., James A. <James.McRacken@duke-energy.com>
Cc: Emily Kearse <KearseE@dnr.sc.gov>; Will Dillman <DillmanJ@dnr.sc.gov>; Troutman, Lindsey C <lindsey_troutman@fws.gov>; Olds, Melanie J <melanie_olds@fws.gov>
Subject: [EXTERNAL] Re: Dylan Brooks and Subpermittees SCP Renewal for Bats

Hey Jennifer,

Thanks for your quick response. Please see attached for Biotope's SCP application to include gray bats for the Bad Creek Pumped Storage project. HDR and Duke are in charge of the study plan, so I have CC'ed their representatives in this email so they can make any necessary changes.

Thanks,

Dylan Brooks

Vice President | Owner

6332 FM 2259

Nacogdoches, TX 75961

(828)507-5523

www.biotopeforenv.com

On Fri, May 10, 2024 at 1:34 PM Jennifer Kindel <KindelJ@dnr.sc.gov> wrote:

> Hello Mr. Brooks,
>
> Please include the federally endangered Gray Bat. They were recorded in Oconee Co last fall. I'm not sure if FWS is including this, so I'm Ccing Lindsey Troutman and Melanie Olds for clarification.
>
> Thank you,
>
> Jen
>
> Jennifer Kindel
>
> **State Bat Biologist, Certified Wildlife Biologist®**
>
> *Cell: 864-419-0739; Kindelj@dnr.sc.gov*
>
> *South Carolina Department of Natural Resources*
>
> *124 Wildlife Drive, Union SC 29379*
>
> *Bats of South Carolina*

From: Dylan Brooks <dylan.biotope@gmail.com>
Sent: Wednesday, May 8, 2024 5:54 PM
To: Emily Kearse <KearseE@dnr.sc.gov>; Jennifer Kindel <KindelJ@dnr.sc.gov>; Will Dillman <DillmanJ@dnr.sc.gov>

Subject: Dylan Brooks and Subpermittees SCP Renewal for Bats

Good Afternoon,

I am reaching out today to renew my Scientific Collections Permit for bats. I would also like to add the subpermittees that will be working for us on the Bad Creek Pumped Storage project for Duke Energy in Oconee County.

The subpermittees I would like to include on my permit are the following people:

Jeremy Van Deventer

Jay Deatherage

Eli Corwin

John Manuel

Stephanie Penk

I have attached their resumes and copies of their federal recovery permits. I have also attached the study plan/map for the Bad Creek Project and the SCP application. For your reference, I have included the expired permit which I held last year.

We hope to **begin the project May 15th if possible**, apologies for the tight timeline but were delayed while hammering out the study plan details with the client.

Please let me know if there is anything I can do to assist with the processing. The check with the processing fee is in the mail.

Sincerely,

Dylan Brooks

Vice President | Owner

Image removed by sender.

6332 FM 2259

Nacogdoches, TX 75961

(828)507-5523

www.biotopeforenv.com

Subject: FW: Bad Creek Relicensing - Draft Bat Study Plan (REQUEST REVIEW)

From: Elizabeth Miller <MillerE@dnr.sc.gov>
Sent: Monday, May 20, 2024 3:07 PM
To: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; Olds, Melanie J <melanie_olds@fws.gov>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Mularski, Eric <Eric.Mularski@HDRInc.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Kulpa, Sarah <Sarah.Kulpa@hdrinc.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Salazar, Maggie <maggie.salazar@hdrinc.com>
Subject: RE: Bad Creek Relicensing - Draft Bat Study Plan (REQUEST REVIEW)

Hi John,

Staff with the South Carolina Department of Natural Resources (SCDNR) have reviewed the May 2024 draft Bat Study Plan. The SCDNR offers the following comments for your consideration.

- Please include the federally endangered Gray bat (*Myotis grisescens*) in the study plan. This species was recorded in Oconee Co in the fall of 2023 by SCDNR staff.
- We really appreciated the provided KMZ map, with locations for bat acoustic and netting sites looking good overall. However, some netting site locations look to be out in the open when viewing with Google Earth but do not appear to when viewing the latitude and longitude in Google Maps (eg, point 16). Please confirm that no netting sites are located out in the open.

Thank you,

Elizabeth

Elizabeth C. Miller
SCDNR
Office: 843-953-3881
Cell: 843-729-4636

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Wednesday, May 8, 2024 1:09 PM
To: Olds, Melanie J <melanie_olds@fws.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>; Maggie Salazar <maggie.salazar@hdrinc.com>
Subject: Bad Creek Relicensing - Draft Bat Study Plan (REQUEST REVIEW)
Importance: High

Melanie and Elizabeth:

Per our previous discussions regarding construction activities of Bad Creek II Complex, please find attached the draft Bad Creek Bat Study Plan. The draft study plan and kmz files can be accessed at the following SharePoint link for your review and comment:

Bad Creek_Bat Study Plan_May 2024

As you are aware, the summer bat survey season begins on May 15 so Duke Energy respectfully requests an expedited review by your respective agencies (comments by Friday, May 24, if possible).

Once we receive comments from your agencies, we will finalize the study plan and send to the Wildlife & Botanical Resources Committee members and copy FERC.

Please let Alan or me know if you have any questions.

Thanks,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From:	Crutchfield Jr., John U
To:	Olds, Melanie J; kate_yates; Elizabeth Miller
Cc:	Stuart, Alan Witten; Fletcher, Scott T; Kulpa, Sarah; Mularski, Eric; McCarney-Castle, Kerry; Huff, Jen
Subject:	Bad Creek Relicensing - Bad Creek II Power Complex Bat Study Plan
Date:	Tuesday, May 28, 2024 6:09:38 AM
Attachments:	image001.png
Importance:	High

Dear Melanie, Kate, and Elizabeth :

Duke Energy is pleased to submit the finalized Bad Creek II Power Complex Bat Study Plan. All suggested revisions from USFWS and SCDNR have been incorporated into the study plan; the package and updated KMZ can be accessed using this folder link: Final Bat Study Plan_May 2024

In consideration of the additional items requested by USFWS , Duke Energy will submit a separate document with responses to those comments later this week, per the Service's request.

Please let Alan or me know if you have any questions.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From:	Crutchfield Jr., John U
To:	Stuart, Alan Witten; Fletcher, Scott T; Kulpa, Sarah; McCarney-Castle, Kerry; Huff, Jen; Mularski, Eric
Subject:	Fwd: [EXTERNAL] 2024-0079174 Bad Creek II Power Complex Bat Study Plan
Date:	Tuesday, May 28, 2024 3:00:07 PM
Attachments:	2024-0079174 Bad Creek Oconee Co_study plan approval.pdf

FYI, included Eric so he is aware of forwarding me this email.

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From: Yates, Kate H <kate_yates@fws.gov>
Sent: Tuesday, May 28, 2024 2:50 PM
To: Dylan Brooks <dylan.biotope@gmail.com>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>
Subject: [EXTERNAL] 2024-0079174 Bad Creek II Power Complex Bat Study Plan

Good afternoon, John, Eric, and Dylan.

Please find the attached form indicating the Service's conditional approval of the Study Plan submitted for the Bad Creek II Power Complex, proposed to start in May 2024. Note the comments in the approval section of the attached letter. I am still unable to access the folder, so have not seen the updated kmz, but you can submit as an attachment later. However, please be cognizant of linear site placement to satisfy the guidelines.

Please submit survey data to us and SCDNR (BatSurveyReports@dnr.sc.gov) via email following the format provided on pg. 34-35 of the Range-wide Indiana Bat & Northern Long-eared Bat Survey Guidelines.

We also request a separate spreadsheet with the data using the FWS format found here USFWS_bat_spreadsheet_SoutheastUS_2023.xlsx (live.com), as this will help align with our internal formatting for surveys associated with projects. We look forward to receiving the results upon completion. Please let us know if there are any revisions to the Study Plan.

If you have any questions, comments, or require additional information regarding this approval, please contact us by email: kate_yates@fws.gov and charleston_regulatory@fws.gov.

Thank you,

Kate H. Yates
Fish and Wildlife Biologist
SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service
South Carolina Ecological Services Field Office
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407
Cell: 843-991-2173
kate_yates@fws.gov

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United States Department of the Interior

Fish and Wildlife Service

South Carolina ES Field Office

176 Croghan Spur Road, Suite 200, Charleston, SC 29407

General Office Phone: (843)727-4707

SITE-SPECIFIC AUTHORIZATION - BAT WORK **2024-0079174 Bad Creek - Oconee County**

Our Field Office has reviewed your study plan and found it to contain sufficient information for our approval. When signed, this statement serves as your site-specific authorization to conduct the proposed activities at the specified locations included in the attached Study Plan Form and supporting files and must be carried with your federal permit when conducting work for this project. All activities must be carried out with strict adherence to permit conditions and authorizations specified in your federal permit as well as your state permit(s) (if needed). The section 10(a)(1)(A) permit authorizing the activities must remain with the surveyor at all times. This authorization is not valid if you have not obtained permission from the owner of the lands where activities will occur.

For federal permit reporting purposes, please use the appropriate USFWS bat survey data spreadsheet, available on the IBAT and NLEB Summer Survey Guidance website[1]. To mitigate the risk of humans transmitting viruses (e.g., SARS-CoV-2) to bats or viral transmission from bats to humans, the U.S. Fish and Wildlife Service requests anyone directly handling or working in close proximity to bats follow current guidelines prepared by the CDC[2] and IUCN Bat Specialist Group[3] in addition to the following the standard WNS decontamination protocols[4].

If the work expands beyond the scope of your original study plan or if there are adverse effects to bats that were not anticipated, cease all survey and/or research activities, and contact this office prior to continuing. Additionally, if a federally listed bat is captured, this USFWS Field Office must be notified within 48 hours with information regarding species, sex, age, and whether or not the bat has a transmitter attached.

Field Office POC: Kate H. Yates

email: kate_yates@fws.gov phone: (843)991-2173

☐ **Authorized as Proposed**

☑ **Authorized with Conditions** (see below)

You are authorized to proceed provided that the following adjustment(s) and/or conditions are met.

1. Approval of state permit, which is currently listed as pending.
2. Submission of revised kmz with correct number of sites and labeled or color coded as to whether a net site or acoustic.
3. Unless there is reasonable justification otherwise, each 1km linear stretch needs a survey. See Appendix E of the survey guidelines

☐ **Not Authorized.**

Comments:

Signature & Date: KATE YATES Digitally signed by KATE YATES Date: 2024.05.28 14:43:56 -04'00'

NOTE: Please check the appropriate box above before signing/locking the document.

[1] https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines
[2] https://www.cdc.gov/healthypets/covid-19/wildlife.html
[3] https://www.iucnbsg.org/uploads/6/5/0/9/6509077/amp_recommendations_for_researchers_final.pdf
[4] https://www.whitenosesyndrome.org/mmedia-education/national-wns-decontamination-protocol-u-s

From: Crutchfield Jr., John U
To: Stuart, Alan Witten; Fletcher, Scott T; Mularski, Eric; Kulpa, Sarah; McCarney-Castle, Kerry; Huff, Jen
Subject: Fwd: [EXTERNAL] Bad Creek Bat survey plan
Date: Thursday, May 30, 2024 5:04:01 PM

FYI.

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From: Yates, Kate H <kate_yates@fws.gov>
Sent: Thursday, May 30, 2024 4:47 PM
To: Dylan Brooks <dylan.biotope@gmail.com>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Subject: [EXTERNAL] Bad Creek Bat survey plan

Good afternoon, Dylan.

Due to a recent situation involving lack of clarity on using K Pro software versions newer than 5.4.7, I wanted to reach out to you in hopes of avoiding a similar problem. Your plan indicates you will be using version 5.6.3 with the 5.4 classifier which is fine according to footnote 1 on the webpage. However, please ensure you use a sensitivity setting of -1 when running the call files. The footnotes are currently unclear on that aspect, but the intention was for the -1 sensitivity setting to be carried forward. Please contact me again prior to running the calls to ensure all software settings are approved for your version.

Thank you and happy surveying.

Kate H. Yates, CWB
Fish and Wildlife Biologist
SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service
South Carolina Ecological Services Field Office
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

Cell: 843-991-2173
kate_yates@fws.gov

From:	Crutchfield Jr., John U
To:	Kulpa, Sarah; Mularski, Eric; McCarney-Castle, Kerry; Huff, Jen
Cc:	Stuart, Alan Witten; Fletcher, Scott T
Subject:	FW: Bad Creek Relicensing - Bad Creek Power II Complex Bat Study Plan (FERC Project No. 2740)
Date:	Friday, May 31, 2024 3:04:18 PM
Attachments:	BadCreek_StudyPlanPackage_Revised_20240524 (1).pdf
Importance:	High

FYI.

From: Crutchfield Jr., John U
Sent: Friday, May 31, 2024 3:01 PM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>
Subject: Bad Creek Relicensing - Bad Creek Power II Complex Bat Study Plan (FERC Project No. 2740)
Importance: High

Bad Creek Pumped Storage Project (FERC No. 2740)–Bad Creek Power II Complex Bat Study Plan

Dear Ms. Salazar:

Per discussion and the Commission's request during the Bad Creek Relicensing Initial Study Report (ISR) meeting held in Greenville, SC held on January 17, 2024, please find attached the Bad Creek Power Complex Bat Study Plan.

This study plan was prepared in consultation with the U.S. Fish & Wildlife Service and the South Carolina Department of Natural Resources. Both agencies reviewed the draft plan, and their comments have been incorporated into the attached finalized study plan.

Please let Alan Stuart or me know if you have any questions about the study plan.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From:	Crutchfield Jr., John U
To:	Jeffrey.Magniez@usda.gov
Cc:	Stuart, Alan Witten; Fletcher, Scott T; Mularski, Eric; Kulpa, Sarah; McCarney-Castle, Kerry; Huff, Jen
Subject:	Bad Creek Relicensing - Bad Creek Power II Complex Bat Study Plan (FERC Project No. 2740)
Date:	Friday, May 31, 2024 2:55:52 PM
Attachments:	BadCreek_StudyPlanPackage_Revised_20240524 (1).pdf
Importance:	High

Mr. Magniez:

Per discussion and your request to Scott Fletcher, Duke Energy, please find attached the Bad Creek II Power Complex Bat Study Plan package.

This finalized study plan incorporates feedback from the USFWS as well as the South Carolina Department of Natural Resources.

A copy of the study plan is being provide to the U.S. Forest Service for your reference and information.

Please let Scott Fletcher or me know of you have any questions.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From:	Crutchfield Jr., John U
To:	Abney, Michael A; Andrew Grosse; Andy Douglas; Austen Attaway; Bill Ranson-Retired; Chris Starker; Dale Wilde; Elizabeth Miller; Mularski, Eric; Fletcher, Scott T; Huff, Jen; Jennifer Kindel; Keith A. Bradley; Ken Forrester; Olds, Melanie J; Amedee, Morgan D.; Pat Cloninger; Samantha Tessel; Stuart, Alan Witten; suewilliams130@gmail.com; Wes Cooler; Willie Simmons
Cc:	Stuart, Alan Witten; Kulpa, Sarah; McCarney-Castle, Kerry
Subject:	Bad Creek Relicensing - Bad Creek Power II Complex Bat Study Plan
Date:	Friday, May 31, 2024 2:33:23 PM
Attachments:	image001.png
Importance:	High

Dear Bad Creek Relicensing Wildlife and Botanical Resources Committee Members:

Duke Energy is pleased to distribute the Bad Creek II Power Complex Bat Study Plan package, including the U.S. Fish and Wildlife (USFS) Study Plan Form for Bat Surveys and Monitoring (v. 2.1) and Google Earth (KMZ), for your reference and information. This finalized study plan incorporates feedback from the USFWS as well as the South Carolina Department of Natural Resources. A copy of the study plan will also be sent to the U.S. Forest Service (Sumter National Forest) and FERC. The deliverable and KMZ are available on the Bad Creek Relicensing SharePoint site at the following link: Bad Creek Bat Study Plan.

Please let Alan or me know if you have any questions.

Thank you,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

U.S. Fish and Wildlife Service

Study Plan Form for Bat Surveys and Monitoring (v. 2.1)[1]

PROJECT & SURVEY INFORMATION

Project Name: Bad Creek II Power Complex

Proposed Survey Start Date: May 2024

Project Proponent's Name (e.g., client/company/institution): Duke Energy

Project Location: State(s): South Carolina

County(s): Oconee

Latitude: 35.008647

Longitude: -83.004316

REQUIRED: Attach or provide links to Google Earth® KMZ files (preferred) and/or shapefiles (mapping must show project boundaries, impacted forest habitat (if known) and all proposed survey sites)
Files are attached: Yes ☑ No ☐
File Links: _____

Project Summary. In the space provided below, please provide a description of the proposed action, including any activities that will permanently or temporarily alter the current environment and existing habitat features.

See attached.

CONTACT INFORMATION

Project Manager/Primary Point of Contact (POC): James McRacken (Duke Energy)

Phone: 980.875.5279

Field Survey Crew Leader (if different from POC): Dylan Brooks (Biotope)

Cell Phone: 704.996.8671

Institution/Company Name: Duke Energy

Mailing Address: 1339 Hagers Ferry Road (MG03A3) Huntersville, NC 28078

POC Email Address: james.mcracken@duke-energy.com

USFWS Sec. 10(a)(1)(A) Permit No.(s) (if applicable): TE-81492B-1, TE88227B-1

State Permit No.(s) (if applicable): To be acquired. Awaiting approval

[1] Unless otherwise directed by the Service, surveyors may complete this fillable form, in lieu of a traditional narrative format, and submit it (and supporting files) to the Ecological Services Field Office in the state(s) where the work is to be completed (https://www.fws.gov/our-facilities). Use of this form is not a requirement at this time. Our goal is to improve pre-survey coordination and to expedite the Field Office review and approval process. Please submit your study plan at least 15 working days in advance of your proposed survey start date. Suggestions for improving this document may be sent to R4_Bat_Survey_Guidance@fws.gov.

Have project proponents been informed that abiding by protective time-of-year restrictions (where available) may be sufficient to avoid take of federally listed bats and (in some cases) may negate the need for a bat survey? Yes☑ No☐

Have project proponents been informed that the Service does not require presence/probable absence surveys for federally listed species and that presence can be assumed in a project area containing suitable habitat? Yes☑ No☐

Will this survey be conducted on private or public lands? *(Check both if applicable)*: Private☑ Public☑

Has permission of all necessary landowners/managing agencies been obtained? Yes☑ No☐

If no, explain: _____

Does this project have a federal nexus[2]? Yes☑ No☐ Unsure☐

If yes, explain: FERC (No.2740) Relicensing and USACE Section 404 Individual Permit

IPaC[3] Consultation Code (if applicable): 2024-0079174

Purpose of Survey: Official P/A Survey☑ Research☐ Monitoring☐
Educational Outreach/Training Other: _____

Survey Target Species: Indiana bat (IBAT)☐ Northern long-eared bat (NLEB)☑
Tricolored bat (TCB)☑ Other: Gray Bat

Has a Phase-1 Habitat Assessment* of the project area been conducted? Yes☑ No☐
If yes, how was the habitat assessment conducted? Field☑ Desktop☑ Combo☑
*(*if available, attach a written report)*

Is suitable habitat[4] present (or assumed present) for all "target" species? Yes☑ No☐

If no, explain: _____

Does this project fall within the outer-tier[5] of any "target" species known home range? Yes☐ No☑ Unsure☐

If yes, which species: _____

Project Configuration

Is this project **linear** (>1 km in total length)? Yes☑ No☐ Combo☐ Unsure☐

If yes, how many 1-km sections containing suitable IBAT/NLEB habitat will be impacted? 45

Is this project **non-linear**? Yes☑ No☐ Combo☐ Unsure☐

If yes, how many acres of suitable IBAT/NLEB habitat is in the overall project area? 179.3

If yes, how many acres of suitable IBAT/NLEB habitat will be directly impacted/cleared? 179.3

PROPOSED METHODS & SURVEY LEVEL OF EFFORT[6]

ACOUSTICS

Total number of detector sites proposed to be surveyed: 37 Number of detector nights/site: linear-4, nonlinear-3

[2] A project or action that is carried out, authorized, funded, and/or permitted by a federal agency.
[3] https://ipac.ecosphere.fws.gov/
[4] See Appendix A of the Guidelines regarding suitable habitat definitions.
[5] See Appendix G of the Guidelines if you are unclear what the out-tier of a known range includes.
[6] Survey level of effort (acoustic or netting) must be spread over at least two calendar nights/survey site.

Total number of detector nights for entire survey: 144

Total proposed number of calendar nights to complete the entire survey: 12

Detector(s) (Brand, Model): Anabat Express Microphone(s): directional ☑ omnidirectional ☑

Recording Format: Full Spectrum ☑ Zero-Crossing ☐

FWS-Approved[7] Acoustic Bat ID Software: KPro vers. 5.6.3 KPro Classifier, NA vers. 5.4 BCID vers.____
Other Candidate Programs (e.g., Sonobat) vers.: _____

Species to be included for automatic software ID classification analysis:

EPFU☑ CORA☑ COTO☐ LABO☑ LACI☑ LANO☑ LASE☑ TABR☑ MYCI☐ MYEV☑ MYGR☑ MYLU☑
MYLE☑ MYSE☑ MYSO☐ MYTH☐ MYVO☐ NYHU☑ PESU☑ Others: MYAU

Will qualitative analysis (i.e., manual vetting) be used? Yes☑ No☐ Unsure☐

Name(s) of qualified biologist(s) conducting qualitative/manual identifications (attach resume or link with qualifications):
Dylan Brooks, John Manuel, Patrick Eli Corwin (resumes attached)

MIST-NETTING

Total number of net sites to be surveyed: 15 Total number of net nights/site: 4, one site with 5

Total number of net nights for entire survey (No. of sites X No. of net nights/site): 61

Total proposed number of calendar nights to complete the entire survey: 10 (3 teams)

A) Maximum number of net set-ups that will be operated/checked (10-min interval) on a given calendar night at a given survey site: 3
B) Minimum Number of personnel present to operate/check X (see A) net set-ups on a given site: 2
C) Proposed Staffing Rate (A divided by B): 1.5

Staffing Rate

Number of Section 10-permitted biologists per net site (or state-permitted in USFWS R5): 1

Do you propose to band bats? Yes☐ No☑

If yes, please answer the following:

What species will be banded? COTO☐ MYGR☑ MYLU☑ MYSE☑ MYSO☐ PESU☑
Others: _____ All captured bats:
If banding *Myotis* sp. or PESU, specify band size: _____
Describe your proposed bands (color and letter-numbers) and banding scheme: _____
Will banding pliers be used? Yes☐ No☐

Will any biological samples be collected from captured bats (e.g., guano, hair, swab, wing punch)? Yes☐ No☑

If yes, explain: _____

Name of institution or facility to conduct DNA analysis: _____

RADIO-TRACKING

Will any bats be radio-tagged and tracked? Yes☐ No☑

[7] https://www.fws.gov/media/automated-acoustic-bat-id-software-programs

If yes, please answer following:

Which species will be radio-tagged? _____
Name of USFWS Section 10 permitted biologist(s) who will apply transmitter(s): _____
Make/model and approximate weight of transmitter(s) to be used: _____
Manufacturer date and estimated life-span of transmitters to be used: _____
Frequency range (MHz) of transmitters (e.g., 150.xxx or 172.xxx): _____
If radio-tracking multiple targeted bats/species, what criteria will be used in selecting which bats will be tracked?
_____
Will all radio-tagged bats be tracked (min. of 4-hrs. search effort/day) to their diurnal roosts for the minimum recommended period of 7 days? Yes☐ No☐
If no, explain: _____
Will night-time foraging data/telemetry be collected? Yes☐ No☐
Glue used for attaching transmitters: Type: Latex-based Surgical Cement Name: Ostobond
Manufacturer: Montreal Ostomy Product Other: _____

EMERGENCE SURVEYS

After diurnal roost sites of radio-tagged bats are identified, will emergence surveys be conducted at each identified roost (assuming landowner permission is obtained)? Yes☐ No☐

If yes, how many emergence surveys/roost? _____

Have you identified a small number (e.g., ≤10) of potentially suitable roost trees* that you propose to conduct emergence surveys for? Yes☐ No☐

*(*If yes, provide photographs of each tree documenting that all of the tree can be observed by the surveyor along with coordinates (lat/long and/or KML/shapefile) of all trees to be surveyed.)*

POTENTIAL HIBERNACULA SURVEYS

Are you aware of any known hibernacula used by the target species within the project area itself or nearby?

Yes☐ No☑ Unknown☐

If yes or unknown, list sites or explain: _____

Has your desktop analysis identified any natural or man-made features that could be used as a hibernaculum by any of the target bat species? Yes☐ No☐ Unknown☐

If yes, underground features (e.g., caves, mines, tunnels, bunkers, cisterns) present: Yes☐ No☐
If yes, above-ground features* (e.g., crawl spaces) present: Yes☐ No☐
If unknown, explain: _____

Are you requesting approval of a field survey for potential hibernacula at this time? Yes*☐ No☐
*(*If yes, attach a separate narrative explaining how the project area(s) will be surveyed for potential hibernacula.)*

Are you submitting the results of a Phase 1 Habitat Assessment of potentially suitable hibernacula identified from field surveys? Yes*☐ No☐
*(*If yes, provide a Phase 1 Habitat Assessment Data Sheet for each potential hibernaculum/portal(s)[8] identified to be surveyed.)*

BRIDGE & CULVERT ASSESSMENTS

Will any bridges or culverts be surveyed for bat presence? Yes☐ No☑

If yes, please answer the following:

[8] If multiple cave entrances/portals, please list all locations.

Structure type(s) (check all that apply): Bridge☐ Culvert☐ Other☐
If "other", explain: _____

Survey methodology for structure(s) (check all that apply):
Visual inspection☐ Guano collection☐ Emergence survey☐ Acoustics*☐
Mist-net*☐ Harp-trap*☐ Other _____
*(*Due to site-specific conditions of structures, coordination with the local USFWS Field Office and appropriate state agency(ies) is necessary before proceeding with these survey methodologies)*

Will guano be collected and analyzed to confirm species ID? Yes☐ No☐
If "yes", name of institution/entity performing analysis: _____

ADDITIONAL SURVEY INFORMATION[9]

Will the proposed bat survey deviate from the current version of the USFWS Survey Guidelines?[10] Yes☐ No☑

If yes, provide justification for any departures or modifications to the guidelines (if applicable) below:

I hereby acknowledge that the information being provided to the Service is accurate and complete as of today's date.

Signature: _____ Date (*Original*): 5/7/2024

Date (*Revised*): 5/24/2024

[9] Attach additional pages to this form, if needed.

[10] Proposed surveys deviating from the current Range-wide IBAT & NLEB Survey Guidelines will only be accepted with a thoroughly described justification. Coordinate with your local USFWS Field Office (https://www.fws.gov/our-facilities) for acceptable modifications.

********FOR U.S. FISH AND WILDLIFE SERVICE USE ONLY**********

United States Department of the Interior

Fish and Wildlife Service

Generic ES Field Office

Street Address

General Office Phone:

SITE-SPECIFIC AUTHORIZATION - BAT WORK

Our Field Office has reviewed your study plan and found it to contain sufficient information for our approval. When signed, this statement serves as your site-specific authorization to conduct the proposed activities at the specified locations included in the attached Study Plan Form and supporting files and must be carried with your federal permit when conducting work for this project. All activities must be carried out with strict adherence to permit conditions and authorizations specified in your federal permit as well as your state permit(s) (if needed). The section 10(a)(1)(A) permit authorizing the activities must remain with the surveyor at all times. This authorization is not valid if you have not obtained permission from the owner of the lands where activities will occur.

For federal permit reporting purposes, please use the appropriate USFWS bat survey data spreadsheet, available on the IBAT and NLEB Summer Survey Guidance website[1]. To mitigate the risk of humans transmitting viruses (e.g., SARS-CoV-2) to bats or viral transmission from bats to humans, the U.S. Fish and Wildlife Service requests anyone directly handling or working in close proximity to bats follow current guidelines prepared by the CDC[2] and IUCN Bat Specialist Group[3] in addition to the following the standard WNS decontamination protocols[4].

If the work expands beyond the scope of your original study plan or if there are adverse effects to bats that were not anticipated, cease all survey and/or research activities, and contact this office prior to continuing. Additionally, if a federally listed bat is captured, this USFWS Field Office must be notified within 48 hours with information regarding species, sex, age, and whether or not the bat has a transmitter attached.

Field Office POC: _____

email: _____ phone:_____

☐ **Authorized as Proposed**

☐ **Authorized with Conditions** (see below)

You are authorized to proceed provided that the following adjustment(s) and/or conditions are met.

☐ **Not Authorized.**

Comments:

Signature & Date:

NOTE: Please check the appropriate box above before signing/locking the document.

[1] https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines
[2] https://www.cdc.gov/healthypets/covid-19/wildlife.html
[3] https://www.iucnbsg.org/uploads/6/5/0/9/6509077/amp_recommendations_for_researchers_final.pdf
[4] https://www.whitenosesyndrome.org/mmedia-education/national-wns-decontamination-protocol-u-s

Project Summary

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Project Purpose and Summary

Duke Energy's Bad Creek Pump Storage Project (Bad Creek or Project), FERC Project No. 2740, is located in Oconee County, South Carolina, approximately eight miles north of Salem. The Bad Creek Reservoir (or upper reservoir) was formed from the damming of Bad Creek and West Bad Creek and serves as the Project's upper reservoir. Lake Jocassee, licensed as part of the Duke Energy Keowee-Toxaway (KT) Hydroelectric Project (FERC Project No. 2503), serves as the lower reservoir. The structures and features included in the Bad Creek Project License include the upper reservoir and dams, inlet/outlet structures in the upper and lower reservoirs, water conveyance system, underground powerhouse, tailrace tunnels, transmission facilities, and an approximately 9.25-mile-long transmission line corridor extending from Bad Creek to the KT Project's Jocassee switchyard.

The Project is operated by Duke Energy under the terms of an Original License issued by the FERC on August 1, 1977, as subsequently amended. The Original License for the existing Project expires on July 31, 2027, therefore the Project is currently undergoing relicensing through the FERC Integrated Licensing Process (ILP) for continued operation of the Project over the new 40 to 50-year license term.

Given the need for additional significant energy storage and renewable energy generation across Duke Energy's service territories over the Project's new license term, Duke Energy is evaluating opportunities to add pumping and generating capacity at the Project. Additional energy storage and generation capacity could be developed by constructing a new power complex (including a new underground powerhouse) adjacent to the existing Bad Creek Powerhouse. Construction of the 1,400-MW Bad Creek II Power Complex (Bad Creek II Complex) is, therefore, an alternative relicensing proposal presently being evaluated by Duke Energy.

The relicensing for the Project which included the proposal for the Bad Creek II Complex was initiated in February 2022 with the filing of the Pre-Application Document. Throughout the relicensing, various state and federal government resource agencies, Indian Tribes, non-governmental organizations, and other interested parties (stakeholders) have been consulted for identification of potential resources areas of interest and informational needs. In consideration of the New License, formal consultation under Section 106 of the National Historic Preservation Act (NHPA) and Section 7 of the Environmental Species Act will be initiated.

If Duke Energy decides to pursue the Bad Creek II Complex and obtains all necessary regulatory approvals for construction, the period for construction of the Bad Creek II Complex is expected to span approximately 7 years. Assuming commencement of construction shortly following the New FERC License issuance by July 2027, the Bad Creek II Complex is expected to be fully in service in 2034.

Purpose of Survey

Construction of the proposed Bad Creek II Complex will require the removal of trees, potentially impacting suitable habitat for state and federally protected bats. Mist-net surveys and acoustic surveys will be used to assess the presence/probable absence (P/A) of the federally proposed tricolored bat (*Perimyotis subflavus*) and federally endangered northern long-eared bat (*Myotis septentrionalis;* NLEB) as well as state listed species of concern known to be present in Oconee

County, including little brown bat (*Myotis lucifugus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii),* tricolored bat, hoary bat (*Lasiurus cinereus*), and gray bat (*Myotis grisescens).* The project area is in the seasonal range (non-coastal area) for the NLEB and tricolored bat. The survey will follow the 2024 Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines.[1]

Existing Habitats

The Project Area is located in the Blue Ridge ecoregion with upland areas that support mixed hardwoods-pine forests including species as Virginia pine, short-leaf pine, pitch pine, white pine, chestnut oak, scarlet oak, northern red oak, black oak, and hickories. Mountain laurel and rhododendron are common understory species. Riparian areas and ravines and steep slopes adjacent to stream channels in forested areas and support hardwood forests that contain tulip poplar, red maple, white oak, northern red oak, American beech, and sweetgum with common understory species that include eastern hemlock, rhododendron, mountain laurel, birch, sourwood, black cherry, doghobble, sassafras, spicebush, and huckleberry.

Suitable summer habitat for NLEB including potential roost trees and snags as well as foraging and commuting habitats are located throughout the Project Area. Existing suitable tricolored bat roost, forage, and travel habitat found in the Project Area included a variety of forested habitats, riparian corridors, and adjacent non-forested habitats including open areas, shrub lands including existing right of ways, and access roads through existing forested areas.

The potential impact area contains suitable summer habitat, as outlined by 2024 USFWS guidelines, that require bat surveys according to linear and non-linear project protocols since tree clearing needs to take place during the restricted cutting timeframes.

Proposed Impact Areas

Spoil Areas: Excavation required for construction of the Bad Creek II Complex will result in a significant quantity of earth and rock (or "spoil") material (4.4 million cubic yards) to be generated. Duke Energy is presently evaluating a range of upland areas within the FERC Project Boundary and/or on property owned by Duke Energy adjacent to the Project Boundary for spoil of excavated earth and additional rock (spoil areas). Construction of the proposed Bad Creek II Complex infrastructure and selected spoil areas will require vegetative clearing. Spoil area alternatives are currently under evaluation and not all spoil alternatives detailed in the attached Google Earth® KMZ files or in Table 1 will be utilized. Some potential spoil areas are within the existing footprint of spoil areas created for the original Project. A vegetative restoration plan will be developed and implemented for the spoil areas following construction.

Temporary Access Road: Duke Energy is proposing the development of a temporary access road (Fisher Knob access road) to provide an alternate route to the Fisher Knob residential community during Bad Creek II Complex construction. The proposed road will be constructed of mostly gravel and will begin at Whitewater Road and traverse approximately 3.7 miles (5.9 km) to the Fisher Knob community.

[1] Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines | FWS.gov

New Transmission Line: Duke Energy currently owns or maintains under a property easement all lands that would be required for construction of the Bad Creek II Complex. A portion of the transmission line corridor is currently maintained under a property easement and additional lands may be required to accommodate the corridor for the proposed 9.3 mile (14.9 km) new Whitewater 525kV transmission line. Approximately 15.03 miles (24.2 km) of access road has been identified to serve as construction and maintenance access for the proposed transmission line.

Table 1 represents the linear and non-linear project components along with proposed acres of forested areas to be cleared by potential project activities.

Table 1. Areas of Direct Impacts (Clearing)

Linear		
Description	**Length in miles (km)**	**Acres to be Directly Impacted/Cleared**
Whitewater525 kV Line	9.3 (14.9)	192 (assuming new 200-foot wide right-of way to be cleared in non-hazardous areas)
Fisher Knob Access Road	3.7 (5.9)	11.4 (assuming 16-foot-wide access road)
Proposed Transmission Access Roads	15 (24.2)	29.3 (assuming 5 feet on either side of the existing road will be trimmed/cleared for construction access)
Total:	**28 (45)**	**232.7**
Non-Linear		
Bad Creek II Power Complex Infrastructure		
Upper Reservoir I/O Structure		8.76
Vertical Shaft		8.96
Transformer Yard		6.49
525kV Switchyard		15.04
Former Construction Yard		8.39
Lower Reservoir I/O Structure		5.86
Lower Reservoir Laydown Yard		10.19
Proposed Spoil Areas Alternatives		
Spoil Area B		22.70
Spoil Area C		9.9
Spoil Area D		10.76
Spoil Area G		10.47
Spoil Area I		8.56
Spoil Area J		14.46
Spoil Area K		17.57
Spoil Area L		16.5
Spoil Area M		4.7
Total Acres:		**179.31 (rounded up to 246 to calculate LOE)**

Spatial Data

The attached Google Earth® KMZ files include:

- Bad Creek FERC Project Boundary – Red polygon
- Spoil Area Alternative Sites – Purple polygon
- Proposed Forest Clearing Areas – Red transparent polygon
- Proposed Access Roads – Gray polyline
- U.S. Forest Service Property – Green transparent polygon
- Fisher Knob Access Road – Yellow polyline
- Proposed new 525kV Transmission and Right-of-Way – Red polyline (transmission centerline) and yellow polygon (new 525kV right-of-way)
- Bat Habitat Assessment Notes – Save the KMZ locally to hard drive and click on purple dots to view the photographs and notes.
- Bat Survey Linear Areas – Red Polyline = Limited Access; Potentially dangerous access for surveys or areas that are currently privately owned. These areas account for approximately 9.3 miles (15 km) or 33 percent of the total linear areas to be impacted by the proposed project. Green polyline = Accessible areas.
- Potential Bat Survey Monitoring Locations – Yellow = Mist net and acoustic. Green dots = Acoustic only.
- Bat Survey Locations from 2021 ERM Bat Survey – Orange triangles = Acoustic Site Locations. Green triangles = Mist Nest Site Locations

Survey Level of Effort and Proposed Methods

The Level of Effort calculations are based on the 2024 USFWS Range-wide Indiana Bat & Northern Long-eared Bat Survey Guideline's (USFWS Guidelines) Table 2. Summary of Current Limit of Effort's (LOE) for Indiana bat (IBAT) and NLEB and in Appendix I: Calculating LOE for a Combined Acoustic and Mist-Netting Survey Pilot Guidance. The USFWS Guidelines state that non-linear projects located in the seasonally active NLEB range require ten net nights per 123 acres of summer suitable habitat while linear projects require four net nights per kilometer of suitable summer habitat within a square kilometer block around the line median.

Based on field reconnaissance site visits, it is estimated that approximately 30 percent of the linear and non-linear project areas are suitable for mist-net set-ups but more conducive for acoustic set-ups. Table 2 (below) represents the LOE percentages based on the USFWS Guidelines.

Table 2. LOE Calculation

Linear

Suitability	**0%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
Net Nights	0	18	36	54	72	90	108	126	144	162	180
Suitability	**100%**	**90%**	**80%**	**70%**	**60%**	**50%**	**40%**	**30%**	**20%**	**10%**	**0%**
Acoustic Nights	180	162	144	126	108	90	72	54	36	18	0

Non-linear

Suitability	**0%**	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
Net Nights	0	2	4	6	8	10	12	14	16	18	20
Suitability	**100%**	**90%**	**80%**	**70%**	**60%**	**50%**	**40%**	**30%**	**20%**	**10%**	**0%**
Acoustic Nights	28	26	23	20	17	14	12	9	6	3	0

As listed in Table 1, the desktop analysis of the Project Area includes approximately 45 km of linear habitat and 179.3 acres of non-linear habitat to be potentially impacted. The minimum USFWS effort LOE will be satisfied by a combined survey approach with 60 mist-net nights and 144 acoustic nights. Duke Energy proposes to add 10 acoustic detector nights as a buffer to account for any potential technical issues, totaling 154 acoustic nights. Qualitative call identification (manual vetting) will be included as part of the acoustic monitoring analysis as necessary. Table 3 represents the proposed combined LOE monitoring.

Table 3. Proposed Combined LOE Monitoring

Linear						**Non-Linear**					
Mist-Netting			**Acoustic**			**Mist-Netting**			**Acoustic**		
Net Sites	Net Nights	Calander Nights/Site	Acoustic Sites	Acoustic Nights	Calendar Nights	Net Sites	Net Nights	Calander Nights/Site	Acoustic Sites	Acoustic Nights	Calendar Nights
12	60	2	33	132	2	3	12	2	4	12	3

The study plan proposed by Duke Energy's consultant, Biotope Forestry & Environmental (Biotope), proposes to survey 12 linear mist-net sites and three non-linear mist-net sites, where two mist-nets will be deployed on the first night and second night, totaling four net nights over two calendar nights to give 48 and 12 net nights within each area respectively. To satisfy the acoustic efforts, 33 linear acoustic sites are proposed, each to be surveyed using two detectors over two calendar nights, totaling 132 detector nights. Four non-linear acoustic sites, each to be surveyed using one detector over three calendar nights, totaling 12 detector nights.

Mist-nets will be deployed for two calendar nights within impact areas. Nets will be opened prior to sunset and left open for a minimum of five hours post sunset under appropriate weather conditions. For all bats captured, general demographic data will be collected including sex, age (adult or juvenile), weight, right forearm length, reproductive condition, and general appearance. Biologists will assess each bat for evidence of white-nose syndrome. All appropriate mist-netting survey protocols (USFWS Guidelines Appendix B) will be followed.

Acoustic detectors will be deployed at each site prior to sunset on night one and record for the minimum desired calendar nights under appropriate weather conditions. For each day with a weather delay as outlined in USFWS Guidelines, the acoustic detector(s) will be deployed an

additional calendar night. Following the completion of the field work at each acoustic detector site, data will be compiled and processed using Wildlife Acoustics Kaleidoscope software. If any target species calls are flagged during this process, the data will be manually vetted by an experienced biologist to confirm the presence of these species on the project area.

Acoustic monitors are also proposed to be placed at a rock shelter identified during the Cultural Resources Survey as well as near the entrance to the existing Project's powerhouse access tunnel as recommended by the S.C. Department of Natural Resources.

Proposed Field Survey Schedule

- May 29, 2024 through June 21, 2024

USFWS IPaC and NLEB Technical Assistance Letter

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218

In Reply Refer To: 04/18/2024 19:02:18 UTC
Project Code: 2024-0079174
Project Name: Bad Creek II Power Complex (P-2740)

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
(843) 727-4707

PROJECT SUMMARY

Project Code: 2024-0079174
Project Name: Bad Creek II Power Complex (P-2740)
Project Type: Power Gen - Hydropower - FERC
Project Description: The proposed Bad Creek II Complex would consist of a new inlet/outlet structure in the existing upper reservoir, water conveyance system, underground powerhouse, powerhouse access tunnels, lower reservoir inlet/outlet structure, switchyard, transformer yard, and transmission line. No modifications to the existing upper and lower reservoirs would be required for the Bad Creek II Complex other than construction of an upper reservoir inlet/outlet structure within the Bad Creek Reservoir and a lower reservoir inlet/outlet structure within Lake Jocassee. Currently licensed operating bands in both reservoirs would not be modified.

The Bad Creek II Complex powerhouse would include four new, variable-speed pump-turbine units with a combined installed generating capacity of 1,400 MW. With both powerhouses generating, full drawdown of the upper reservoir (i.e., 160 ft) will require approximately 11.4 hours, and full refill of the reservoir will require approximately 13 hours. In this manner, the addition of the Bad Creek II Complex introduces more capacity and generation into the power grid during a shorter period of time, which could increase the number of pumping-generating cycles per year, in turn increasing annual generation from the Project. Historical average annual generation since the Project began operation in 1992 is 1,954,292 MW-hours (MWh). While annual generation for a pumped storage project is solely dependent upon how the station is used to supplement/integrate with the Duke Energy power grid, assuming the same utilization factor for the existing Project and a total Project installed capacity of 2,800 MW, the annual generation for the Bad Creek Project, with the Bad Creek II Complex added, would increase to an estimated 4,886,000 MWh, an increase of 2,932,000 MWh per year.

Duke Energy is proposing the development of a temporary access road (Fisher Knob access road) to provide an alternate route to the Fisher Knob residential community during the Bad Creek II Complex construction. The proposed gravel road will begin at Whitewater Road and traverse approximately 3.7 miles/5.9 kilometers to the Fisher Knob community. Surface waters along the route have been identified and qualitatively evaluated as part of the FERC relicensing studies. Surface waters will be bridged, and no permanent or temporary impacts are anticipated. Road construction is anticipated to begin in the Spring 2026 and the road will be decommissioned following project construction.

If Duke Energy decides to pursue the Bad Creek II Complex and obtains

all necessary regulatory approvals for construction, the period for construction of the Bad Creek II Complex is expected to span approximately 7 years. Assuming commencement of construction shortly following the New FERC License issuance by July 2027, the Bad Creek II Complex is expected to be fully in service in 2034.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@34.9773504,-82.9937585164285,14z

Counties: Oconee County, South Carolina

ENDANGERED SPECIES ACT SPECIES

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
Small Whorled Pogonia *Isotria medeoloides* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened
Smooth Coneflower *Echinacea laevigata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3473	Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

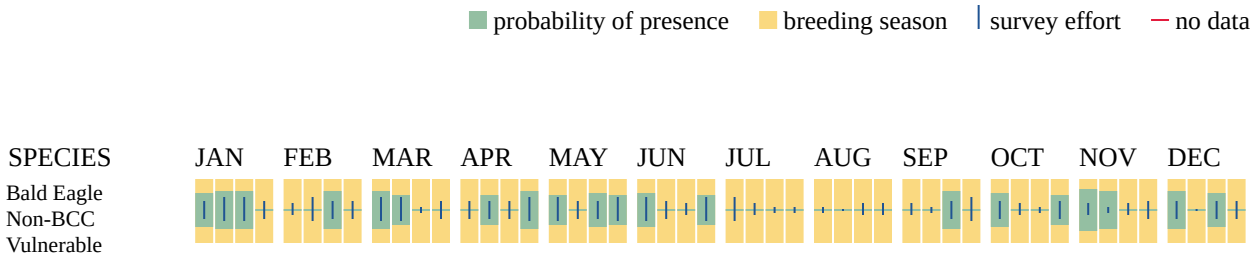
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Aug 31
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Chuck-will's-widow *Antrostomus carolinensis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9604	Breeds May 10 to Jul 10
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10

NAME	BREEDING SEASON
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

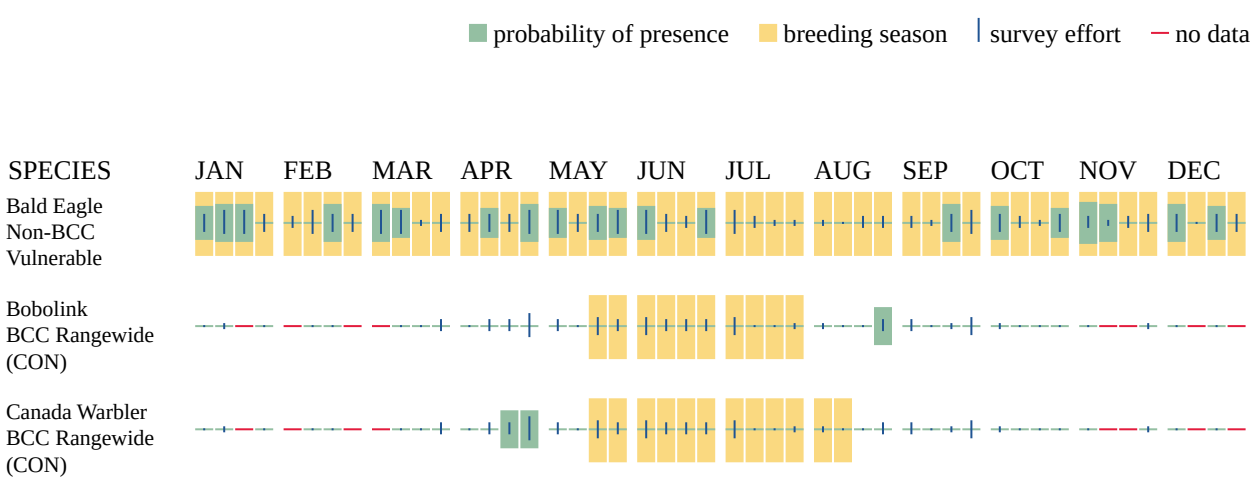
Probability of Presence (■)

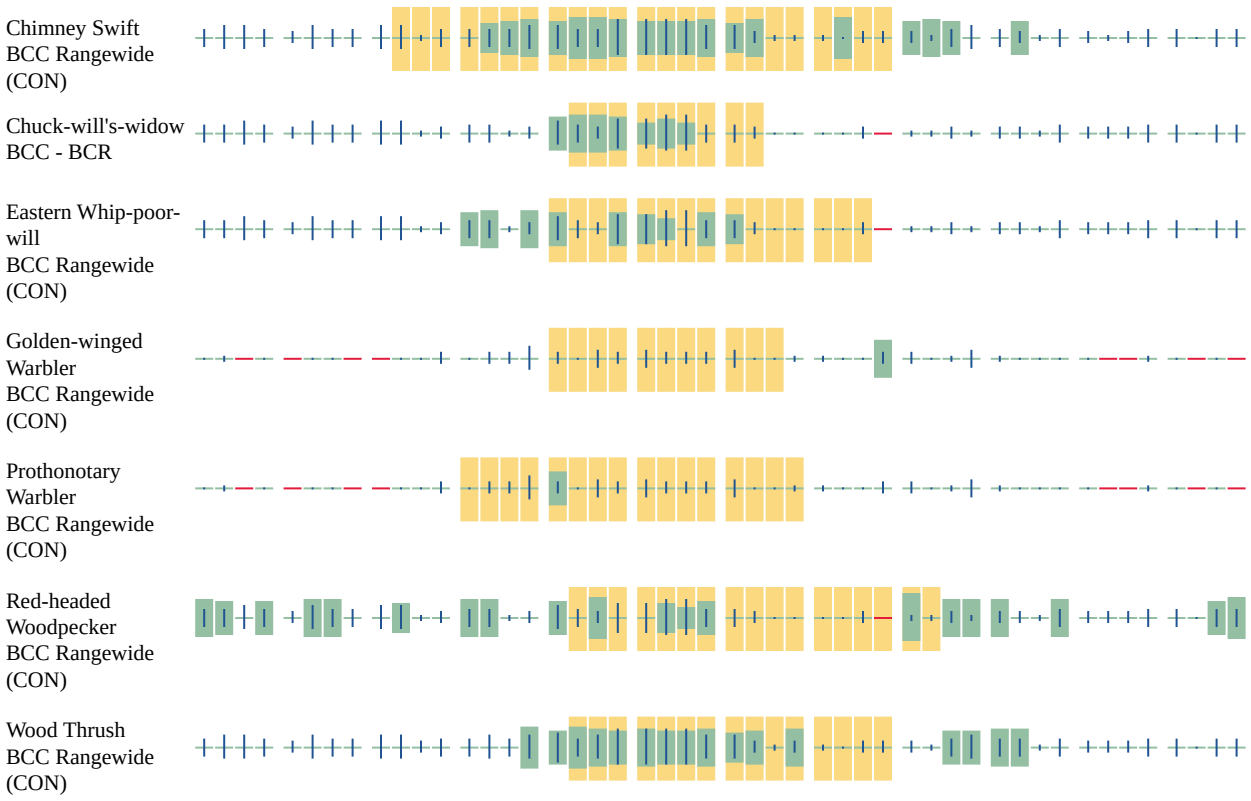
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- PEM1A

FRESHWATER POND

- PUBHx
- PUBFx
- PUSCh
- PUBHh

RIVERINE

- R4SBC
- R3UBH
- R5UBH

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A

LAKE

- L2USAh
- L1UBHh

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Eric Mularski
Address: 440 S. Church Street
City: Charlotte
State: NC
Zip: 28202
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LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Energy Regulatory Commission

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218

In Reply Refer To: 04/18/2024 19:26:29 UTC
Project code: 2024-0079174
Project Name: Bad Creek II Power Complex (P-2740)

Federal Nexus: yes
Federal Action Agency (if applicable): Federal Energy Regulatory Commission

Subject: Technical assistance for 'Bad Creek II Power Complex (P-2740)'

Dear Eric Mularski:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on April 18, 2024, for 'Bad Creek II Power Complex (P-2740)' (here forward, Project). This project has been assigned Project Code 2024-0079174 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project. **Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (Dkey), invalidates this letter.**

Determination for the Northern Long-Eared Bat

Based on your IPaC submission and the standing analysis for the Dkey, your project has reached the determination of "May Affect" the northern long-eared bat.

Next Steps

Your action may qualify for the Interim Consultation Framework for the northern long-eared bat. To determine if it qualifies, review the Interim Consultation Framework posted here https://www.fws.gov/library/collections/interim-consultation-framework-northern-long-eared-bat. If you

determine it meets the requirements of the Interim Consultation Framework, follow the procedures outlined there to complete section 7 consultation.

If your project does **not** meet the requirements of the Interim Consultation Framework, please contact the South Carolina Ecological Services for further coordination on this project. Further consultation or coordination with the Service is necessary for those species or designated critical habitats with a determination of “May Affect”.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Monarch Butterfly *Danaus plexippus* Candidate
- Small Whorled Pogonia *Isotria medeoloides* Threatened
- Smooth Coneflower *Echinacea laevigata* Threatened
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered

You may coordinate with our Office to determine whether the Action may cause prohibited take of the species listed above.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Bad Creek II Power Complex (P-2740)

2. Description

The following description was provided for the project 'Bad Creek II Power Complex (P-2740)':

> The proposed Bad Creek II Complex would consist of a new inlet/outlet structure in the existing upper reservoir, water conveyance system, underground powerhouse, powerhouse access tunnels, lower reservoir inlet/outlet structure, switchyard, transformer yard, and transmission line. No modifications to the existing upper and lower reservoirs would be required for the Bad Creek II Complex other than construction of an upper reservoir inlet/outlet structure within the Bad Creek Reservoir and a lower reservoir inlet/outlet structure within Lake Jocassee. Currently licensed operating bands in both reservoirs would not be modified.
>
> The Bad Creek II Complex powerhouse would include four new, variable-speed pump-turbine units with a combined installed generating capacity of 1,400 MW. With both powerhouses generating, full drawdown of the upper reservoir (i.e., 160 ft) will require approximately 11.4 hours, and full refill of the reservoir will require approximately 13 hours. In this manner, the addition of the Bad Creek II Complex introduces more capacity and generation into the power grid during a shorter period of time, which could increase the number of pumping-generating cycles per year, in turn increasing annual generation from the Project. Historical average annual generation since the Project began operation in 1992 is 1,954,292 MW-hours (MWh). While annual generation for a pumped storage project is solely dependent upon how the station is used to supplement/integrate with the Duke Energy power grid, assuming the same utilization factor for the existing Project and a total Project installed capacity of 2,800 MW, the annual generation for the Bad Creek Project, with the Bad Creek II Complex added, would increase to an estimated 4,886,000 MWh, an increase of 2,932,000 MWh per year.
>
> Duke Energy is proposing the development of a temporary access road (Fisher Knob access road) to provide an alternate route to the Fisher Knob residential community during the Bad Creek II Complex construction. The proposed gravel road will begin at Whitewater Road and traverse approximately 3.7 miles/5.9 kilometers to the Fisher Knob community. Surface waters along the route have been identified and qualitatively evaluated as part of the FERC relicensing studies. Surface waters will be bridged, and no permanent or temporary impacts are anticipated. Road construction is anticipated to begin in the Spring 2026 and the road will be decommissioned following project construction.

If Duke Energy decides to pursue the Bad Creek II Complex and obtains all necessary regulatory approvals for construction, the period for construction of the Bad Creek II Complex is expected to span approximately 7 years. Assuming commencement of construction shortly following the New FERC License issuance by July 2027, the Bad Creek II Complex is expected to be fully in service in 2034.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@34.9773504,-82.9937585164285,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of "may affect" for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. Does any component of the action involve construction or operation of wind turbines?

   Note: For federal actions, answer 'yes' if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

3. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Yes

4. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

5. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   No

6. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No

7. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   Yes

8. Is FERC reviewing the proposed action under the Natural Gas Act, in whole or in part?

   No

9. Have you determined that your proposed action will have no effect on the northern long-eared bat? Remember to consider the effects of any activities that would not occur but for the proposed action.

   If you think that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, answer "No" below and continue through the key. If you have determined that the northern long-eared bat does not occur in your project's action area and/or that your project will have no effects whatsoever on the species despite the potential for it to occur in the action area, you may make a "no effect" determination for the northern long-eared bat.

   Note: Federal agencies (or their designated non-federal representatives) must consult with USFWS on federal agency actions that may affect listed species [50 CFR 402.14(a)]. Consultation is not required for actions that will not affect listed species or critical habitat. Therefore, this determination key will not provide a consistency or verification letter for actions that will not affect listed species. If you believe that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, please answer "No" and continue through the key. Remember that this key addresses only effects to the northern long-eared bat. Consultation with USFWS would be required if your action may affect another listed species or critical habitat. The definition of Effects of the Action can be found here: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

   No

10. [Semantic] Is the action area located within 0.5 miles of a known northern long-eared bat hibernaculum?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered

    No

11. Does the action area contain any caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating northern long-eared bats?

    Yes

12. Have you conducted, or will you conduct, a voluntary Phase 1 habitat assessment for potentially suitable hibernacula in accordance with the guidance in Appendix H of the USFWS' current Range-wide Indiana bat and Northern long-eared bat Survey Guidelines?

    Note: The survey guidelines can be found at: https://www.fws.gov/library/collections/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    No

13. Will the proposed action result in the cutting or other means of knocking down, bringing down, or trimming of any trees suitable for northern long-eared bat roosting?

    Note: Suitable northern long-eared bat roost trees are live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities.

    Yes

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

412

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the inactive (hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

206

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the active (non-hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

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Will all potential northern long-eared bat (NLEB) roost trees (trees ≥3 inches diameter at breast height, dbh) be cut, knocked, or brought down from any portion of the action area greater than or equal to 0.1 acre? If all NLEB roost trees will be removed from multiple areas, select 'Yes' if the cumulative extent of those areas meets or exceeds 0.1 acre.

Yes

Enter the extent of the action area (in acres) from which all potential NLEB roost trees will be removed. If all NLEB roost trees will be removed from multiple areas, entire the total extent of those areas. Round up to the nearest tenth of an acre.

412

For the area from which all potential northern long-eared bat (NLEB) roost trees will be removed, on how many acres (round to the nearest tenth of an acre) will trees be allowed to regrow? Enter '0' if the entire area from which all potential NLEB roost trees are removed will be developed or otherwise converted to non-forest for the foreseeable future.

256.3

Will any snags (standing dead trees) ≥3 inches dbh be left standing in the area(s) in which all northern long-eared bat roost trees will be cut, knocked down, or otherwise brought down?

No

Will all project activities by completed by April 1, 2024?

No

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Eric Mularski
Address: 440 S. Church Street
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LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Energy Regulatory Commission
Name: Sarah Salazar
Email: Sarah.Salzar@ferc.gov
Phone: 2025026863

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Biotope Resumes

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Resume

Education

2011 Haywood Community College
- Associate in Applied Science: Fisheries and Wildlife Management Technology

2015 Western Carolina University
- Bachelor of Science: Natural Resource Conservation and Management

Background

Mr. Brooks has more than 12 years of project experience in ecological and environmental services. In that time, he has conducted ecological field investigations on a variety of different projects including habitat assessments as well as endangered species surveys for various natural resource extraction companies. Much of Mr. Brooks' experience is comprised of presence/absence surveys for threatened and endangered bat species (*Myotis sodalis and Myotis septentrionalis*). The majority of Mr. Brooks' experience has been as a team leader and/or permitted biologist on site. Mr. Brooks has held a **Federal Recovery Permit (ES81492B-1)** to collect *M. sodalis* and *M. septentrionalis* since 2014 and has held state permits in MD, MN, PA, WV, IA, OH, MI, IL, IN, VA, TN, NC, SC, GA, AR, MS, and TX.

Qualification and Experience with Bats

Mr. Brooks is knowledgeable and experienced in the application of the following equipment and techniques as they relate to the detection, capture, and handling of bat species:

- Bat handling (species level identification and various physical measurements)
- Mist-net site selection, set up, and operation
- Harp trap site selection, set up, and operation
- Radio telemetry
- Estimated 4,000 contact hours performing surveys for listed bats
- Application of split-ring metal forearm identification bands
- Reichard's Wing Damage Index Scoring
- Suitability assessments for both summer and winter bat habitat
- Acoustical monitoring and call analysis
- Autumn portal/cave evaluations and surveys
- White-nose syndrome disinfection protocols
- Collecting swab and tissue samples

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Identified Bat Species

- Indiana bat (*Myotis sodalis*)
- Northern long-eared bat (*Myotis septentrionalis*)
- Gray bat (*Myotis grisescens*)
- Eastern small-footed bat (*Myotis leibii*)
- Little brown bat (*Myotis lucifugus*)
- Silver-haired bat (*Lasionycteris noctivagans*)
- Tricolored bat (*Perimyotis subflavus*)
- Evening bat (*Nycticeius humeralis*)
- Hoary bat (*Lasiurus cinereus*)
- Eastern red bat (*Lasiurus borealis*)
- Big brown bat (*Eptesicus fuscus*)
- Southeastern myotis (*Myotis austroriparius*)
- Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)

Indiana Bat (*Myotis sodalis*) Experience

- Captured and processed approximately 34 *Myotis sodalis*
- Placed radio transmitters on 13 *Myotis sodalis*
- Conducted approximately 2,500 hours of radio-telemetry (night time foraging and roost tree locations) for the Indiana bat (*Myotis sodalis*)

Northern Long-eared Bat (*Myotis septentrionalis*) Experience

- Captured and processed approximately 325 *Myotis septentrionalis*
- Placed radio-transmitters on 36 *Myotis septentrionalis*
- Conducted approximately 4,200 hours of radio-telemetry (night time foraging and roost tree locations) for the Northern long-eared bat (*Myotis septentrionalis*)

Gray Bat (*Myotis grisescens*) Experience

- Captured and processed 7 *Myotis grisescens*
- No radio-transmitters were placed on *Myotis grisescens* since their roosts were known to be caves near project area
- No radio-telemetry was required for this species for the purposes of these studies

Tricolored Bat (*Perimyotis subflavus*) Experience

- Captured and processed approximately 400 *Perimyotis subflavus*
- Placed radio-transmitters on 1 *Perimyotis subflavus*
- Conducted approximately 50 hours of radio-telemetry (diurnal roost tree locations) for the tricolored bat (*Perimyotis subflavus*)

Project Experience

- **Project Manager** – Allegheny National Forest Bat Survey Project**:** 2023. Mist-net and structure survey for the federally endangered Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), the proposed federally endangered tricolored bat (*Perimyotis subflavus*), and the little brown bat (*Myotis lucifugus*) throughout the Allegheny National Forest in Pennsylvania.

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- **Project Manager** – TVA Pumped Storage-Rorex Creek Project: 2023. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), gray bat (*Myotis* grisescens) the proposed federally endangered tricolored bat (*Perimyotis subflavus*), and the little brown bat (*Myotis lucifugus*) in Jackson County, Alabama.

- **Project Manager** – Hillsboro Solar Project: 2023. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), the proposed federally endangered tricolored bat (*Perimyotis subflavus*), and the little brown bat (*Myotis lucifugus*) in Lawrence County, Alabama.

- **Project Manager** – Trifecta Solar Project: 2023. Mist-net survey for the federally endangered northern long-eared bat (*Myotis septentrionalis*) and the little brown bat (*Myotis lucifugus*) in Choctaw County, Mississippi.

- **Project Manager** – Stamey Solar Project: 2023. Mist-net survey for the proposed federally endangered tricolored bat (*Perimyotis subflavus*) in Darlington County, South Carolina.

- **Project Manager** – Blackfin Pipeline Project: 2023. Mist-net survey for the proposed federally endangered tricolored bat (*Perimyotis subflavus*) throughout multiple counties in eastern Texas.

- **Project Manager** – Navigator Carbon Sequestration Pipeline Project**:** 2022. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) as well as the proposed federally endangered tricolored bat (*Perimyotis subflavus*) throughout multiple counties in eastern Illinois.

- **Project Manager** – Chester Solar Farm Bat Survey: 2022. Mist-net survey for the federally endangered northern long-eared bat (*Myotis septentrionalis*) for a proposed solar farm in Chester, VA.

- **Project Manager** – Timberwolf Wind Energy Project: 2021. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat for the proposed Timberwolf Wind Project in Fillmore County, Minnesota.

- **Project Manager** – Prairie Creek Wind Energy Project: 2021. Mist-net survey for the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) in Blackford County, IN.

- **Project Manager** – Mobley to Majorsville: 2018. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area in Wheeling, WV.

- **Project Manager** – Brues to Glendale: 2018. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area in Wheeling, WV.

- **Project Manager –** EASTERN NORTH CAROLINA NORTHERN LONG-EARED BAT RESEARCH STUDY: 2017-2019. A survey used to determine the habitat preferences and distribution of the federally threatened northern long-eared bat (*Myotis septentrionalis*) in North Carolina, further document fall/winter activity, and develop greater understanding of winter habitat use and behavior in the region.

- **Project Manager –** DIAMOND TRAIL WIND ENERGY PROJECT: 2017. A summer survey and winter habitat assessment for the federally threatened northern long-eared bat (*Myotis*

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septentrionalis) on Invenergy property in multiple counties throughout central Iowa

- **Project Manager –** CLEAN LINE AND PLAINS PIPELINE: 2016. A linear summer survey for the federally endangered Indiana bat (*Myotis sodalis)* and threatened northern long-eared bat (*Myotis septentrionalis*) near known maternity colony trees, Multiple counties throughout eastern Arkansas.

- **Project Manager –** NEW KENT BAT SURVEY: 2016. A summer survey and winter habitat assessment for the federally threatened northern long-eared bat (*Myotis septentrionalis)* on military land in New Kent County, VA.

- **Project Manager** - ROVER PIPELINE: 2015. A linear summer survey for the federally endangered Indiana bat (*Myotis sodalis)* and threatened northern long-eared bat (*Myotis septentrionalis*) near known maternity colony trees, Multiple counties throughout Ohio and West Virginia.

- **Project Manager** – SUNOCO TETRATECH PIPELINE: 2014. A linear summer survey for the federally endangered Indiana bat (*Myotis sodalis*), eastern small-footed bat (*Myotis leibii*) and northern long eared bat (*Myotis septentrionalis*) near known maternity colony trees, Multiple counties throughout southern Pennsylvania.

- **Project Manager** – AMEI COAL MINING: 2014. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area in Wallace, WV.

- **Project Manager** – WILLIAMS PIPELINE: 2013. A linear summer survey for the federally endangered Indiana bat (*Myotis sodalis*) and northern long eared bat (*Myotis septentrionalis*) near known maternity colony trees, Multiple counties in western PA.

- **Project Manager** – BLACK CASTLE MINING COMPANY: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) near known maternity colony trees, Boone County, WV.

- **Project Manager** – REPUBLIC ENERGY CORPORATION: 2013. A summer, spring, and fall survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near a known colony, Fayette & Kanawha Counties, WV (Application No. S-3010-11).

- **Project Manager** – COAL RIVER MINING: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis)* at a proposed surface mine project area in Kanwaha County, WV.

- **Project Manager** – CARDNO MM&A: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis)* at a proposed surface mine area in Raleigh County, WV.

- **Project Manager** – BANDMILL COAL CORPORATION: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis)* at a proposed surface mine in Logan County, WV.

- **Project Manager** – NATIONAL RESOURCES: 2013. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis)* at a proposed surface mine in Wyoming and McDowell County, WV.

- **Project Manager** – ALPHA NATURAL RESOURCES: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) near known

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maternity colony trees, Boone County, WV.

- **Project Manager** – ALPHA NATURAL RESOURCES: 2012. A summer, spring, and fall survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near a known colony, Fayette & Kanawha Counties, WV.
- **Project Manager** – MARSHALL MILLER: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed fine coal refuse disposal facility near Wyoming, Wyoming County, WV.
- **Project Manager** – ALPHA NATURAL RESOURCES: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near Stollings, Logan County, WV.
- **Project Manager** – ALPHA NATURAL RESOURCES: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near Peytona, Boone County, WV.
- **Biologist** – MARFORK COAL COMPANY: 2012. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed coal surface mine near Colcord, Raleigh County, WV.
- **Biologist** – ALPHA NATURAL RESOURCES: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) near known maternity colony trees, Boone County, WV.
- **Biologist** – ALPHA NATURAL RESOURCES: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed project area near Cabin Creek, Kanawha County, WV.
- **Wildlife Technician** – ALPHA NATURAL RESOURCES: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed Browns Branch Surface Mine near Bandytown, Boone County, WV.
- **Wildlife Technician** – MARSHALL MILLER: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed Toney Fork West Surface Mine near Lorado, Boone and Logan Counties, WV.
- **Wildlife Technician** – ALPHA NATURAL RESOURCES: 2011. A summer survey and winter habitat assessment for the federally endangered Indiana bat (*Myotis sodalis*) at a proposed Mt. McGuire Surface Mine near Hickory Camp Branch, Fayette County, WV.

Dylan Brooks
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References

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Mary Gilmore
Technical Bat Lead
EnviroScience, Inc
Personal Cell: (304)533-0999
mgilmore@enviroscienceinc.com

Eli Corwin

Ecologist
1402 Houston St.
Lufkin, TX 75904
corwine123@gmail.com

Background

Mr. Corwin has more than 10 years of project experience in ecological and environmental services. In that time, he has conducted and managed ecological field investigations on a variety of different projects from large and small transportation as well as endangered species surveys for various natural resource extraction companies. Much of Mr. Corwin's experience is comprised of presence/absence surveys for threatened and endangered bat species (*Myotis sodalis, M. septentrionalis, M. grisescens, Perimyotis subflavus*). Currently, Mr. Corwin has conducted approximately 400 summer mist-net surveys and 90 fall portal surveys; most of which Mr. Corwin has been the team leader and/or permitted biologist on site. Furthermore, Mr. Corwin is experienced in the application of split-ring metal arm bands and radio transmitters to listed bat species as well as the subsequent radio telemetry.

Vascular Plants of the Eastern United States

Mr. Corwin has completed numerous classes pertaining to the identification of flora of the eastern United States, including field botany, plant physiology, plant morphology, wetland ecology, plant ecology, and forest ecology. Furthermore, he has conducted ecological field investigations on a variety of projects that have provided him a solid foundation for identifying vascular plants of the eastern United States including site assessments and biological inventories, natural resource extraction and transportation, and transmission line installation.

Qualification and Experience with Bats

Mr. Corwin is knowledgeable and experienced in the application of the following equipment and techniques as they relate to the detection, capture, and handling of bat species:

- Bat handling (species level identification and various physical measurements)
- Mist-net site selection, set up, and operation
- Harp trap site selection, set up, and operation
- Radio telemetry
- Estimated 4700 contact hours performing surveys for listed bat species
- Application of split-ring metal forearm identification bands
- Application of radio-transmitters
- Reichard's Wing Damage Index Scoring used for characterizing wing condition of bats affected by white-nose syndrome
- Suitability assessments for both summer and winter bat habitat
- Acoustical monitoring and call analysis
- Hibernacula surveys
- White-nose Syndrome disinfection protocols

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FORESTRY & ENVIRONMENTAL, LLC

Indiana Bat (*Myotis sodalis*) Experience

- Captured and processed 26 *Myotis sodalis*
- Placed radio transmitters on 4 *Myotis sodalis*
- Conducted approximately 300 hours of radio telemetry (night time foraging and roost tree locations) for *Myotis sodalis*

Northern Long-eared Bat (*Myotis septentrionalis*) Experience

- Captured and processed approximately 37 *Myotis septentrionalis*
- Placed radio transmitters on one *Myotis septentrionalis*
- Conducted 150 hours of radio telemetry (roost tree locations) for the Northern Long-Eared Bat (*Myotis septentrionalis*)

Gray Bat (*Myotis grisescens*) Experience

- Captured and processed and/or identified 39 *Myotis grisescens*

Tricolored Bat (*Perimyotis subflavus*) Experience

- Captured and processed and/or identified approximately 15 *Perimyotis subflavus*
- Placed radio transmitters on 1 *Perimyotis subflavus*
- Conducted 140 hours of radio telemetry (roost tree locations) for Tricolored bats.

Qualifications and Experience with Ecological & Environmental Services

Mr. Corwin's field and natural history skills include a variety of taxa and disciplines from:

- Herbaceous and woody vegetation identification
- Federal and state listed threatened and endangered species surveys
- Habitat assessments
- Geographic Information Systems
- Geospatial Analysis
- Acoustic Survey Techniques and Data Analysis

Selected Project Experience

West Virginia

- Habitat assessment survey for the proposed Pennsylvania Pipeline Project
- Mist-net survey for the Federally Endangered Indiana Bat for Black Castle Surface Mine in Boone County, WV
- Mist-net survey for the Federally Endangered Indiana Bat for Long Branch Surface Mine in Kanawha and Fayette Counties, WV
- Hibernacula survey for the Federally Endangered Indiana Bat for Long Branch Surface Mine in Kanawha and Fayette Counties, WV
- Mist-net survey for the Federally Endangered Indiana Bat for Marfork Surface Mine in Raleigh County, WV
- Mist-net survey for threatened and endangered bats on the Rover Pipeline throughout West Virginia

Ohio

- Wetland survey for the proposed Pennsylvania Pipeline Project throughout Ohio
- Mist-net survey for threatened and endangered bats on the Rover Pipeline throughout Ohio
- Mist-net survey for threatened and endangered bats on the The Greenery Bat Survey (Lewis Field)
- Mist-net survey for threatened and endangered bats on the Johnstown Bat Survey

Pennsylvania

- Habitat assessment for the Federally Endangered Indiana Bat for the proposed Pennsylvania Pipeline Project

Arkansas

- Mist-net survey for threatened and endangered bats on the Clean-Line Transmission Line Project throughout Arkansas

Illinois

- Mist-net survey for threatened and endangered bats for the Country Mark Pipeline in Marion County, IL

Kansas

- Mist-net survey for threatened and endangered bat species at a U.S. Army Corps of Engineers facility in Johnson County, Kansas

Missouri

- Mist-net survey to determine bat community composition at multiple Army National Guard facilities in Missouri

Tennessee

- Mist-net survey to determine bat community composition at multiple Tennessee Army National Guard facilities in Tennessee and Georgia

Georgia

- Mist-net survey to determine bat community composition at multiple Tennessee Army National Guard facilities in Tennessee and Georgia

North Carolina

- Mist-net survey for threatened and endangered bat species on Eastern Band of Cherokee lands for the Eastern Band of Cherokee Wildlife Division in Cherokee County, North Carolina

South Carolina

- Mist-net survey for all bat species on conservation easement properties in coastal South Carolina

Virginia

- Mist-net survey for threatened and endangered bat species on the Chester Solar Technology Park Project in Chesterfield County

Alabama

- Mist-net survey for threatened and endangered bat species on the TVA Pumped Storage

project in Jackson County
- Mist-net survey for threatened and endangered bat species on the Loves Good-Hope project in Cullman County
- Mist-net survey for threatened and endangered bat species on the Hillsboro Solar project in Lawrence County

Mississippi
- Mist-net survey for threatened and endangered bat species on the Trifecta Project in Choctaw County

Texas
- Mist-net survey for threatened and endangered bat species on the Blackfin Bat Surveys Project in Haller and Waldin Counties

Permits

- Has held state permits in has held state permits in PA, MO, WV, AL, OH, VA, TN, NC, SC, GA, AR, KS, IL, MS, and TX.
- Pennsylvania Qualified Bat Surveyor
- USFWS Native Endangered Species Recovery (**ES81492B-1**)

Education

University of North Carolina at Wilmington
Bachelor of Science: Major Geography, Minor Geospatial Technology

Jay B Deatherage

President - Owner
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Resume

Summary

Mr. Deatherage has more than 12 years of project experience in natural resources management and consulting. Mr. Deatherage's bat research has entailed presence/absence surveys for threatened and endangered bat species (*Myotis sodalis, Myotis grisescens, Perimyotis subflavus, Myotis lucifugus,* and *Myotis septentrionalis*) on various projects. Mr. Deatherage is experienced in habitat assessments, radio tracking for both forage and roost tree data, emergence counts, portal assessment and exclusion, and acoustic surveys. Furthermore, Mr. Deatherage is experienced in the application of split-ring metal forearm bands and radio transmitters to listed bat species. He currently holds a **Federal Recovery Permit (ES88227B-1**) to collect *M. sodalis* and *M. septentrionalis* and has held state permits in WV, IA, AL, OH, IL, PA, MS, TX, NC, and VA.

Qualifications and Experience with Bats

Mr. Deatherage is knowledgeable and experienced in the application of the following equipment and techniques as they relate to the detection, capture, and handling of bat species:

- Bat handling (species level identification and various physical measurements)
- Mist-net site selection, set up, and operation
- Harp trap site selection, set up, and operation
- Radio telemetry
- Application of split-ring metal forearm identification bands
- Reichard's Wing Damage Index Scoring
- Suitability assessments for both summer and winter bat habitat
- Acoustical monitoring and call analysis
- Autumn portal/cave evaluations and surveys
- White-nose syndrome disinfection protocols
- Collecting swab and tissue samples

Identified Bat Species

- Indiana Bat (*Myotis sodalis*)
- Northern Long-eared Bat (*Myotis septentrionalis*)
- Eastern Small-footed Bat (*Myotis leibii*)
- Little Brown Bat (*Myotis lucifugus*)
- Gray bat (*Myotis grisescens*)

- Southeastern Myotis (*Myotis austroriparius*)
- Silver-haired Bat (*Lasionycteris noctivagans*)
- Tricolored Bat (*Perimyotis subflavus*)
- Evening Bat (*Nycticeius humeralis*)
- Hoary Bat (*Lasiurus cinereus*)
- Eastern Red Bat (*Lasiurus borealis*)
- Big Brown Bat (*Eptesicus fuscus*)
- Seminole Bat *(Lasiurus seminolus)*
- Rafinesque's Big-Eared Bat *(Corynorhinus rafinesquii)*

Selected Project Experience

Pennsylvania

- **Project Manager** – ALLEGHENY NATIONAL FOREST BAT SURVEY PROJECT: 2023. A summer mist-net and structure survey for *M. sodalis, M. grisescens, M. lucifugus, P. subflavus*, and *M. septentrionalis* throughout the Allegheny National Forest.

Alabama

- **Project Manager** – TVA ROREX PUMPED STORAGE PROJECT: 2023. A summer mist-net survey for *M. sodalis, M. grisescens, M. lucifugus, P. subflavus*, and *M. septentrionalis* on future TVA property in Jackson County.

- **Project Manager** – COVIA HOLDINGS, LLC MINING PROJECT: 2022. A summer mist-net survey for *M. sodalis* and *M. septentrionalis* on Covia property in Tuscaloosa County.

Iowa

- **Project Manager** - DIAMOND TRAIL WIND ENERGY PROJECT: 2017. A summer mist-net survey for *M. sodalis* and *M. septentrionalis* on Invenergy property in multiple counties throughout central Iowa.

Virginia

- **Lead Biologist** – Chester Solar Project: 2022. *M. septentrionalis* summer mist-net survey on project area for a proposed solar farm in Chester County.

West Virginia

- **Project Manager** – APPALACHIAN POWER: 2021. *M. sodalis* summer mist-net survey for a proposed transmission line through Wyoming and Raleigh Counties.
- **Project Manager** – APPALACHIAN POWER: 2021. *M. sodalis* summer mist-net survey for a proposed coal mine expansion in Logan County.
- **Project Manager** - REPUBLIC ENERGY, INC: 2012. *M. sodalis* summer, spring, and fall surveys, and winter habitat assessment on a proposed coal mine in Kanawha and Fayette Counties
- **Project Manager** - MARSHAL MILLER**:** 2012. *M. sodalis* summer mist-net survey and winter habitat assessment on a proposed coal refuse site located in Wyoming and Logan Counties, WV.
- **Project Manager** - MARFORK COAL COMPANY: 2012. *M. sodalis* summer mist-net survey and winter habitat assessment on a proposed coal mine in Raleigh County, WV.
- **Project Manager** - ALPHA NATURAL RESOURCES: 2012. *M. sodalis* summer mist-net survey and winter habitat assessment on a proposed coal mine in Boone and Logan Counties, WV.
- **Lead Biologist** - ALPHA NATURAL RESOURCES: 2011. *M. sodalis* summer mist-net survey and winter habitat assessment on three proposed coal mines in Boone County, WV.

Education and Professional Trainings

- Stephen F. Austin State University
    - Bachelor of Science in Forest Wildlife Management 2011

Kentucky Bat Working group workshop for bat handling and identification
Texas Accredited Forester

Resume

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Asheville, NC 28803
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Work Experience

- **Currently—Biotope Forestry and Environmental, Wildlife Biologist III (3).** Responsible for performing mist-net surveys for threatened and endangered bat species as well as forest inventory and habitat assessments.
    - **Fall 2023—**Bat acoustic analysis for projects located throughout the Carolinas.
    - **Summer 2023—**Mist-net survey for *Perimyotis subflavus* and *Myotis lucifugus* in northeastern Alabama. Many *Myotis grisescens* were handled and identified along with two *P. subflavus.* One *P. subflavus* was affixed with a transmitter. I located two roosts located for *P. subflavus* on this project.
    - **September 2022–** Indiana Bat Portal Searches in West Virginia and eastern Kentucky.
    - **June 2022-August 2022–** Northeast Ohio Regional Airport Bat Survey, Mill Creek Habitat Restoration Bat survey.
- **January 2021-December 2021—NC Forest Service, (Buncombe County) Assistant County Ranger.** Wildfire suppression, prescribed burning, forest management, forestation, urban forestry.
- **Spring/Summer 2021 Volunteer with Indiana State University and NCWRC**–Bat mist-netting surveys. Team lead for the application of radio transmitters to *Myotis grisescens*.
    - **April 2021-** Netting target bridges in Asheville area.
- **April 2020-July 2020–ISU Bat Center, Bat Technician.** Assisted with Joy O'Keefe and Joey Weber's gray bat project along French Broad River which included bridge inspections, acoustic station maintenance, and identification of gray bats and other species.
- **September 2018-December 2020—Biotope Forestry and Environmental, Forest Technician**. Forest Inventory for clients Campbell Global, F&W Forestry Services and American Forest Management in the coastal plain of the Carolinas, Florida, Mississippi, and Texas
- **Summer of 2018—Ecological Engineering, Wildlife Technician.** Mist-net surveys for threatened and endangered bat species. Radio telemetry tracking of northern long-eared bats in Francis Marion NF (longleaf pine forest and swamp habitat). Identified the following bat species: *Myotis septentrionalis, Lasiurus borealis, Lasiurus seminolus, Nycticeius humeralis, Eptesicus fuscus, Perimyotis subflavus, and Tadarida brasiliensis.* Work also included surveying for host plants for various butterfly, skipper and moth species (various species of *Asclepius, Pontedaria, Pieris,* and *Gymnopogon ambiguus).*
- **May 2018—Ecological Solutions and Innovations, Forest Technician**. Forest health assessment and merchantable timber inventory.
- **April 2018—Biotope Forestry & Environmental, Forest Technician**. Clients included Campbell Global and American Forest Management

- **Winter 2017-2018—Calyx Engineers and Consultants, Staff Scientist**. Mist-net surveys for threatened and endangered bat species in northeastern North Carolina. Radio telemetry tracking of northern long-eared bat. Study areas were North River Gamelands, Merchants Millpond State Park, and Great Dismal Swamp State Park. Identified the following bat species: *Myotis spetentrionalis, Myotis austroriparius, Myotis lucifugus, Lasiurus borealis, Corynorhinus rafinesquii,* and *Eptesicus fuscus.*
- **Fall 2017—Apogee Environmental, Bat Biologist (WV).** Fall portal netting and harp trapping old, abandoned coal mines near Mahan, WV. Identified *Myotis sodalis, Myotis leibii, and Eptesicus fuscus.*
- **Fall 2017—Borealis Biological, Bat technician**. Fall portal netting old, abandoned coal mines and adits near Man, WV. Identified *Myotis leibii.*
- **Summers and Falls 2014-2017—Apogee Environmental, Bat Biologist (WV).** Summer mist netting and radio telemetry tracking of Indiana bats. Worked in PA, OH, TN, and GA as a technician. Identified *Myotis sodalis, Myotis leibii, Myotis septentrionalis, Lasionycteris noctivagans, Perimyotis subflavus, Eptesicus fuscus, Nycticeius humeralis, Lasiurus borealis, Lasiurus cinereus.* Applied transmitters to northern long-eared bats many times. WV permitted Bat Biologist, and Bat Identifier (BI) in PA.
- **2013—Seasonal Park Technician at Chimney Rock State Park, NC.** Work included surveying and controlling invasive plant species, creating a blooming calendar of native wildflowers, outreach, and general park maintenance.
- **Fall 2010- Fall 2011—Duke Forest (Duke University), Forest Technician.** Work included the decadal forest inventory of the forest property (> 7,000 acres) using the double sampling method with a prism-point sampling technique. Prepared forests for timber sales and inspected logging operations. Invasive species control, trail maintenance, and grounds maintenance. Regularly used ArcGIS to make detailed sale area maps, and inventory maps.
- **Summer of 2010—Student Conservation Association, Trail Maintenance Worker.** Trail restoration.

Education

Western Carolina University (Cullowhee, NC)—Bachelor's degree in Natural Resource Management with a concentration in Forest Management
Haywood Community College (Clyde, NC)—Associates of Applied Science in Forest Management Technology. Graduated magna cum laude.

Awards, Certificates, and Training

Federal Recovery Permit for bats (**ES81492B-1**)
2021 NWCG- S-212 Chainsaw Certification
2018-Workshop on using Sonobat and Kaleidoscope at SBDN in Roanoke, VG
2012 Asheville-Buncombe Tech Community College – Welding Program (MIG and TIG)
2011 National Wildfire Coordinating Group – Introduction to Wildland Fire Behavior (S-190)
2011 National Wildfire Coordinating Group – Firefighter Training (S-130)

2011 National Wildfire Coordinating Group – Human Factors in the Wildland Fire Service (L-180)
2011 National Wildfire Coordinating Group – Pack Test
2010 Council of Eastern Forest Technician Schools—Award for Superior Academic Achievement

References

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Stephanie R Penk

Wildlife Biologist

38 Oddyssey Ln

Sylva NC 28779

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Resume

Summary

Dr. Penk has 11 years of experience working in the environmental services field. During that time, she has quickly distinguished herself as a capable and competent biologist, swiftly building her credentials and confidence in endangered species surveys for *Myotis sodalis* and *Myotis septentrionalis*. At this point in her career Dr. Penk has performed approximately 265 mist-net surveys, two thirds of which she acted as the team lead. For three summer net season's Dr. Penk managed the mist-netting and telemetry effort on a variety of projects across Pennsylvania, West Virginia, Ohio, Virginia, Illinois, Minnesota, Arkansas, Maryland, and Iowa. In 2016, Dr. Penk received her independent Qualified Bat Surveyor permit from the Pennsylvania Game commission as well as her West Virginia state endangered species collection permit. She has since received a **Federal Recovery Permit (ES 81353B-1)** to capture *Myotis sodalis* and *Myotis septentrionalis* with mist-nets. She has continued to work seasonally performing mist-net surveys as a lead biologist nearly every summer since 2016, maintaining her surveying skills and continuing to collect state permits as her experience broadens (e.g., TN, AL, VA, NC, PA, MN, IA, IL, AR, MD, VA, KY, OH, TX).

Qualifications and Experience with Bats

Dr. Penk is experienced in the use of the following equipment and techniques as they relate to the detection, capture, and handling of bats including federally protected species:

- Bat handling and identification of Eastern U.S bat species and others
    - *Myotis sodalis*, *Myotis septentrionalis*, *Myotis lucifugus*, *Myotis leibii*, *Myotis austroriparius*, *Nycticeius humeralis*, *Perimyotis subflavus*, *Eptesicus fuscus*, *Lasiurus borealis*, *Lasiurus cinereus*, *Lasionycteris noctivagans, Dobsonia beauforti*, *Pteropus hypomelanus*
- Determining sex, age, and necessary measurements of bats
- Suitable survey site selection
- Mist-net set up and operation
- Harp trap set up and operation
- Radio telemetry; foraging and roost tree locating
- Analysis of telemetry data using LOAS programs
- Transmitter application
- Application of split-ring metal and celluloid identification bands
- Wing Damage Index Scoring
- Bat habitat assessments
- Acoustic monitor placement and data analysis

- White-nose Syndrome decontamination protocols
- Wing swab collection

Indiana Bat (*Myotis sodalis*) Experience

- Captured and processed 27 *Myotis sodalis* (Mist-net and harp trapping)
- Personally placed 3 radio transmitters on *Myotis sodalis*; assisted with 1
- Conducted approximately 160 hours of radio telemetry (nighttime foraging and roost tree locations) for the Indiana Bat
- Performed over 25 emergence counts on known *Myotis sodalis* roost trees
- Performed mist-net site reconnaissance

Northern Long-eared Bat (*Myotis septentrionalis*) Experience

- Captured and processed an estimated 101 *Myotis septentrionalis*; 66 as the team lead
- Personally placed 14 radio transmitters on *Myotis septentrionalis*; assisted with 14
- Conducted over 420 hours of radio telemetry to determine roost tree locations
- Performed approximately 120 emergence counts on said roost trees
- Performed mist-net site reconnaissance; yielded high rate of *Myotis septentrionalis* captures

Selected Project Experience

Pennsylvania

- Mist-net survey for the Federally Endangered Indiana Bat, northern long-eared bat, tricolored bat, and little brown bat for the proposed Pennsylvania Pipeline Project throughout Pennsylvania.
- Mist-net survey for the Federally Endangered Indiana Bat for the proposed Pennsylvania Pipeline Project throughout Pennsylvania.
- Project manager for US Forest Service inventory of bats in Allegheny National Forest using mist-nets on forest sites as well as innovative traps for structure emergence surveys.

Ohio

- Habitat Assessment for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Rover Pipeline throughout Ohio.
- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Rover Pipeline throughout Ohio.
- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Dr. No Well Pad in Monroe County, Ohio.
- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Valenka-2 Well Pad in Monroe County, Ohio.

West Virginia

- Habitat Assessment for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Rover Pipeline throughout West Virginia.
- Mist-net survey for the Federally Endangered Indiana Bat for Long Branch Surface Mine in Kanawha and Raleigh Counties, West Virginia.

- Mist-net survey for the Federally Endangered Indiana Bat for Blue Pennant Surface Mine in Boone and Raleigh Counties, West Virginia.
- Habitat Assessment for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Inception Gas Pipeline in Harrison County, West Virginia.

Maryland

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Terrapin Hills Wind Project in Garrett County, Maryland.

Minnesota

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Timberwolf Wind Project in Fillmore County, Minnesota.

North Carolina

- Mist-net survey for long term monitoring of bat species with the Eastern Band of Cherokee Fish and Wildlife service in Cherokee, North Carolina.
- Mist-net survey for northern long-eared bat research project on National game lands in Camden, North Carolina.

Virginia

- Mist-net survey for the Federally Endangered northern long-eared bat for the RAYTHEON project conducted with the US Navy in New Kent, Virginia.
- Mist-net survey for the Federally Endangered northern long-eared bat for the Chester Solar Project conducted with a private energy firm in Chester, Virginia.

Illinois

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Navigator HGP project across from Springfield to Quincy, Illinois. Tricolored bats included as a target species.

Indiana

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Prairie Creek Windfarm Project in Blackford County, Indiana.

Iowa

- Mist-net survey for the Federally Endangered Indiana Bat and northern long-eared bat for the proposed Diamond Trail Wind Project in Iowa County, Iowa.

Education and Professional Trainings

- University of Guelph, Guelph ON, Canada
    - Bachelor of Science Honors, Major: Wildlife Biology
    - Graduated with Distinction 2012
- University of Toronto, Toronto ON, Canada
    - PhD graduate March 2022
    - Department of Ecology and Evolutionary Biology
        - Emphasis on mathematical modeling in ecology

From:	Crutchfield Jr., John U
To:	Kulpa, Sarah; Mularski, Eric; McCarney-Castle, Kerry; Huff, Jen
Cc:	Stuart, Alan Witten; Lineberger, Jeff; Fletcher, Scott T
Subject:	Fwd: [EXTERNAL] RE: Bad Creek Relicensing - Bad Creek Power II Complex Bat Study Plan (FERC Project No. 2740)
Date:	Friday, May 31, 2024 5:44:30 PM

FYI

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From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Friday, May 31, 2024 5:31 PM
To: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>
Subject: [EXTERNAL] RE: Bad Creek Relicensing - Bad Creek Power II Complex Bat Study Plan (FERC Project No. 2740)

Thank you, Mr. Crutchfield,

I'll review this and get back to you next week with any questions.

Best,

Sarah L. Salazar *(she/her)* ✧ *Environmental Protection Specialist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863* ***Please consider the environment before printing this email.***

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Friday, May 31, 2024 3:01 PM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Cc: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>
Subject: Bad Creek Relicensing - Bad Creek Power II Complex Bat Study Plan (FERC Project No. 2740)
Importance: High

Bad Creek Pumped Storage Project (FERC No. 2740)–Bad Creek Power II Complex Bat Study Plan

Dear Ms. Salazar:

Per discussion and the Commission's request during the Bad Creek Relicensing Initial Study Report (ISR) meeting held in Greenville, SC held on January 17, 2024, please find attached the Bad Creek Power Complex Bat Study Plan.

This study plan was prepared in consultation with the U.S. Fish & Wildlife Service and the South Carolina Department of Natural Resources. Both agencies reviewed the draft plan, and their comments have been incorporated into the attached finalized study plan.

Please let Alan Stuart or me know if you have any questions about the study plan.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From:	Mularski, Eric
To:	kate_yates; Olds, Melanie J; Elizabeth Miller
Cc:	Charleston Regulatory, FW4; Crutchfield Jr., John U; Fletcher, Scott T; McRacken Jr., James A.; McCarney-Castle, Kerry; Kulpa, Sarah; Salazar, Maggie
Subject:	RE: 2024-0079174 Bad Creek II Power Complex Bat Study Plan
Date:	Friday, May 31, 2024 4:54:10 PM
Attachments:	20240531_Bat Study Plan_USFWS Supplemental Questions.pdf

Good afternoon Kate,

Attached are responses to questions you provided Duke Energy's sub-consultant (Dylan Brooks of Biotope) via email on May 23, 2024, for the Bad Creek II Power Complex Project. Please review and let us know if you have any questions or concerns.

Thank you,

Eric Mularski, PWS, PMP
D 704-973-6878 **M** 704-806-1521
Eric.mularski@hdrinc.com

hdrinc.com/follow-us

From: Yates, Kate H <kate_yates@fws.gov>
Sent: Tuesday, May 28, 2024 2:48 PM
To: dylan.biotope <dylan.biotope@gmail.com>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; Mularski, Eric <Eric.mularski@hdrinc.com>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>
Subject: 2024-0079174 Bad Creek II Power Complex Bat Study Plan

Good afternoon, John, Eric, and Dylan.

Please find the attached form indicating the Service's conditional approval of the Study Plan submitted for the Bad Creek II Power Complex, proposed to start in May 2024. Note the comments in the approval section of the attached letter. I am still unable to access the folder, so have not seen the updated kmz, but you can submit as an attachment later. However, please be cognizant of linear site placement to satisfy the guidelines.

Please submit survey data to us and SCDNR (BatSurveyReports@dnr.sc.gov) via email following the format provided on pg. 34-35 of the Range-wide Indiana Bat & Northern

Long-eared Bat Survey Guidelines.

We also request a separate spreadsheet with the data using the FWS format found here USFWS_bat_spreadsheet_SoutheastUS_2023.xlsx (live.com), as this will help align with our internal formatting for surveys associated with projects. We look forward to receiving the results upon completion. Please let us know if there are any revisions to the Study Plan.

If you have any questions, comments, or require additional information regarding this approval, please contact us by email: kate_yates@fws.gov and charleston_regulatory@fws.gov.

Thank you,

Kate H. Yates

Fish and Wildlife Biologist

SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service

South Carolina Ecological Services Field Office

176 Croghan Spur Road, Suite 200

Charleston, South Carolina 29407

Cell: 843-991-2173

kate_yates@fws.gov

May 31, 2024

Dear Ms. Yates,

Per your email correspondence on May 23, 2024 with Duke Energy's sub-consultant (Dylan Brooks of Biotope), Duke Energy is providing this letter to answer additional questions posed by the U.S. Fish and Wildlife Service (USFWS) regarding the proposed Bad Creek II Power Complex Bat Study Plan (2024-0079174).

1. **USFWS Question 1**

   I do not see specific acoustic manual vetting qualifications in your resume. I see you have abundant capture and handling experience with a Federal permit, but only a vague mention of "acoustic monitoring and call analysis" at the beginning of your resume. Did you take any courses on call classification of eastern bat species? Many of your jobs say summer surveys but it is unclear on your qualifications to manually vet bat calls. Please resubmit your resume with clarification.

   It is possible that Maximum Likelihood Estimates for the target species and netting results will be sufficient, so we can address that later for sake of time.

   Duke Energy Response: *Three additional resumes were added to the Bad Creek II Power Complex revised Bat Study Plan for the three trained Biotope staff members that will be analyzing / vetting the call data (Dylan Brooks, John Manuel, Eli Corwin). Regarding Maximum Likelihood Estimates, we agree if further discussion is needed, Duke Energy will be happy to re-engage on that subject in the future.*

2. **USFWS Question 2**

   The kmz shows 32 sites but the form and project summary say 37. It is also unclear on the map which sites are proposed for netting versus acoustics. Please submit a revised kmz.

   Duke Energy Response: *The sites shown on the map (kmz) are the baseline reconnaissance points; sites will be added when the survey team is on the ground and able to identify/delegate remaining sites. An updated kmz will be provided upon completion of surveys with exact locations of studied areas.*

3. **USFWS Question 3**

   I see a linear stretch of over 5 km with no proposed survey site of either kind and one of roughly 3 km with no survey site. Please try to survey a site in each km stretch. You don't have to put 2 detectors and each linear site as long as minimum Level of Effort is reached. I'd prefer not to see big voids of over a km unless there is justification.

Duke Energy Response: *The linear gaps between sites related to the proposed 525kV transmission corridor and associated transmission line access roads are due to safety-related concerns from steep/ rugged terrain in remote conditions and permissions for access onto non-Duke owned property. The design for the proposed 525kV transmission line is not finalized and recent surveys of the proposed access roads have eliminated approximately 3.8 miles of access road illustrated on the Bat Study Plan kmz. Duke Energy is open to discuss access and design nuances associated with this complex project*.

4. **USFWS Question 4**

Table 3 is confusing because you have to read the text to figure out that detector nights is calculated using 2 detectors per site on linear and only 1 on non-linear. This results in initially thinking the math is wrong when quickly referring to Table 3. Since proposing 132 detector nights on linear, that is 73.3% acoustic effort, so you need 26.7% or more netting effort on linear. You cannot round down on minimum net nights, so would need at least 49 net nights on linear. Please state the exact proportion of effort you are proposing with each method in linear and non-linear areas in Table 3.

Duke Energy Response*: The survey Level of Effort was revised in the Study Plan Form and on Table 3 of the Project Summary attachment in the Bat Study Plan Package dated May 24, 2024. A table was provided in the revised Bat Survey Plan that best describes the proportion of netting/acoustics in the nonlinear vs. linear areas.*

5. **USFWS Question 6**

Where are the 10 extra acoustic sites? They are mentioned in the text, but not on the kmz or added to the table. This is not required for the plan, but if you do add detector sites as a buffer against equipment malfunction, please include results for all acoustic sites in your report even if the extra sites were not needed to fulfill the minimum level of effort.

Duke Energy Response*: These sites will be determined after initial field reconnaissance. Duke Energy will include all results for acoustic sites in the study report, even if the extra sites were not needed to fulfill the minimum level of effort.*

6. **USFWS Question 7**

Will recommend running the classifier with and without the MYSO because literally at the edge of their range.

Duke Energy Response*: The classification analysis will be run with and without the MYSO classifier for this study.*

Please feel free to reach out to me with any additional concerns or questions. Duke Energy would like the thank the Service for their feedback and interest in the Bad Creek II Power Complex project and Bat Study Plan.

Sincerely,
Eric Mularski, PWS, PMP
HDR Engineering, Inc
440 S. Church Street, Suite 1200
Desk 704-973-6878, Mobile 704-806-1521

From:	Crutchfield Jr., John U
To:	Abney, Michael A; Andrew Grosse; Andy Douglas; Austen Attaway; Bill Ranson-Retired; Chris Starker; Dale Wilde; Elizabeth Miller; Fletcher, Scott T; Huff, Jen; Jennifer Kindel; Keith A. Bradley; Ken Forrester; Olds, Melanie J; Amedee, Morgan D.; Pat Cloninger; Samantha Tessel; Stuart, Alan Witten; suewilliams130@gmail.com; Wes Cooler; Willie Simmons; Morgan D. Amedee
Cc:	Kulpa, Sarah; McCarney-Castle, Kerry; Salazar, Maggie; Thames, Kelly
Subject:	Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)
Date:	Wednesday, November 13, 2024 5:42:56 PM
Attachments:	image001.png
Importance:	High

Dear Bad Creek Relicensing Wildlife and Botanical Resources Committee:

Duke Energy is pleased to distribute the Bad Creek "*Presence/Absence Acoustic and Mist-Net Surveys for Threatened & Endangered Bat Species*" draft report for resource committee review. The bat survey was carried out in response to comments made by the South Carolina Department of Natural Resources [SCDNR] on the Initial Study Report requesting that "*a bat survey be performed to evaluate the presence of bat species and their utilization of habitat by conducting acoustic monitoring and mist net surveys in the newly identified Project areas proposed for development"*. The survey methods presented in this draft report were developed in consultation with the U.S. Fish and Wildlife Service (USFWS) and the SCDNR and were presented in the Bat Study Plan, which was distributed to the resource committee in May 2024.

The deliverable is available on the Bad Creek Relicensing SharePoint site at the following link: Bat Study Report_Nov 2024. Duke Energy is requesting a 30-day review period, therefore, please submit all comments by **December 13**. Review comments should be made in the PDF on SharePoint to avoid version control issues. A confirmation email is kindly requested upon review completion (email me at John.Crutchfield@duke-energy.com).

Please note that Duke Energy plans to file a copy of the bat survey report with the Draft License Application (DLA) in January 2025.

If you have any questions, please contact Alan Stuart or me.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202

From: Crutchfield Jr., John U
To: McCarney-Castle, Kerry
Subject: FW: [EXTERNAL] Bat Study Report
Date: Thursday, November 14, 2024 6:11:13 AM

-----Original Message-----
From: Sue Williams <suewilliams130@gmail.com>
Sent: Wednesday, November 13, 2024 7:09 PM
To: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Subject: [EXTERNAL] Bat Study Report

Hi John.

I have reviewed the Bat Study Report. AQD has no comments on the study.

Sue Williams
Six Mile, SC

From: Crutchfield Jr., John U
To: McCarney-Castle, Kerry
Subject: Fw: [EXTERNAL] RE: Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)
Date: Thursday, December 5, 2024 4:47:44 PM
Attachments: image001.png

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From: Elizabeth Miller <MillerE@dnr.sc.gov>
Sent: Thursday, December 5, 2024 4:39 PM
To: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Cc: Jennifer Kindel <KindelJ@dnr.sc.gov>
Subject: [EXTERNAL] RE: Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)

Hi John,

I've been unable to edit the pdf on the SharePoint. The only comment SCDNR had on the report was that Rafinesque's big-eared bat is a state endangered species and the Eastern small-footed bat is state threatened species. Please let me know if you have any questions.

Thank you,

Elizabeth

Elizabeth C. Miller
SCDNR
Office: 843-953-3881
Cell: 843-729-4636

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Wednesday, November 13, 2024 5:42 PM
To: Abney, Michael A <Michael.Abney@duke-energy.com>; Andrew Grosse <GrosseA@dnr.sc.gov>; Andy Douglas <adoug41@att.net>; Austen Attaway <AttawayA@dnr.sc.gov>; Bill Ranson <bill.ranson@retiree.furman.edu>; Chris Starker <cstarker@upstateforever.org>; Dale Wilde <dwilde@keoweefolks.org>; Elizabeth Miller <MillerE@dnr.sc.gov>; Fletcher, Scott T

<Scott.Fletcher@duke-energy.com>; Jen Huff <jen.huff@hdrinc.com>; Jennifer Kindel <KindelJ@dnr.sc.gov>; Keith A. Bradley <BradleyK@dnr.sc.gov>; Ken Forrester <ForresterK@dnr.sc.gov>; Olds, Melanie J <melanie_olds@fws.gov>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <CloningerP@dnr.sc.gov>; Samantha Tessel <TesselS@dnr.sc.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Sue Williams <suewilliams130@gmail.com>; Wes Cooler <wes.cooler@mac.com>; Willie Simmons <SimmonsW@dnr.sc.gov>; Morgan D. Amedee <morgan.amedee@des.sc.gov>
Cc: Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>; Maggie Salazar <maggie.salazar@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)
Importance: High

Dear Bad Creek Relicensing Wildlife and Botanical Resources Committee:

Duke Energy is pleased to distribute the Bad Creek "*Presence/Absence Acoustic and Mist-Net Surveys for Threatened & Endangered Bat Species*" draft report for resource committee review. The bat survey was carried out in response to comments made by the South Carolina Department of Natural Resources [SCDNR] on the Initial Study Report requesting that "*a bat survey be performed to evaluate the presence of bat species and their utilization of habitat by conducting acoustic monitoring and mist net surveys in the newly identified Project areas proposed for development"*. The survey methods presented in this draft report were developed in consultation with the U.S. Fish and Wildlife Service (USFWS) and the SCDNR and were presented in the Bat Study Plan, which was distributed to the resource committee in May 2024.

The deliverable is available on the Bad Creek Relicensing SharePoint site at the following link: Bat Study Report_Nov 2024. Duke Energy is requesting a 30-day review period, therefore, please submit all comments by **December 13**. Review comments should be made in the PDF on SharePoint to avoid version control issues. A confirmation email is kindly requested upon review completion (email me at John.Crutchfield@duke-energy.com).

Please note that Duke Energy plans to file a copy of the bat survey report with the Draft License Application (DLA) in January 2025.

If you have any questions, please contact Alan Stuart or me.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy

525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From: Crutchfield Jr., John U
To: Stuart, Alan Witten; Fletcher, Scott T; Kulpa, Sarah; McCarney-Castle, Kerry
Subject: FW: [EXTERNAL] 2024-0079174 Bad Creek Bat Survey - Additional documents requested
Date: Thursday, December 12, 2024 9:13:05 AM

FYI.

From: Yates, Kate H <kate_yates@fws.gov>
Sent: Thursday, December 12, 2024 9:07 AM
To: Dylan Brooks <dylan.biotope@gmail.com>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>
Subject: [EXTERNAL] 2024-0079174 Bad Creek Bat Survey - Additional documents requested

Good morning.

Thank you for submitting the Bad Creek bat survey report. The Service is still reviewing. In addition to the summary tables (A4 and A5 which were blank pages in the report), please also submit the detector log files, K Pro output call spreadsheet and the USFWS spreadsheet.

Many thanks for your assistance in this matter.

Kind regards,

Kate H. Yates, CWB

Fish and Wildlife Biologist

SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service

South Carolina Ecological Services Field Office

176 Croghan Spur Road, Suite 200

Charleston, South Carolina 29407

Cell: 843-991-2173

kate_yates@fws.gov

From: Crutchfield Jr., John U
To: Stuart, Alan Witten; Fletcher, Scott T; Kulpa, Sarah; McCarney-Castle, Kerry
Subject: Fw: [EXTERNAL] 2024-0079174 Bad Creek Bat Survey - raw files request
Date: Friday, December 13, 2024 9:53:14 AM

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From: Yates, Kate H <kate_yates@fws.gov>
Sent: Friday, December 13, 2024 8:39 AM
To: Dylan Brooks <dylan.biotope@gmail.com>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Subject: [EXTERNAL] 2024-0079174 Bad Creek Bat Survey - raw files request

Good morning, Dylan.

The Service would like to review the raw .wav file data for all auto classified NLEB (MYOSEP) and IBAT (MYOSOD). Although the report explains the manual rejection of these calls, the MLE values suggesting likely presence are very strong at multiple sites and multiple nights for these listed species. We feel that a second look at these calls by one of our own internal experts is warranted. Please use the following link to upload the files:

https://fws-fileshare.app.box.com/f/095e301acb4642eda2ed49732722da83

Thank you for your cooperation in this matter.

Kind regards,

Kate H. Yates, CWB
Fish and Wildlife Biologist
SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service
South Carolina Ecological Services Field Office
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407
Cell: 843-991-2173
kate_yates@fws.gov

From: Dylan Brooks
To: Thames, Kelly; McCarney-Castle, Kerry
Subject: Fwd: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey
Date: Monday, December 16, 2024 10:25:08 AM

Thanks,

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

---------- Forwarded message ---------
From: **Dylan Brooks** <dylan.biotope@gmail.com>
Date: Thu, Dec 12, 2024 at 10:47 AM
Subject: Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey
To: Yates, Kate H <kate_yates@fws.gov>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>, Olds, Melanie J <melanie_olds@fws.gov>

Thanks, Kate! I really appreciate that. We try really hard to be as thorough as possible while keeping the "fluff" minimal. Please don't hesitate to let me know if there is ever anything we can do to help make things easier on your end. I'm very open to feedback and updating our reports to make processing as painless as possible.

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Thu, Dec 12, 2024 at 9:54 AM Yates, Kate H <kate_yates@fws.gov> wrote:

> Thank you, Dylan. Yes, the one USFWS spreadsheet with all the projects is fine. I also would like to say that your reports are always a pleasure to read because they are very thorough and organized. I appreciate that very much.
>
> Kate H. Yates, CWB
> Fish and Wildlife Biologist
> SC Renewable Energy Coordinator
>
> U.S. Fish and Wildlife Service
> South Carolina Ecological Services Field Office
> 176 Croghan Spur Road, Suite 200
> Charleston, South Carolina 29407
> Cell: 843-991-2173
> kate_yates@fws.gov
>
> ---
>
> **From:** Dylan Brooks <dylan.biotope@gmail.com>
> **Sent:** Thursday, December 12, 2024 9:37 AM
> **To:** Yates, Kate H <kate_yates@fws.gov>
> **Cc:** Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Olds, Melanie J <melanie_olds@fws.gov>
> **Subject:** [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey
>
>
>
> Hey Kate,
>
> I am so sorry about this! I have no idea how that happened. I have attached a revised Appendix C with the missing information included. I just received your other email as well

and have reached out to our acoustic analyst for the additional information you requested. We should be able to have that over by tomorrow morning.

In regards to the USFWS spreadsheet, we typically submit that at the end of the year with all of our projects consolidated on one spreadsheet for the region. Do you want us to start doing one spreadsheet per project on acoustic projects in SC? I just want to make sure we do it in a way that makes things as easy as possible for you for processing.

Thanks,

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Wed, Dec 11, 2024 at 5:36 PM Yates, Kate H <kate_yates@fws.gov> wrote:

> Good afternoon, Dylan.
>
> I have been reviewing the Bad Creek bat survey report. Would you mind sending the MLE Summary (Table A4) and Qualitative Summary (Table A5) separately? They don't show up in the pdf report for some reason. Pages 53-61 and 63-65 are blank. It must have just been a quirk when converting the file type.
>
> Many thanks,
>
> Kate H. Yates, CWB
> Fish and Wildlife Biologist
> SC Renewable Energy Coordinator
>
> U.S. Fish and Wildlife Service
> South Carolina Ecological Services Field Office
> 176 Croghan Spur Road, Suite 200
> Charleston, South Carolina 29407
> Cell: 843-991-2173
> kate_yates@fws.gov

From:	Dylan Brooks
To:	kate_yates
Cc:	Charleston Regulatory, FW4; Crutchfield Jr., John U; McCarney-Castle, Kerry; Thames, Kelly
Subject:	Re: 2024-0079174 Bad Creek Bat Survey - raw files request
Date:	Monday, December 16, 2024 10:19:21 AM

Good Morning Kate,

All of the files should be available in the folder you provided. Let me know if you have any questions or require any additional information. Also, I have added Kelly and Kerry from HDR to the thread as they are the client representatives from HDR.

Thanks,

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Fri, Dec 13, 2024 at 8:37 AM Yates, Kate H <kate_yates@fws.gov> wrote:

> Good morning, Dylan.
>
> The Service would like to review the raw .wav file data for all auto classified NLEB (MYOSEP) and IBAT (MYOSOD). Although the report explains the manual rejection of these calls, the MLE values suggesting likely presence are very strong at multiple sites and multiple nights for these listed species. We feel that a second look at these calls by one of our own internal experts is warranted. Please use the following link to upload the files:
>
> https://fws-fileshare.app.box.com/f/095e301acb4642eda2ed49732722da83
>
> Thank you for your cooperation in this matter.
>
> Kind regards,

Kate H. Yates, CWB
Fish and Wildlife Biologist
SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service
South Carolina Ecological Services Field Office
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407
Cell: 843-991-2173
kate_yates@fws.gov

From:	Dylan Brooks
To:	kate_yates
Cc:	Charleston Regulatory, FW4; Kuczynska, Vona; Crutchfield Jr., John U; McCarney-Castle, Kerry; Thames, Kelly
Subject:	Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request
Date:	Monday, December 16, 2024 2:49:53 PM
Attachments:	image.png

Thanks, Kate! I'll be on the lookout for an email with further instruction from Vona and will make sure we have everything in order on our end.

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Mon, Dec 16, 2024 at 2:36 PM Yates, Kate H <kate_yates@fws.gov> wrote:

> Thank you, Dylan. I believe Vona can help with the file sharing.
>
> As for the full spectrum, there is an upgrade available for Anabat Express detectors.
>
> https://www.titley-scientific.com/product/express-fs-upgrade/
>
> Thank you and we will be in touch,
>
> Kate H. Yates, CWB
> Fish and Wildlife Biologist
> SC Renewable Energy Coordinator
>
> U.S. Fish and Wildlife Service
> South Carolina Ecological Services Field Office
> 176 Croghan Spur Road, Suite 200
> Charleston, South Carolina 29407
> Cell: 843-991-2173
> kate_yates@fws.gov
>
> ---
>
> **From:** Dylan Brooks <dylan.biotope@gmail.com>

Sent: Monday, December 16, 2024 2:22 PM
To: Yates, Kate H <kate_yates@fws.gov>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Kuczynska, Vona <vona_kuczynska@fws.gov>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request

Good Afternoon Kate,

I hope all is well with you. Our analyst originally tried to upload the calls in folders broken down by detector site over the weekend. However, the file sharing link you provided will only accept files, so our attempts to upload them organized in folders resulted in an error message. Is there another preferable way to share the data with you so we can organize the calls and share them in folders separated by their KPRO ID? We're open to whatever strategy works best for you.

Also, the Anabat Express units used on this project only record zero crossing data. I am sorry for the confusion with this matter. We are currently in the process of converting to SM4 units and will use those units for surveys in SC moving forward if you would like.

image.png

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Mon, Dec 16, 2024 at 1:37 PM Yates, Kate H <kate_yates@fws.gov> wrote:

Good afternoon, Dylan. I greatly appreciate your patience as we work through this. Would you mind having your acoustic analyst upload all myotis files in full spectrum and organized by folder according to the K Pro auto ID? The call files uploaded this morning are all in zero cross with no ID attached. I have copied Vona Kuczynska here if you need an R script for efficiency.

Many thanks,

Kate H. Yates, CWB
Fish and Wildlife Biologist
SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service
South Carolina Ecological Services Field Office
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407
Cell: 843-991-2173
kate_yates@fws.gov

From: Dylan Brooks <dylan.biotope@gmail.com>
Sent: Monday, December 16, 2024 10:19 AM
To: Yates, Kate H <kate_yates@fws.gov>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request

Good Morning Kate,

All of the files should be available in the folder you provided. Let me know if you have any questions or require any additional information. Also, I have added Kelly and Kerry from HDR to the thread as they are the client representatives from HDR.

Thanks,

Dylan Brooks
Vice President | Owner

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Nacogdoches, TX 75961
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www.biotopeforenv.com

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> Good morning, Dylan.
>
> The Service would like to review the raw .wav file data for all auto classified NLEB (MYOSEP) and IBAT (MYOSOD). Although the report explains the manual rejection of these calls, the MLE values suggesting likely presence are very strong at multiple sites and multiple nights for these listed species. We feel that a second look at these calls by one of our own internal experts is warranted. Please use the following link to upload the files:
>
> https://fws-fileshare.app.box.com/f/095e301acb4642eda2ed49732722da83
>
> Thank you for your cooperation in this matter.
>
> Kind regards,
>
> Kate H. Yates, CWB
> Fish and Wildlife Biologist
> SC Renewable Energy Coordinator
>
> U.S. Fish and Wildlife Service
> South Carolina Ecological Services Field Office
> 176 Croghan Spur Road, Suite 200
> Charleston, South Carolina 29407
> Cell: 843-991-2173
> kate_yates@fws.gov

From:	Dylan Brooks
To:	Kuczynska, Vona
Cc:	kate_yates; Charleston Regulatory, FW4; Crutchfield Jr., John U; McCarney-Castle, Kerry; Thames, Kelly
Subject:	Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request
Date:	Thursday, December 19, 2024 10:46:27 AM
Attachments:	Outlook-pij5l0xh.png NoID.zip

Hey Vona,

No problem at all. The NoID files were just uploaded on the FWS Fileshare. I have attached them to this email as well. Please let me know if you need anything else.

Thanks,

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Wed, Dec 18, 2024 at 5:50 PM Kuczynska, Vona <vona_kuczynska@fws.gov> wrote:

> Hi Dylan,
>
> Thanks for these. Can your analyst also share the NOID folder please?
>
> Thank you,
> Vona Kuczynska
>
> Fish and Wildlife Biologist
>
> U.S. Fish and Wildlife Service
>
> Missouri Ecological Services Field Office
>
> 101 Park DeVille Drive, Suite A, Columbia, MO 65203
>
> Mobile: 573-540-3835

Book time to meet with me

FWS Fileshare - Share Files With Me

From: Dylan Brooks <dylan.biotope@gmail.com>
Sent: Wednesday, December 18, 2024 4:39 PM
To: Kuczynska, Vona <vona_kuczynska@fws.gov>
Cc: Yates, Kate H <kate_yates@fws.gov>; Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request

Good Afternoon Vona,

Thank you for sending that over! Our analyst had already manually sorted the myotis calls and separated them into their respective folders, but that R script will be super helpful in the future. I have uploaded a compressed folder into the file sharing link in your signature line with all of the Myotis calls for the Bad Creek project. I also attached the compressed folder to this email in case that is easier. I believe these folders contain everything Kate has requested, but if you notice anything else that is needed please let me know. Also, let me know if you have any issues accessing the folder or if you have any questions. We look forward to your feedback.

Thanks,

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Wed, Dec 18, 2024 at 4:29 PM Kuczynska, Vona <vona_kuczynska@fws.gov> wrote:

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Vona

Vona Kuczynska

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U.S. Fish and Wildlife Service

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Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Kuczynska, Vona <vona_kuczynska@fws.gov>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>

Subject: Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request

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As for the full spectrum, there is an upgrade available for Anabat Express detectors.

https://www.titley-scientific.com/product/express-fs-upgrade/

Thank you and we will be in touch,

Kate H. Yates, CWB
Fish and Wildlife Biologist
SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service
South Carolina Ecological Services Field Office
176 Croghan Spur Road, Suite 200
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Cell: 843-991-2173
kate_yates@fws.gov

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image.png

Dylan Brooks
Vice President | Owner

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>
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> 176 Croghan Spur Road, Suite 200
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> Cell: 843-991-2173
> kate_yates@fws.gov
>
> ---
>
> **From:** Dylan Brooks <dylan.biotope@gmail.com>

Sent: Monday, December 16, 2024 10:19 AM
To: Yates, Kate H <kate_yates@fws.gov>
Cc: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
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Good Morning Kate,

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Dylan Brooks
Vice President | Owner

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>
> https://fws-fileshare.app.box.com/f/095e301acb4642eda2ed49732722da83
>
> Thank you for your cooperation in this matter.

Kind regards,

Kate H. Yates, CWB
Fish and Wildlife Biologist
SC Renewable Energy Coordinator

U.S. Fish and Wildlife Service
South Carolina Ecological Services Field Office
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407
Cell: 843-991-2173
kate_yates@fws.gov

From:	Kuczynska, Vona
To:	Thames, Kelly
Cc:	kate_yates; Charleston Regulatory, FW4; McCarney-Castle, Kerry; Dylan Brooks; Stuart, Alan Witten; Kulpa, Sarah
Subject:	Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request
Date:	Friday, December 20, 2024 3:24:21 PM
Attachments:	image001.png Outlook-iecmc44f.png

Yes, I believe I have everything. Thank you.

Vona Kuczynska

Fish and Wildlife Biologist

U.S. Fish and Wildlife Service

Missouri Ecological Services Field Office

101 Park DeVille Drive, Suite A, Columbia, MO 65203

Mobile: 573-540-3835

Book time to meet with me

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Sent: Friday, December 20, 2024 2:21 PM
To: Kuczynska, Vona <vona_kuczynska@fws.gov>
Cc: Yates, Kate H <kate_yates@fws.gov>; Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Dylan Brooks <dylan.biotope@gmail.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>
Subject: RE: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request

Thanks for the quick response, Vona!

Do you have everything you need at this point?

Thanks,
Kelly

Kelly Thames, PWS, TN-QHP
D 704.338.6710 **M** 704.996.9986

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From: Kuczynska, Vona <vona_kuczynska@fws.gov>
Sent: Friday, December 20, 2024 3:19 PM
To: Thames, Kelly <Kelly.Thames@hdrinc.com>
Cc: kate_yates <kate_yates@fws.gov>; Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Dylan Brooks <dylan.biotope@gmail.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>
Subject: Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request

Hi Kelly,

Thanks for making me aware of your timelines, it helps to know that. Assuming we don't get furloughed, I will look as early as the week of December 30th and would have an answer for you that week. If we are furloughed, I am not sure, but it is on my list of priorities for whenever we would return back to the office.

Vona

Vona Kuczynska

Fish and Wildlife Biologist

U.S. Fish and Wildlife Service

Missouri Ecological Services Field Office

101 Park DeVille Drive, Suite A, Columbia, MO 65203

Mobile: 573-540-3835

Book time to meet with me

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From: Thames, Kelly <Kelly.Thames@hdrinc.com>
Sent: Friday, December 20, 2024 1:53 PM
To: Kuczynska, Vona <vona_kuczynska@fws.gov>
Cc: Yates, Kate H <kate_yates@fws.gov>; Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Dylan Brooks <dylan.biotope@gmail.com>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>
Subject: RE: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request

Hi Vona,

We appreciate your review of the acoustic files. When you have moment to digest, do you mind providing an estimated timeline as to when you think you may be done with the data review?

We (Duke and HDR) met some of your colleagues in the USFWS Charleston office this past week, and this was an outstanding question we had. We have an upcoming public engagement meeting on January 16th - the Bad Creek Bat Study Report (conducted and authored by Biotope) will likely be discussed, and we are evaluating our approach to this discussion pending your availability to provide input by then or not.

For context, Duke Energy is applying for a new FERC license and the public engagement meeting is part of that process. HDR is Duke's consultant, and Biotope is a subconsultant to HDR.

Again, we really appreciate your time on this!

Thanks!
Kelly

Kelly Thames, PWS, TN-QHP
D 704.338.6710 **M** 704.996.9986

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From: Dylan Brooks <dylan.biotope@gmail.com>
Sent: Thursday, December 19, 2024 10:45 AM
To: Kuczynska, Vona <vona_kuczynska@fws.gov>
Cc: kate_yates <kate_yates@fws.gov>; Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: Re: [EXTERNAL] Re: 2024-0079174 Bad Creek Bat Survey - raw files request

Hey Vona,

No problem at all. The NoID files were just uploaded on the FWS Fileshare. I have attached them to this email as well. Please let me know if you need anything else.

Thanks,

Dylan Brooks
Vice President | Owner

6332 FM 2259
Nacogdoches, TX 75961
(828)507-5523
www.biotopeforenv.com

On Wed, Dec 18, 2024 at 5:50 PM Kuczynska, Vona <vona_kuczynska@fws.gov> wrote:

> Hi Dylan,
>
> Thanks for these. Can your analyst also share the NOID folder please?
>
> Thank you,
> Vona Kuczynska
>
> Fish and Wildlife Biologist
>
> U.S. Fish and Wildlife Service
>
> Missouri Ecological Services Field Office
>
> 101 Park DeVille Drive, Suite A, Columbia, MO 65203
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> Cell: 843-991-2173
> kate_yates@fws.gov

From:	Thames, Kelly
To:	Kulpa, Sarah; McCarney-Castle, Kerry; Settevendemio, Erin; Huff, Jen; Salazar, Maggie
Subject:	FW: [EXTERNAL] Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)
Date:	Friday, January 10, 2025 8:34:19 AM
Attachments:	image001.png Outlook-h3jdalwn.png Outlook-oateazfz.png Outlook-thrjmdos

---

Kelly Thames, PWS, TN-QHP
D 704.338.6710 **M** 704.996.9986

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From: Olds, Melanie J <melanie_olds@fws.gov>
Sent: Friday, January 10, 2025 8:32 AM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Cc: kate_yates <kate_yates@fws.gov>; Troutman, Lindsey C <lindsey_troutman@fws.gov>; Jennifer Kindel <KindelJ@dnr.sc.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>; Thames, Kelly <kelly.thames@hdrinc.com>; dylan.biotope@gmail.com
Subject: Re: [EXTERNAL] Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)

Alan,

We have reviewed the Presence/Absence Acoustic and Mist-Net Surveys for Threatened & Endangered Bat Species draft report for the Bad Creek Hydro Project in Oconee County and find it to be acceptable for probable absence of northern long-eared bat and presence of the gray bat and proposed endangered tricolored bat in the project area. For Indiana bat we don't agree with your determination of probably absence because so many of the calls in the data set are consistent with this species, so therefore acoustic presence of the species cannot be excluded and is tentative presumed present.

Please be aware that our approval of these survey results is not a section 7(a)(2) concurrence and does not authorize implementation of any part of the proposed action or remove the applicant from the permitting requirements that may be required by other State and federal agencies. Additional coordination with our office may be necessary.

Again, sorry for the delay in reviewing the bat survey report. We wanted to be thorough in our

review and appreciate the timely response to getting us the data set to review.

Melanie

Melanie Olds

Fish & Wildlife Biologist

Regulatory Team Lead/FERC Coordinator

U.S. Fish and Wildlife Service

South Carolina Ecological Services Field Office

176 Croghan Spur Road, Suite 200

Charleston, SC 29407

Phone: (843) 534-0403

From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Friday, December 13, 2024 9:59 AM
To: Olds, Melanie J <melanie_olds@fws.gov>
Cc: Yates, Kate H <kate_yates@fws.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Subject: Re: [EXTERNAL] Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)

Thank you, Melanie. Please note I am retiring at the end of this month and am winding things down. Please direct future correspondence to Alan Stuart.
I have enjoyed working with you on the Bad Creek relicensing and wish you the best.
Regards, John Crutchfield

Get Outlook for iOS

From: Olds, Melanie J <melanie_olds@fws.gov>
Sent: Friday, December 13, 2024 7:32:35 AM
To: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Cc: Yates, Kate H <kate_yates@fws.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Subject: Re: [EXTERNAL] Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)

John,

The Service is still working on our review of the bat survey report. I apologize we fell a bit behind because this came in right before I had a family emergency and it sat in my inbox and not assigned until I got back and caught up. Kate is one of our resident bat experts and is working on the review. You've probably seen some emails from her requesting additional information. I believe she will be potentially requesting some of the raw data as well. I wanted you to know so that you aren't caught off guard. We do occasionally ask for these kinds of additional data just to make sure that we haven't missed anything before accepting the results of the bat survey.

I'm cc'ing Alan since I know we have an in-person meeting next week to discuss sect. 7 needs for the project and accepting of these results tie into the discussion. We hope to have our review completed ASAP.

Melanie

Melanie Olds

Fish & Wildlife Biologist

Regulatory Team Lead/FERC Coordinator

U.S. Fish and Wildlife Service

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From: Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
Sent: Wednesday, November 13, 2024 5:41 PM
To: Abney, Michael A <Michael.Abney@duke-energy.com>; Andrew Grosse <grossea@dnr.sc.gov>; Andy Douglas <adoug41@att.net>; Austin Attaway <attawaya@dnr.sc.gov>; Bill Ranson <bill.ranson@retiree.furman.edu>; Chris Starker <cstarker@upstateforever.org>; Dale Wilde <dwilde@keoweefolks.org>; Elizabeth Miller <MillerE@dnr.sc.gov>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Jen Huff <jen.huff@hdrinc.com>; Jennifer Kindel <kindelj@dnr.sc.gov>; Keith Bradley <bradleyk@dnr.sc.gov>; Ken Forrester <forresterk@dnr.sc.gov>; Olds, Melanie J <melanie_olds@fws.gov>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <cloningerp@dnr.sc.gov>; Samantha Tessel <Tessels@dnr.sc.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Sue Williams <suewilliams130@gmail.com>; Wes Cooler <wes.cooler@mac.com>; Willie Simmons <simmonsw@dnr.sc.gov>; Morgan D. Amedee <morgan.amedee@des.sc.gov>
Cc: Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>; Maggie Salazar <maggie.salazar@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: [EXTERNAL] Bad Creek Relicensing - Bat Survey Draft Report (Ready for Resource Committee Review)

Dear Bad Creek Relicensing Wildlife and Botanical Resources Committee:

Duke Energy is pleased to distribute the Bad Creek "*Presence/Absence Acoustic and Mist-Net*

Surveys for Threatened & Endangered Bat Species" draft report for resource committee review. The bat survey was carried out in response to comments made by the South Carolina Department of Natural Resources [SCDNR] on the Initial Study Report requesting that "*a bat survey be performed to evaluate the presence of bat species and their utilization of habitat by conducting acoustic monitoring and mist net surveys in the newly identified Project areas proposed for development"*. The survey methods presented in this draft report were developed in consultation with the U.S. Fish and Wildlife Service (USFWS) and the SCDNR and were presented in the Bat Study Plan, which was distributed to the resource committee in May 2024.

The deliverable is available on the Bad Creek Relicensing SharePoint site at the following link: Bat Study Report_Nov 2024. Duke Energy is requesting a 30-day review period, therefore, please submit all comments by **December 13**. Review comments should be made in the PDF on SharePoint to avoid version control issues. A confirmation email is kindly requested upon review completion (email me at John.Crutchfield@duke-energy.com).

Please note that Duke Energy plans to file a copy of the bat survey report with the Draft License Application (DLA) in January 2025.

If you have any questions, please contact Alan Stuart or me.

Regards,

John Crutchfield
Project Manager II
Water Strategy, Hydro Licensing & Lake Services
Regulated & Renewable Energy
Duke Energy
525 South Tryon Street, DEP-35B | Charlotte, NC 28202
Office 980-373-2288| Cell 919-757-1095

From:	Thames, Kelly
To:	McCarney-Castle, Kerry
Subject:	FW: Bad Creek USFWS Meeting on 12/18/2024 - Final Notes/Presentation
Date:	Monday, January 13, 2025 10:06:45 AM
Attachments:	20241218_Bad Creek II_USFWS Meeting Summary.pdf 2024.12.18_Bad Creek II_USFWS Meeting Presentation.pdf

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Kelly Thames, PWS, TN-QHP
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From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Monday, January 13, 2025 10:05 AM
To: Olds, Melanie J <melanie_olds@fws.gov>
Cc: Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: Bad Creek USFWS Meeting on 12/18/2024 - Final Notes/Presentation

Good morning Melanie,

Again, thank you for sitting down with us in December to discuss ESA Consultation needs for Bad Creek. We appreciate your guidance and believe our meeting with you was time well spent. Please find the attached final meeting summary and presentation.

We look forward to continued coordination with you and staff.
Thank you !
Alan

PS. Happy New Year !

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
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Meeting Summary

Project:	Bad Creek II Power Complex	
Subject:	USFWS Informal Consultation Meeting	
Date:	Wednesday, December 18, 2024	
Location:	USFWS Field Office, Charleston, SC	
Attendees:	Melanie Olds, USFWS Christy Johnston Hughes, USFWS Lyndsey Troutman, USFWS Kate Yates, USFWS	Alan Stuart, Duke Energy Scott Fletcher, Duke Energy Sarah Kulpa, HDR Kelly Thames, HDR
Attachments:	Duke-USFWS Bad Creek Meeting-Dec 2024.pdf (PowerPoint presentation)	

Summary

1. The meeting between Duke Energy and the United States Fish and Wildlife Services South Carolina Ecological Services Field Office (USFWS) provided an overview of the existing and proposed expansion of the Bad Creek Pumped Storage Project (Project), including potential impacts of construction of the second powerhouse (Bad Creek II Power Complex or BCII) and relevant federal licenses and permits, namely the new Federal Energy Regulatory Commission (FERC) license and a Clean Water Act (CWA) Section 404/401 Individual Permit via a pre-construction notification (PCN).
2. The natural resources and bat surveys performed for Duke Energy provide suitable baseline information to inform USFWS' evaluations for the FERC licensing and CWA 404/401 permit application processes.
3. The acoustic and mist-net bat surveys were performed in the summer of 2024 and the draft report (currently under USFWS review) provides a summary of probable absence/presence of federally listed northern long-eared (NLEB), Indiana, tricolored, little brown, and gray bats. Additional review of the study data (i.e., acoustic data) is being performed by USFWS to validate Biotope's original study findings/conclusions that there is low probability of Indiana bat and NELB in the Project's area of interest (AOI). identify probable absence/presence of Indiana bat and NLEB.
4. USFWS expects the level of tree clearing proposed for the construction of BCII will trigger formal consultation under Section 7 of the Endangered Species Act. USFWS expects to prepare a single Biological Opinion (BiOp) for the Bad Creek relicensing and BCII construction during the post-filing phase of the FERC Integrated Licensing Process (ILP).
5. USFWS and Duke Energy agreed on a preliminary outline for the (applicant prepared) Biological Assessment (BA). USFWS is willing to review the draft BA ahead of Duke

Energy's inclusion of the BA in the FERC [Final] License Application. The BA will include currently federally listed bat species as well as At-Risk Species.

6. While additional, primarily short-term, impacts will be identified and evaluated in the BA, the primary impact of concern to USFWS for listed bat species is tree clearing.
7. The BA will not include avian species or measures recommended under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. USFWS recommended Duke Energy consult with separate regional contacts regarding compliance with these acts.
8. Recommended conservation measures for tree-roosting and migratory bats expected to be applicable to the construction of BCII are similar to those being developed for Duke Energy's Habitat Conservation Plan (HCP) and will primarily consist of time-of-year restrictions on tree clearing to avoid pupping season. Locations of nearest hibernaculum will be identified, through the review of state and federal data, to determine if any additional measures are required. Relevant measures proposed in the Bad Creek Relicensing Agreement will also provide conservation and protection for listed bat species. The USFWS will likely also recommend periodic monitoring over the new license term.

A detailed summary of the meeting discussion and action items follows.

Introduction and Meeting Objectives

- Introduction of meeting attendees and roles:
    - Melanie (USFWS) – Regulatory Team Lead/USFWS FERC Coordinator
    - Kate (USFWS) – SC Renewable Energy Coordinator
    - Lyndsey (USFWS) – Fish and Wildlife Biologist
    - Alan Suart (Duke Energy) – Bad Creek Relicensing Project Manager
    - Scott Fletcher (Duke Energy) – Natural Resources Manager
    - Sarah Kulpa (HDR) – Bad Creek Relicensing Project Manager and FERC Hydropower Licensing Specialist
    - Kelly Thames (HDR) – Environmental Project Manager and 404/401 Specialist
- Alan kicked off introductions and summarized meeting objectives.
- HDR noted they would capture meeting notes and provide the meeting summary in consultation correspondence for the Bad Creek license application following USFWS review of the meeting summary; USFWS confirmed.
- Alan confirmed that BCII will be proposed in the FERC Draft and Final License Applications (DLA, FLA).
- Scott and Lyndsey are working on Duke Energy's HCP that applies to Duke Energy's entire service territory. While the FERC federal action does not trigger Section 10 (incidental "take") consultation with USFWS, it is an opportunity to incorporate HCP measures into the Section 7 consultation.

Project Overview

- Bad Creek Pumped Storage Project - Alan provided an overview of Project location, purpose and operation, and major features.
- Bad Creek II Power Complex - Alan provided overview and purpose of proposed Project expansion.
    - Noted primary difference between powerhouses is two smaller tunnels (BCII) as compared to one (existing powerhouse), which allows for partial powerhouse isolation for unit maintenance, and variable speed pump-turbine generator units for BCII (existing units are single-speed).
    - Noted that the Fisher Knob Access Road, which was originally scoped as a temporary road to provide access to the Fisher Knob community during construction, is no longer proposed (cost prohibitive; Traffic Management Plan to be developed and implemented instead). Several natural resources surveys, bat surveys, and stream habitat assessments were performed along the previously proposed route of the then-proposed access road. Findings of these various studies and surveys have been previously provided in relicensing documents and will be provided in the Final License Application.
    - Expansion of the transmission line corridor, which is 9.25 miles long extending from the existing Project to the Jocasee Hydroelectric Project, will require improvements/widening and use of existing United States Forest Service (USFS) logging roads for access; there are no federal lands within the Bad Creek Project Boundary.
    - Potential impacts will include placement of spoil material (i.e., rock and earth from tunnel excavation) in the uplands and tree clearing (main project site and transmission line).

Federal Energy Regulatory Commission (FERC) Relicensing Process

- Alan noted the DLA is expected to be filed the last week of February, 2025.
- Sarah described how the ILP has been heavily front-loaded in the pre-filing phase, with the goal of filing FLA with as much stakeholder and agency concurrence as possible to reduce risk of protracted FERC post-filing period (i.e., issue new license by existing license expiration [expires July 31, 2027]).
- General discussion of process with FERC after FLA is filed. Melanie noted past/recent South Carolina projects have not required formal Section 7 consultation with USFWS (avoided impacts to listed species). BCII will likely require formal consultation.

Bad Creek II Construction Impacts and Permitting

Expanded FERC Project Boundary

- The FERC Project Boundary encompasses all lands necessary for the operation and construction of the Project and BCII. Alan provided an overview of the expanded Project

Boundary and noted that it is not equal to the Limits of Disturbance (LOD) for BCII construction.
- Kelly noted that the FERC boundary does not include existing transmission line access roads that cross USFS lands. Improvements to these roads will occur under access agreements with USFS and would be subject to CWA Sections 404 and 401 considerations.
- There are no federal lands included in the FERC Project Boundary (i.e., that would trigger mandatory conditioning under Section 4(e) of the Federal Power Act).

Types of Disturbance

- Kelly provided an overview of multiple types of disturbance activities (e.g., tree and vegetation clearing) that would be expected for the construction of BCII.
    - Fill and/or disturbance activities of streams and wetlands would be subject to CWA Section 404/401 consideration/permitting.
- Sarah noted FERC identified impacts in their scoping documents (2022-2023) and these impacts will be evaluated by Duke Energy in Exhibit E (Environmental Report, prepared in the style of an Applicant-prepared Environmental Assessment) of the DLA/FLA, which provides FERC the information they need to prepare their National Environmental Policy Act (NEPA) evaluation. FERC's NEPA evaluation is currently anticipated to be an Environmental Assessment (EA) in lieu of an Environmental Impact Statement. FERC will ultimately determine which document will be prepared.
- Kelly provided an overview of potential spoil disposal areas (combination of previously disturbed and new locations).
    - Spoil disposal locations are currently under evaluation to determine which combination of areas to use, largely driven by minimizing Waters of the United States (WOTUS) impacts and constructability feasibility.
    - Sarah noted that construction of the existing Project utilized much of the excavated material at the time to build the Bad Creek Reservoir dams; in the absence of dam construction needs, excavation of material for BCII requires disposal. Some of the spoil areas under consideration were spoil areas used during original construction.
    - The existing submerged underwater weir in Lake Jocasee downstream of the inlet/outlet structure (I/O structure) was constructed with rock excavated for the existing underground powerhouse and tunnel. Similarly, underground rock excavations from the construction of BCII will be added to the downstream slope of the underwater weir.
    - Alan stated that only some of the spoil disposal areas identified in the figures shown will be used.
- Kelly provided a transmission line corridor overview including types of disturbance.
    - Transmission line towers will be located on ridges.
    - Topography is steep and in some cases, the line is so far above the ground surface, vegetation maintenance is not needed in some valleys.
- Scott noted access road access agreements will be renewed with USFS.

- Kelly reviewed the BCII Preliminary Impacts Table, including a preliminary estimate of 400 acres of tree clearing.

Anticipated Permits and Schedule

- Kelly provided overview of anticipated Project permits.
    - South Carolina Department of Environmental Services (SCDES) confirmed two separate 401 Water Quality certifications – one for the FERC license (i.e., Project operation over new license term) and one for the CWA Section 404/401 permit (i.e., BCII construction impacts).
    - Sarah noted the FERC licensing process is an umbrella process, but the CWA Section 404/401 permit process is independent and parallel, and neither is contingent on the other. Additional permits and regulatory approvals will be required to construct BCII but these will be pursued after license issuance and CWA 404/401 permit issuance.
    - Kelly noted the USACE has stated their preference is to adopt the FERC NEPA document to satisfy their own requirements.
- Kelly explained the previously proposed schedule for the CWA Section 404/401 permit filing (discussed at the pre-application meeting with USACE and SCDES in March 2024) was driven by the need for early construction of Fisher Knob Access Road.
    - Since Fisher Knob Access Road is no longer proposed, the CWA Section 404/401 application will likely be filed after the FERC FLA is filed; the FLA will be filed no later than July 31, 2025.
    - CWA Section 404/401 permit application estimated submittal in October 2025, which aligns better with the expected FERC NEPA process.
- Melanie noted that Bald and Golden Eagle Protection Act (BGEPA) and Migratory Bird Treaty Act (MBTA) USFWS contacts are separate (located in Atlanta).
    - Action item: Duke Energy should consult with BGEPA and MBTA contacts for compliance with those acts - Scott has contacts in USFWS Region 4-Atlanta.
- Kelly noted it is still important to obtain USFWS preliminary concurrence on the BA for the FLA.
- Melanie and Lyndsey pointed out the BiOp schedule shown in FERC guidance indicates 135 days to prepare the USFWS BiOp; however, USFWS statutory review timeline does not start until an adequacy review has been conducted (e.g., USFWS has the needed information to author the BiOp).
    - USFWS would not initiate BiOp efforts until FERC requests formal consultation after the FLA is filed; however, USFWS can review a draft BA ahead of formal consultation initiation.
    - Melanie noted USFWS will not prepare a BiOp in advance of formal consultation.
    - Melanie noted USFWS and other federal agencies have agreed that when species listings change, consultation is reinitiated.
        - Notably, re-consultation does not occur with FERC after the license has been issued.

        - USFWS would prefer to consult on species in anticipation of listing. The tricolored bat is an example – it is recommended to consult on that species now *and* when it is uplisted from proposed endangered to endangered at a later date – that way it would be already included in consultation.
    - USFWS confirmed they expect to prepare a single BiOp in conjunction with the FERC process, and that this would also be applicable to the CWA 404/401 process.
    - Duke Energy will include potential species listings in BA evaluation and conservation measures.
        - Conservation measures regarding proposed for listing species are voluntary until said species is uplisted to endangered or threatened.
        - Then, when proposed for listing species are uplisted, USFWS can issue a letter that converts those species into the formal BA.
    - Melanie noted another reason to wait for FERC to initiate formal consultation is because FERC may want to consult on other species.
    - Melanie agreed that a draft BA can be submitted to USFWS before sending to FERC and USFWS can review (after DLA is filed, but before FLA is filed).
- Kelly confirmed a CWA Section 404/401 Individual Permit via a notification PCN will be pursued. Kelly provided overview of studies and process to date, as well as coordination with USACE.

Related Studies / Federally Protected Species

- Natural Resource Assessments (NRAs) conducted in 2021 and 2023 at the Project and within transmission line corridor – these comprehensive reports included survey results and evaluations of federally protected species (habitat surveys).
- Review of USFWS Information for Planning and Consultation (IPaC) Species List:
    - Kelly noted that gray bat has been added for the Project Boundary.
    - Melanie pointed out that monarch butterfly has been uplisted from Candidate to Proposed Threatened as of 12/17/2024.
    - Small whorled pogonia study in 2024 revealed that suitable habitat is present, but no individual species were identified (same for smooth coneflower survey carried out in 2021).

Bat Survey Study Results (Conducted by Biotope)

- Summary of probable absence/presence of NLEB, Indiana, tricolored, little brown, and gray bats are provided in meeting slides.
- Melanie confirmed little brown bat is currently an At-Risk Species and will be reviewed at later date.
- Kate stated that upon review of the draft *Bad Creek Pumped Storage Presence/Absence Acoustic and Mist-net Surveys for Threatened & endangered Bat Species* report (bat survey report; 2024), that there are strong Maximum Likelihood Estimator (MLE) values for NLEB and Indiana bat at multiple sites over multiple nights.

    - Action item: A USFWS internal bat expert will perform additional review of the acoustic data – currently USFWS does not have timeframe estimate for when this review will be complete. (*Note: In follow-up email between Kelly and Vona Kuczynska [USFWS], USFWS stated this review is expected to begin in early January*.)
- Sarah noted that the bat survey report will be included in the Updated Study Report (USR; due to FERC 1/3/2025) and will be discussed at the USR meeting on 1/16/2025. [USR has since been filed; the bat survey draft report was filed as Attachment 3.]
    - Depending on the status of USFWS acoustic data review, Duke Energy may provide high level overview at the USR meeting and note that direct consultation with USFWS is ongoing.
- Melanie noted that if Indiana bat is determined to be likely present (currently determined to be probably absent), this would be a significant change for South Carolina.
    - Indiana bat has not been previously recorded in South Carolina, but the South Carolina Department of Natural Resources (SCDNR) believes the species is moving into this territory.
    - Similar to Indiana bat, NLEB has not been previously recorded in the upstate of South Carolina and is believed to be widely impacted by white nose syndrome.
    - Hence, USFWS is doing thorough review of the acoustic data given the strong MLE values for Indiana bat and NLEB.
- Gray bat determination of probable presence triggers the UFSWS formal consultation.
- Noise from blasting and construction and tree removal are USFWS' primary concern for bat impacts.
    - USFWS asked if helicopters will be used for transmission line construction. Scott noted this is a possibility.
- Lyndsey noted the bat HCP development has resulted in the development of a table that summarizes common disturbance activities and resulting effects to bat species.
    - Suggested to pull information from this into the BA/Exhibit E.
    - Time of year tree clearing has been discussed but not yet confirmed.
    - Action Item: Scott to provide tables to HDR. [completed]
- Melanie recommended that since little brown bat was determined to be probably present, USFWS would like to do a conference opinion for the species.
    - FERC may disagree to include little brown bat in the BA because the species is an At-Risk Species (e.g., not formally listed), but noted that many bat conservation measures for other species will benefit little brown bat as well.
- Scott asked about hoary bat and its potential to be listed in in 2027 (based on review of USFWS work plan).
    - Hoary bat was detected as present in the acoustic survey.
    - Hoary bat is considered a tree-roosting bat, but migratory and might fall in same (conference opinion) category as little brown bat. Similarly, measures for other tree-roosting species would likely be protective of this species.
    - Discussion ensued as to where hoary bat is overwintering if summering in South Carolina (since detected in bat survey).

    - Hoary bat and gray bat trends (overwintering and summering sites) are not well known.
    - Gray bat is likely still in summer phase (even if caught in the fall during studies conducted by others). USFWS believes they may then fly back north to winter sites (caves in TN).
- Kelly noted that the SCDNR-requested Bat Species Protection Plan will include numerous bat species and will include all species discussed above plus additional species.
    - Duke Energy plans to develop Species Protection Plans for species other than bats as well.
- Kelly asked for confirmation about USFWS consultation and when consultation is re-initiated.
    - USFWS confirmed that consultation is closed after the FERC license is issued and is not reopened; however, consultation may be re-initiated if there is another federal action; for example, a CWA Section 404/401 amendment/modification via a USACE action, or a FERC license amendment.
- Kelly noted the primary goal of the BA is to be inclusive to account for potential future listings.
- USFWS has not yet fully parsed out implications associated with monarch butterfly's recent proposed threatened listing and recommended that Duke maintain their Monarch Candidate Conservation Agreement with Assurances (CCAA) measures.

Biological Assessment

- Kelly provided the high-level BA outline and solicited feedback.
- USFWS confirmed to include little brown bat, hoary bat, and Indiana bat in the BA evaluation.
- USFWS suggested to separate effects into construction and operation effects for all species.
    - Suggested for tree-roosting bats, effects and conservation measures can be evaluated together.
    - Tricolored bat merits separate treatment due to their ability also roost in culverts and structures (not an ONLY tree-roosting bat).
        - Scott noted that a culvert field review was conducted – those present near the Bad Creek Project were too small (< 18-inches in diameter) for TCB habitat suitability. Lyndsey noted this was important to include in the BA.
    - Gray bat also merits separate treatment since it is not a tree roosting bat.
    - Indiana bats are tree roosting but overwinter in caves. Caves are not present in project area (e.g., there is no karst geology).
        - Scott and colleagues searched the existing access tunnel for bat presence. Lighting, positive air pressure, high level of human activity, and warm temperatures were observed; there was no evidence of bat use.

The bat survey also located an acoustic sensor near this location and no Indiana bats were detected.

- USFWS noted that BGEPA and MBTA evaluations should not be included in the BA.
- Review of impact categories (e.g., habitat alteration, noise/vibration, other harm, etc.).
    - USFWS noted to add helicopter use in the “Other Impact” category.
    - Melanie noted that increased use of roads during construction can potentially increase strikes of tricolored bat foraging along those corridors; however, species will habituate and strike impacts may be mitigated by existing tree canopy overhanging roads.
        - Evaluate potential for strikes under "Other Harm" and limit to a few years until the bats habituate.
- USFWS confirmed there is no need to provide a NLEB/TCB Determination Key result with the BA.
- Melanie will review draft BA ahead of FLA filing.
    - Duke Energy/HDR will target providing USFWS a draft BA by end of March 2025 to provide at least 60 days for USFWS review.
    - Melanie is the UFSWS FERC coordinator, will be the point of contact, and will distribute to her team to review.
- Potential determination discussion:
    - USFWS stated there may be adverse effects, but likely no jeopardy with implementation of conservation and mitigation measures.
    - As part of the BiOp - USFWS will analyze jeopardy and will issue incidental take statement as part of the BiOp.
    - USFWS indicated that pursuing an ESA Section 10 permit is not necessary.
    - Christy is the final signatory on the BiOp.

Conservation Measures

- Scott noted the USFWS Minimum Conservation Measures (MCM) for protection of bats in the *NLEB and TCB Voluntary Environmental Review Process for Development Projects V1.0* (dated 10/15/2024) will be followed for tree roosting bats. Duke Energy extended appreciation for the timely USFWS MCM guidelines.
- Melanie noted that tree clearing during winter is ideal.
    - It may be difficult to implement clearing only during winter over the course of project construction; the critical timeframe to avoid clearing during the pupping season (May 15-July 31). Should avoid the pupping season and quantify how much tree clearing will occur during active season (provide upper estimate) in general. Scott noted tree clearing will need to be phased, given the scale of the BCII construction.
- Scott asked if Indiana bat and NLEB are determined to be present – i.e., does the clearing avoidance pupping timeframe expand to include clearing avoidance during spring and fall swarming.
    - USFWS stated that the Project is not located within 0.5 miles of known hibernaculum, so USFWS doesn't expect so. (Action item: Lyndsey to confirm).

- Scott noted additional best management measures that Duke Energy commonly implements include:
    - Not clearing when temperatures are below 40 degrees Fahrenheit during the authorized tree clearing season.
    - If trees are observed to have shaggy/loose bark, measures may include flushing bats (e.g., tapping trees). Lyndsey noted this should be captured in conservation measures, but is also as an effect because it forces bats out of the trees.
- Melanie suggested to also include discussion in BA about relevant funding/mitigation for species from Bad Creek Relicensing Agreement as a mitigation measure. Melanie specifically recalled the potential Wildlife Enhancement Funding contained in the BCRA.
- Scott asked about gray bat conservation measures. Melanie noted there may not be any and that a May Affect Not Likely to Adversely Affect is still likely.
    - Tree removal and blasting are the potential impacts.
- Kelly asked if there are any studies or data for blasting/noise impacts (vibrations, decibel levels) to bats. USFWS does not have recommended references or data.
    - The Indiana bat conservation measure is to stay away from hibernaculum with noise/vibrations.
    - Kelly asked if there are any recommendation for time of day for blasting and USFWS answered no.
    - Noise and vibration from blasting are fairly directional and confined, and are less impactful the further away from the surface where it occurs so significant impacts are not a concern. Christy does not anticipate major effects to this suite of bat species (unless an Indiana bat cave is identified). There are no restrictions for blasting during pupping season. Deep underground blasting is not likely to have a surface impact.
        - Christy noted that extensive studies (related to Indiana bat and blasting in West Virigina) support this discussion. There is really only disturbance to Indiana bat if blasting directly beneath trees and proximity to caves.
        - Tree removal for surface blasting is the impact – the tree removal is what drives the formal consultation.
    - USFWS suggested to note in the BA where the closest known hibernacula are located relative to the project.
        - Action item: Scott to provide the data from his work on the Bat HCP. HDR/Duke will contact additional NC or SC agencies if needed to obtain this data.
        - Alan and Scott discussed that there were no hibernacula associated with Cedar Cliff (western North Carolina) and the project did include blasting and clearing. Tree clearing was conducted outside of time of year restrictions.
- USFWS noted that operational impacts evaluated in the BA should be minimal overall.
    - Christy noted, as above, that it is important to separate analysis for construction (time-constrained event) and operations, such that the overall effect to species is a shorter duration and not expected to have lingering effects over time. Kelly noted this will be done for each species.

- USFWS noted that tree removal outside the pupping season is the primary conservation measure.
- Discussion about additional recommended measures ensued.
    - Permanent and temporary lighting to be down-casted if possible (typically USFWS requests no work at night) and to focus on the temporary impacts (not permanent) - especially for construction.
        - Duke Energy noted that overnight construction cannot be eliminated. Kelly noted there is lighting guidance in the NLEB/TCB Determination Key.
        - As an example, USFWS views SCDOT lighting/overnight work as undesirable.
        - Action item: Duke Energy/HDR will review construction lighting within 1,000 feet of suitable roosting habitat.
- Melanie noted USFWS typically recommends consideration for continuing monitoring of bats as species protection measures. Melanie noted that the bat monitoring efforts at Catawba Wateree as an example in South Carolina. Details of a monitoring plan can be fleshed out later (i.e., BA should note the development of the Bat Species Protection Plan, but details are not necessary for BA).
    - Kelly asked if a monitoring plan would allow for not redoing a full bat survey after 5 years and USFWS answered, potentially yes.
    - This relicensing would not trigger formal consultation if not for BCII. But USFWS would still recommend monitoring even if BCII not proposed or executed.
    - USFWS is interested in monitoring long term for general trends; methods do not need to be as extensive as Biotope's survey, but should follow USFWS summer survey guidelines.
- Bad Creek Relicensing Agreement Species Protection Plans:
    - Reviewed list of species (suggested by SCDNR) and noted there will be mention of these in BA but not full discussion.
    - Kelly asked about how long plant species surveys are valid for.
        - Plant surveys don't have set expiration by USFWS. Not a concern given none present and habitat not strong – likely results in a May Affect Not Likely to Adversely Affect.
        - USFWS noted that once habitat is disturbed then don't need to resurvey.
- Avian protection measures:
    - Duke noted that existing towers don't have strike deflectors measures installed. No historical occurrences/issues with collision or electrocution with the existing right-of-way. However, flight diverters and a retrofit of existing transmission line will be done as part of the Bad Creek Relicensing Agreement.
    - Kelly asked for confirmation there will be no avian discussion in the BA. USFWS confirmed.

Miscellaneous

- Kelly noted and Melanie confirmed that multiple tracking IDs for the project have been created for BCII.
    - 2022-0030610 is what Melanie is using. She advises to pick a tracking ID that has the most activity and provide to her. Melanie will link all overlapping tracking IDs for the Bad Creek Project in the USFWS system.
    - Action item: Kelly will investigate this and provide the preferred tracking ID back to Melanie.
- Melanie will attend the USR meeting on 1/16/2025 via Teams.
- USFWS is planning a BatBlitz near the SC-GA border as part of additional research ongoing by USFWS.
- (Not directly related to Bad Creek Project) Scott noted that until the bat HCP is implemented in 2027, Duke Energy is following current MCM guidance and has an agreement with the USFWS Asheville office. Scott would like to have a similar interim agreement with Charleston and other offices (Raleigh, Bloomington, Jacksonville), though not a signed agreement.

Action Items

- USFWS to provide feedback regarding the strong MLE values with respect to Indiana bat and NLEB.
- Duke Energy to consult with USFWS contacts in Atlanta office for BGEPA and MBTA consultation.
- Scott (Duke Energy) to provide HDR with Bat HCP disturbance activities and effects table.
- Scott (Duke Energy) to provide HDR hibernaculum locations from his work on the Bat HCP.
- Duke Energy/HDR will review construction lighting within 1,000 feet of suitable roosting habitat.
- Lyndsey (USFWS) will confirm the dates for clearing avoidance are contained to the pupping season (per Appendix 2 of the *NLEB and TCB Voluntary Environmental Review Process for Development Projects V1.0*, dated 10/15/2024) if Indiana bat and NLEB are determined to be present.
- Sarah (HDR) to search for a previous FERC EA with a BiOP included as an example proceeding to inform Duke Energy's and USFWS' understanding of sequence and timing of post-filing formal consultation activities.
- Kelly (HDR) to follow up with Melanie with preferred USFWS IPaC tracking number for the project.

Bad Creek II Power Complex Project

USFWS Informal Consultation Meeting

DUKE ENERGY®

BUILDING A SMARTER ENERGY FUTURE®

DECEMBER 18, 2024

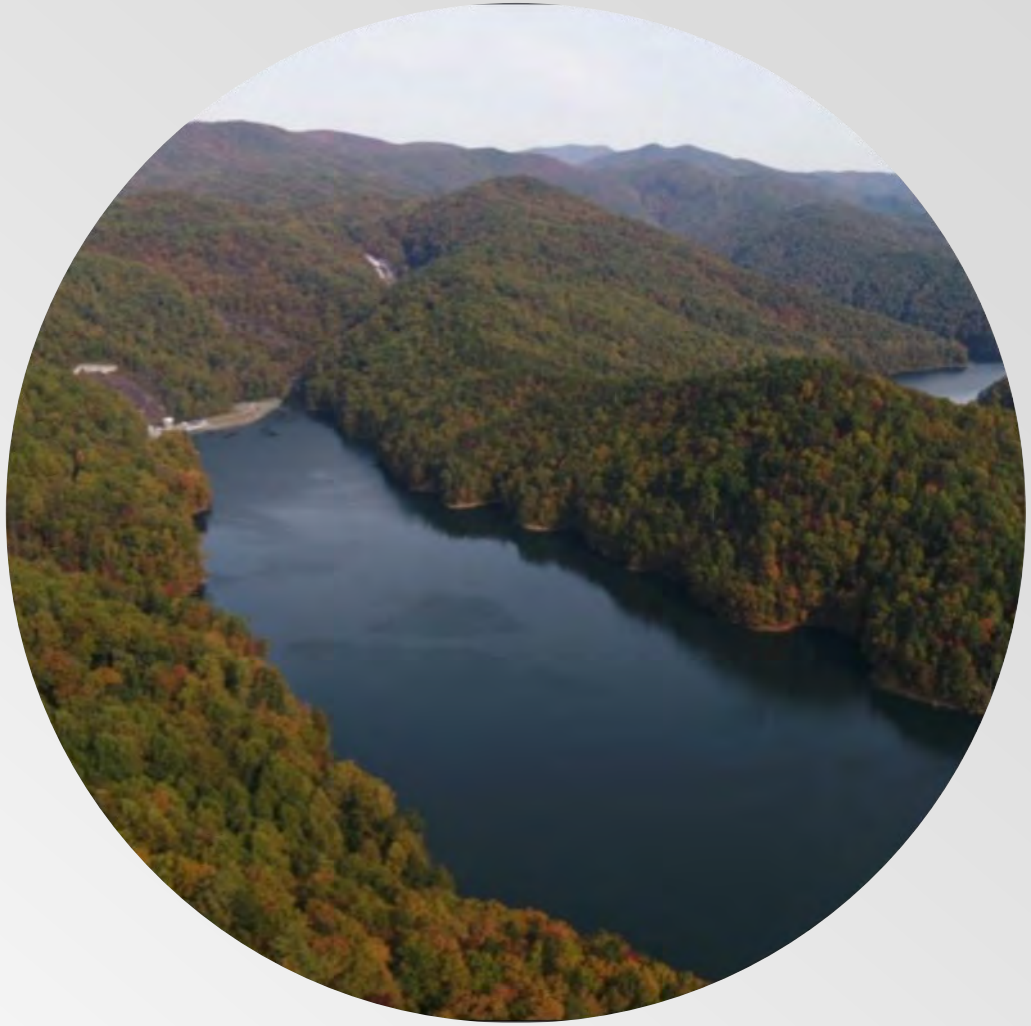
Meeting Agenda

- Introductions
- Review of Meeting Objectives
- Project Overview
- Bad Creek II Construction Impacts & Permitting
- Federally Protected Species
- Conservation Measures
- Next Steps and Discussion

Meeting Objectives

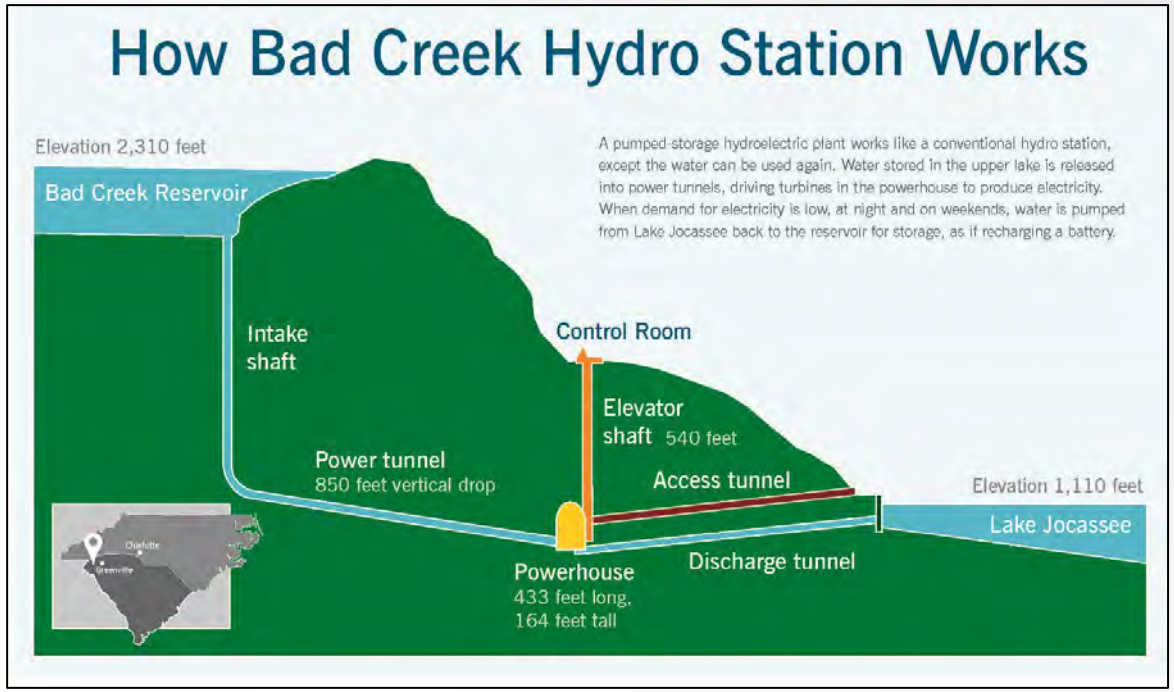
- Provide USFWS staff with an overview and project update for the proposed Bad Creek II Complex (Project), with a focus on terrestrial resource impacts, completed relicensing studies, and proposed PM&E measures.
- Gain understanding and alignment of Endangered Species Act Section 7 consultation processes for parallel federal (FERC, USACE, USFWS) actions (including Applicant-prepared Biological Assessment and USFWS point of contact for each)
- Confirm species listing for Biological Assessment and discuss how changes in species listings will be managed through Project development.
- Review conservation measures applicable to listed species that may be impacted by Project construction.
- Discuss the applicability, triggers, and processes for take permits under Sections 7 or 10.

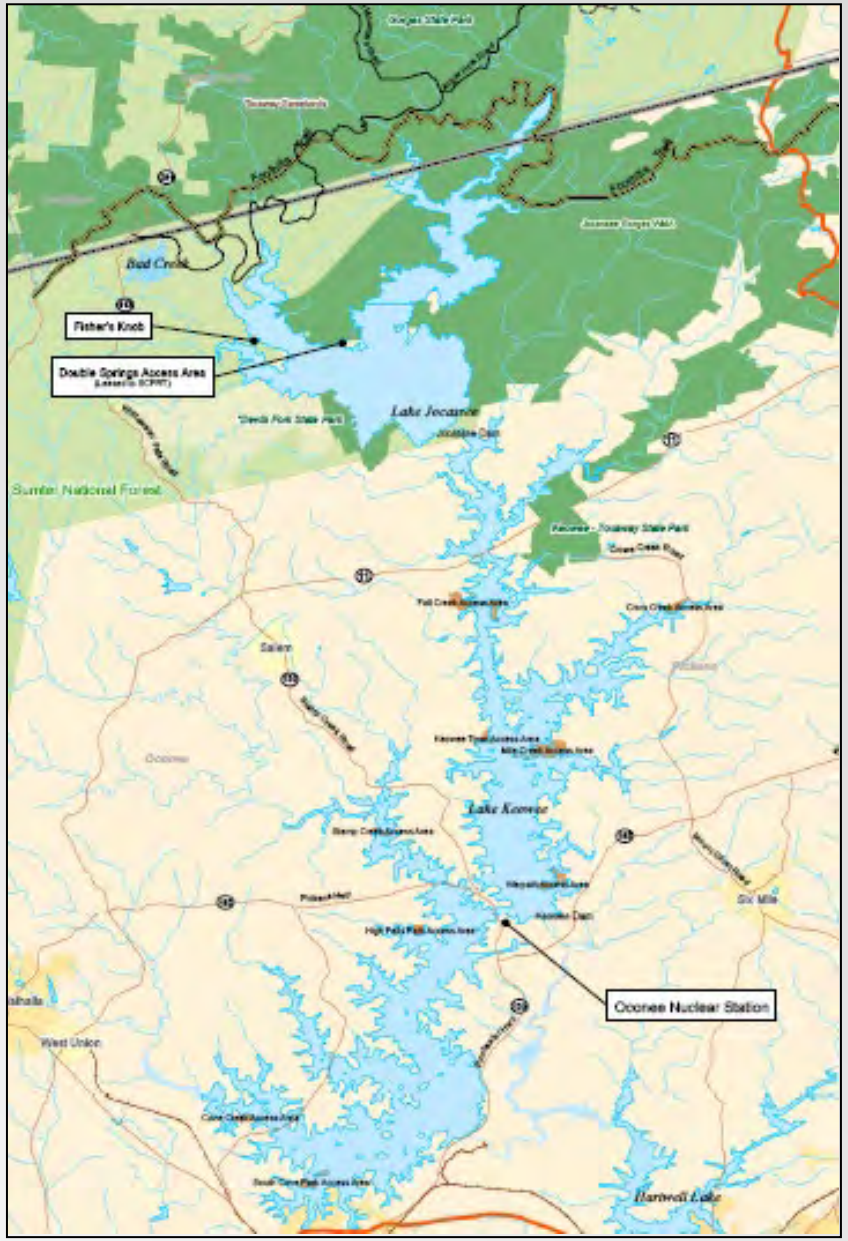
Existing Project and Project Expansion Overview



Bad Creek Pumped Storage Project - Background

- FERC Project No. 2740
- Bad Creek Upper Reservoir is upper pool and Lake Jocassee is the lower pool
- Lake Jocassee licensed as part of Keowee-Toxaway Hydroelectric Project
- Construction completed 1991





Bad Creek Pumped Storage Project - Background

- The powerhouse is a three-level structure located in a mined rock cavern 600 ft underground. Bad Creek has 4 pump-turbine units with an Authorized Installed Capacity of 1,400 MW.

- Project inlet/outlet structure is located in the Whitewater River Cove of Lake Jocassee; at full pond, water surface is 40 feet above intake.

Bad Creek Pumped Storage Project - Background

- Existing transmission consists of a 100-kV transmission line and a 525-kV transmission line extending about 9.25 miles from the Bad Creek switchyard to the Jocassee switchyard.
- The two lines share a common 254-ft-wide right-of-way corridor for 7.4 miles, at which point they diverge toward their respective destinations.
- Other project facilities include transformer yards, access roads, transmission towers, and equipment building.

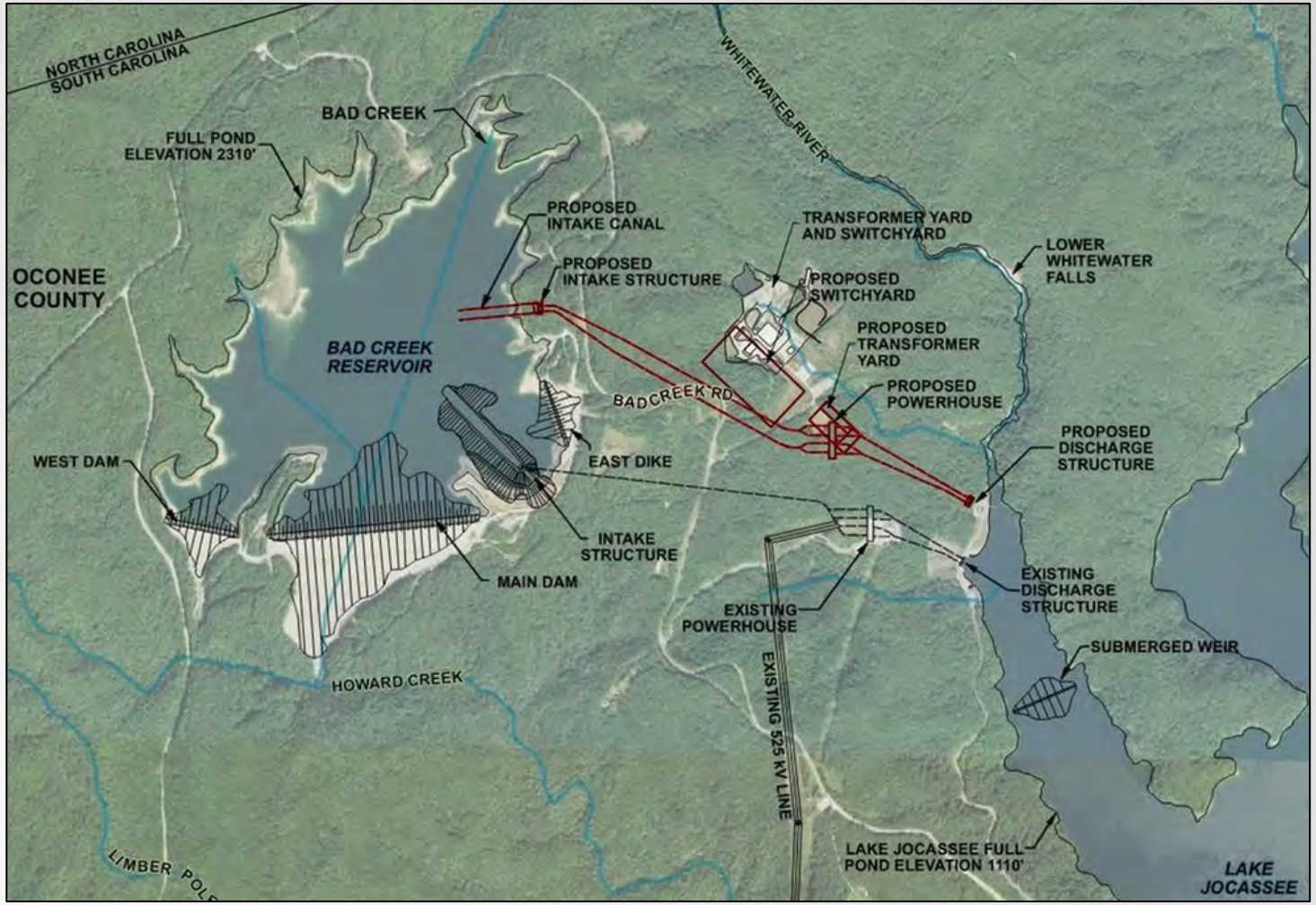
Bad Creek Pumped Storage Project Expansion

Existing Bad Creek Powerhouse

- Four units used for peak load generation
- 1,400 MW capacity; 23 hours of storage
- Generates using water from Bad Creek Reservoir
- Pumps back water from Lake Jocassee using excess energy

Proposed Bad Creek Powerhouse Addition

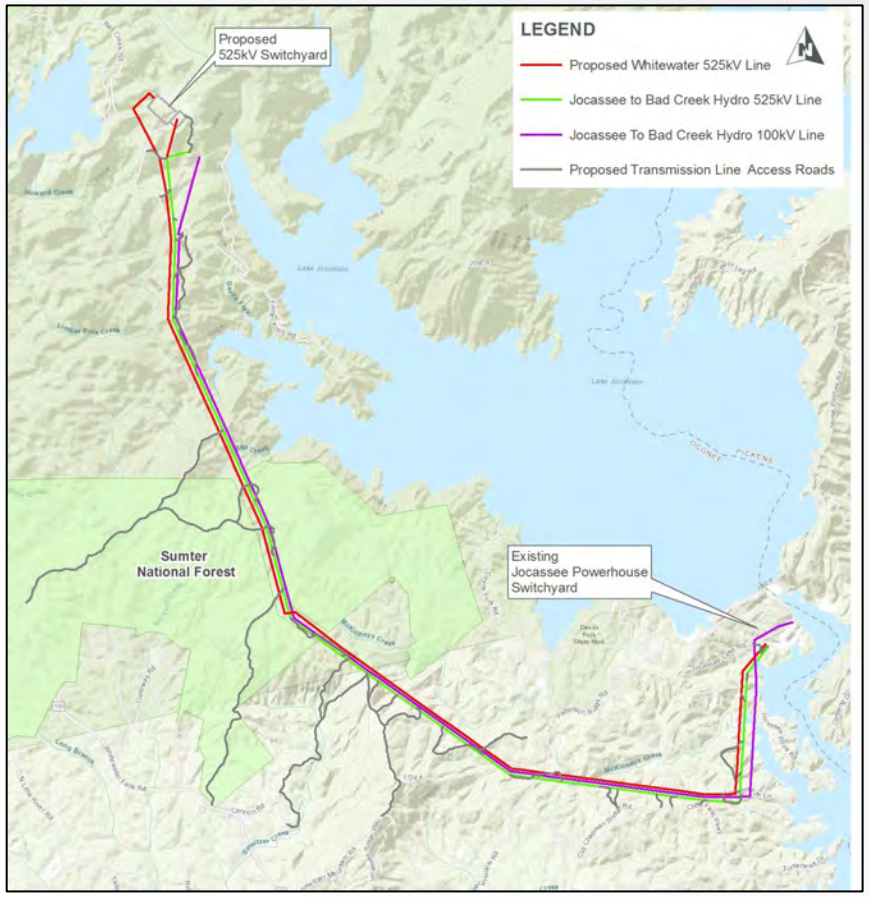
- Would essentially double existing Bad Creek capacity
- Utilize existing Bad Creek Reservoir
- Two new underground tunnels and powerhouse (4 Units)
- Additional 1,400 MW capacity; Total site max. ~3,460 MWs with 11 hours of storage



- *Note: Fisher Knob temporary access road is no longer proposed*

Bad Creek Pumped Storage Project Expansion

- 9.3-mile Whitewater 525kV Transmission Line from the future 525KV Switchyard to Jocassee Tie Substation
- Constructed in existing transmission line corridor

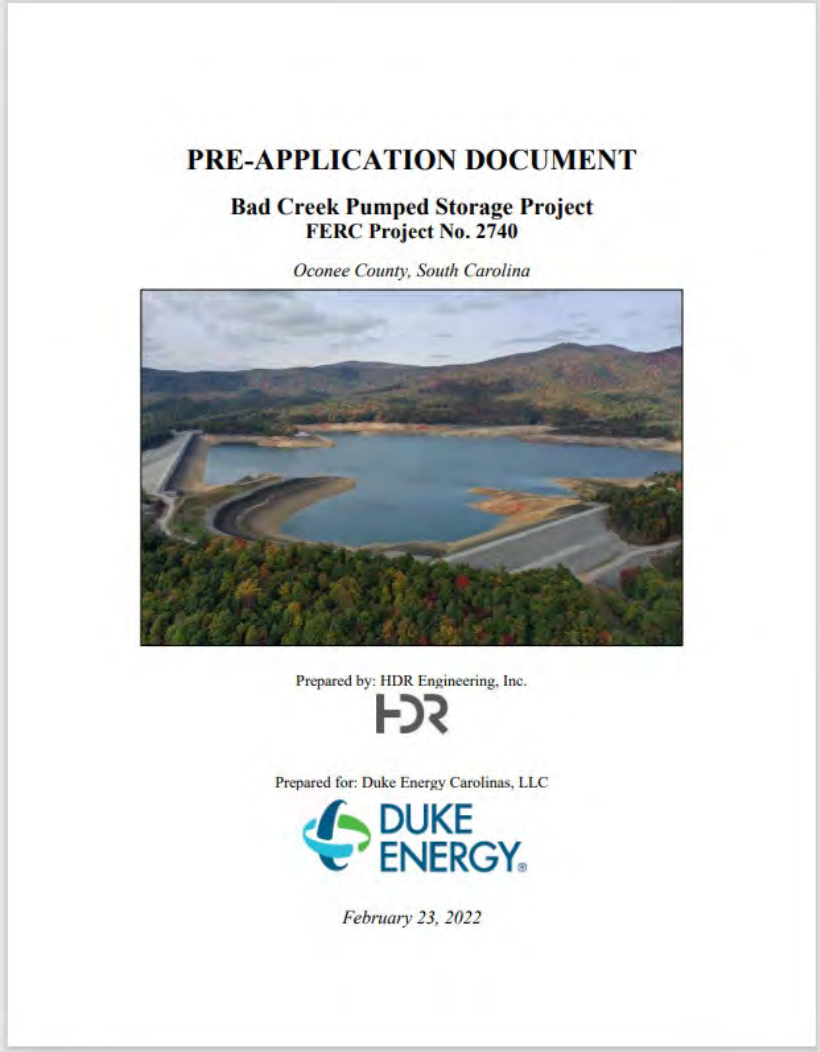


- Access roads for proposed 525kV Whitewater Transmission Line total approximately 16.6 miles, primarily follow existing unmaintained logging roads on property owned by Duke Energy and the U.S. Forest Service (Sumter National Forest).

Bad Creek Pumped Storage Project (with Expansion)

FERC Relicensing Process

- Existing license expires July 31, 2027
- Integrated Licensing Process
- Agency and Stakeholder Participation
- Bad Creek Relicensing Agreement
- Final License Application to be filed no later than July 31, 2025
  - Include USFWS concurrence


PRE-APPLICATION DOCUMENT

Bad Creek Pumped Storage Project
FERC Project No. 2740

Oconee County, South Carolina

Prepared by: HDR Engineering, Inc.

Prepared for: Duke Energy Carolinas, LLC

DUKE ENERGY

February 23, 2022

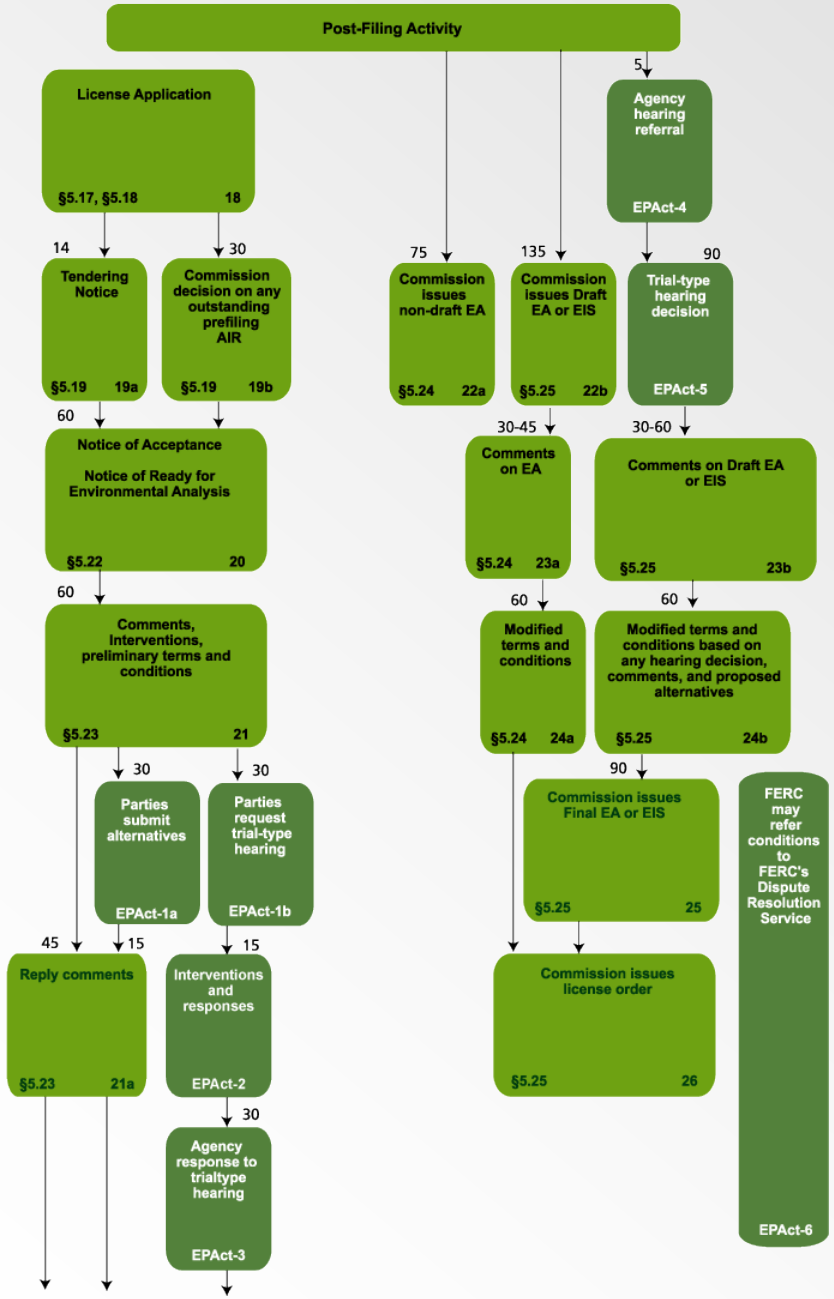
FERC ILP Schedule – Pre-Filing

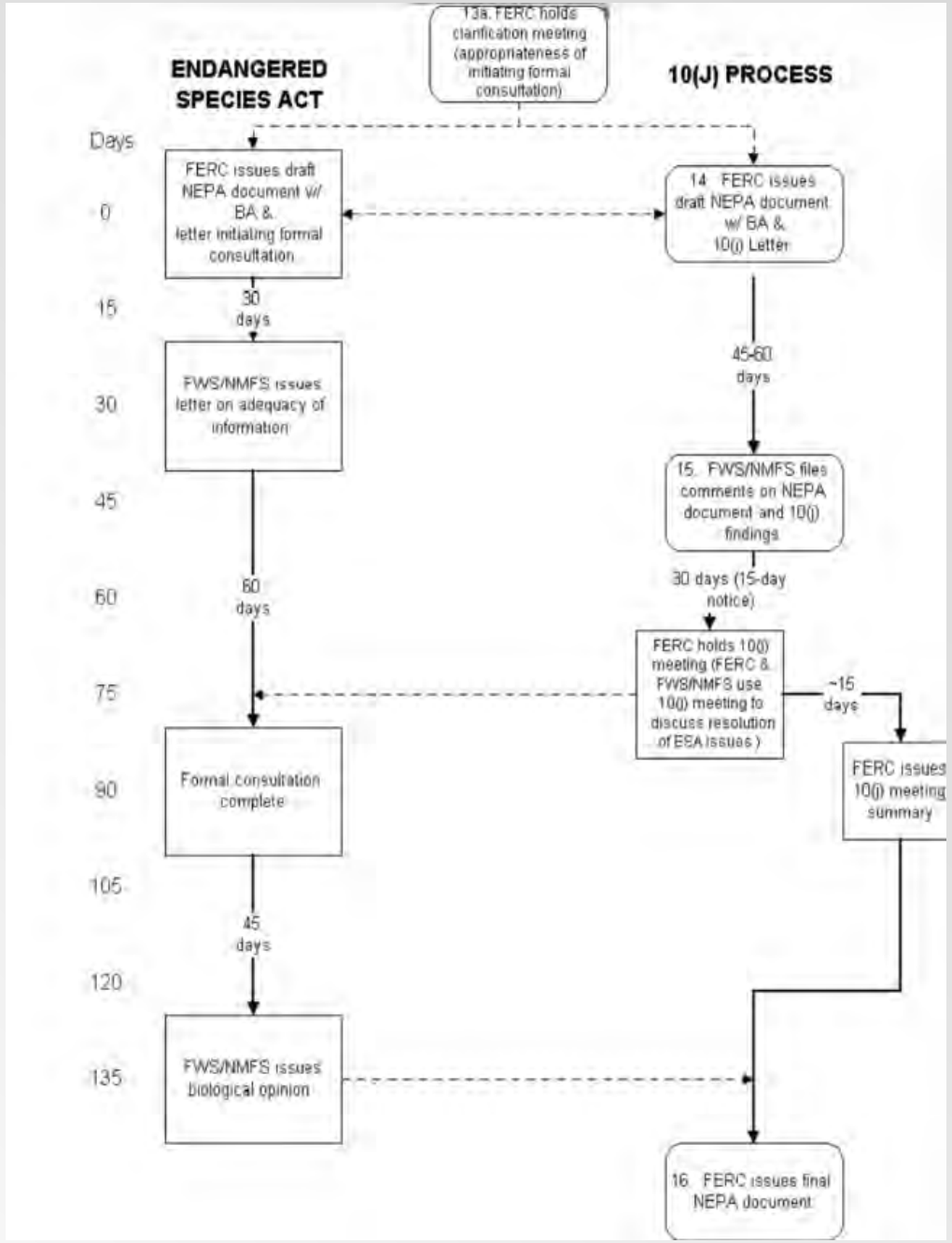
Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File Notice of Intent (NOI) Initiand Pre-application Document (PAD) (18 CFR §5.5(d))	Licensee	Within 5 years to 5.5 years prior to license expiration	Feb 23, 2022
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days following filing of NOI/PAD	Mar 25, 2022
Issue Notice of NOI/PAD and Scoping Document 1 (SD1) (18 CFR §5.8(a))	FERC	Within 60 days following filing of NOI/PAD	Apr 22, 2022
Conduct Scoping Meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days following Notice of NOI/PAD and SD1	May 16-17, 2022
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	Licensee Stakeholders	Within 60 days following Notice of NOI/PAD and SD1	June 23, 2022
Issue Scoping Document 2 (SD2) (18 CFR §5.10)	FERC	Within 45 days following deadline for filing comments on PAD/SD1	Aug 5, 2022
File Proposed Study Plan (PSP) (18 CFR §5.11)	Licensee	Within 45 days following deadline for filing comments on PAD/SD1	Aug 5, 2022
PSP Meeting (18 CFR §5.11(e))	Licensee	Within 30 days following filing of PSP	Sept 7, 2022
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days following filing of PSP	Nov 5, 2022
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Licensee	Within 30 days following deadline for comments on PSP	Dec 5, 2022
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following filing of RSP	Dec 20, 2022
Issue Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days following filing of RSP	Jan 4, 2023
Conduct First Season of Studies (18 CFR §5.15)	Licensee	-	Spring-Fall 2023
File Study Progress Reports (18 CFR §5.15(b))	Licensee	Quarterly	Spring 2023 -Fall 2024
File Initial Study Report (ISR) (18 CFR §5.15(c))	Licensee	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	Jan 4, 2024
ISR Meeting (18 CFR §5.15(c)(2))	Licensee Stakeholders	Within 15 days following filing of ISR	Jan 17, 2024

FERC ILP Schedule – Pre-Filing (cont.)

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File ISR Meeting Summary (18 CFR §5.15(c)(3))	Licensee	Within 15 days following ISR Meeting	Feb 1, 2024
Comments on ISR Meeting and Additional or Modified Study Requests (18 CFR §5.15(c)(4))	Stakeholders	Within 30 days following filing of ISR Meeting Summary	Mar 1, 2024
File Response to Comments on ISR and Meeting Summary (18 CFR §5.15(c)(5))	Licensee	Within 30 days following filing of ISR Meeting Comments	Apr 1, 2024
Resolution of Meeting Summary Disagreements and Issue Amended Study Plan Determination (if required) (18 CFR §5.15(c)(6))	FERC	Within 30 days following filing of response to ISR Meeting Comments	May 1, 2024
Conduct Second Season of Studies (if necessary)	Licensee	-	Spring-Fall 2024
File Updated Study Report (USR) (18 CFR §5.15(f))	Licensee	Pursuant to the approved study plan or no later than 2 years after Commission approval, whichever comes first	Jan 3, 2025
USR Meeting (18 CFR §5.15(f))	Licensee Stakeholders	Within 15 days following filing of USR	Jan 16, 2025
Deadline to File Preliminary Licensing Proposal (PLP) or Draft License Application (DLA) (18 CFR §5.16(a))	Licensee	No later than 150 days prior to the deadline for filing the FLA	March 3, 2025
Comments on PLP or DLA (18 CFR §5.16(e))	Stakeholders	Within 90 days following filing of PLP or DLA	June 2, 2025
Deadline to file FLA (18 CFR §5.17)	Licensee	No later than 24 months before the existing license expires	July 31, 2025

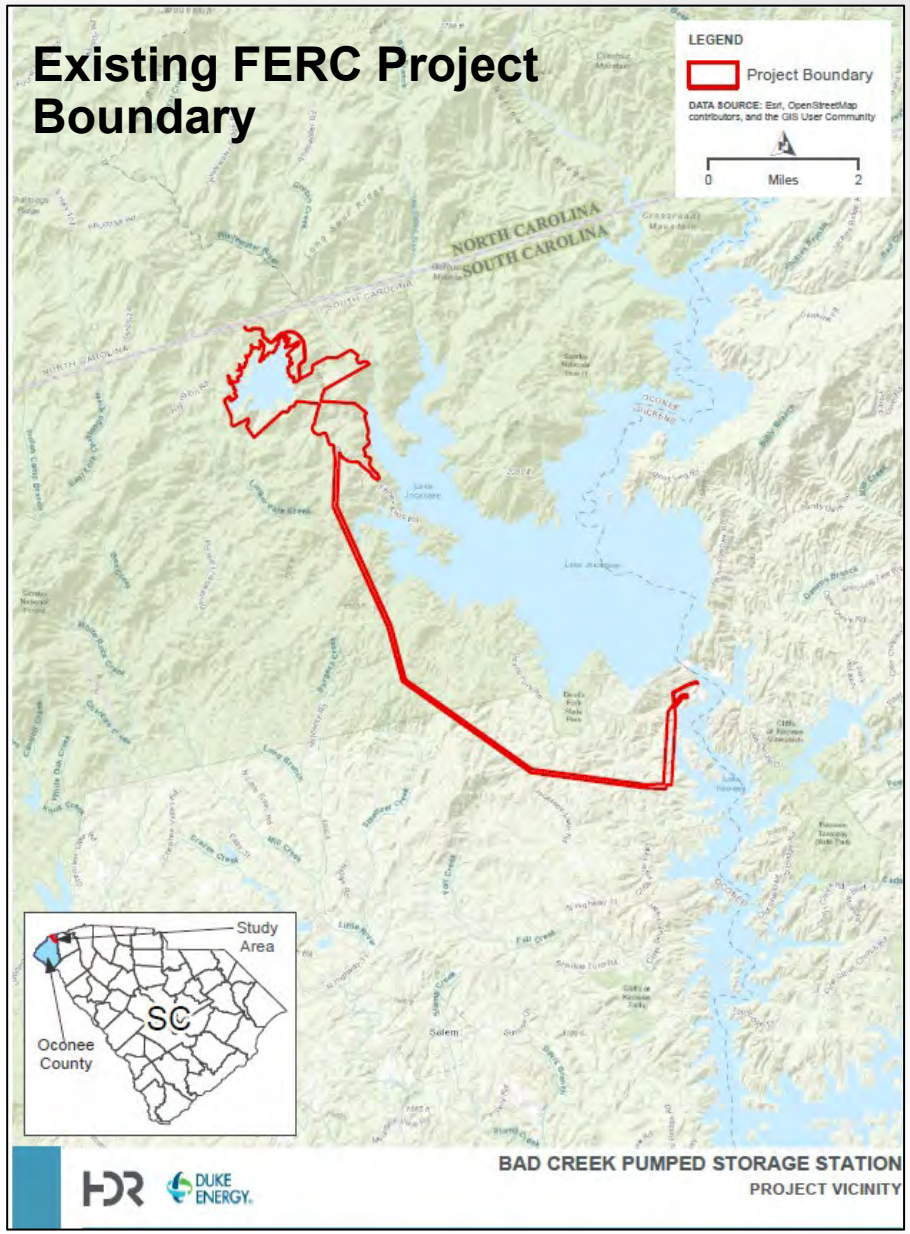
FERC ILP Schedule – Post-Filing





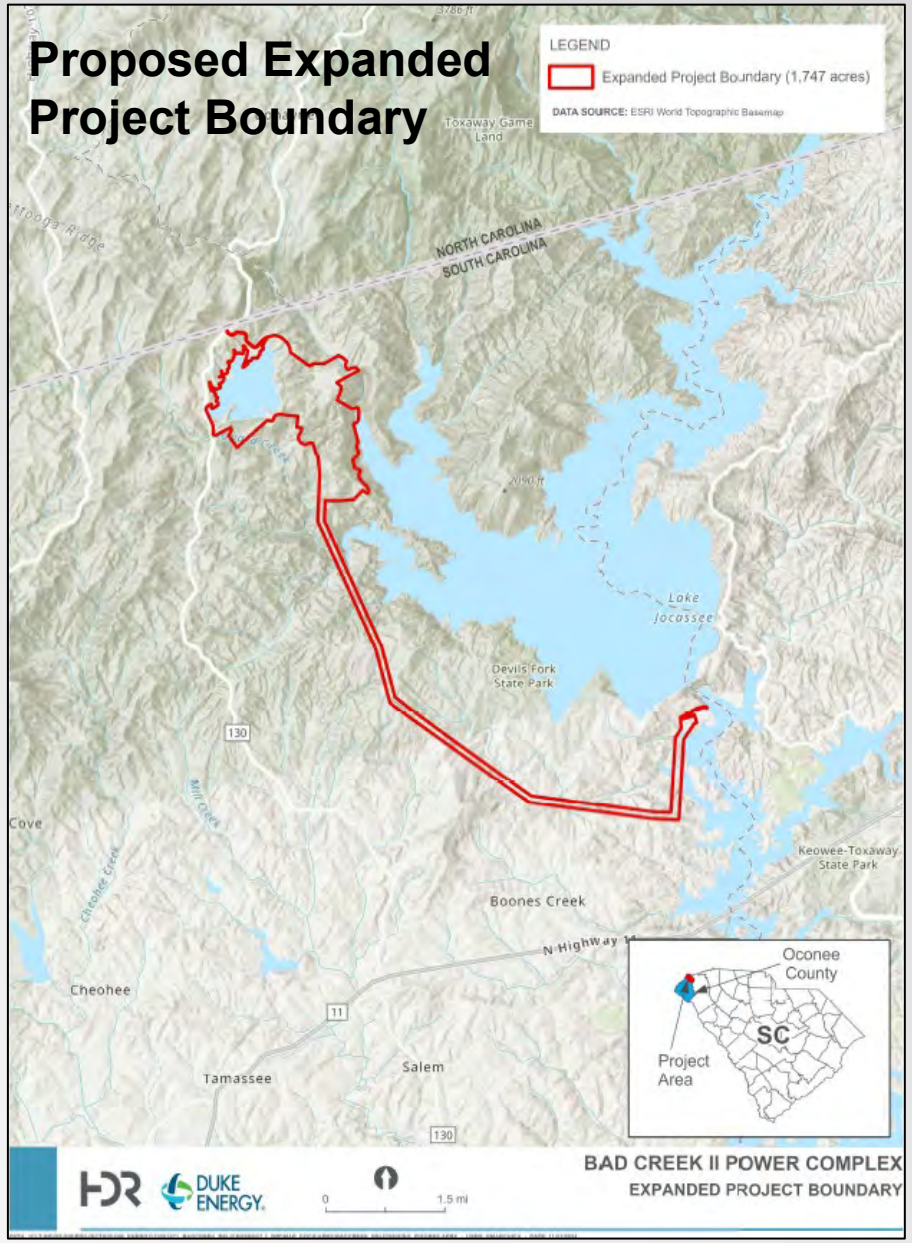
Bad Creek II Construction Impacts & Permitting

Proposed Expanded Project Boundary



Project boundary expanded to include areas potentially impacted from spoil placement, project works & transmission line widening.

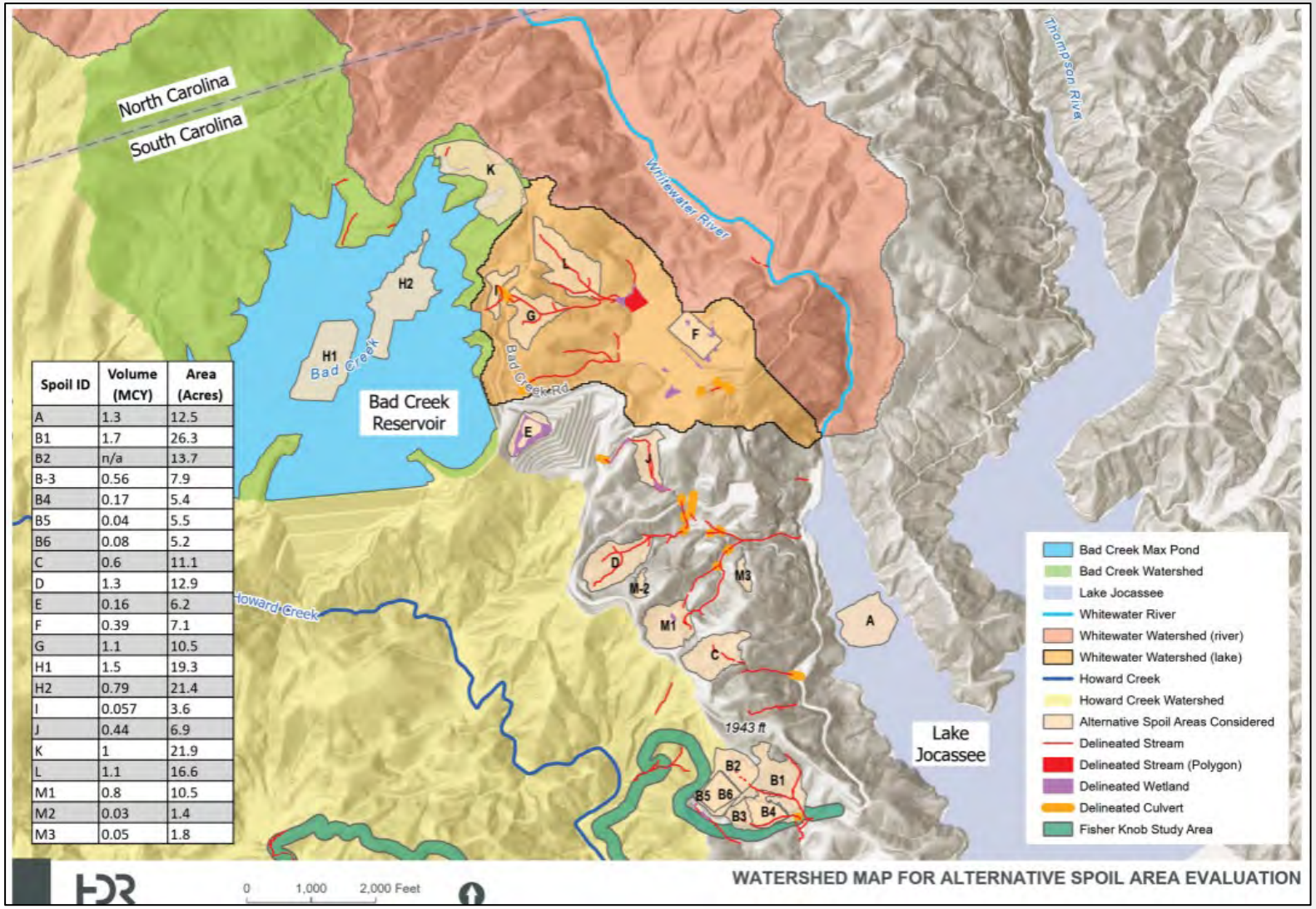
- **Original:** 1,280 acres
- **Expanded:** 1,747 acres



Bad Creek II Construction Activities and Impacts

- Tree and vegetation clearing
- Grading
- Excavation
- Erosion and sedimentation
- Water quality
- Fill and/or disturbance of streams and wetlands
- Cofferdam installation and removal in lower reservoir
- Temporary noise and lighting
- Temporary and permanent habitat loss
- Construction traffic and vehicles
- Visual resources
- Restricted public access

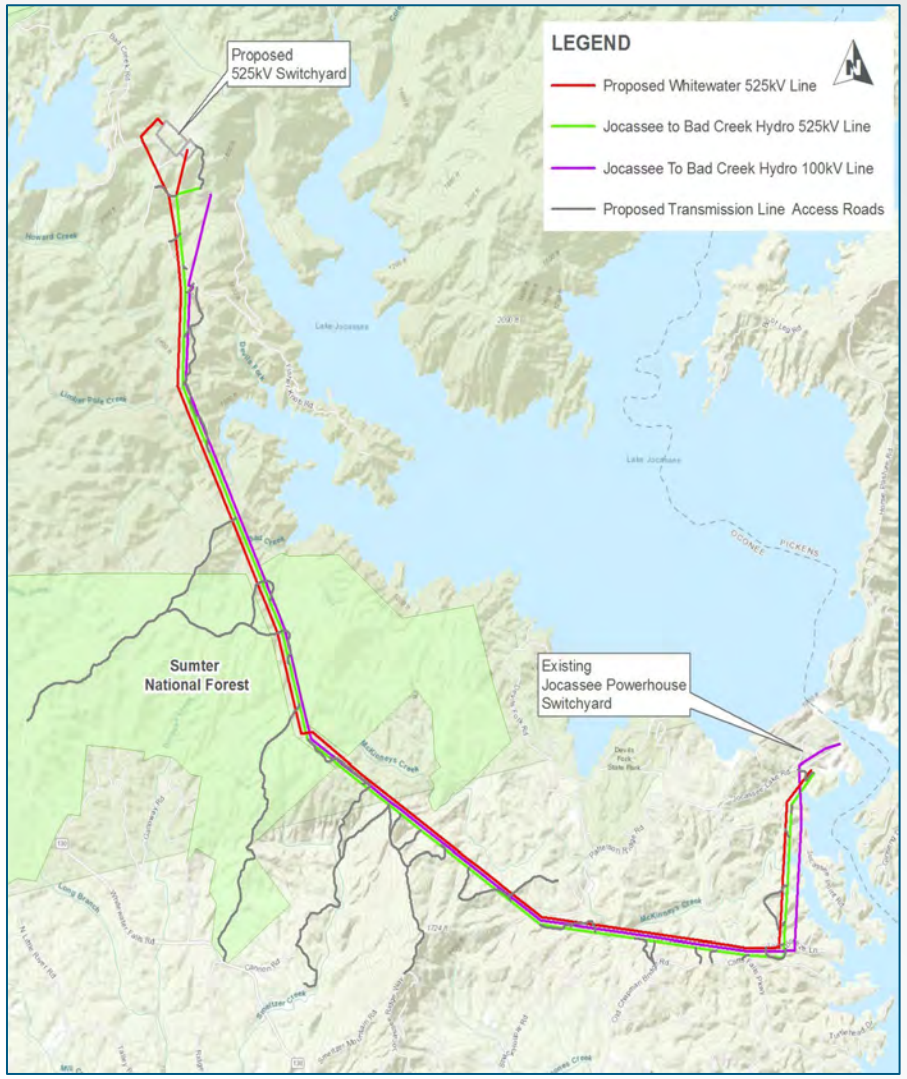
Proposed Expanded Project Boundary – Potential Spoil Areas

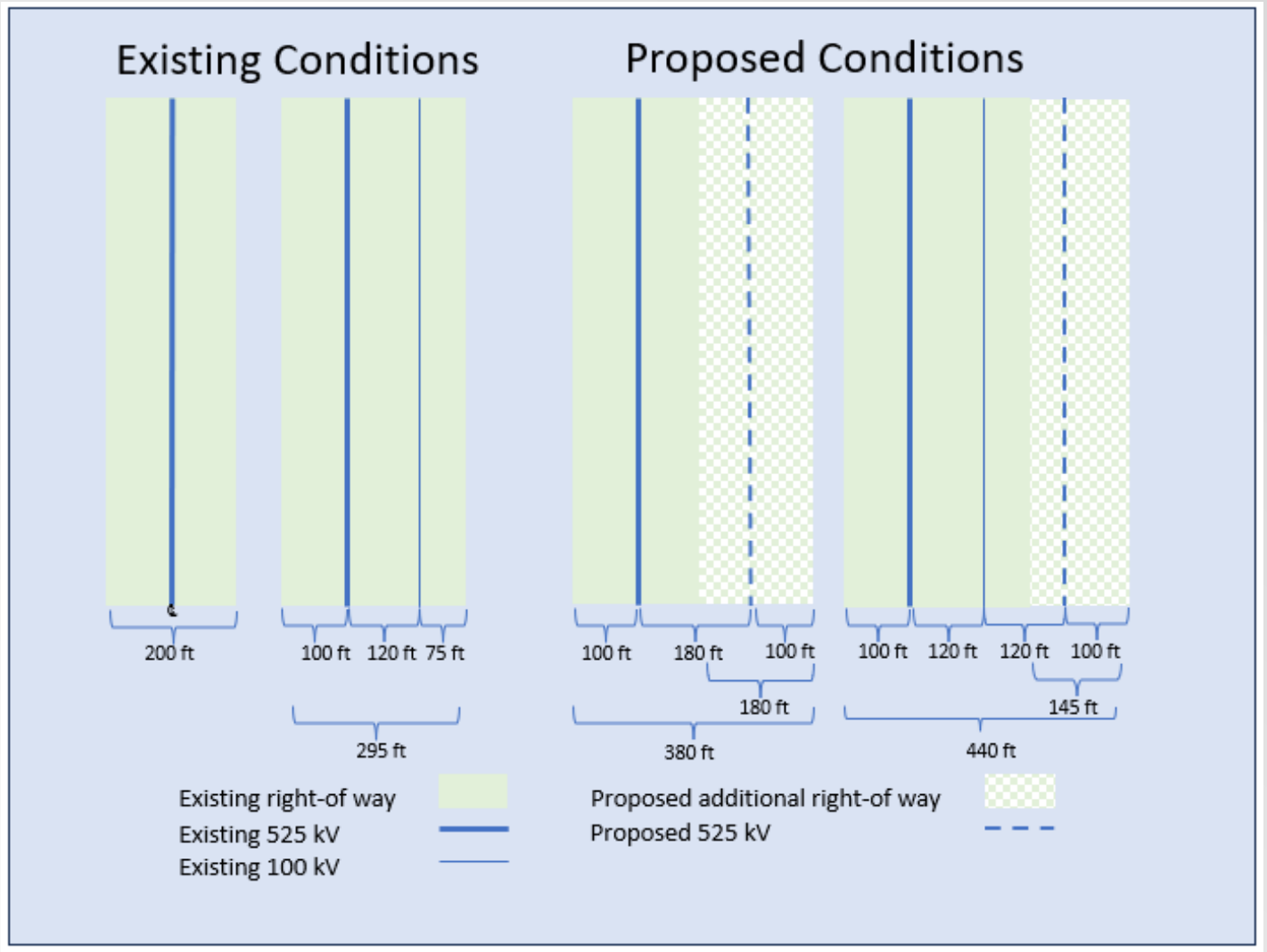


Spoil ID	Volume (MCY)	Area (Acres)
A	1.3	12.5
B1	1.7	26.3
B2	n/a	13.7
B-3	0.56	7.9
B4	0.17	5.4
B5	0.04	5.5
B6	0.08	5.2
C	0.6	11.1
D	1.3	12.9
E	0.16	6.2
F	0.39	7.1
G	1.1	10.5
H1	1.5	19.3
H2	0.79	21.4
I	0.057	3.6
J	0.44	6.9
K	1	21.9
L	1.1	16.6
M1	0.8	10.5
M2	0.03	1.4
M3	0.05	1.8

- Approximately **4.4 million cubic yards of excavated material** for Bad Creek II construction will need to be deposited at upland spoil locations and/or along the existing submerged weir in Lake Jocassee.
- Preferred potential areas for spoil placement are currently under evaluation.

Transmission Line Addition





Bad Creek II Impacts Summary Table (Preliminary)

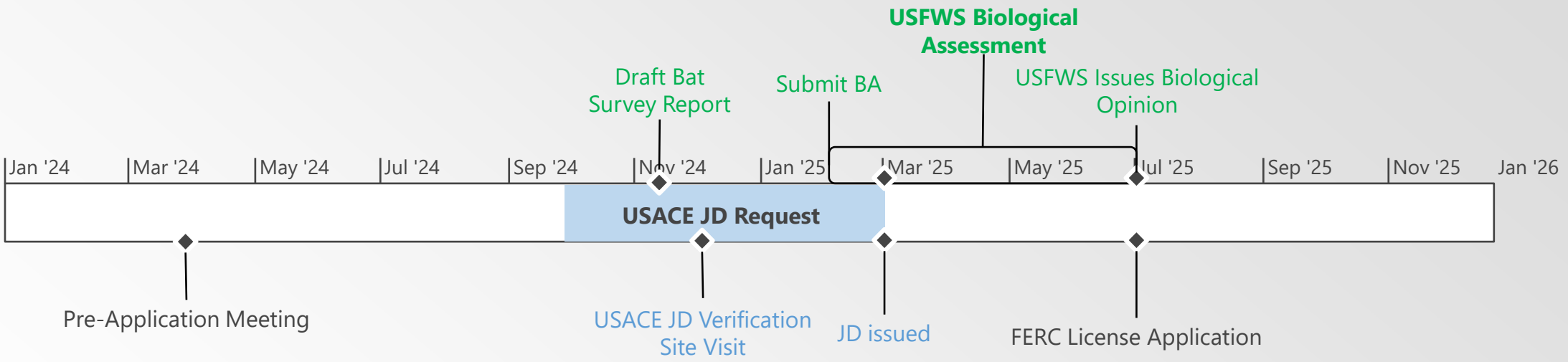
	Limits of Disturbance (Acres)	Surface Waters Impacts	Floodplain Impacts	Tree Clearing (Acres)
Bad Creek Power Complex Infrastructure				
Administrative Building	14.6	Not Anticipated	Not Anticipated	13.8
Laydown Area	22.4	Not Anticipated	Not Anticipated	16.2
Upper Reservoir I/O Structure	19.6	Not Anticipated	Not Anticipated	8.7
Vertical Shaft Yard	8.9	Streams - ~350 linear feet	Not Anticipated	8.9
Transformer Yard	32.1	Isolated Wetlands – ~1.52 acres Streams – ~1,200 linear feet	Not Anticipated	6.4
525kV Switchyard	14.4	Streams – ~550 linear feet Forested Wetlands – ~0.1 acre	Not Anticipated	14.4
Former Construction Yard	21.7	Isolated Wetlands – ~1.52 acres	Not Anticipated	8.4
Lower Reservoir I/O Structure	7.1	Lake Jocassee – ~0.8 acres	Impacts (Lake Jocassee)	5.9
Lower Reservoir I/O Structure Laydown Yard	17.1	Not Anticipated	Not Anticipated	10.2
Spoil Area C Access	5.0	Not Anticipated	Not Anticipated	2.7
Spoil Area Alternatives				
A	13.9	Lake Jocassee - ~13.9 acres	Impacts (Lake Jocassee)	0.0
B	26.2	Streams - ~1,845 linear feet	Not Anticipated	24.7
C	10.9	Streams - ~286 linear feet	Not Anticipated	6.1
D	12.5	Streams - ~1,000 linear feet	Not Anticipated	12.5
E	6.2	Isolated Wetlands - ~2.96 acres	Not Anticipated	0.0
F	10.7	Isolated Wetlands – ~1.52 acres	Not Anticipated	4.3
G	10.5	Streams – ~1,484 linear feet	Not Anticipated	10.5
H	19.3	Upper Reservoir – ~19.3 acres	Not Anticipated	0.0
I	3.5	Not Anticipated	Not Anticipated	3.5
J	5.8	Streams – ~165 linear feet	Not Anticipated	5.7
K	23.2	Upper Reservoir – ~2.5 acres	Not Anticipated	16.9
L	16.5	TBD	Not Anticipated	16.5
M	10.5	Streams – ~350 linear feet Wetlands - ~0.22 acres	Not Anticipated	10.5
525kV Whitewater Transmission Line				
Construction Access Roads	TBD	Yes – TBD	Not Anticipated	TBD
New Transmission Line Construction		Yes - TBD	Not Anticipated	191.6

Anticipated Environmental Permits and Regulatory Compliance Review

Permit or Review	Agency	Region/Agency Department
New License (Authorizing Construction and Continued Operation)	Federal Energy Regulatory Commission	Office of Energy Projects Division of Hydropower Licensing
Clean Water Act (CWA) 404 Individual Permit	U.S. Army Corps of Engineers	Charleston District Greenville Field Office
CWA 401 Water Quality Certification*	S.C. Department of Environmental Services (SCDES)	Water Quality Certification & Wetlands Section
• **Section 7 Endangered Species Act** • **S.C Non-Game Endangered Species** • **Bald & Golden Eagle Protection Act** • **Migratory Bird Treaty Act**	U.S. Fish & Wildlife Service S.C. Department of Natural Resources	S.C. Ecological Field Office Office of Environmental Programs
Section 106 National Historic Preservation Act	S.C. Department of Archives and History	South Carolina State Historical Preservation Office
Other Permits		
CWA Section 402/ S.C. Pollution Control Act – NPDES Stormwater Permits	SCDES	Stormwater Program
Construction in Navigable Waters Permit	SCDES	Water Quality Certification & Wetlands Section
Floodplain Development Permit	Oconee County	Oconee County Planning & Zoning
U.S Forest Service Special Use Permit	U.S. Forest Service	Andrew Pickens Ranger District

**Required for both FERC license and 404 Individual Permit*

Permitting and Regulatory Agency Coordination Schedule (2024-2025)



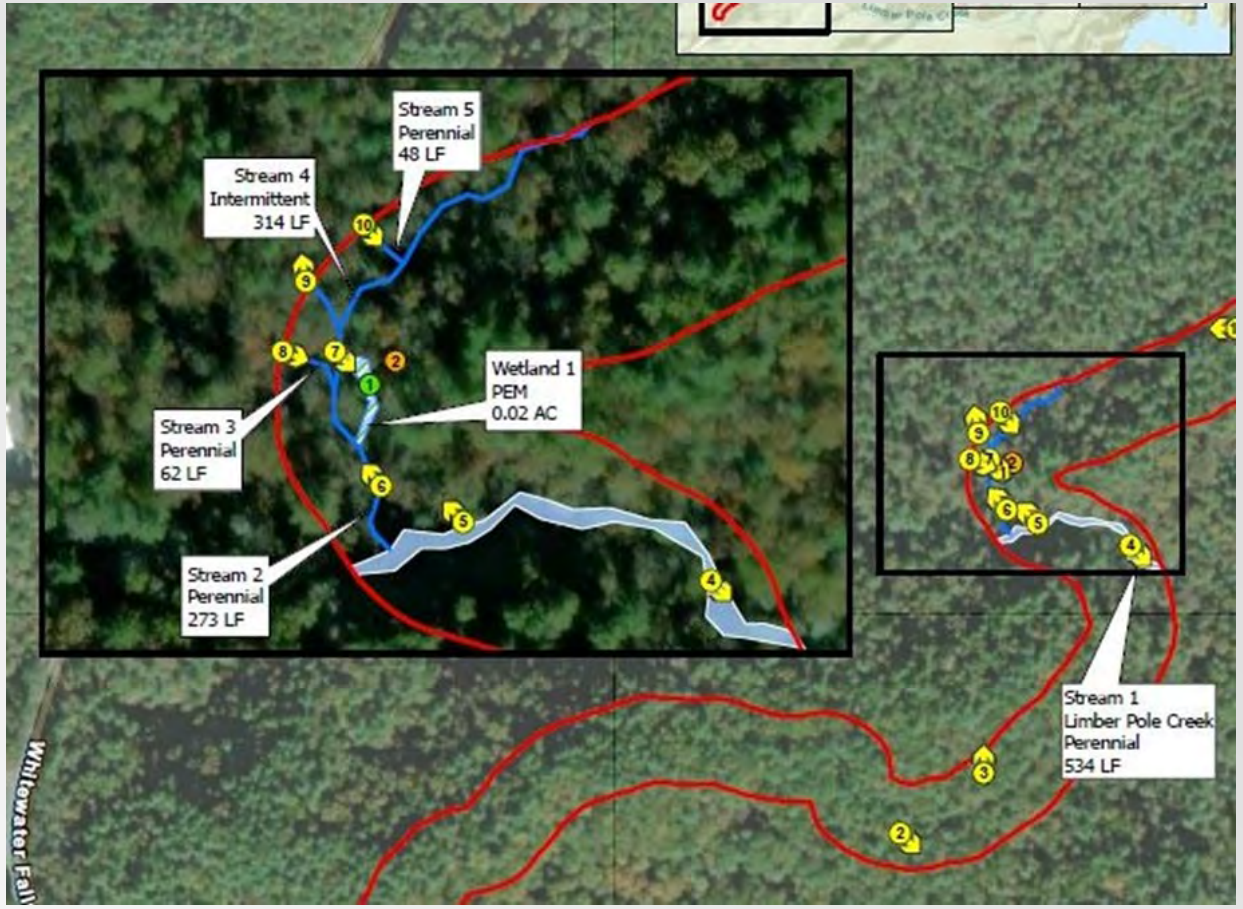
FERC New License 7/31/2027
USACE 404/401 WQC Received 9/1/2027
Bad Creek II Construction Begins 11/2027

Italicized dates are estimated dates for regulatory actions or contingent on regulatory actions

CWA 404/401 Individual Permit

- 404 Individual Permit (issued by USACE)
  - Pre-construction notification (PCN) required for fill and/or disturbance of streams and wetlands resulting from:
    - Bad Creek Pumped Storage Project Expansion, and
    - 525kV Whitewater Transmission Line and access roads
  - WOTUS surveys completed and field-verified by USACE
  - NHPA compliance studies completed
  - ESA compliance studies completed
    - Goal to include USFWS concurrence with PCN
  - USACE to adopt FERC NEPA review as part of their review/approval process

- 401 Water Quality Certification (issued by SCDES)
  - One for 404 Individual Permit
  - Separate one for FERC relicensing



Other Related Studies

- Natural Resources Assessments (HDR 2021 and 2023)
  - Federally protected species
  - At-risk species
- Bat Survey (ERM 2021)
- Herptile Survey (Duke Energy 2023)
- Small Whorled Pogonia Survey (HDR 2024)
- Bat Survey (Biotope 2024)

Bear Scat

Potential persistent trillium habitat

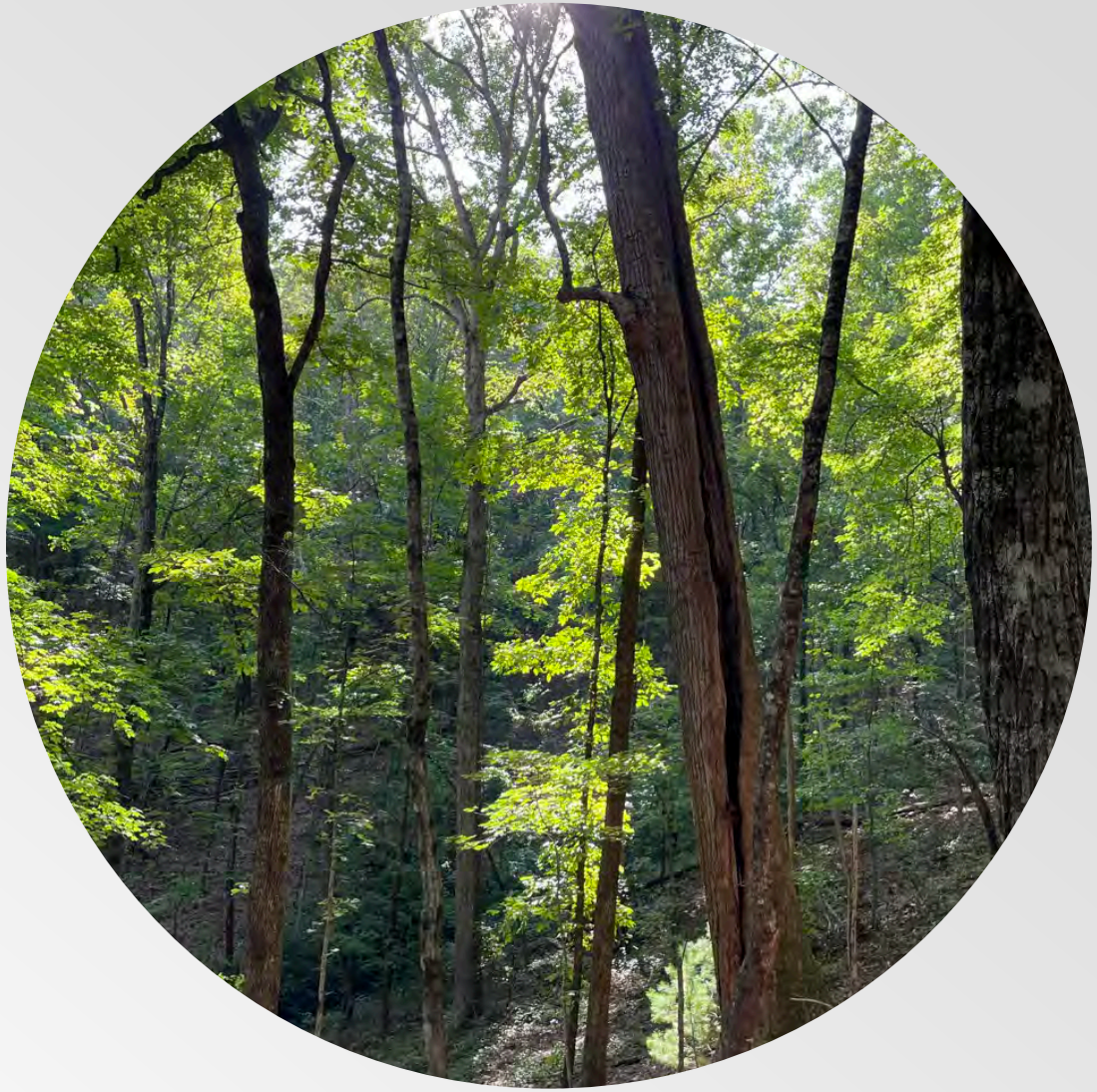
Potential bat roosting habitat

Southern gray-cheeked salamander

Potential small whorled pogonia habitat

Potential smooth coneflower habitat

Federally Protected Species



Federally Protected Species – USFWS IPaC List (12/16/2024)

Species	Designation	Preferred Habitat	Habitat Present within Project Area
Birds			
Bald Eagle (*Haliaeetus leucocephalus*)	BGEPA	Nests at tops of large, mature trees near large rivers, lakes, and marshes containing small animals, fish, and carrion.	Potential habitat is within forested areas in close proximity to Lake Jocassee.
Mammals			
Tri-colored bat (*Perimyotis subflavus*)	Proposed Endangered	Forested landscapes, often in open woods. They can also be found over water and adjacent to water edges.	Potential summer habitat within forested areas and unmaintained low forested valleys.
Northern long-eared bat (*Myotis septentrionalis*)	Endangered	Hibernates in caves and mines during winter, roosts under bark, in cavities or crevices in trees and snags during summer.	Potential summer habitat within forested areas and unmaintained low forested valleys.
Gray bat (*Myotis grisescens*)	Endangered	Inhabits caves or cave-like structures year-round; winter hibernation caves are typically cold, deep vertical shafts and summer caves are generally warm caves or cave-like structures scattered near bodies of water. They forage over rivers, streams, lakes, and bodies of water.	Potential foraging habitat.
Plants			
Small whorled pogonia (*Isotria medeoloides*)	Threatened	Older hardwood stands of beech, birch, maple, oak, and hickory, sometimes softwoods like hemlock, with an open understory; acidic soils with a thick layer of dead leaves, often on slopes or near small streams.	Forested areas adjacent to existing right-of-way and unmaintained low forested valleys.
Smooth coneflower (*Echinacea laevigata*)	Endangered	This species is typically found in meadows, open woodlands, the ecotonal regions between meadows and woodlands, cedar barrens, dry limestone bluffs, clear cuts, and roadside and utility rights-of way.	Existing open areas and maintained right-of-way.
Insects			
Monarch butterfly (*Danaus plexippus*)	Candidate	Monarchs are typically found in open grass areas during the breeding season. Adults use a wide variety of flowering plants throughout migration and breeding.	Existing open areas and maintained right-of-way.
***No Designated Critical Habitats at this location**			

Federally Listed Plants - 2021 and 2024 Surveys

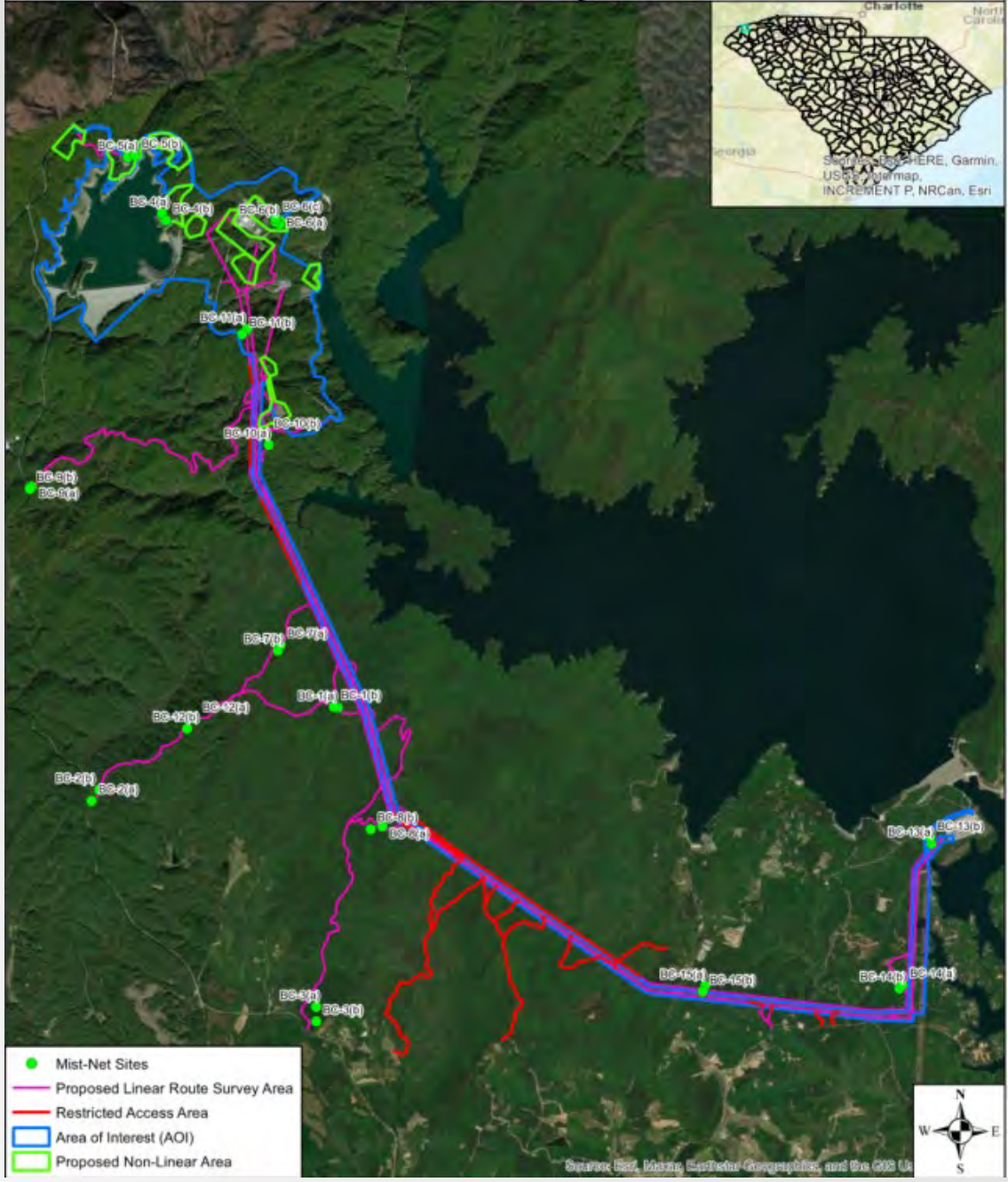
Findings

- *Small whorled pogonia* – habitat present, no individual species identified in 2021 and 2024 surveys.

- *Smooth coneflower* - habitat present, no individual species identified in 2021 survey.

2024 Bat Survey Results

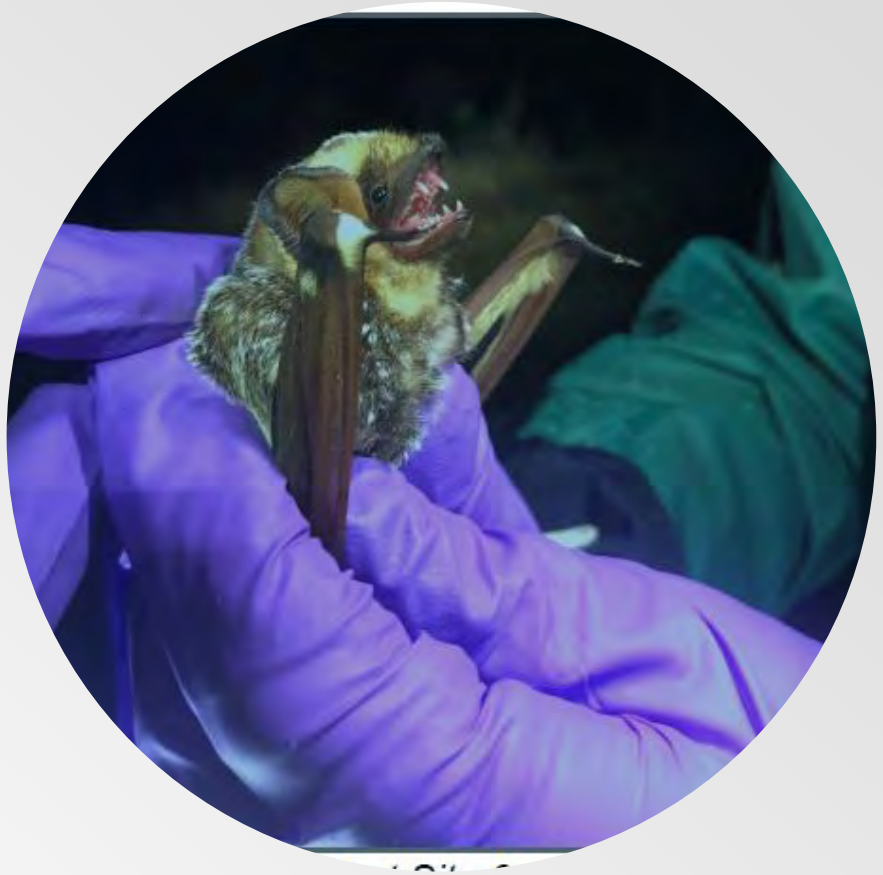
- A bat study plan was developed in consultation with USFWS and SCDNR and approved by the USFWS on May 28, 2024.
  - **Northern Long-eared Bat** (Endangered)
    - Probable absence
  - **Indiana Bat** (Endangered)
    - Probable absence
  - **Tricolored Bat** (Proposed Endangered)
    - Likely present
  - **Little Brown Bat** proposed to be listed (Endangered or Threatened)
    - Likely present
  - **Gray Bat** (Endangered)
    - Likely present



2024 Bat Survey Results

- A **total of 41 bats** were captured across three species during mist netting; approximately 51% and 41% of the captures were big brown bats and eastern red bats respectively, with the remaining 7% eastern small-footed bats.
- Acoustic measures confirmed the likely presence of gray bat, little brown bat, and tricolored bat.

Species	Likely presence
Eastern red bat (*Lasiurus borealis*)	High
Big brown bat (*Eptesicus fuscus*)	High
Rafinesque's big-eared (*Corynorhinus rafinesquii*)	High
Little brown bat (*Myotis lucifugus*)	High
Gray bat (*Myotis grisescens*)	High
Tricolored bat (*Perimyotis subflavus*)	High
Evening bat (*Nycticeius humeralis*)	High
Hoary bat (*Lasiurus cinereus*)	High
Eastern small-footed bat (*Myotis leibii*)	High
Brazillian [Mexican] free-tailed bat (*Tadarida brasiliensis*)	High
Silver-haired bat (*Lasionycteris noctivagans*)	Low
Seminole bat (*Lasiurus seminolus*)	Low
Southeastern bat (*Myotis austroriparius*)	Low
Northern long-eared bat (*Myotis septentrionalis*)	Low
Indiana bat (*Myotis sodalis*)	Low

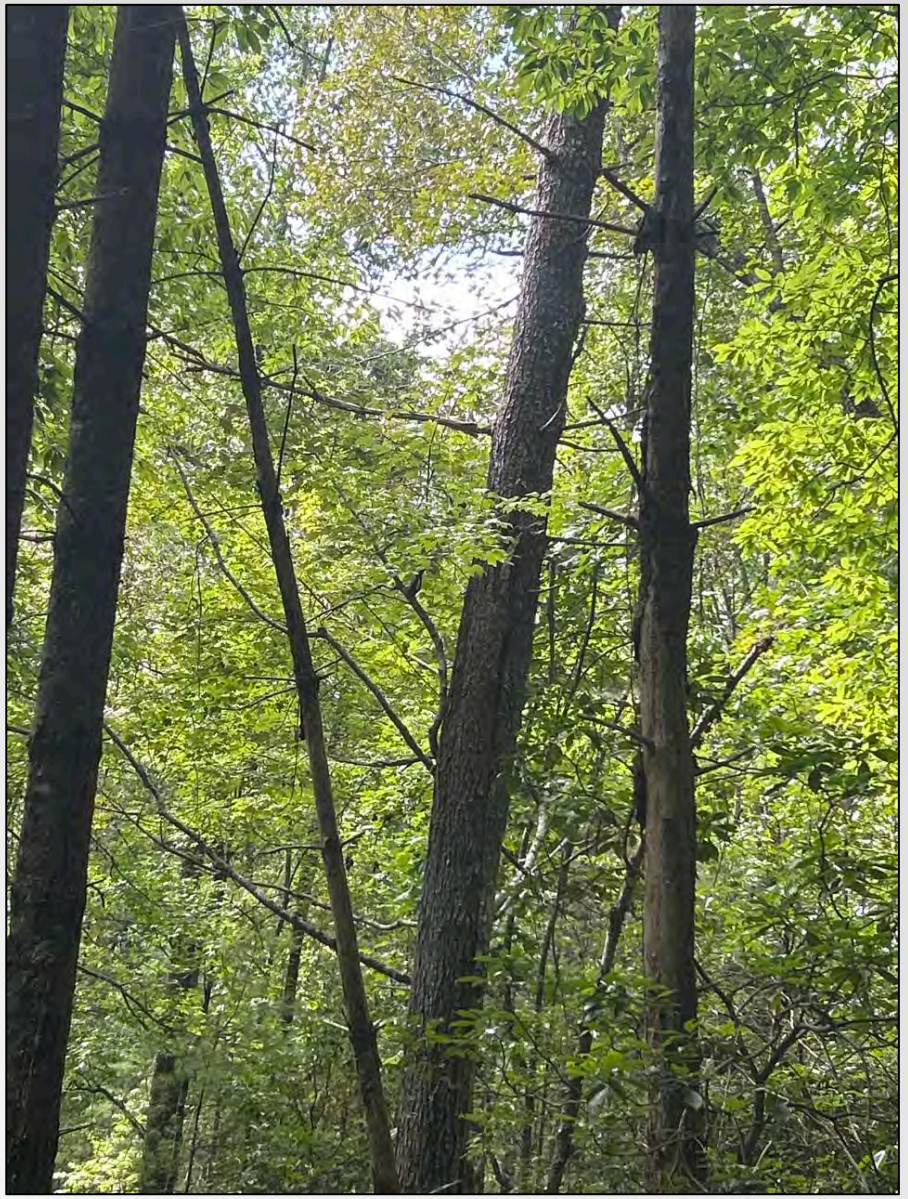


Endangered Species Act (ESA) – Evolving Project Species Listings

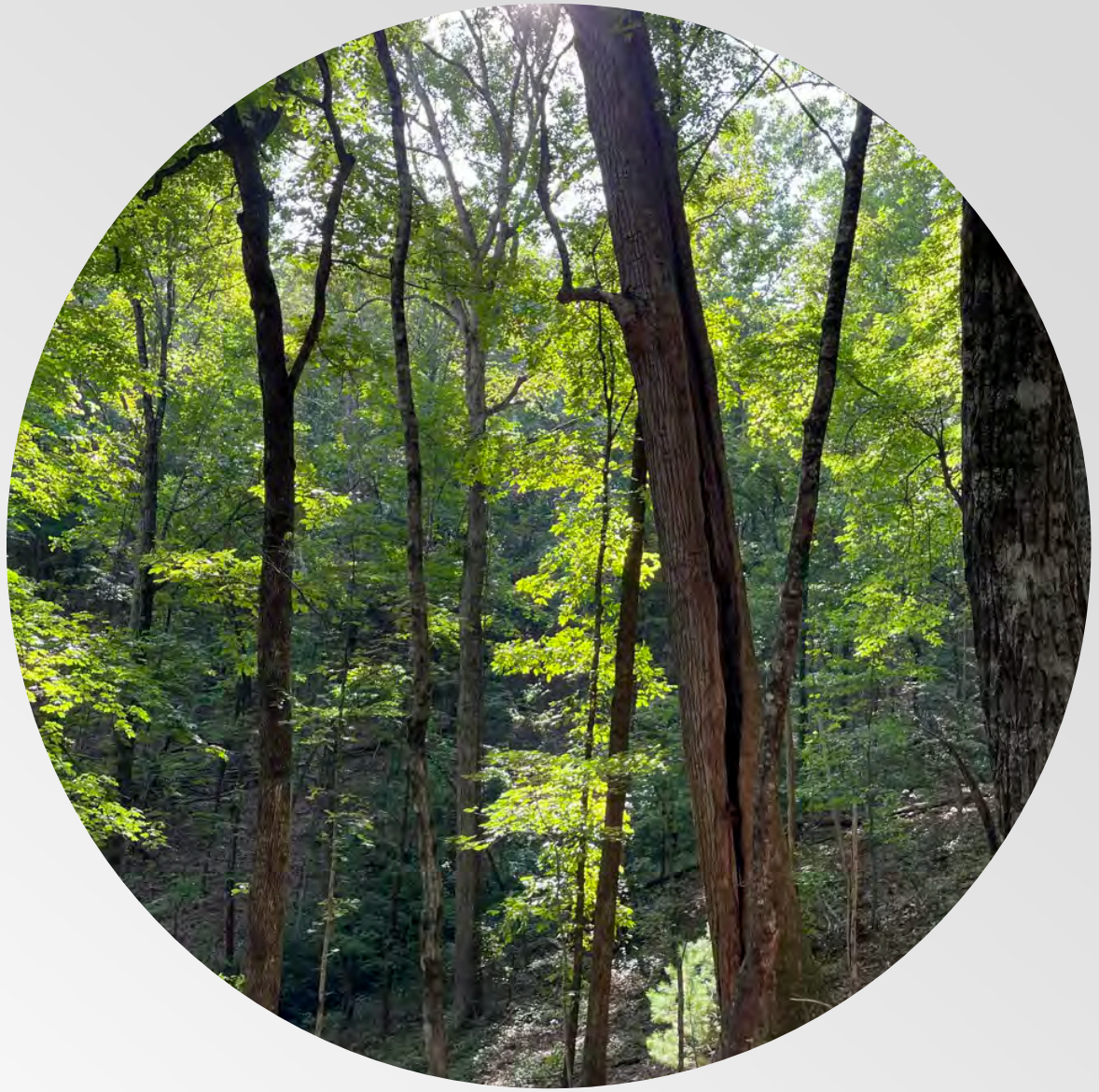
Species	Regulatory Listing Status	Habitat within Project Boundary	On IPaC Species List	Considerations
Northern long-eared bat	Listed as E in 2023	Yes	Yes	No NLEB detected; **will be evaluated in the BA.**
Tricolored bat	Listed as PE in 9/2022 with final rule expected in 2024 – not yet listed	Yes	Yes	Detected via acoustic measures; **will be evaluated in the BA.**
Monarch butterfly	Proposed to be listed as Threatened 4(d) (12/12/2024) with final rule expected 12/2025	Yes	Yes	Duke Energy active partner in the Monarch CCAA. Areas within the Project Boundary may be included in CCAA areas (e.g., transmission ROW); **will be evaluated in the BA. Proposed Pollinator Enhancement Plan and 2 Monarch CCAA monitoring sites.**
Little brown bat	Proposed to be listed in 9/2023 with final rule expected in 2024 – not yet listed	Yes	No	Detected via acoustic measures; **will be evaluated in the FERC-required Bat Species Protection Plan.**
Carolina hemlock, American bumblebee, and Golden-winged warbler	Under ESA review for proposed listing in 2025-2026 – not yet listed	Yes	No	Known or potentially found within Project Boundary. **Proposed Integrated Vegetation Management Plan for sensitive plant species and wildlife habitat.**

USFWS Biological Assessment

1. Introduction
2. Description of Proposed Activities
3. Methodology
4. Action Area and Existing Natural Resources
5. Potential Project Impacts and Effects
    a) Habitat Alteration
    b) Artificial Lighting
    c) Noise and/or vibration
    d) Water Quality,
    e) Other Harm, Injury, and/or Mortality
6. Species Assessment
    a) Northern Long-Eared Bat
    b) Tricolored Bat
    c) Gray Bat
    d) Monarch Butterfly
    e) Small Whorled Pogonia
    f) Smooth Coneflower
7. Eagles and Migratory Birds
8. Determination of Effects Summary
9. References



Conservation Measures



Minimum Conservation Measures for the Protection of Listed Bats

- Project to follow minimum conservation measures outlined in the *NLEB and TCB Voluntary Environmental Review Process for Development Projects V1.0*, dated 10/15/2024
  - Per NLEB/TCB Determination Key:
    - Bad Creek within Hibernating Range for TCB/NLEB
    - Bad Creek not located within 0.5 miles of a known hibernaculum

Bad Creek II Relicensing Agreement Species Protection Plans

If Bad Creek II is constructed, the "*Licensee will implement Species Protection Plans (SPPs) that may include federal or state listed species and/or State Wildlife Action Plan (SWAP) species agreed upon between the Licensee and SCDNR at the time of submittal of the SPPs with the Application for New License. The SPPs agreed upon by the Licensee and SCDNR may be developed to focus on an individual species or species guilds that could address multiple species in an ecosystem or ecological community. The Licensee will commit to supporting up to ten (10) SPPs." (AIP, Section 9.0)*

Bat Species Protection Plan:

a. Northern Long-eared Bat *Myotis septentrionalis**
b. Tricolored Bat *Perimyotis subflavus**
c. Gray Bat *Myotis grisescens**
d. Hoary Bat *Lasiurus cinereus*
e. Indiana Bat *Myotis sodalis*
f. Rafinesque's Big-eared Bat *Corynorhinus rafinesquii*
g. Little Brown Bat *Myotis lucifugus*
h. Big Brown Bat *Eptesicus fuscus*
i. Southeastern Bat *Myotis austroriparius*
j. Eastern small-footed bat *Myotis leibii*
k. Silver-haired bat *Lasionycteris noctivagans*

Other Species Protection Plans to be developed:

- Swallow-Tailed Kite *Elanoides forficatus*
- Avian – Early Successional Habitat
- Avian – Hardwood Forest Habitat
- Blue Ridge Reptiles and Amphibians Guild
- Box Turtle *Terrapene carolina*
- Pickerel frog *Lithobates palustris*
- Four-toed Salamander *Hemidactylium scutatum*
- Crayfish Guild
- Botanical
  - Small Whorled Pogonia *Isotria medeoloides**
  - Persistent Trillium *Trillium persistens*
  - Smooth Coneflower *Echinacea laevigata**

*Listed on Project IPaC Official Species List

Avian Protection

- Migratory Bird Protections – FERC & USFWS Memorandum of Understanding: MOU focuses on avoiding or minimizing adverse impacts on migratory birds and strengthening migratory bird conservation through enhanced collaboration between the Commission and USFWS by identifying areas of cooperation.
- Migratory birds are protected under the Migratory Bird Treaty Act (MBTA). Bald eagles are protected under the Bald and Golden Eagle Protection Act.
- Duke Energy Avian Protection Plan is written in accordance with Avian Powerline Interaction Committee and USFWS suggested practices.
- A proposed rule revising the regulations authorizing the issuance of incidental take permits for eagles (i.e., golden and bald eagles) was published in September 2022. A final rule was issued February 2024. Duke Energy will evaluate this ITP process in 2025.
- A proposed rule for developing and implementing MBTA regulations was proposed in 2021; however, it has recently been withdrawn from the Office of Management and Budget review.
- Duke Energy has no installed avian protection measures (e.g., bird flight diverters, marker balls, bird shields) regarding the existing transmission lines and ancillary facilities.

Next Steps and Discussion

Additional Items for Discussion or Confirmation

- USFWS comments/requests on Bat Survey Report
- USFWS points of contact / Project distribution list
- Updated Study Report (USR) and USR Meeting – January 16th
- Confirm schedule and process for Biological Assessment

Additional Information

Bad Creek Relicensing Agreement – Proposed PM&E Measures

Bad Creek (Existing Project) Measures

- Bad Creek Reservoir Normal Operating Range: Maintain reservoir between 2,310.00 ft msl and 2,150.0 ft msl.
- Implement the Low Inflow Protocol.
- Implement the Maintenance and Emergency Protocol.
- Water Quality Certification: Implement the Water Quality Certification.

Fish Entrainment Mitigation Measures:

- Revise lighting and public safety devices to reduce light shining on Lake Jocassee.
- Pumping start-up sequence.
- Coordinate with SCDNR regarding fish entrainment measures when Lake Jocassee falls below 1099 ft msl.

Species Protection Plans: Implement up to 10 Species Protection Plans, including a Special Status Bat Protection Plan

Eagle and Raptor Protection: Install eagle and raptor protection measures (i.e., pole retrofits, substation caps and covers, flight diverters) at strategic locations.

Integrated Vegetation Management Plan: Implement measures to protect sensitive native plant and wildlife species and habitats.

Pollinator Enhancement Program:

- Plant milkweed and other native wildflowers in strategic locations.
- Add up to two Monarch CCAA monitoring sites.

Recreation Management Plan:

- Foothills Trail Interpretative Exhibit: Develop exhibit for display at the Bad Creek Visitors Center.
- Maintain 43 miles of the Foothills Trail.
- Extend Foothills Trail easements for 43 miles of the Foothills Trail.
- Privy Pilot Study: Install 2 primitive privies / outhouses along the Foothills Trail and study for 2 years.
- Depending on the findings of the pilot privy study, install up to 8 additional privies along the Foothills Trail.
- Bad Creek Visitors Overlook Improvements: New viewing telescopes, interpretative signage, picnic area.

Visual Resources Management Plan:

- Select exterior colors and lighting to reduce visual effects as normal maintenance and repair occurs.
- Review and update plan as needed every ten years.

Implement the Historic Properties Management Plan:

- Nominate Site 38OC249 for inclusion in the NRHP.
- Monitor Site 38OC249 annually.
- Develop an interpretative exhibit regarding the cultural history of the Project area.

Bad Creek Relicensing Agreement – Proposed PM&E Measures

Bad Creek II Construction Measures

- Erosion and Sediment Control Plan: Implement non-structural and structural Best Management Practices during construction.
- Spoil Disposal: Install French drains to minimize impacts to streams.
- Water Quality Management Plan: Implement the monitoring included in the WQMP.

Fish Entrainment Measures:

- Conduct ADCP-based flow study.
- Hydroacoustic fish monitoring for 10 years.

Public Recreation:

- Revise the Public Safety Plan to install additional public safety measures in Whitewater River cove to educate boaters about the hazards of Bad Creek II operations.
- Repair damage to Musterground Road and Foothills Trailhead Road intersection caused by construction activities prior to reopening it.
- Provide FTC access to Musterground Road for trail maintenance during construction.
- Highway 281 Lot Security Monitoring.
- Signage: enhance signage at the main rap at DFSP and the Musterground Road entrance.
- Brewer Road: Reopen Brewer Road to provide access to Musterground Road during construction, construct a game carcass disposal area and game processing / cleaning station

Visual Resources Management Plan: Select lighting and exterior finishes that minimize visual effects.

Bald Eagle and Peregrine Falcon – identify nests with potential to be disturbed and implement appropriate buffers or implement a construction plan.

Bad Creek Relicensing Agreement – Proposed PM&E Measures

Non-License Measures

- Lake Keowee Source Water Protection Program: Provide $500,000 within two years following the new license and $500,000 within one year following the start of commercial operation of Bad Creek II.
- Fisheries Enhancement and Management: Provide $10,500,000 to SCDNR. Provide an additional $1,000,000 within one year following the start of commercial operation of Bad Creek II.

Public Recreation

- Make repairs and improvements to the Foothills Trail identified in the 2023 RUN Study / Trail Assessment during the current license.
- Construct a storage building on Project lands for the Foothills Trail Conference to support trail maintenance activities.
- Provide rights of first refusals to NC and SC for the Foothills Trail and spur trails.
- Consult with the FTC on spur trail expansion at the Foothills Trail.
- Develop a Pumped Storage Operations interpretative display for Devils Fork State Park.
- DFSP Improvements: Courtesy dock at the Villa Ramp with 2 slips (one with a lift for emergency responders).
- Jocassee Gorges Road Maintenance: Provide $1,500,000.
- No-Cost Leases: Lease approximately 1,900 acres of land to SCDNR for the license term.
- Extend the Laurel Preserve Tract lease for the term of the new license.
- Sponsor an annual wildlife viewing and environmental education event at the Project.

Terrestrial Resources

- Oconee County Conservation Bank: Provide $500,000 within two years of the new license and $500,000 within one year following the start of commercial operation of Bad Creek II.
- Keowee-Toxaway Habitat Enhancement Program: Provide $500,000 within two years following the new license and $500,000 within one year following the start of commercial operation of Bad Creek II.
- Wildlife Enhancement Program: Provide $2,500,000 within one year following the start of Bad Creek II construction.

From:	Stuart, Alan Witten
To:	Olds, Melanie J
Cc:	McCarney-Castle, Kerry; Thames, Kelly
Subject:	Bad Creek P-2740 Avoidance During the Pup Season/Revised Meeting Summary
Date:	Monday, February 17, 2025 9:02:20 AM
Attachments:	image001.png image002.png 20241218_Bad Creek II_USFWS Meeting Summary_Rev2.pdf

Good morning Melanie,

Please see below. Per our email exchange, please find the attached revied meeting summary.

If you have any questions, let us know.
Thanks !
Alan

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
526 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

From: Thames, Kelly <Kelly.Thames@hdrinc.com>
Sent: Friday, February 7, 2025 8:56 AM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Cc: McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>
Subject: RE: [EXTERNAL] Bad Creek P-2740 Avoidance During the Pup Season

Good Morning Alan,

Attached are the updated Rev 2 notes, to include completed USFWS actions of providing their acoustic data review, hibernaculum confirmation, and pupping season confirmation.

Please let Melanie know that we'd like to use **IPaC tracking ID 2024-0130237** and all others can be superseded (I completed this action and provided the ID in the attached).

Actions I noted as ongoing are:

- BGEPA/MBTA coordination with USFWS Atlanta

- Review of construction lighting
- Review of previous FERC EA with a BiOP as an example

The ongoing actions are longer lead items than the others we already competed, so let me know if this suffices for this record.

Let me know if any questions or edits.

Thanks,
Kelly

Kelly Thames, PWS, TN-QHP
D 704.338.6710 **M** 704.996.9986

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From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Tuesday, January 28, 2025 11:18 AM
To: McCarney-Castle, Kerry <Kerry.McCarney-Castle@hdrinc.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
Subject: FW: [EXTERNAL] Bad Creek P-2740 Avoidance During the Pup Season

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From: Olds, Melanie J <melanie_olds@fws.gov>
Sent: Friday, January 24, 2025 11:15 AM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Subject: RE: [EXTERNAL] Bad Creek P-2740 Avoidance During the Pup Season

Olds, Melanie J reacted to your message:

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Friday, January 24, 2025 4:10:10 PM
To: Olds, Melanie J <melanie_olds@fws.gov>
Cc: Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: Re: [EXTERNAL] Bad Creek P-2740 Avoidance During the Pup Season

Hi Melanie, thank you for your cooperation and approval of our request.

As a side note, we plan to update the meeting summary(yet again) to incorporate primarily USFWS's review of the acoustic data we provided you post-meeting. This approach will allow consolidated consultations.
Thank you again!
Alan

From: Olds, Melanie J <melanie_olds@fws.gov>
Sent: Friday, January 24, 2025 10:42:55 AM
To: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Cc: Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: Re: [EXTERNAL] Bad Creek P-2740 Avoidance During the Pup Season

Morning Alan,

For the hibernation range avoiding tree clearing during the active season (summer occupancy April 1 - Sept 30) is the best, however, we understanding that this is a good portion of the year and really limits projects, so avoiding the pupping season (May 15-July 31) is the next best conservation measure. Implementing this pupping season restriction would avoid impacts to pregnant/lactating females and non-volant pups. We find it acceptable for Duke implementing this avoidance period and continuing to evaluate the project impacts to make a determination of effect for the tree roosting bats.

Melanie

Melanie Olds

Fish & Wildlife Biologist

Regulatory Team Lead/FERC Coordinator

U.S. Fish and Wildlife Service

South Carolina Ecological Services Field Office

176 Croghan Spur Road, Suite 200

Charleston, SC 29407

Phone: (843) 534-0403

From: Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
Sent: Monday, January 20, 2025 10:03 AM
To: Olds, Melanie J <melanie_olds@fws.gov>
Cc: Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Thames, Kelly <Kelly.Thames@hdrinc.com>
Subject: [EXTERNAL] Bad Creek P-2740 Avoidance During the Pup Season

Good morning Melanie,

For the Bad Creek II project, given the absence of known hibernaculum within a 0.5-mile radius, and including the survey of the access tunnel and culverts on the site deemed as unsuitable hibernacula, Duke Energy would like to pose avoidance of clearing during the Pup Season window (May 15-July 31) as a conservation measure for the project's summer tree roosting bat species in the SC hibernating range. We hope this would assist with the determination that the proposed action would either not likely adversely affect or would adversely affect but would not be likely to jeopardize the project's summer tree roosting bat species (evaluation currently ongoing).

Also, attached is the revised meeting summary with Lindsey's name corrected throughout.

Please let us know if this is acceptable or if the Service would provide their recommended summer clearing avoidance window for the project's summer tree roosting bat species.

Thank you,
Alan

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
526 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

Meeting Summary

Project:	Bad Creek II Power Complex	
Subject:	USFWS Informal Consultation Meeting	
Date:	Wednesday, December 18, 2024	
Location:	USFWS Field Office, Charleston, SC	
Attendees:	Melanie Olds, USFWS Christy Johnston Hughes, USFWS Lindsey Troutman, USFWS Kate Yates, USFWS	Alan Stuart, Duke Energy Scott Fletcher, Duke Energy Sarah Kulpa, HDR Kelly Thames, HDR
Attachments:	Duke-USFWS Bad Creek Meeting-Dec 2024.pdf (PowerPoint presentation)	

Summary

1. The meeting between Duke Energy and the United States Fish and Wildlife Services South Carolina Ecological Services Field Office (USFWS) provided an overview of the existing and proposed expansion of the Bad Creek Pumped Storage Project (Project), including potential impacts of construction of the second powerhouse (Bad Creek II Power Complex or BCII) and relevant federal licenses and permits, namely the new Federal Energy Regulatory Commission (FERC) license and a Clean Water Act (CWA) Section 404/401 Individual Permit via a pre-construction notification (PCN).
2. The natural resources and bat surveys performed for Duke Energy provide suitable baseline information to inform USFWS' evaluations for the FERC licensing and CWA 404/401 permit application processes.
3. The acoustic and mist-net bat surveys were performed in the summer of 2024 and the draft report (currently under USFWS review) provides a summary of probable absence/presence of federally listed northern long-eared (NLEB), Indiana, tricolored, little brown, and gray bats. Additional review of the study data (i.e., acoustic data) is being performed by USFWS to validate Biotope's original study findings/conclusions that there is low probability of Indiana bat and NELB in the Project's area of interest (AOI). identify probable absence/presence of Indiana bat and NLEB.
4. USFWS expects the level of tree clearing proposed for the construction of BCII will trigger formal consultation under Section 7 of the Endangered Species Act. USFWS expects to prepare a single Biological Opinion (BiOp) for the Bad Creek relicensing and BCII construction during the post-filing phase of the FERC Integrated Licensing Process (ILP).
5. USFWS and Duke Energy agreed on a preliminary outline for the (applicant prepared) Biological Assessment (BA). USFWS is willing to review the draft BA ahead of Duke

Energy's inclusion of the BA in the FERC [Final] License Application. The BA will include currently federally listed bat species as well as At-Risk Species.

6. While additional, primarily short-term, impacts will be identified and evaluated in the BA, the primary impact of concern to USFWS for listed bat species is tree clearing.
7. The BA will not include avian species or measures recommended under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. USFWS recommended Duke Energy consult with separate regional contacts regarding compliance with these acts.
8. Recommended conservation measures for tree-roosting and migratory bats expected to be applicable to the construction of BCII are similar to those being developed for Duke Energy's Habitat Conservation Plan (HCP) and will primarily consist of time-of-year restrictions on tree clearing to avoid pupping season. Locations of nearest hibernaculum will be identified, through the review of state and federal data, to determine if any additional measures are required. Relevant measures proposed in the Bad Creek Relicensing Agreement will also provide conservation and protection for listed bat species. The USFWS will likely also recommend periodic monitoring over the new license term.

A detailed summary of the meeting discussion and action items follows.

Introduction and Meeting Objectives

- Introduction of meeting attendees and roles:
    - Melanie (USFWS) – Regulatory Team Lead/USFWS FERC Coordinator
    - Kate (USFWS) – SC Renewable Energy Coordinator
    - Lindsey (USFWS) – Fish and Wildlife Biologist
    - Alan Suart (Duke Energy) – Bad Creek Relicensing Project Manager
    - Scott Fletcher (Duke Energy) – Natural Resources Manager
    - Sarah Kulpa (HDR) – Bad Creek Relicensing Project Manager and FERC Hydropower Licensing Specialist
    - Kelly Thames (HDR) – Environmental Project Manager and 404/401 Specialist
- Alan kicked off introductions and summarized meeting objectives.
- HDR noted they would capture meeting notes and provide the meeting summary in consultation correspondence for the Bad Creek license application following USFWS review of the meeting summary; USFWS confirmed.
- Alan confirmed that BCII will be proposed in the FERC Draft and Final License Applications (DLA, FLA).
- Scott and Lindsey are working on Duke Energy's HCP that applies to Duke Energy's entire service territory. While the FERC federal action does not trigger Section 10 (incidental "take") consultation with USFWS, it is an opportunity to incorporate HCP measures into the Section 7 consultation.

Project Overview

- Bad Creek Pumped Storage Project - Alan provided an overview of Project location, purpose and operation, and major features.
- Bad Creek II Power Complex - Alan provided overview and purpose of proposed Project expansion.
    - Noted primary difference between powerhouses is two smaller tunnels (BCII) as compared to one (existing powerhouse), which allows for partial powerhouse isolation for unit maintenance, and variable speed pump-turbine generator units for BCII (existing units are single-speed).
    - Noted that the Fisher Knob Access Road, which was originally scoped as a temporary road to provide access to the Fisher Knob community during construction, is no longer proposed (cost prohibitive; Traffic Management Plan to be developed and implemented instead). Several natural resources surveys, bat surveys, and stream habitat assessments were performed along the previously proposed route of the then-proposed access road. Findings of these various studies and surveys have been previously provided in relicensing documents and will be provided in the Final License Application.
    - Expansion of the transmission line corridor, which is 9.25 miles long extending from the existing Project to the Jocasee Hydroelectric Project, will require improvements/widening and use of existing United States Forest Service (USFS) logging roads for access; there are no federal lands within the Bad Creek Project Boundary.
    - Potential impacts will include placement of spoil material (i.e., rock and earth from tunnel excavation) in the uplands and tree clearing (main project site and transmission line).

Federal Energy Regulatory Commission (FERC) Relicensing Process

- Alan noted the DLA is expected to be filed the last week of February, 2025.
- Sarah described how the ILP has been heavily front-loaded in the pre-filing phase, with the goal of filing FLA with as much stakeholder and agency concurrence as possible to reduce risk of protracted FERC post-filing period (i.e., issue new license by existing license expiration [expires July 31, 2027]).
- General discussion of process with FERC after FLA is filed. Melanie noted past/recent South Carolina projects have not required formal Section 7 consultation with USFWS (avoided impacts to listed species). BCII will likely require formal consultation.

Bad Creek II Construction Impacts and Permitting

Expanded FERC Project Boundary

- The FERC Project Boundary encompasses all lands necessary for the operation and construction of the Project and BCII. Alan provided an overview of the expanded Project

Boundary and noted that it is not equal to the Limits of Disturbance (LOD) for BCII construction.
- Kelly noted that the FERC boundary does not include existing transmission line access roads that cross USFS lands. Improvements to these roads will occur under access agreements with USFS and would be subject to CWA Sections 404 and 401 considerations.
- There are no federal lands included in the FERC Project Boundary (i.e., that would trigger mandatory conditioning under Section 4(e) of the Federal Power Act).

Types of Disturbance

- Kelly provided an overview of multiple types of disturbance activities (e.g., tree and vegetation clearing) that would be expected for the construction of BCII.
    - Fill and/or disturbance activities of streams and wetlands would be subject to CWA Section 404/401 consideration/permitting.
- Sarah noted FERC identified impacts in their scoping documents (2022-2023) and these impacts will be evaluated by Duke Energy in Exhibit E (Environmental Report, prepared in the style of an Applicant-prepared Environmental Assessment) of the DLA/FLA, which provides FERC the information they need to prepare their National Environmental Policy Act (NEPA) evaluation. FERC's NEPA evaluation is currently anticipated to be an Environmental Assessment (EA) in lieu of an Environmental Impact Statement. FERC will ultimately determine which document will be prepared.
- Kelly provided an overview of potential spoil disposal areas (combination of previously disturbed and new locations).
    - Spoil disposal locations are currently under evaluation to determine which combination of areas to use, largely driven by minimizing Waters of the United States (WOTUS) impacts and constructability feasibility.
    - Sarah noted that construction of the existing Project utilized much of the excavated material at the time to build the Bad Creek Reservoir dams; in the absence of dam construction needs, excavation of material for BCII requires disposal. Some of the spoil areas under consideration were spoil areas used during original construction.
    - The existing submerged underwater weir in Lake Jocasee downstream of the inlet/outlet structure (I/O structure) was constructed with rock excavated for the existing underground powerhouse and tunnel. Similarly, underground rock excavations from the construction of BCII will be added to the downstream slope of the underwater weir.
    - Alan stated that only some of the spoil disposal areas identified in the figures shown will be used.
- Kelly provided a transmission line corridor overview including types of disturbance.
    - Transmission line towers will be located on ridges.
    - Topography is steep and in some cases, the line is so far above the ground surface, vegetation maintenance is not needed in some valleys.
- Scott noted access road access agreements will be renewed with USFS.

- Kelly reviewed the BCII Preliminary Impacts Table, including a preliminary estimate of 400 acres of tree clearing.

Anticipated Permits and Schedule

- Kelly provided overview of anticipated Project permits.
    - South Carolina Department of Environmental Services (SCDES) confirmed two separate 401 Water Quality certifications – one for the FERC license (i.e., Project operation over new license term) and one for the CWA Section 404/401 permit (i.e., BCII construction impacts).
    - Sarah noted the FERC licensing process is an umbrella process, but the CWA Section 404/401 permit process is independent and parallel, and neither is contingent on the other. Additional permits and regulatory approvals will be required to construct BCII but these will be pursued after license issuance and CWA 404/401 permit issuance.
    - Kelly noted the USACE has stated their preference is to adopt the FERC NEPA document to satisfy their own requirements.
- Kelly explained the previously proposed schedule for the CWA Section 404/401 permit filing (discussed at the pre-application meeting with USACE and SCDES in March 2024) was driven by the need for early construction of Fisher Knob Access Road.
    - Since Fisher Knob Access Road is no longer proposed, the CWA Section 404/401 application will likely be filed after the FERC FLA is filed; the FLA will be filed no later than July 31, 2025.
    - CWA Section 404/401 permit application estimated submittal in October 2025, which aligns better with the expected FERC NEPA process.
- Melanie noted that Bald and Golden Eagle Protection Act (BGEPA) and Migratory Bird Treaty Act (MBTA) USFWS contacts are separate (located in Atlanta).
    - Action item: Duke Energy should consult with BGEPA and MBTA contacts for compliance with those acts - Scott has contacts in USFWS Region 4-Atlanta. [ongoing]
- Kelly noted it is still important to obtain USFWS preliminary concurrence on the BA for the FLA.
- Melanie and Lindsey pointed out the BiOp schedule shown in FERC guidance indicates 135 days to prepare the USFWS BiOp; however, USFWS statutory review timeline does not start until an adequacy review has been conducted (e.g., USFWS has the needed information to author the BiOp).
    - USFWS would not initiate BiOp efforts until FERC requests formal consultation after the FLA is filed; however, USFWS can review a draft BA ahead of formal consultation initiation.
    - Melanie noted USFWS will not prepare a BiOp in advance of formal consultation.
    - Melanie noted USFWS and other federal agencies have agreed that when species listings change, consultation is reinitiated.
        - Notably, re-consultation does not occur with FERC after the license has been issued.

        - USFWS would prefer to consult on species in anticipation of listing. The tricolored bat is an example – it is recommended to consult on that species now *and* when it is uplisted from proposed endangered to endangered at a later date – that way it would be already included in consultation.
    - USFWS confirmed they expect to prepare a single BiOp in conjunction with the FERC process, and that this would also be applicable to the CWA 404/401 process.
    - Duke Energy will include potential species listings in BA evaluation and conservation measures.
        - Conservation measures regarding proposed for listing species are voluntary until said species is uplisted to endangered or threatened.
        - Then, when proposed for listing species are uplisted, USFWS can issue a letter that converts those species into the formal BA.
    - Melanie noted another reason to wait for FERC to initiate formal consultation is because FERC may want to consult on other species.
    - Melanie agreed that a draft BA can be submitted to USFWS before sending to FERC and USFWS can review (after DLA is filed, but before FLA is filed).
- Kelly confirmed a CWA Section 404/401 Individual Permit via a notification PCN will be pursued. Kelly provided overview of studies and process to date, as well as coordination with USACE.

Related Studies / Federally Protected Species

- Natural Resource Assessments (NRAs) conducted in 2021 and 2023 at the Project and within transmission line corridor – these comprehensive reports included survey results and evaluations of federally protected species (habitat surveys).
- Review of USFWS Information for Planning and Consultation (IPaC) Species List:
    - Kelly noted that gray bat has been added for the Project Boundary.
    - Melanie pointed out that monarch butterfly has been uplisted from Candidate to Proposed Threatened as of 12/17/2024.
    - Small whorled pogonia study in 2024 revealed that suitable habitat is present, but no individual species were identified (same for smooth coneflower survey carried out in 2021).

Bat Survey Study Results (Conducted by Biotope)

- Summary of probable absence/presence of NLEB, Indiana, tricolored, little brown, and gray bats are provided in meeting slides.
- Melanie confirmed little brown bat is currently an At-Risk Species and will be reviewed at later date.
- Kate stated that upon review of the draft *Bad Creek Pumped Storage Presence/Absence Acoustic and Mist-net Surveys for Threatened & endangered Bat Species* report (bat survey report; 2024), that there are strong Maximum Likelihood Estimator (MLE) values for NLEB and Indiana bat at multiple sites over multiple nights.

    - Action item: A USFWS internal bat expert will perform additional review of the acoustic data – currently USFWS does not have timeframe estimate for when this review will be complete.
        - Follow-up: This action item has been completed. In an email dated January 10, 2025, USFWS provided their determination that the agency accepts the probable absence of NLEB and presence of the gray bat and proposed endangered tricolored bat in the project area. Due to the number of calls reviewed in the acoustic data consistent with Indiana bat, USFWS cannot exclude the acoustic presence of Indiana bat and USFWS presumes the species as tentatively present.
- Sarah noted that the bat survey report will be included in the Updated Study Report (USR; due to FERC 1/3/2025) and will be discussed at the USR meeting on 1/16/2025. [USR has since been filed; the bat survey draft report was filed as Attachment 3.]
    - Depending on the status of USFWS acoustic data review, Duke Energy may provide high level overview at the USR meeting and note that direct consultation with USFWS is ongoing.
- Melanie noted that if Indiana bat is determined to be likely present (currently determined to be probably absent), this would be a significant change for South Carolina.
    - Indiana bat has not been previously recorded in South Carolina, but the South Carolina Department of Natural Resources (SCDNR) believes the species is moving into this territory.
    - Similar to Indiana bat, NLEB has not been previously recorded in the upstate of South Carolina and is believed to be widely impacted by white nose syndrome.
    - Hence, USFWS is doing thorough review of the acoustic data given the strong MLE values for Indiana bat and NLEB.
- Gray bat determination of probable presence triggers the UFSWS formal consultation.
- Noise from blasting and construction and tree removal are USFWS' primary concern for bat impacts.
    - USFWS asked if helicopters will be used for transmission line construction. Scott noted this is a possibility.
- Lindsey noted the bat HCP development has resulted in the development of a table that summarizes common disturbance activities and resulting effects to bat species.
    - Suggested to pull information from this into the BA/Exhibit E.
    - Time of year tree clearing has been discussed but not yet confirmed.
    - Action Item: Scott to provide tables to HDR. [completed]
- Melanie recommended that since little brown bat was determined to be probably present, USFWS would like to do a conference opinion for the species.
    - FERC may disagree to include little brown bat in the BA because the species is an At-Risk Species (e.g., not formally listed), but noted that many bat conservation measures for other species will benefit little brown bat as well.
- Scott asked about hoary bat and its potential to be listed in in 2027 (based on review of USFWS work plan).
    - Hoary bat was detected as present in the acoustic survey.

    - Hoary bat is considered a tree-roosting bat, but migratory and might fall in same (conference opinion) category as little brown bat. Similarly, measures for other tree-roosting species would likely be protective of this species.
    - Discussion ensued as to where hoary bat is overwintering if summering in South Carolina (since detected in bat survey).
    - Hoary bat and gray bat trends (overwintering and summering sites) are not well known.
    - Gray bat is likely still in summer phase (even if caught in the fall during studies conducted by others). USFWS believes they may then fly back north to winter sites (caves in TN).
- Kelly noted that the SCDNR-requested Bat Species Protection Plan will include numerous bat species and will include all species discussed above plus additional species.
    - Duke Energy plans to develop Species Protection Plans for species other than bats as well.
- Kelly asked for confirmation about USFWS consultation and when consultation is re-initiated.
    - USFWS confirmed that consultation is closed after the FERC license is issued and is not reopened; however, consultation may be re-initiated if there is another federal action; for example, a CWA Section 404/401 amendment/modification via a USACE action, or a FERC license amendment.
- Kelly noted the primary goal of the BA is to be inclusive to account for potential future listings.
- USFWS has not yet fully parsed out implications associated with monarch butterfly's recent proposed threatened listing and recommended that Duke maintain their Monarch Candidate Conservation Agreement with Assurances (CCAA) measures.

Biological Assessment

- Kelly provided the high-level BA outline and solicited feedback.
- USFWS confirmed to include little brown bat, hoary bat, and Indiana bat in the BA evaluation.
- USFWS suggested to separate effects into construction and operation effects for all species.
    - Suggested for tree-roosting bats, effects and conservation measures can be evaluated together.
    - Tricolored bat merits separate treatment due to their ability also roost in culverts and structures (not an ONLY tree-roosting bat).
        - Scott noted that a culvert field review was conducted – those present near the Bad Creek Project were too small (< 18-inches in diameter) for TCB habitat suitability. Lindsey noted this was important to include in the BA.
    - Gray bat also merits separate treatment since it is not a tree roosting bat.

    - Indiana bats are tree roosting but overwinter in caves. Caves are not present in project area (e.g., there is no karst geology).
        - Scott and colleagues searched the existing access tunnel for bat presence. Lighting, positive air pressure, high level of human activity, and warm temperatures were observed; there was no evidence of bat use. The bat survey also located an acoustic sensor near this location and no Indiana bats were detected.
- USFWS noted that BGEPA and MBTA evaluations should not be included in the BA.
- Review of impact categories (e.g., habitat alteration, noise/vibration, other harm, etc.).
    - USFWS noted to add helicopter use in the “Other Impact” category.
    - Melanie noted that increased use of roads during construction can potentially increase strikes of tricolored bat foraging along those corridors; however, species will habituate and strike impacts may be mitigated by existing tree canopy overhanging roads.
        - Evaluate potential for strikes under "Other Harm" and limit to a few years until the bats habituate.
- USFWS confirmed there is no need to provide a NLEB/TCB Determination Key result with the BA.
- Melanie will review draft BA ahead of FLA filing.
    - Duke Energy/HDR will target providing USFWS a draft BA by end of March 2025 to provide at least 60 days for USFWS review.
    - Melanie is the UFSWS FERC coordinator, will be the point of contact, and will distribute to her team to review.
- Potential determination discussion:
    - USFWS stated there may be adverse effects, but likely no jeopardy with implementation of conservation and mitigation measures.
    - As part of the BiOp - USFWS will analyze jeopardy and will issue incidental take statement as part of the BiOp.
    - USFWS indicated that pursuing an ESA Section 10 permit is not necessary.
    - Christy is the final signatory on the BiOp.

Conservation Measures

- Scott noted the USFWS Minimum Conservation Measures (MCM) for protection of bats in the *NLEB and TCB Voluntary Environmental Review Process for Development Projects V1.0* (dated 10/15/2024) will be followed for tree roosting bats. Duke Energy extended appreciation for the timely USFWS MCM guidelines.
- Melanie noted that tree clearing during winter is ideal.
    - It may be difficult to implement clearing only during winter over the course of project construction; the critical timeframe to avoid clearing during the pupping season (May 15-July 31). Should avoid the pupping season and quantify how much tree clearing will occur during active season (provide upper estimate) in general. Scott noted tree clearing will need to be phased, given the scale of the BCII construction.

- Scott asked if Indiana bat and NLEB are determined to be present – i.e., does the clearing avoidance pupping timeframe expand to include clearing avoidance during spring and fall swarming.
    - USFWS stated that the Project is not located within 0.5 miles of known hibernaculum, so USFWS doesn't expect so.
        - Follow-up: This action has been completed. In an email dated January 16, 2025, USFWS confirmed that the project is not located within 0.5 miles of a known hibernaculum.
        - In an email dated January 24, 2025, USFWS stated "For the hibernation range avoiding tree clearing during the active season (summer occupancy April 1 - Sept 30) is the best, however, we understand that this is a good portion of the year and really limits projects, so avoiding the pupping season (May 15-July 31) is the next best conservation measure. Implementing this pupping season restriction would avoid impacts to pregnant/lactating females and non-volant pups. We find it acceptable for Duke implementing this avoidance period and continuing to evaluate the project impacts to make a determination of effect for the tree roosting bats."
- Scott noted additional best management measures that Duke Energy commonly implements include:
    - Not clearing when temperatures are below 40 degrees Fahrenheit during the authorized tree clearing season.
    - If trees are observed to have shaggy/loose bark, measures may include flushing bats (e.g., tapping trees). Lindsey noted this should be captured in conservation measures, but is also as an effect because it forces bats out of the trees.
- Melanie suggested to also include discussion in BA about relevant funding/mitigation for species from Bad Creek Relicensing Agreement as a mitigation measure. Melanie specifically recalled the potential Wildlife Enhancement Funding contained in the BCRA.
- Scott asked about gray bat conservation measures. Melanie noted there may not be any and that a May Affect Not Likely to Adversely Affect is still likely.
    - Tree removal and blasting are the potential impacts.
- Kelly asked if there are any studies or data for blasting/noise impacts (vibrations, decibel levels) to bats. USFWS does not have recommended references or data.
    - The Indiana bat conservation measure is to stay away from hibernaculum with noise/vibrations.
    - Kelly asked if there are any recommendation for time of day for blasting and USFWS answered no.
    - Noise and vibration from blasting are fairly directional and confined, and are less impactful the further away from the surface where it occurs so significant impacts are not a concern. Christy does not anticipate major effects to this suite of bat species (unless an Indiana bat cave is identified). There are no restrictions for blasting during pupping season. Deep underground blasting is not likely to have a surface impact.

        - Christy noted that extensive studies (related to Indiana bat and blasting in West Virigina) support this discussion. There is really only disturbance to Indiana bat if blasting directly beneath trees and proximity to caves.
        - Tree removal for surface blasting is the impact – the tree removal is what drives the formal consultation.
    - USFWS suggested to note in the BA where the closest known hibernacula are located relative to the project.
        - Action item: Scott to provide the data from his work on the Bat HCP. HDR/Duke will contact additional NC or SC agencies if needed to obtain this data. [completed]
        - Alan and Scott discussed that there were no hibernacula associated with Cedar Cliff (western North Carolina) and the project did include blasting and clearing. Tree clearing was conducted outside of time of year restrictions.
- USFWS noted that operational impacts evaluated in the BA should be minimal overall.
    - Christy noted, as above, that it is important to separate analysis for construction (time-constrained event) and operations, such that the overall effect to species is a shorter duration and not expected to have lingering effects over time. Kelly noted this will be done for each species.
- USFWS noted that tree removal outside the pupping season is the primary conservation measure.
- Discussion about additional recommended measures ensued.
    - Permanent and temporary lighting to be down-casted if possible (typically USFWS requests no work at night) and to focus on the temporary impacts (not permanent) - especially for construction.
        - Duke Energy noted that overnight construction cannot be eliminated. Kelly noted there is lighting guidance in the NLEB/TCB Determination Key.
        - As an example, USFWS views SCDOT lighting/overnight work as undesirable.
        - Action item: Duke Energy/HDR will review construction lighting within 1,000 feet of suitable roosting habitat. [ongoing]
- Melanie noted USFWS typically recommends consideration for continuing monitoring of bats as species protection measures. Melanie noted that the bat monitoring efforts at Catawba Wateree as an example in South Carolina. Details of a monitoring plan can be fleshed out later (i.e., BA should note the development of the Bat Species Protection Plan, but details are not necessary for BA).
    - Kelly asked if a monitoring plan would allow for not redoing a full bat survey after 5 years and USFWS answered, potentially yes.
    - This relicensing would not trigger formal consultation if not for BCII. But USFWS would still recommend monitoring even if BCII not proposed or executed.
    - USFWS is interested in monitoring long term for general trends; methods do not need to be as extensive as Biotope's survey, but should follow USFWS summer survey guidelines.

- Bad Creek Relicensing Agreement Species Protection Plans:
    - Reviewed list of species (suggested by SCDNR) and noted there will be mention of these in BA but not full discussion.
    - Kelly asked about how long plant species surveys are valid for.
        - Plant surveys don't have set expiration by USFWS. Not a concern given none present and habitat not strong – likely results in a May Affect Not Likely to Adversely Affect.
        - USFWS noted that once habitat is disturbed then don't need to resurvey.
- Avian protection measures:
    - Duke noted that existing towers don't have strike deflectors measures installed. No historical occurrences/issues with collision or electrocution with the existing right-of-way. However, flight diverters and a retrofit of existing transmission line will be done as part of the Bad Creek Relicensing Agreement.
    - Kelly asked for confirmation there will be no avian discussion in the BA. USFWS confirmed.

Miscellaneous

- Kelly noted and Melanie confirmed that multiple tracking IDs for the project have been created for BCII.
    - 2022-0030610 is what Melanie is using. She advises to pick a tracking ID that has the most activity and provide to her. Melanie will link all overlapping tracking IDs for the Bad Creek Project in the USFWS system.
    - Action item: Kelly will investigate this and provide the preferred tracking ID back to Melanie.
        - Follow-up: This action item has been completed. HDR would like to use tracking ID 2024-0130237; all others can be superseded.
- Melanie will attend the USR meeting on 1/16/2025 via Teams.
- USFWS is planning a BatBlitz near the SC-GA border as part of additional research ongoing by USFWS.
- (Not directly related to Bad Creek Project) Scott noted that until the bat HCP is implemented in 2027, Duke Energy is following current MCM guidance and has an agreement with the USFWS Asheville office. Scott would like to have a similar interim agreement with Charleston and other offices (Raleigh, Bloomington, Jacksonville), though not a signed agreement.

Action Items

- USFWS to provide feedback regarding the strong MLE values with respect to Indiana bat and NLEB. [completed]
- Duke Energy to consult with USFWS contacts in Atlanta office for BGEPA and MBTA consultation. [ongoing]
- Scott (Duke Energy) to provide HDR with Bat HCP disturbance activities and effects table. [completed]

- Scott (Duke Energy) to provide HDR hibernaculum locations from his work on the Bat HCP. [completed]
- Duke Energy/HDR will review construction lighting within 1,000 feet of suitable roosting habitat. [ongoing]
- Lindsey (USFWS) will confirm the dates for clearing avoidance are contained to the pupping season (per Appendix 2 of the *NLEB and TCB Voluntary Environmental Review Process for Development Projects V1.0*, dated 10/15/2024) if Indiana bat and NLEB are determined to be present. [completed]
- Sarah (HDR) to search for a previous FERC EA with a BiOP included as an example proceeding to inform Duke Energy's and USFWS' understanding of sequence and timing of post-filing formal consultation activities. [ongoing]
- Kelly (HDR) to follow up with Melanie with preferred USFWS IPaC tracking number for the project. [completed]