# UPDATED STUDY REPORT

## Bad Creek Pumped Storage Project
## FERC Project No. 2740

*Oconee County, South Carolina*

Prepared by: HDR Engineering, Inc.

Prepared for: Duke Energy Carolinas, LLC

***January 2025***

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# BAD CREEK PUMPED STORAGE PROJECT
# FERC PROJECT NO. 2740
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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| APE | Area of Potential Effect |
| Bad Creek or Project | Bad Creek Pumped Storage Project |
| Bad Creek II | Bad Creek II Power Complex |
| CFD | Computational fluid dynamics |
| CFR | Code of Federal Regulations |
| CHEOPS | Computer Hydro-Electric Operations and Planning Software™ |
| CUI // PRIV | Controlled Unclassified Information // Privileged |
| CWA | Clean Water Act |
| DEM | Digital elevation model |
| DLA | Draft License Application |
| Duke Energy or Licensee | Duke Energy Carolinas, LLC |
| EJ | Environmental Justice |
| FERC or Commission | Federal Energy Regulatory Commission |
| FLA | Final License Application |
| HDR | HDR Engineering, Inc. |
| ILP | Integrated Licensing Process |
| ISR | Initial Study Report |
| KT Project | Keowee-Toxaway Hydroelectric Project |
| LIP | Low Inflow Protocol |
| NOI | Notice of Intent |
| NRHP | National Register of Historic Places |
| PAD | Pre-Application Document |
| PSP | Proposed Study Plan |
| RC | Resource Committee |
| RSP | Revised Study Plan |
| SCDES | South Carolina Department of Environmental Services |
| SCDNR | South Carolina Department of Natural Resources |
| SHPO | State Historic Preservation Office |
| SPD | Study Plan Determination |
| SQT | Stream Quantification Tool |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| USR | Updated Study Report |
| WQMP | Water Quality Monitoring Plan |

# 1 Introduction and Background

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the owner and operator of the 1,400-megawatt Bad Creek Pumped Storage Project (Project) (Project No. 2740) located in Oconee County, South Carolina, approximately eight miles north of Salem. The Project utilizes the Bad Creek Reservoir as the upper reservoir and Lake Jocassee, which is licensed as part of the Keowee-Toxaway (KT) Hydroelectric Project (FERC Project No. 2503), as the lower reservoir.

The existing (original) license for the Project was issued by the Federal Energy Regulatory Commission (FERC or Commission) for a 50-year term, with an effective date of August 1, 1977, and expires July 31, 2027. The license has been subsequently and substantively amended, with the most recent amendment on August 6, 2018, for authorization to upgrade and rehabilitate the four pump-turbines in the powerhouse and increase the Authorized Installed and Maximum Hydraulic capacities for the Project.[1] Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Given the need for additional significant energy storage and renewable energy generation across Duke Energy's service territories over the Project's new 40 to 50-year license term, Duke Energy is proposing additional pumping and generating capacity at the Project. Additional energy storage and generation capacity would be developed by constructing a new power complex (including a new underground powerhouse) adjacent to the existing Bad Creek powerhouse. Therefore, the effects of construction and operation of the 1,400-megawatt Bad Creek II Power Complex (Bad Creek II) is being evaluated by Duke Energy in conjunction with Project relicensing. The proposed expanded Project Boundary including lands necessary for the construction and operation of Bad Creek II is shown on Figure 1.

[1] *Duke Energy Carolinas LLC*, 164 FERC ¶ 62,066 (2018)

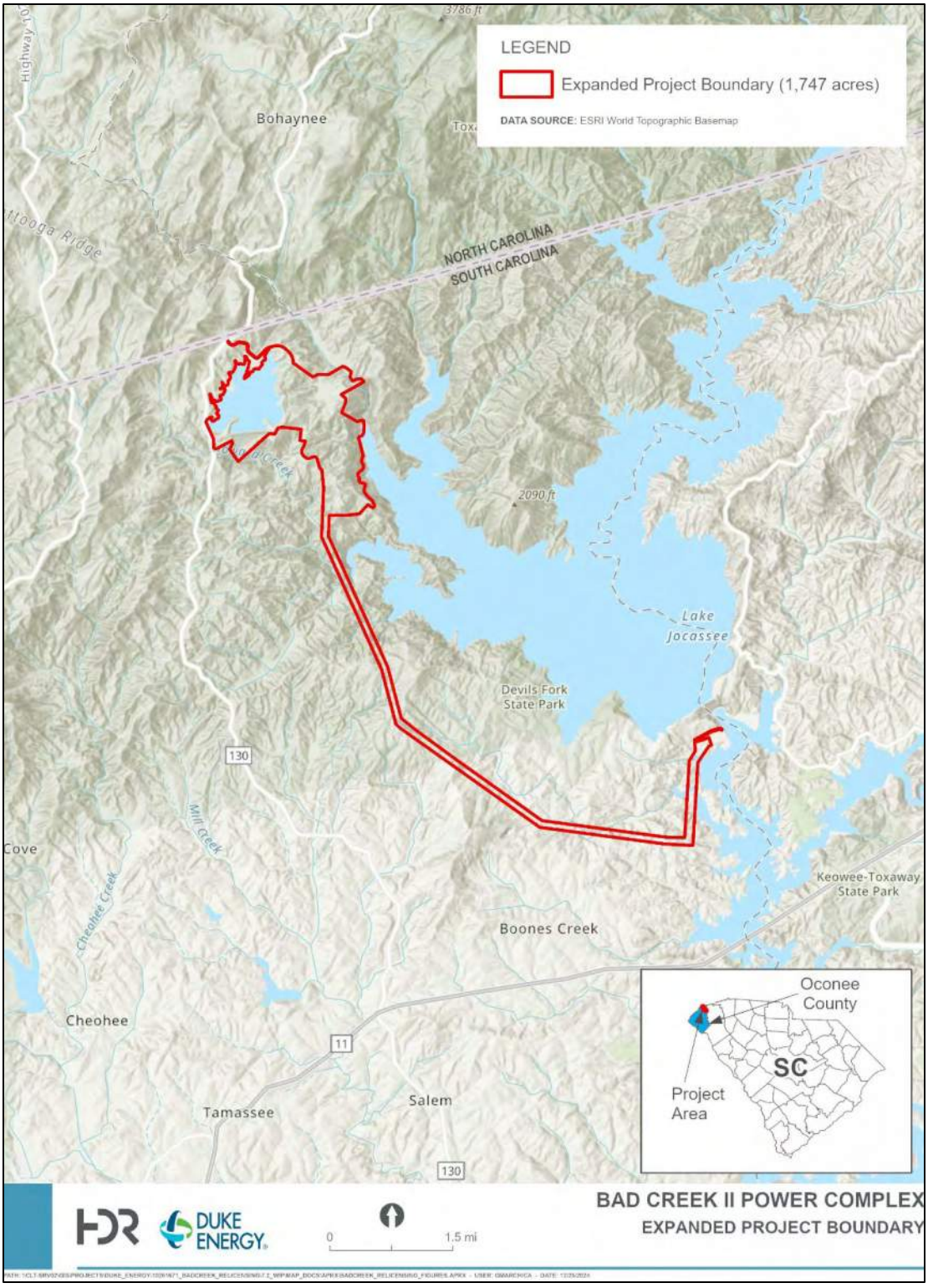


**Figure 1. Bad Creek Pumped Storage Project Location and Proposed Expanded Project Boundary**

Duke Energy filed a Pre-Application Document (PAD) and associated Notice of Intent (NOI) with the Commission on February 23, 2022, to initiate the ILP. The PAD provides a description of the Project and summarizes the existing, relevant, and reasonably available information to assist the Commission, resource agencies, Indian Tribes, non-governmental organizations, and other stakeholders in identifying issues, determining information needs, and preparing study requests. Based on stakeholder comments on the PAD, NOI, and Proposed Study Plan (PSP) filed August 5, 2022, and in consideration of FERC criteria for study requests under the ILP, Duke Energy proposed a total of six resource studies in the Revised Study Plan (RSP) in accordance with 18 CFR §5.11, which was filed with the Commission and made available to stakeholders on December 5, 2022. FERC issued its Study Plan Determination (SPD) on January 4, 2023, which included modifications to one of the six proposed studies (Recreational Resources Study). These six studies support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of Bad Creek II.

- Water Resources Study
- Aquatic Resources Study
- Cultural Resources Study
- Visual Resources Study
- Recreational Resources Study
- Environmental Justice Study

Duke Energy completed its first year of studies in 2023 and its second year of studies in 2024 with stakeholder consultation as required by the Commission's SPD. Duke Energy filed the Initial Study Report (ISR) on January 4, 2024, and per the Commission's regulations at 18 CFR §5.15(f), Duke Energy held an ISR meeting with participants and FERC staff within 15 days of filing the ISR on Wednesday, January 17, 2024; copies of the meeting summary and presentation are included in **Attachment 1**. Timely comments on the ISR and meeting summary were received[2] and are included in **Attachment 1**, along with Duke Energy responses. On May 2024, FERC issued a letter requesting additional information related to the ISR and Duke Energy provided a response on June 12, 2024; copies of correspondence are included in **Attachment 1**.

[2] In their ISR comments, FERC staff requested GIS data and raw water quality data; these data files will be filed concurrently with the USR.

In accordance with the schedule presented in the RSP, Duke Energy has provided relicensing stakeholders with Quarterly ILP Study Progress Reports that include a description of study activities conducted during the previous quarter, activities expected to occur in the next quarter, and identified variances from the approved study plan. Study Progress Reports from 2024 are included in **Attachment 1**[3].

This Updated Study Report (USR) describes the Licensee's methods and results of the studies conducted in support of preparing an application for a new license for the existing Project and construction of Bad Creek II.

The Commission's regulations at 18 CFR §5.15(f) require Duke Energy to hold a meeting with participants and FERC staff within 15 days of filing the USR. Accordingly, Duke Energy will hold a USR Meeting on January 16, 2025. Additional details regarding the meeting are presented below. A Microsoft Teams® meeting link will be provided upon request.

| | |
|---|---|
| Date: | Thursday, January 16, 2025 |
| Time: | 9:00 a.m. (until 5:00 p.m., if necessary; lunch will be provided) |
| Location: | Duke Energy's Wenwood Operations Center<br>425 Fairforest Way<br>Greenville, SC 29607 |

To provide an RSVP for the meeting for Duke Energy's planning purposes, or for additional information, please contact:

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An agenda for the USR Meeting is provided in **Attachment 2**. Participants are free to join the meeting in part based on interests or availability, but please note that the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

[3] Final relicensing study reports that were filed as attachments to Quarterly Progress Reports are not included in Attachment 1 as these are provided in individual USR Appendices.

## 1.1 Study Implementation

Duke Energy conducted studies in 2023 and 2024 in accordance with 18 CFR §5.15, as provided in the RSP and as subsequently modified by FERC. Major ILP milestones to-date are presented in Table 1. Duke Energy will submit all study documents that must be filed with the Commission via FERC's eFiling system.

**Table 1. Major ILP Milestones Completed**

| Date | Milestone |
|---|---|
| February 23, 2022 | Duke Energy Filed NOI and PAD (18 CFR §5.5, 5.6) |
| April 22, 2022 | FERC Issued Notice of PAD/NOI and Scoping Document 1 (18 CFR §5.8(a) and §5.8(c)) |
| May 16 & 17, 2022[1] | FERC Conducted Scoping Meetings (18 CFR §5.8(**d)**) |
| June 23, 2022 | Stakeholders Submitted Comments on the PAD, Scoping Document 1, and Study Requests (18 CFR §5.9) |
| August 5, 2022 | FERC Issued Scoping Document 2 (18 CFR §5.10) |
| August 5, 2022 | Duke Energy Filed PSP (18 CFR §5.11(a)) |
| September 7, 2022 | Duke Energy Held Study Plan Meeting (18 CFR §5.11(e)) |
| November 5, 2019 | Stakeholders Submitted Comments on the PSP (18 CFR §5.12) |
| December 5, 2022 | Duke Energy Filed RSP (18 CFR §5.13(a)) |
| December 20, 2022 | Stakeholders Submitted Comments on the RSP (18 CFR §5.13(b)) |
| January 4, 2023 | FERC Issued the SPD (18 CFR §5.13(c)) |
| March 30, 2023 | Duke Energy Submitted First Quarterly Report and ILP Study Update |
| May - November 2023 | Duke Energy Conducted First Season of Field Studies (18 CFR §5.15(a)) |
| July 28, 2023 | Duke Energy Submitted Second Quarterly Progress Report (18 CFR §5.15(b)) |
| September 28, 2023 | Duke Energy Submitted Third Quarterly Progress Report (18 CFR §5.15(b)) |
| January 4, 2024 | Duke Energy Submitted ISR (18 CFR §5.15(c)(1)) |
| January 17, 2024 | Duke Energy Hosted ISR Meeting (18 CFR §5.15(c)(2)) |
| February 1, 2024 | Duke Energy Filed ISR Meeting Summary (18 CFR §5.15(c)(3)) |
| January – November 2024 | Duke Energy Conducted Second Season of Field Studies (18 CFR §5.15(a)) |
| April 1, 2024 | Duke Energy Submitted Fourth Progress Report (18 CFR §5.15(b)) |
| June 28, 2024 | Duke Energy Submitted Fifth Quarterly Progress Report (18 CFR §5.15(b)) |
| October 2, 2024 | Duke Energy Submitted Sixth Quarterly Progress Report (18 CFR §5.15(b)) |

[1] Due to the ongoing construction upgrade activities at the Project, the remote location of the Project, and COVID-19 conditions in early 2022, Duke Energy prepared an overview video orientation of the Project for general viewing by interested parties in lieu of an on-site environmental review site visit. The virtual environmental site review presentation was given by Duke Energy one hour prior to each scoping meeting, pursuant to 18 CFR §5.8(d). A site visit was later held with the relicensing Resource Committees in August 2022, and a site visit is planned for FERC staff on January 15, 2025.

In addition to the major ILP milestones listed above, Duke Energy has conducted additional stakeholder consultation since the PSP through the relicensing Resource Committees (RCs). The following RCs were established to facilitate implementation of the relicensing studies and development of Duke Energy's relicensing proposal in the draft license application (DLA) and final license application (FLA):

- Aquatic Resources
- Water Resources
- Recreation & Visual Resources
- Wildlife & Botanical Resources
- Cultural Resources
- Operations

RC meetings since the filing of the PSP are listed in Table 2. In addition to RC meetings, Duke Energy has also consulted with individual RC members regarding study plan development, study implementation, and study report comments.

**Table 2. Relicensing Resource Committee Meetings**

| Date | Consultation Activity |
|---|---|
| August 16, 2022 | Project site visit and tour of the powerhouse and upper reservoir. |
| November 17, 2022 | Virtual meeting with all RCs to review and discuss comments received on the PSP. |
| February 22, 2023 | Hybrid in-person/virtual meeting with the RCs to discuss implementation of the studies in accordance with the SPD. |
| March 28, 2023 | Meeting with the Recreation & Visual Resources RC to discuss the Recreational Resources and Visual Resources studies methodology and schedules. |
| April 6, 2023 | Aquatic Resources RC meeting to discuss initial results of the Aquatic Resources Task 1 Entrainment Study. |
| May 16, 2023 | Virtual meeting with Water Resources RC to discuss results of Task 1 of the Water Resources Study. |
| July 27, 2023 | Hybrid in-person/virtual meeting with Water and Aquatic Resources RCs to discuss study progress and results to-date. |
| July 27, 2023 | Hybrid in-person/virtual meeting with the Recreation & Visual Resources RC to discuss and select Key Views for the Visual Resources Study and provide update on the Recreational Resources Study. |
| July 31, 2023 | Virtual meeting with the Wildlife and Botanical RC to discuss updates regarding listed species, proposed temporary access road, avian protection along the transmission line corridor, and Clean Water Act (CWA) Section 404/401 permitting. |
| January 11, 2024 | Virtual meeting with the Recreation & Visual Resources RC to discuss and choose Key Observation Points based on photos captured during leaf-off conditions in November 2023 and obtain input for selection of nighttime views for photo rendering. |
| April 4, 2024 | Virtual meeting with the Water Resources, Operations, Aquatic Resources, and Recreation & Visual Resources RCs to discuss results of CHEOPS modeling and additional CFD modeling. |
| May 9, 2024 | Virtual meeting with the Recreation and Visual Resources RC to discuss results of the Recreation Use and Needs Study and updates on the Visual Resources Study. |

In addition to the FERC-approved studies, Duke Energy notes additional consultation and fieldwork were performed in support of the future application to be filed pursuant to CWA Section 404/401 permitting for construction of Bad Creek II including a herptile survey (filed with the ISR), a bat study plan and survey, and a small whorled pogonia study plan and survey. The bat survey and small whorled pogonia survey reports, which were developed in consultation with the Wildlife and Botanical RC, are provided in **Attachment 3** and **Attachment 4,** respectively.

Duke Energy requested a CWA 404/401 pre-application meeting, which was subsequently held with the U.S. Army Corps of Engineers (USACE), South Carolina Department of Natural

Resources (SCDNR), South Carolina Department of Environmental Services (SCDES) [4], U.S. Fish and Wildlife Service (USFWS), Catawba Indian Nation, Duke Energy, and Duke Energy's consultant (HDR Engineering, Inc [HDR]), on March 28, 2024. A follow-up meeting with Duke Energy, HDR, and USACE was held on April 11, 2024, to further discuss the permitting process. An Approved Jurisdictional Request was filed with the USACE on September 27, 2024, and an on-site field visit to verify waters of the U.S. determinations took place in early December 2024. Additionally, a meeting with SCDES was held on August 8, 2024, to introduce and discuss plans for future monitoring of waters of the U.S. during and after construction of Bad Creek II, and a meeting with USFWS was held on December 18, 2024 to discuss Duke Energy's plans for preparation of a Biological Assessment and potential protection, mitigation, and enhancement measures for listed bat species.

In March 2024, Duke Energy began negotiating a Relicensing Agreement with relicensing stakeholders to reach consensus on measures to minimize potential impacts to environmental resources for continued operation of the project as well as construction of Bad Creek II. During the negotiation process, Duke Energy reached consensus with stakeholders and issued a binding Relicensing Agreement for signature on December 6, 2024.

## 1.2 USR Document Road Map

The USR consists of six individual study reports; technical reports for studies that have been revised or completed since the ISR filing are included as appendices to this USR. Table 3 lists the study reports (i.e., appendices) and associated attachments, as well the timeframe for the study as approved by the Commission and status of the individual study reports [by task]. Final reports filed with the ISR are not being filed again. However, as noted below in Table 3, two reports for which addenda were developed in 2024 are included, without modification since the ISR, for reference.

[4] SCDES was established on July 1, 2024, when the South Carolina Department of Health and Environmental Control became two separate agencies.

The final Cultural Resources Study Report (**Appendix E**) is being filed separately as Controlled Unclassified Information // Privileged (CUI // PRIV)[5] pursuant to 18 CFR § 388.112, as this report contains information regarding the specific location and nature of historic and archaeological resources, which is not for public disclosure.

[5] Classified Uncontrolled Information // Privileged (CUI // PRIV) - Denotes information that section 388.112 of the Commission's regulations, 18 CFR §388.112, recognizes as privileged. The term 'privileged' includes any work-product privilege, attorney-client privilege, governmental privilege, or other privilege recognized under Federal, State, or foreign law. FERC CUI Processes | Federal Energy Regulatory Commission

## Table 3. USR Organization and Study Report Status

| USR Appendix | Study Task | Attachment | Included in USR | Status / Notes |
|---|---|---|---|---|
| Appendix A - Water Resources Study | Task 1 – Summary of Existing Water Quality Data and Standards | 1* | No | Final filed with ISR. |
| | Task 2 – Water Quality Monitoring in Whitewater River Arm | 2 | Yes | Complete; Final report included. |
| | Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse | 3 | Yes | Final report was filed with ISR, however, an addendum was developed in 2024, therefore, this report is being filed again to maintain connection between report and addendum. |
| | Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels | 4 | Yes | Complete; Final report included. |
| | Task 5 – Future Water Quality Monitoring Plan Development | 5 | Yes | Interim draft reflecting SCDES and stakeholder feedback. Revised plan will be included with the FLA. |
| | Consultation Documentation | 6 | Yes | Includes consultation specific to this study since the ISR filing. |
| Appendix B – Aquatic Resources Study | Task 1 – Consultation on Entrainment | 1 | Yes | Final report was filed with ISR, however, two addenda were developed in 2024, therefore this final report is being filed again to maintain connection between report and addenda. |
| | Task 2 – Desktop Studies on Pelagic and Littoral Habitat Effects | 2 | Yes | Complete; Final report included. |
| | Task 3 – Mussel Surveys and Stream Habitat Quality Surveys | 3 | Yes | Complete; Final report included. |
| | Consultation Documentation | 4 | Yes | Includes consultation specific to this study since the ISR filing. |

| USR Appendix | Study Task | Attachment | Included in USR | Status / Notes |
|---|---|---|---|---|
| Appendix C – Visual Resources Study | Tasks 1 – 9<br>(Consultation documentation included) | N/A | Yes | Complete; Final report included. |
| Appendix D – Recreational Resources Study | Task 1 – Foothills Trail Corridor Recreation Use and Needs Methodology | 1 | Yes | Complete; Final report included. |
| | Task 2 – Foothills Trail Corridor Conditions Assessment | 2 | Yes | Complete; Final report included. |
| | Task 3 – Whitewater River Cove Existing Recreational Use Evaluation | 3* | No | Final report filed with ISR. |
| | Task 4 – Whitewater River Cove Recreational Public Safety Evaluation | 4 | Yes | Complete; Final report included. |
| | Consultation Documentation | 5 | Yes | Includes consultation specific to this study since the ISR filing. |
| Appendix E – Cultural Resources Study | Task 1 – APE Determination<br>Task 2 – Cultural Resources Survey of the APE | 1<br>[Filed Separately CUI // PRIV] | Yes | Complete; Final report and supplemental report included. |
| | Consultation Documentation | 2<br>[Filed Separately CUI // PRIV] | Yes | Includes consultation specific to this study since the ISR filing. |
| Appendix F – Environmental Justice Study | Environmental Justice Study<br>(Consultation documentation included) | N/A* | No | Final report filed with ISR. Outreach consultation will be included in DLA. |

*Report not included; placeholder page.

## 1.3 Proposals to Modify Ongoing Studies or for New Studies

Duke Energy does not propose substantive modifications to the completed studies or new studies to be performed in support of development of the draft or final license applications and FERC staff's future environmental analysis. Adjustments to the study boundaries and field activities have been made as described in the previously filed quarterly progress reports and below in Section 2 in support of pursuit of other environmental (i.e., CWA 404/401 permitting) and local land disturbance approvals. Study boundary and field activity adjustments have been made to accommodate the following:

- **Temporary Fisher Knob Access Road:** In 2022 and 2023, Duke Energy evaluated the development of a temporary access road to the Fisher Knob community for use during the Bad Creek II construction, which warranted additional effort and expanded the area of work in several of the studies. The temporary 3.7-mile-long access road would have been constructed following license issuance on Duke-owned property and would have been maintained during construction of Bad Creek II. The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies were modified to assess the potential effects of the temporary access road. Duke Energy conducted a natural resources assessment of the proposed route to identify potential terrestrial and aquatic resources that may require additional evaluation, a presence / potential absence bat survey, and a survey for small whorled pogonia. In October 2024, after thoroughly evaluating the potential cost, design, environmental effects, and feasibility of constructing and maintaining the temporary road, Duke Energy decided to not pursue the temporary access road as an option for Bad Creek II development.
- **Spoil Areas:** Spoil area alternatives are undergoing evaluation and preliminary potential locations were presented in the ISR. Since that time, conceptual design modifications have been made to individual spoil piles (size and location) based on existing natural resources and feasibility considerations. Potential spoil areas are considered in the Water and Aquatic Resources studies and are also considered in the work carried out for CWA Section 404/401 water quality permitting. A revised map of potential spoil locations is provided in **Attachment 5**.

- **Transmission Line Corridor and Transmission Corridor Access Routes**: The existing FERC Project Boundary is 1,280 acres; an expanded Bad Creek II Project Boundary was proposed in the ISR to incorporate additional areas affected by spoil pile placement and other features pertinent to the new facility (1,490 acres). Since the ISR submittal, the proposed expanded Project Boundary was revised to include an additional 453 acres (for a total of 1,733 acres) largely as a result of widening the existing transmission line corridor to accommodate the new approximately 9.25-mile-long 525-kV transmission line for Bad Creek II and, to a lesser extent, to accommodate a potential spoil area just northeast of Bad Creek Reservoir. Due to these adjustments, the Cultural Resources Area of Potential Effects (APE) was expanded to 1,733 acres and additional field surveys were performed per Section 106 of the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.). Findings from additional surveyed areas are included in the Cultural Resources Study Report Addendum. Other wildlife and natural resources were not resurveyed within the corridor as previously completed linear surveys included buffers that encompassed the additional areas.

  Duke Energy is presently evaluating potential improvements to existing access routes for use during construction of the proposed additional transmission line. These non-project access routes are located outside the FERC Project Boundary, owned by Duke Energy, subject to Duke Energy-held easements, or are existing U.S. Forest Service roads that would be subject to federal authorization under a non-commercial road use agreement. Primary site access for construction is provided by the existing Bad Creek Road.

# 2 Status and Summaries of Studies

This section describes Duke Energy's overall progress in implementing the study plan and schedule, data collected, and variances from the study plan and schedule. Study methods and results are summarized for each of the six studies approved in the Commission's SPD. A summary of study task status is included above in Table 3.

## 2.1 Water Resources Study

The Water Resources Study is intended to provide sufficient information to support an analysis of the potential Project-related effects on water resources, as well as potential effects or impacts due to the construction and operation of Bad Creek II, using existing and new information. The main objectives of this study are:

- To evaluate water resources and water quality impacts of current Project operations using existing data.
- To evaluate water resources and water quality impacts potentially resulting from the construction and operation of Bad Creek II.
- To address stakeholder concerns regarding water resources in the Project Boundary with clear nexus to the Project and Bad Creek II.

The five main tasks of this study are described below in Section 2.1.1 through Section 2.1.5. Individual reports documenting methods and results of completed study tasks are included in **Appendix A**. Stakeholder consultation documentation associated with the Water Resources Study since the time of ISR filing is also provided in **Appendix A.**

### 2.1.1 Task 1 – Summary of Existing Water Quality Data and Standards

#### 2.1.1.1 Overview

Duke Energy performed a literature and desktop review of available water quality data collected in Lake Jocassee and Howard Creek. The main goal of this desktop review was to compile previously collected water quality data and provide a summary of existing data from Lake Jocassee and Howard Creek under current Project operations and prior to Project operations while addressing stakeholder concerns. Data were also evaluated against current designated uses and water quality standards applicable to the Project set forth by the SCDES. The final report

was included with the ISR as **Appendix A, Attachment 1** and is not provided again in the USR. For consistency with cross-referencing in other sections of the USR, this report retains the previously assigned name of Attachment 1 and a placeholder page is included in Appendix A.

## 2.1.2 Task 2 – Water Quality Monitoring in Whitewater River Arm

### 2.1.2.1 Overview

To better understand the effectiveness of the existing submerged weir and evaluate current-day (i.e., baseline) water quality information in the Whitewater River cove of Lake Jocassee[6], Duke Energy gathered continuous temperature and periodic (bi-weekly) dissolved oxygen data from the three historic water quality monitoring stations in the Whitewater River cove from June through September of 2023 and 2024. Data collection in 2023 represents conditions under two-unit and three-unit[7] operations at the Project and data collection in 2024 represents operations with four units after the completion of all pump-turbine runner upgrades. Summaries of methods and results are provided below, and the final report, reviewed by the Water Resources RC, is included in **Appendix A, Attachment 2**.

### 2.1.2.2 Methods Summary

Three historic water quality monitoring stations in the Whitewater River arm of Lake Jocassee were assessed as part of the Water Resources Study (Stations 564.1, 564.0, 560.0). Continuous water quality data (temperature and dissolved oxygen) were collected at all three stations from June 1 – October 11, 2023 with in-Situ VuLink® dataloggers positioned at five staggered elevations.

Water temperature and dissolved oxygen data were also collected during the discrete bi-weekly sampling events; vertical profiles were collected from the water surface to the lake bottom (in approximately 6-foot [2-meter] increments) at all three monitoring locations.

[6] Water quality in the Whitewater River cove is reflective of water quality conditions in Bad Creek Reservoir. Water from Bad Creek Reservoir is exchanged directly with Lake Jocassee; due to the small drainage area of Bad Creek Reservoir, inflows are minimal and have limited to no effect on water quality or Project operations. Additionally, retention time in Bad Creek Reservoir is approximately three days under single pump-turbine operation. There are no existing water quality data in Bad Creek Reservoir; it is used only for Project operations and there is no public access.

[7] Unit 3 became operational in March 2023.

#### 2.1.2.3 Results Summary

Water quality data collected in 2023 represented conditions under upgraded three-unit operations and data collected in 2024 represented conditions under upgraded four-unit operations at the Project. There is no noticeable difference in the water quality datasets due to increased pumping or generation. Results from both years indicate water upstream of the submerged weir is, as expected, well-mixed and does not stratify, or is weakly stratified for a short period of time in early summer in the upper water column. Data from monitoring locations downstream of the weir reveal stratification under all pumping and generation scenarios, indicating the weir is functioning as it was designed and helps to dissipate energy from the I/O structure. This preservation of stratification downstream of the weir is also supported by historical water quality monitoring and by three-dimensional computational fluid dynamics (CFD) model results under current project conditions as well as Bad Creek II conditions, which will have near double the flows generated from the combined powerhouses.

Detailed results from this study are included in **Appendix A, Attachment 2.**

### 2.1.3 Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse

#### 2.1.3.1 Overview

Duke Energy developed a three-dimensional CFD model to determine the spatial extent of vertical mixing in the Whitewater River arm under three scenarios: 1) current conditions, 2) upgraded conditions, and 3) proposed conditions (additional operation of Bad Creek II Complex). In advance of CFD modeling, a 2-D hydraulic model was developed to determine the approximate affected area (associated with the Project and Bad Creek II operations) to establish the CFD boundary based on the hydraulic model results. Sixteen scenarios were evaluated to help determine the impact of Project operations on mixing in the Whitewater River arm with and without expanding the existing submerged weir (in both generating and pumping mode; and at full pond and maximum drawdown).

Summaries of methods and results are provided below, and the final report, reviewed by the Water Resources RC, was included with the ISR as **Appendix A, Attachment 3**. The report also included an addendum titled "*Bad Creek CFD Model Verification Report*", which provided a

summary of field methods and results of flow and velocity data collected in the Whitewater River cove to verify and provide stakeholders confidence in CFD model results.

After filing the ISR, Duke Energy provided updated hydraulic capacities, provided by the selected Original Equipment Manufacturer, for proposed variable speed pump-turbines for Bad Creek II. Based on this information, additional CFD modeling was conducted using the updated proposed hydraulic capacities. Results of updated CFD modeling are provided as a second addendum to the Task 3 study report.

**Report Addendums**

Two study report addenda are included in **Appendix A, Attachment 3**.

- *Addendum 1 - Bad Creek CFD Model Verification Report*: Flows were measured in the Whitewater River cove along five transects with an acoustic doppler current profiler to provide verification and confidence in modeled results. Results from the verification studies agreed well with modeled results and as mentioned above, a verification report was developed as an addendum to the Task 3 report.
- *Addendum 2- Updated Hydraulic Capacities*: In 2023, the Original Equipment Manufacturer provided design information for variable speed pump-turbines for Bad Creek II, which will result in increased hydraulic capacities compared to those initially proposed and modeled. Total pumping capacity (with both projects) would be 35,800 cfs (16,240 + 19,560 cfs), resulting in a 9 percent increase (i.e., 32,720 cfs vs. 35,800 cfs); therefore, additional model runs were performed under proposed configurations for pumping operations under full pond and minimum normal pond elevations in Lake Jocassee in the upper portion of the Whitewater River cove (i.e., upstream of the weir).

#### 2.1.3.2 Methods Summary

Models developed for determining the effect of a second powerhouse include a 2-D hydraulic flow model and a 3-D CFD model. The 2-D model was developed first to evaluate the hydraulics of the Whitewater River cove with the goal of determining the CFD model boundary. Results from the 2-D model were used as input into the CFD model to determine the downstream modeling boundary; the significantly reduced computational run time of the 2-D model was able to achieve this step in a single model run as opposed to a lengthy iterative process. Sixteen

scenarios were evaluated using the CFD model to evaluate effects of Project operations on vertical mixing in the Whitewater River arm and downstream of the submerged weir to determine how far downstream Project effects extend. Scenarios modeled the existing and expanded submerged weir configuration in both generating and pumping mode; and at full pond (elevation 1,110 feet mean sea level) and maximum drawdown (elevation 1,080 feet). Results under full pond and maximum drawdown provide potential upper and lower limits of hydraulic effects of Bad Creek II Complex operations. The CFD model domain covers approximately 922 acres and generally encompasses the area upstream of the Devil's Fork arm and Whitewater River arm confluence. Scenarios were compared relatively to assess how pumping and generating affect the hydraulics downstream of the submerged weir and also to assess how the geometry of the submerged weir affects the flow patterns and vertical mixing downstream of the weir.

#### 2.1.3.3 Results Summary

The CFD model domain was appropriately sized to evaluate the hydraulic effects of Project and Bad Creek II operations. Results indicate hydraulic effects in Lake Jocassee due to operations are limited to the model domain (i.e., the area upstream of the Devil's Fork arm and Whitewater River arm confluence) and conditions to maintain natural stratification downstream of the weir exist under all modeled scenarios.

In generation mode, the energy of the water discharged from the Project is dissipated as it is forced across the top of the existing submerged weir. Similar vertical mixing patterns result from the existing and proposed expanded weir geometries under existing and proposed generation flows. Model results indicate Bad Creek II Complex powerhouse operations will not alter existing stratification patterns observed at Station 564.0 (downstream of weir) or further downstream into Lake Jocassee.

In pumping mode, hydraulic effects due to Bad Creek II operations are limited to the Whitewater River cove upstream of the submerged weir and in the upper water column across the top of the weir. No modeled configuration of pumping operations creates mixing downstream of the submerged weir. Water quality profile data (current and historic) also support CFD model results, indicating stratification is preserved downstream of the submerged weir.

Under increased pumping capacities, higher modeled surface flows were observed at Lake Jocassee minimum reservoir level with a maximum of ten feet per second immediately downstream of the Bad Creek II lower inlet/outlet structure. The highest flows are limited to the area of the recessed shoreline associated with the structure. These high flows under maximum pumping operations could have implications for non-motorized boats (i.e., kayaks)[8] near the inlet/outlet structure in Whitewater River cove; however, it is noteworthy that Lake Jocassee has never been at minimum pond, and it is unlikely Bad Creek II would be operating at full capacity under such conditions. Additionally, at minimum pond, the northern portion of the Whitewater Water River cove upstream of the Bad Creek II lower inlet/outlet structure would be mostly dewatered (lake bottom elevation is at or above 1,080 feet above mean sea level) and would therefore be inaccessible to boating, regardless of operations. Surface flows with Lake Jocassee at full reservoir elevation and intermediate reservoir elevations were similar to existing flows.

Detailed results from CFD modeling in the Whitewater River cove are included in **Appendix A, Attachment 3**.

## 2.1.4 Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels

### 2.1.4.1 Overview

Operation of Bad Creek II, which will add pumping and generating capacity to the Project, has the potential to impact water surface elevation rate of change in Lake Jocassee compared to existing conditions (but will not change the allowable fluctuation in Lake Jocassee under the KT Project License and associated agreements). Duke Energy used the existing Computer Hydro-Electric Operations and Planning Software™ (CHEOPS) model to evaluate the difference in water exchange rate, frequency, and magnitude between Bad Creek Reservoir and Lake Jocassee due to the addition of a second powerhouse. Additionally, potential impacts to Lake Keowee as a result of operating an additional powerhouse at the Project were considered.

[8] Results of the Existing Boater Use study indicated less than 10% of boaters recreating in the Whitewater River cove do so in a non-motorized boat (i.e., kayak = 7%, canoe=<1%).

Summaries of methods and results are provided below, and the final report developed in consultation with the Water Resources, Aquatic Resources, and Recreation & Visual Resources RCs, is included in **Appendix A, Attachment 4**.

#### 2.1.4.2 Methods Summary

The existing CHEOPS model developed during KT Project relicensing was updated to evaluate Bad Creek Reservoir, KT Project, and downstream USACE reservoir elevations as well as flows under two scenarios, the Baseline Scenario and the Bad Creek II Scenario. The Baseline Scenario includes Bad Creek operations with the existing upgraded units, existing FERC license limits for Bad Creek Reservoir elevations, the requirements of the KT Project license including the Low Inflow Protocol (LIP), anticipated generation and pumping, and the 2014 Operating Agreement. The Bad Creek II Scenario is identical to the Baseline Scenario except it also includes the four additional Bad Creek II units.

CHEOPS models the effects of operational changes and physical modifications at multi-development hydroelectric projects using daily inflows, plant generating characteristics, and operating criteria of the system to simulate operations, allocate flow releases, and calculate energy production within the system. The Savannah River CHEOPS was developed during KT relicensing and updated to support Bad Creek relicensing. Model updates included incorporating upgraded units at the Project, revising the reservoir storage curve for Bad Creek Reservoir, incorporating the requirements of the current KT Project FERC license, and adding revised pumping and generation dispatch tables for Bad Creek and Jocassee Pumped Storage Station. Three hydrologic conditions were used: Normal hydrology based on an unimpaired inflow dataset for the period 1939-2011, as well as two climate change sensitivities (ccLow and ccHigh) used during KT Project relicensing.

#### 2.1.4.3 Results Summary

Modeled results for the Baseline and Bad Creek II scenarios were compared to identify potential differences in the effects of Bad Creek II as contrasted with effects under existing FERC license conditions; this comparison focused primarily on reservoir elevation effects. The effects of Bad Creek II are constrained by Duke Energy's continued compliance with the existing KT Project FERC license including the KT LIP and the 2014 Operating Agreement. These requirements

would not be modified with the relicensing of the Project or the construction and operation of Bad Creek II,

Simulated reservoir levels for Bad Creek Reservoir, Lake Jocassee, and Lake Keowee under both model scenarios were generally comparable using Normal and ccLow hydrology, but additional Bad Creek Reservoir storage was accessed for a short duration under ccHigh hydrology. Simulated reservoir elevations under the three hydrology conditions maintain reservoir elevations at Lake Keowee higher than the minimum operating levels for the existing municipal water intakes and Oconee Nuclear Station. Bad Creek and the KT Project were simulated to be in some stage of the LIP approximately 67 to 70 percent of the period of record depending on the hydrology used. Little to no effects to the downstream USACE hydroelectric projects were identified in the model results.

Typically, about 60 percent of the time, the Bad Creek II scenario results in an approximately 15-foot increase in 24-hour fluctuations at Bad Creek Reservoir as compared with the Baseline scenario. In contrast, at Jocassee, about 97 percent of the time, the Bad Creek II scenario results in an approximately 0.4- to 0.2-ft decrease in 24-hour fluctuation as compared to the Baseline scenario. The decreased range in 24-hour fluctuations in Lake Jocassee is due to increased generation and pumping volumes associated with Bad Creek II operation. Both Bad Creek and Bad Creek II operations are synched with Jocassee Pumped Storage Station operations in the model such that both Bad Creek and Bad Creek II typically generate and pump when Jocassee generates and pumps. However, a larger volume of water moves between Bad Creek Reservoir and Lake Jocassee in the Bad Creek II scenario, offsetting more of the lake level fluctuation effects at Lake Jocassee caused by Jocassee Pumped Storage Station operations. The model indicates little to no difference in 24-hour fluctuations at Lake Keowee between the Bad Creek II scenario and the Baseline scenario.

Detailed results, model description, and performance measures are included in **Appendix A, Attachment 4**.

## 2.1.5 Task 5 – Water Quality Monitoring Plan Development

### 2.1.5.1 Overview

The development of Bad Creek II and construction activities associated with it could result in temporary and permanent impacts to water resources at the Project. Accordingly, Duke Energy proposed to develop a Water Quality Monitoring Plan (WQMP) focused on water quality impacts associated with the Bad Creek II as part of the new license. The WQMP was developed in consultation with state agencies and relicensing stakeholders and focuses on the proposed Bad Creek II with the main goal of identifying applicable monitoring methods and water quality parameters and/or surface water conditions associated with construction and post-construction. Summaries of methods and results are provided below, and the draft WQMP is included in **Appendix A, Attachment 5**.

A meeting between Duke Energy, SCDES, and Duke Energy's consultant (HDR) was held on August 8, 2024, to discuss objectives and methods outlined in the WQMP as well as permitting requirements for the CWA 401 Water Quality Certification; the draft WQMP was submitted to SCDES for review on August 28, 2024, and comments were received on September 23, 2024. On October 4, 2024, Duke Energy distributed the draft WQMP to the Aquatic and Water Resources RCs for a 30-day review period. No additional comments were received. The WQMP is being maintained as draft in the USR, in the event comments on the USR or at the USR meeting merit further revision to the WQMP ahead of the final version to be filed with the FLA. Meeting summaries and consultation documentation are included in Appendix A, Attachment 6.

Duke Energy will continue to work with stakeholders to finalize the WQMP and file with the FLA.

### 2.1.5.2 Methods Summary

The WQMP identifies water quality monitoring methods in the Whitewater River cove of Lake Jocassee as well as stream condition monitoring in upland areas that will potentially be affected by Bad Creek II construction activities. Site-specific monitoring prior to Bad Creek II construction (i.e., pre-construction phase), during construction (i.e., construction phase), and for a period of time following construction (i.e., post-construction phase) to document operational conditions was evaluated when developing the WQMP.

The WQMP describes two different monitoring strategies to assess Project waters depending on location (i.e., Lake Jocassee vs. upland areas). Select water quality parameters in the Whitewater River cove of Lake Jocassee will be measured via a multi-parameter sonde, while upland surface waters will be monitored downstream of impacted areas via stream habitat quality surveys / stream assessments. These stream assessments will evaluate stream conditions, aquatic resources, and habitat function and will be supported by routine monitoring of storm events and best management practices which will be developed and implemented though the Erosion and Sediment Control permitting process (i.e., National Pollutant Discharge Elimination System Program for Construction Stormwater). In addition to supporting the Water Resources Study for the relicensing, the WQMP was developed in support of CWA 404/401 permitting related to potential impacts to surface waters down gradient from upland spoil locations and access roads as well as potential impacts to Lake Jocassee from construction activities and proposed submerged weir expansion.

#### 2.1.5.3 Results Summary

Construction activities could result in temporarily elevated turbidity from sediment loading in Lake Jocassee, which could in turn reduce quality of aquatic habitat. While water quality impacts would be temporary to the construction phase only and occur in a very localized area likely limited to the Whitewater River cove, monitoring water quality at a consistent location in Lake Jocassee during and after construction of Bad Creek II is proposed to maintain and document compliance with SCDES water quality standards for turbidity. The turbidity water quality standard for trout waters under S.C. Reg.61-69, is not to exceed 10 NTU or 10 percent above natural conditions, provided existing uses are maintained. However, Duke Energy is seeking a temporary variance from SCDES during construction of Bad Creek II to meet the turbidity compliance criteria standard for South Carolina freshwater lakes (i.e., 25 NTU).

This rationale is based on the large turbidity refugia available to sensitive species (i.e., Whitewater River cove only makes up 1.5 percent of the lake) and the fact that impacts will be temporary, allowing fish to return to Whitewater River cove following construction. Water quality data will be reported per requirements of the SCDES 401 Water Quality Certification and appropriate agencies would be consulted. An annual report will be developed by April 15 each year through the post-construction phase for filing with SCDES with a courtesy copy to FERC.

Duke Energy's proposed monitoring strategy targets potential challenges in meeting SCDES water quality standards during construction by reviewing turbidity data routinely (weekly) during construction at a location immediately downstream of the Project so issues can be identified quickly and management controls applied if necessary.

### 2.1.6 Study Status

Duke Energy has completed the Water Resources Study in accordance with the RSP and the Commission's SPD. The Water Resources Study Report is included in **Appendix A**. Tasks 1 through 5 are complete and the final study reports for Tasks 2, 3, and 4 are attached to **Appendix A** as Attachments 2, 3, and 4 (the Task 1 final report was submitted with the ISR, therefore, Attachment 1 is a placeholder page to maintain continuity in numbering). Task 5, the WQMP, is being submitted as a draft report for the reasons described above in Section 2.1.5.1 and is attached to **Appendix A** as Attachment 5. Consultation documentation associated with Water Resources Study tasks since the filing of the ISR is included in **Appendix A**, Attachment 6.

### 2.1.7 Variances from FERC-Approved Study Plan

The study has been conducted in accordance with the FERC-approved RSP except the study area was expanded to incorporate effects of the [no longer proposed] temporary access road on water resources. This modification is relevant for Task 5 only.

## 2.2 Aquatic Resources Study

The goal of the Aquatic Resources study is to evaluate potential impacts to fish and aquatic life populations, communities, and habitats, due to the construction and operation of Bad Creek II.

The main objectives of this study are to:

- Evaluate the potential for increased fish entrainment due to the addition of Bad Creek II and consult with agencies and other Project stakeholders regarding results of the desktop Entrainment Study.
- Assess changes to pelagic and littoral aquatic habitat in Lake Jocassee resulting from the expanded underwater weir and additional discharge, using models developed for the Water Resources Study and KT Project relicensing.
- Evaluate potential direct impacts to aquatic habitat (including wetlands) related to Bad Creek II construction activities and weir expansion by quantifying and characterizing

surface waters, including resource quality, and presence/absence mussel surveys in streams located in upland areas where spoil deposition may occur will also be conducted.

The tasks of this study are described below in Section 2.2.1 through Section 2.2.3. Individual reports documenting methods and results of completed study tasks are included in **Appendix B**. Stakeholder consultation documentation for the Aquatic Resources Study since the time of ISR filing is also provided in **Appendix B**.

## 2.2.1 Task 1 – Consultation on Entrainment

### 2.2.1.1 Overview

Fish entrainment at the existing Project has been a subject of extensive studies throughout the Project's history. Therefore, a significant baseline of entrainment information is currently available for review. An empirical entrainment study was completed by Duke Energy in cooperation with the South Carolina Department of Natural Resources (SCDNR) and USFWS at the Project during the first three years of operations (1991 to 1993) (Barwick et al. 1994). An updated desktop entrainment study was completed in 2021 and attached to the PAD as Appendix F. In response to comments made on the PAD from stakeholders, Duke Energy proposed Task 1 Consultation on Entrainment which was approved by FERC in the SPD.

The Desktop Entrainment Analyses (Kleinschmidt 2023[9]) included in **Appendix B, Attachment 1** was developed as a desktop study in support of relicensing and to evaluate the effects of Bad Creek II operations. More specifically, it considers the potential for the entrainment of Lake Jocassee fishes through the Project with Bad Creek II (i.e., two powerhouses). After filing the ISR, Duke Energy provided updated hydraulic capacities from the preferred Original Equipment Manufacturer for proposed variable speed pump-turbines for Bad Creek II. Based on this information, additional entrainment modeling was conducted using the updated proposed hydraulic capacities. Results of updated entrainment modeling are provided as an addendum to the Task 1 study report (i.e., Addendum 1). Additionally, per the Commission's request in their ISR comments, a literature review was carried out for the intrinsic population growth rate of threadfin shad, as well as other species of interest, as appropriate; this review is included as

[9] Kleinschmidt Group (Kleinschmidt). 2023. Desktop Entrainment Analyses. Prepared for Duke Energy. December 2021, Revised November 2023.

Addendum 2 to the Task 1 study report. (Note the Entrainment Report has not changed since ISR filing but is being filed again to maintain connectivity with addenda).

Summaries of methods and results are provided below, and the final report, which incorporates Aquatics Resources RC feedback, is included in **Appendix B, Attachment 1**.

Two study reports (addenda) are included in **Appendix B, Attachment 1**.

- *Addendum 1 - Updated Entrainment Modeling Results:* After filing the ISR, Duke Energy provided updated hydraulic capacities, provided by the selected Original Equipment Manufacturer, for proposed variable speed pump-turbines for Bad Creek II. Based on this information, additional entrainment modeling was conducted using the updated proposed hydraulic capacities. These additional model runs also incorporated the pump-turbine runner upgrades at the existing four units completed in March 2024. The study indicated calculated entrainment estimate aligns with previous assessments for Bad Creek II since the water volume pumped remains consistent.
- *Addendum 2 – Entrainment Literature Review:* In comments dated March 1, 2024, FERC staff requested additional information regarding the revised Desktop Entrainment Analysis provided with the ISR. This second addendum addresses FERC staff concerns by incorporating a more comprehensive literature review to ensure the best available data is used. It also provides additional insights into the effects of entrainment on the Threadfin Shad and Blueback Herring populations in Lake Jocassee.

#### 2.2.1.2 Methods Summary

Entrainment rates were developed from previously observed entrainment via hydroacoustic monitoring and tailrace netting at the Project intake (Barwick et al. 1994[10]). Entrainment rates are typically expressed in fish per million cubic feet of water; because the number of hours the Project and Bad Creek II is expected to run each day and the total volume of water pumped is known, the number of fish expected to be entrained can be estimated. An entrainment risk assessment was used to identify and analyze potential future entrainment mortality events while

[10] Barwick, D.H., T.C. Folsom, L.E. Miller, and S.S. Howie. 1994. Assessment of Fish Entrainment at the Bad Creek Pumped Storage Station. Duke Power Company. Huntersville, NC.

assessing the resiliency of the population (i.e., its ability to tolerate the expected level of mortality).

Seasonal entrainment rates were described with Log Normal distributions. The expanded Project (i.e., existing Project with Bad Creek II) is assumed to pump up to 6 hours per day on weekdays and 2 hours per day on weekends. Duke Energy provided operations data from 2014 to 2018 in 15-minute increments that would also be reflective of the new pumping operations. It was assumed that if a unit was pumping, it was pumping at max capacity for the entire 15-minute period. Therefore, the number of hours operated per day is the number of 15-minute intervals with pumping operations divided by 4. Entrainment mortality events were simulated with the open-source software package Stryke[11]. It was also assumed all fish simulated are routed through the Project and Bad Creek II powerhouses and there is 100 percent mortality. Seasonal event scenarios and seasonal unit operations are included in **Appendix B, Attachment 1** and updated pumping rates and medium numbers of fish entrained under seasonal and operational scenarios are included in **Addendum 1.**

#### 2.2.1.3 Results Summary

Based on the exploratory analysis and simulation, risk of entrainment increases at lower Lake Jocassee surface water elevations. Fluctuation in forebay elevations could increase risk of entrainment. The estimated rates of entrainment mortality at the Project or Bad Creek II Complex are not expected to affect the long-term sustainability of Lake Jocassee fish populations based on intrinsic population growth rates. The species with the largest impact, Blueback Herring and Threadfin Shad, have relatively high fecundity, meaning that population-level compensatory mechanisms would likely offset the entrainment losses in terms of effects on these fish populations. In addition, while some level of entrainment mortality will inevitably occur, many natural populations have excess reproductive capacity that will compensate for some losses of individuals. No expected risk to Blueback Herring was indicated because the estimated entrainment rate of 0.7 percent per year is substantially below the expected recovery rate of the species. The expected entrainment rate of 12 percent for Threadfin Shad is close to the expected annual increase for the slowest recovery surrogate, American Shad, indicating that entrainment

[11] https://github.com/knebiolo/stryke

mortality may keep the population from substantial increase, but is not likely to cause the population to decrease, unless combined with other non-project impacts. Recent runs to incorporate increased pumping capacities (due to variable speed turbines) showed that newly calculated entrainment rates are consistent with previous assessments since the water volume pumped will remain the same; detailed results from this study as well as additional information on species' life histories (threadfin shad and blueback herring) are included in **Appendix B, Attachment 1**.

## 2.2.2 Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat

### 2.2.2.1 Overview

The Aquatic Resources Task 2 Study evaluated how the addition of Bad Creek II operations and an expanded submerged weir could affect pelagic trout habitat in Lake Jocassee and alter littoral zone conditions by changing water discharge and surface water elevations. This objective was met through the evaluation of model results developed for the Water Resources Study (Task 3 [CFD modeling] and Task 4 [CHEOPS modeling]).

Summaries of methods and results are provided below and the final report, which incorporates Aquatic Resources RC feedback, is included in **Appendix B, Attachment 2**.

### 2.2.2.2 Methods Summary

Results from the CFD model (Task 3 of the Water Resources Study) were used to evaluate potential effects on pelagic trout habitat due to changes in water column mixing in Lake Jocassee associated with Bad Creek II operations and an expanded weir.

Results from the CHEOPS model (Task 4 of the Water Resources Study) were used to evaluate potential effects on littoral habitat in Lake Jocassee associated with differences in water exchange rates, the magnitude of water exchanges, and the frequency of such changes. Stable water surface elevations are important for species that use the littoral zone for spawning, therefore, CHEOPS model results were used to compare water surface elevations during growing and spawning seasons and the resultant amount of littoral zone habitat in Lake Jocassee under Bad Creek II operations (BCII Scenario) compared to the amount of littoral zone habitat under existing license requirements (Baseline Scenario).

#### 2.2.2.3 Results Summary

Based on a review of the CFD model output, pelagic trout habitat in Lake Jocassee was not substantially different before construction or during operation of Bad Creek II. Based on historic spatial temperature and dissolved oxygen dynamics of Lake Jocassee and hydraulic modeling to predict flow velocity and water column mixing, no impacts to pelagic trout habitat are expected as a result of Bad Creek II operations.

Most CHEOPS performance measures showed no significant differences between the Baseline Scenario and the BCII Scenario. The operation of Bad Creek II increased generation and pumping volumes that, when offset by Jocassee Pumped Storage Station operations, resulted in more stable surface elevations at Lake Jocassee based on 24-hour elevation fluctuations. As a result, some performance measures related to maximizing spawning success for black bass, Blueback Herring, sunfish, and Threadfin Shad significantly improved under the BCII Scenario when compared to the Baseline Scenario. The CHEOPS model results also indicated that reservoir levels to support littoral habitat during the growing or spawning season (at or above either 1,107 ft msl or 1,105 ft msl) were not significantly different under the BC II Scenario as compared to the Baseline Scenario, therefore, littoral habitat in Lake Jocassee under Bad Creek II operations is expected to remain the same or improve as compared to Baseline conditions. Increased generation and pumping rates in the BCII Scenario (coupled with increased Jocassee Pumped Storage Station operations which act to offset Bad Creek II operations) would reduce the range of water surface elevation fluctuation, thereby maintaining greater reservoir elevation stability during fish spawning and growing season periods. Based on the BCII Scenario results, Lake Jocassee is shown to be held most often above 1,104 ft msl which maintains greater than 98 percent of Lake Jocassee's total littoral zone habitat.

Detailed results are included in the final report, which incorporates Aquatics Resources RC feedback, in **Appendix B, Attachment 2**.

## 2.2.3 Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

### 2.2.3.1 Overview

The construction of Bad Creek II and expanded submerged weir is likely to affect surface waters and wetlands and, subsequently, may impact aquatic life. Therefore, Duke Energy evaluated the level of impacts by quantifying and characterizing surface waters, including the resource quality of those waters. Objectives for this task were met through a combination of activities including desktop description of impacted surface waters, previously conducted Natural Resource Assessments of areas of potential impact, presence/absence surveys for mussels, and characterization of habitat quality through surveys of streams in potential spoil deposition areas.

Summaries of methods and results are provided below, and the final report is included in **Appendix B, Attachment 3**. Consultation associated with this task is included in **Appendix B, Attachment 4**.

### 2.2.3.2 Methods Summary

In consultation with SCDNR, stream habitat quality surveys were completed for streams within proposed spoil locations using a combination of the U.S. Environmental Protection Agency (USEPA) Rapid Bioassessment Protocol, the North Carolina Stream Assessment Method, and SCDNR's Stream Quantification Tool (SQT). Detailed methods are provided in **Appendix B, Attachment 3**. Additionally, a memo summarizing the stream survey approach and methods prepared during consultation with SCDNR and filed with the Commission in the September 28, 2023, Relicensing Study Progress Report No. 3 is also provided in **Appendix B, Attachment 3**.

Mussel surveys consisted of an assessment for supportive habitat followed by timed searches where suitable habitat was identified. Areas surveyed for suitable mussel habitat included the shoreline of Lake Jocassee in the vicinity of the submerged weir and the proposed Bad Creek II lower inlet/outlet structure, Howard Creek, and Limber Pole Creek. Timed searches lasted a minimum of four person-hours in Lake Jocassee and one person-hour in creeks. Detailed methodology information for mussel surveys is provided in **Appendix B, Attachment 3**.

#### 2.2.3.3 Results Summary

Stream habitat quality assessments of streams within spoil locations using the USEPA Rapid Bioassessment Protocol and North Carolina Stream Assessment Method indicated the streams within potential spoil locations and those potentially crossed by the proposed temporary access road are in fully functioning condition. SQT stream ratings for streams along the temporary access road are relatively low due because the surveyed streams exhibit moderate hydraulic disconnect from the floodplain. Nonetheless, the streams are generally in stable, functioning condition for the stream classification and characteristics which they exhibit (e.g., streams classified as Rosgen B-type streams at this position in the watershed typically exhibit entrenchment). Macroinvertebrate surveys of Limber Pole Creek and Howard Creek found abundant EPT taxa and suitable habitat conditions, resulting in a high bioclassification score indicating a fully supporting system. While fish community sampling resulted in limited fish species collected from Howard Creek and none from Limber Pole Creek, this is typical of streams high in the watershed elevation where flow may be limited in areas and high gradient sections of stream may include natural barriers to upstream movement. No mussel habitat was identified in streams within potential spoil locations. Although suitable mussel habitat was present in Limber Pole Creek, Howard Creek, and areas of shoreline in Lake Jocassee, no native mussels were observed during any of the surveys. Additional study details and assessment of impacts are included in **Appendix B, Attachment 3.**

### 2.2.4 Study Status

Duke Energy has completed the Aquatic Resources Study in accordance with the RSP and the Commission's SPD. The Aquatic Resources Study Report is included in **Appendix B** which includes three attached reports, one for each of the completed study tasks.

### 2.2.5 Variances from FERC-Approved Study Plan

While there have been no variances from the FERC-approved RSP for Tasks 1 and 2 of the Aquatic Resources Study, there were minor variances for Task 3 associated with safety concerns in the field due to inclement / severe weather during field data collection. Data forms for five streams were not completed; however, consistent with SCDNR's determination during the July 2023 site visit (see **Appendix B, Attachment 3**) it is likely these streams also present fully functioning conditions.

Additionally, similar to the Water Resources study, the study area for the Aquatic Resources Study was expanded to evaluate potential effects of the [no longer proposed] temporary access road to aquatic resources. This additional area was not included in the RSP.

While not considered a variance, methods for determining stream quality were expanded to include the SQT methodology, which was completed in collaboration with the SCDNR.

## 2.3 Visual Resources Study

The goal of the Visual Resources Study is to document existing (i.e., baseline) conditions and evaluate potential visual impacts from construction and operation of Bad Creek II.

The main tasks of this study are briefly described below in Section 2.3.1 through Section 2.3.9 and the final study report including stakeholder consultation is included in **Appendix C**.

### 2.3.1 Task 1 – Existing Landscape Description

#### 2.3.1.1 Overview

The goal of Task 1 is to describe the key scenic characteristics of the existing landscape within the Project area and surrounding lands expected to potentially be within visual range of Project facilities.

#### 2.3.1.2 Methods Summary

Available information for the study area was reviewed to characterize the existing landscape and develop a baseline description for key scenic characteristics and scenic quality of the landscape within the proposed expanded Project area. Information sources included federal, state, and local government planning documents that include information on scenic and visual resource conditions; and photographs and aerial/satellite imagery; and regional management plans

#### 2.3.1.3 Results Summary

The existing landscape description provides existing available information in the study area to characterize the existing landscape within the proposed Bad Creek II area and the scenic quality of the surrounding landscape. This review established a baseline for existing conditions and character that proposed changes can be evaluated against. The management plans of landscape level scenic resources near the Project area characterize Project operations and vegetation

management that may impact visual resources within the study area. The character of the existing landscape is described using the fundamental visual elements of form, line, color, texture, and pattern. See the final report (**Appendix C**) for details of Task 1.

## 2.3.2 Task 2 – Seen Area Analysis

### 2.3.2.1 Overview

Task 2 identified areas within the existing landscape from which the existing and proposed Bad Creek facilities are or would potentially be visible. The seen area analysis was then used to identify potential Key Views (Task 4) for additional field investigations (Task 3).

### 2.3.2.2 Methods Summary

The Seen Area Analysis methodology is based on the use of standard Geographic Information System tools for calculating viewsheds based on a digital elevation model (DEM) and a set of observer points. The model analysis takes the observer dataset and a DEM raster dataset and analyzes which cells can be seen by the observer and which cannot, typically because a landform feature blocks the sight line.

The Seen Area Analysis was performed using Viewshed Analysis Spatial Analyst Tool in ESRI ArcGIS Pro software. The data utilized to perform the analysis are U.S. Geological Survey DEM data which are bare earth data that do not account for trees, buildings, or other surface objects. This represents line-of-sight conditions based only on topography. Because the primary Project area is predominantly forested, the bare earth seen area analysis results are a conservative representation of potential visibility. The seen area analysis also does not account for the effects of atmospheric conditions such as humidity, cloud cover, or fog. The effects of revegetation of spoils areas and the potential temporary access road are also not incorporated in the analyses.

The analysis was run from the perspective of project features looking out over the landscape. The results of the analysis can be used inversely to identify points in the landscape with direct views of Project features.

### 2.3.2.3 Results Summary

The seen area maps show a color gradation, with darker color indicating more observation points if the feature is visible. Areas of the landscape with a color, even pale, indicates that at least a

portion of the Project feature is visible. The maps are provided in the final Visual Resources Study Report (**Appendix C).**

## 2.3.3 Task 3 – Field Investigation

### 2.3.3.1 Overview

The goal of Task 3 was to acquire photographs of potential Key Views for use in completing Tasks 4 through 9.

### 2.3.3.2 Methods Summary

Photographs were collected on December 11, 2023, at the potential Key Views (see Task 4) selected by the Recreation & Visual Resources RC. Daytime views were collected by a three-person crew between 10:00 am and 1:30 pm; night views were collected between 6:00 pm and 9:30 pm. Weather conditions were good for photography with clear conditions during both sessions. Both 24 millimeter (mm) and 50 mm images were collected for all views.

### 2.3.3.3 Results Summary

The images collected in December 2023 are included in **Appendix C**.

## 2.3.4 Task 4 – Key Views Selection

### 2.3.4.1 Overview

The objective of Task 4 was to identify a set of Key Views that adequately covers the range of visibility and potential scenic and visual impacts of the Project. Considerations in selecting specific Key Views included viewing distance to ensure adequate representation of potential foreground, middleground, and background views of the Project features; viewing direction; and the types of viewer groups (residents, recreational users, and motorists) that might experience views of the Project facilities.

### 2.3.4.2 Methods Summary

Based on the results of the Seen Area Analysis developed for Task 2, travel routes, and potential viewer characteristics, Duke Energy identified 11 potential Key Views. The Recreation & Visual Resources RC evaluated these sites during its July 27, 2023, meeting and selected six for additional evaluation (Task 3). The RC elected to use the existing visualization of the lower inlet

/ outlet area as viewed from the Whitewater River cove that was developed during initial project planning instead of re-creating it. Duke Energy agreed to include an analysis of the visual effects along with the additional four visualizations to be developed in this study.

Four daytime Key Views were selected for use during Tasks 5 through 9 and two nighttime viewpoints for use with Task 9.

#### 2.3.4.3 Results Summary

The potential Key Views Photolog is included in **Appendix C**

## 2.3.5 Task 5 – Existing Visual Quality Assessment

#### 2.3.5.1 Overview

This task involved assessing the existing scenic and visual quality of each Key View identified during Key View selection (Task 4) based on consideration of the standard visual elements (form, line, color, texture, and pattern), the apparent naturalness of the landscape as seen from the specific Key View, and the degree of human modification of the landscape.

#### 2.3.5.2 Methods Summary

Scenic and visual quality were evaluated using concepts from the U.S. Forest Service Scenery Management System, which includes landscape character descriptions and scenic integrity objectives for U.S. Forest Service landscapes that can be used to help assess the compatibility of a proposed project with the surrounding landscape.

#### 2.3.5.3 Results Summary

The overall Scenic Integrity Objective of each view was rated based on existing conditions; results are included in **Appendix C**.

## 2.3.6 Task 6 – Visual Analysis

#### 2.3.6.1 Overview

This task involved assessment of the expected scenic and visual impact at each Key View based on changes in landform and changes or addition to structures to determine the potential extent of visual contrast introduced by the Bad Creek II, and the expected viewer response to those changes.

#### 2.3.6.2 Methods Summary

Visual simulations of the expected appearance of Bad Creek II from the selected Key Views were used to provide the basis for the visual analysis which includes assessing the effect the expansion of the Project to the landscape would have on the area's landscape character and the landscape's scenic integrity. In the visual simulation process, a rendered image from a digital three-dimensional (3D) model of the proposed project-build scenario was integrated with the existing conditions photography. Using project design and location specific information, HDR built a 3D model using Autodesk 3DS Max. Proposed facility components (i.e., Bad Creek II primary transmission line, transformer yard, switchyard, lower reservoir inlet/outlet structure, spoil disposal areas, temporary access road, etc.) were also built and simulated in the model. A virtual sun was created in the model with real-world attributes. These Project elements were then assessed in terms of their level of impact based on setting and viewer characteristics.

#### 2.3.6.3 Results Summary

The Visual Analysis results assess Key Views 2, 3, 4, 7, and 10b. Existing and proposed conditions are assessed, and results are included in Appendix C.

### 2.3.7 Task 7 – Visual Management Consistency Review

#### 2.3.7.1 Overview

This task involved review of the consistency of the Bad Creek II visualizations (Task 6) with visual resource protection guidance in the management plans (U.S. Forest Service Management Plans, Jim Tillerman Natural Resources Plan, Oconee County Comprehensive Plan, KT Shoreline Management Plan) reviewed during Task 1.

#### 2.3.7.2 Results Summary

There are no conflicts between current visual management plans and the Project or Bad Creek II.

### 2.3.8 Task 8 – Mitigation Assessment

#### 2.3.8.1 Overview

Duke Energy identified and assessed potential mitigation measures to further reduce the scenic and visual effects of Bad Creek II identified during the visual impact assessment (Task 6).

#### 2.3.8.2 Methods Summary

Measures to reduce the contrast created by Project facilities including Bad Creek II, and thereby reduce the level of scenic and visual impact, were identified and evaluated in terms of their physical feasibility, approximate cost, and effectiveness in reducing contrast and visual impact.

#### 2.3.8.3 Results Summary

Minimal adverse visual effects were identified, but potential protection, mitigation, and enhancement measures that would further reduce visual effects are included in Appendix C.

### 2.3.9 Task 9 – Conceptual Design of Bad Creek II Complex

#### 2.3.9.1 Overview

This task assesses, to the extent possible, visual resource conditions relative to site layout, conceptual designs, proposed construction processes, and lighting.

#### 2.3.9.2 Methods Summary

Based on Recreation & Visual Resources RC requests to evaluate the potential effects of additional lighting associated with Bad Creek II, a similar process to the Key Views Selection (Task 4) was used to identify potential viewpoints for lighting visualizations. HDR identified four potential nighttime viewpoints – two with foreground views and two background views. The foreground views have a clear view of the facility while the background views will support evaluation of the effects of additional facility lighting on the surrounding landscape. Photographs were collected at the four potential viewpoints and RC members selected two for lighting visualizations.

HDR developed visualizations of lighting using the selected viewpoints, evaluated the management plans reviewed during Task 1, and developed three-dimensional renderings.

#### 2.3.9.3 Results Summary

The evaluation of the conceptual design of Bad Creek II was included in the study report included in **Appendix C**.

### 2.3.10 Visual Resources Study Status

Duke Energy completed the Visual Resources Study in accordance with the RSP and the Commission's SPD. The final report, developed in consultation with the Recreation & Visual Resources RC, is included in **Appendix C**.

### 2.3.11 Variances from FERC-Approved Study Plan

The following changes to the study were made in consultation with the Recreation & Visual Resources RC:

- **Key Views:** The study plan specified that up to four Key Views would be identified. However, the RC requested, and Duke Energy agreed to evaluate five Key Views including the visualization of the lower inlet/outlet structure on Lake Jocassee that was developed during Bad Creek II planning.
- **Lighting Evaluation:** Task 9 does not specify how the lighting evaluation or effects would be evaluated. Duke Energy elected to develop visualizations using nighttime images for use with the evaluation. Duke Energy consulted with the RC to select the viewpoints for use with the lighting visualizations.

## 2.4 Recreational Resources Study

Goals and objectives of the Recreational Resources Study were met through four study tasks: (1) a Recreation Use and Needs Study for the 43-mile-long portion of the Foothills Trail (or trail) managed by Duke Energy; (2) a Foothills Trail Corridor Conditions Assessment of the 43-mile-long portion of the Foothills Trail managed by Duke Energy; (3) an Existing Recreational Use Characterization of Whitewater River cove; and (4) a Recreational Public Safety Evaluation of Whitewater River cove.

The main tasks of this study are briefly described below in Section 2.4.1 through Section 2.4.4. Individual reports documenting methods and results of completed study tasks and stakeholder consultation are included in **Appendix D**.

## 2.4.1 Task 1 – Foothills Trail Corridor Recreation Use and Needs Methodology

### 2.4.1.1 Overview

The goals of Task 1 are to assess current recreation use and identify future recreation needs along the 43-mile-long segment of the Foothills Trail and associated access areas that are maintained by Duke Energy and referenced in the existing Recreation Plan for the Project[12].

### 2.4.1.2 Methods Summary

A variety of data collection methods were employed to characterize current recreational use and determine future needs at the access areas on the Foothills Trail. Data collection methods included site inventories, traffic and trail counts, and user surveys. Overall, data collection occurred between March 1, 2023 and May 10, 2024, although the timing of each collection method varied. These data were analyzed to characterize trail use, user types and satisfaction levels, estimate future trail use, and identify recreation needs. Additionally, Applied Trails Research, LLC estimated current hiking and backpacking/camping carrying capacity of the Duke Energy-maintained portion of the Foothills Trail. Complete methods are documented in **Appendix D, Attachment 1**.

### 2.4.1.3 Results Summary

Trail counter data were used to estimate use of the Foothills Trail at the eight Duke Energy-maintained access points, the Lower Whitewater Falls Overlook, and Coon Branch Spur. Trail counter data were also collected just before the eastern terminus of the Foothills Trail within Table Rock State Park and between Table Rock State Park and Sassafras Mountain at Long Ridge Trail. Locations that received the highest use during the study period were Table Rock State Park (65,788 total visitors with an average of 239 visitors per day), Sassafras Mountain west of the observation tower (26,140 total visitors with an average of 95 visitors per day), and Bad Creek Hydro (9,223 total visitors with an average of 67 visitors per day). Locations that received the least amount of use during the study period were Laurel Fork Falls (2,522 total

[12] Duke Energy filed a copy of the 1980 document, "A Plan for Development and Management of the Foothills Trail and a supplement to the Bad Creek Pumped Storage Project #2740 Exhibit R," with the Commission on July 25, 2022, in response to additional information requested by FERC staff.

visitors or an average of 9 visitors per day) and Canebrake Access (2,702 total visitors or an average of 10 visitors per day).

During the construction of Bad Creek II, the Bad Creek Hydro Access trailhead would be closed to public access for 5-7 years. During that time, visitors would need to utilize other areas to access the Foothills Trail, Coon Branch Spur, and Lower Whitewater Falls Spur and overlook. This would impact an estimated 9,000 to 11,000 visitors, annually, between March and November and additional visitors in December, January and February. Use of Musterground Road is also analyzed in the final Task 1 report. User surveys were conducted in-person at Bad Creek Hydro, Horsepasture River, Laurel Valley, and Toxaway River between March and November 2023. An online version of the survey was also available between March and November 2023.

During the study period, 315 surveys were collected. Of the respondents living in the USA, 60.6 percent reported South Carolina as their home state, with North Carolina (16.5 percent), Georgia (6.1 percent), and Florida (4.5 percent) also commonly reported. Most respondents indicated that a primary reason for visiting the Foothills Trail was for hiking (72 percent) or backpacking (35 percent). Other popular activities were camping, wildlife viewing, picnicking, swimming, and shoreline relaxation.

Average daily vehicles, parking capacity, and turnover were used to estimate each access area's parking occupancy rate. Traffic counter data collected at Bad Creek Hydro Access, Laurel Valley Access[13], Sassafras Mountain Access, and Upper Whitewater Falls Access were used to estimate average daily vehicles at each site's parking area.

In addition to current and future use of the Duke Energy-maintained portion of Foothills Trail and associated access areas, this study examined potential impacts to recreation around the Bad Creek II construction area. Results of the Recreation Use and Needs study, including the trail carrying capacity assessment and stakeholder consultation, are included in **Appendix D, Attachment 1**.

[13] Spot count data was also used qualitatively to inform parking demand at Laurel Valley Access.

## 2.4.2 Task 2 – Foothills Trail Corridor Conditions Assessment

### 2.4.2.1 Overview

The goal of Task 2 was to evaluate the current condition of the trail surface and corridor and identify key areas of future maintenance needs or improvements for the 43-mile segment of the Foothills Trail maintained by Duke Energy. Summaries of methods and results are provided below, and the final report is included in **Appendix D, Attachment 2**.

### 2.4.2.2 Methods Summary

Duke Energy retained Long Cane Trails to perform a trail conditions assessment of the Foothills Trail maintained by Duke Energy. The 43 miles of the main trail corridor maintained by Duke Energy as well as spur trails were assessed for trail tread, out slope, backslope, drainage, constructed structures (not including engineered bridges), and corridor condition. Trail standards from the Trail Solutions guide (Felton 2004[14]) on building singletrack was used as a base for trail condition analysis. Constructed structures (such as stairs, hand railings, bridges, etc.) were identified and recorded and the location tracked geospatially. Structures in need of significant maintenance or replacement were recorded in detail with photo documentation. Similarly, trail condition and corridor features requiring maintenance or repair as well as areas of significant erosion, areas with significant drainage issues (i.e., standing water), obstructed areas along the trail (i.e., downed trees), and notable occurrences of litter and vandalism were recorded and tracked geospatially.

### 2.4.2.3 Results Summary

Long Cane Trail identified 89 areas needing maintenance or improvements (i.e., trail issues) along the 43-mile segment of the Foothills Trail and five spur trails maintained by Duke Energy. Detailed results, photographs, and stakeholder consultation are included in **Appendix D, Attachment 2.**

[14] Felton, V. 2004. Trail Solutions: IMBA's Guide to Building Sweet Singletrack (IMBA (International Mountain Bicycling Association), Ed.). International Mountain Bicycling Association.

## 2.4.3 Task 3 – Whitewater River Cove Existing Recreational Use Evaluation

### 2.4.3.1 Overview

The objectives of Task 3 included establishing baseline recreational use within the study area, specifically the level of boating use in Whitewater River cove, and quantifying potential recreational impacts of temporary closures of Whitewater River cove during Bad Creek II construction.

The final report was included with the ISR as **Appendix D, Attachment 3,** and is therefore not provided again in the USR. For consistency with cross-referencing in other sections of the USR, this report retains the previously assigned name of Attachment 3 and a placeholder page is included in Appendix D.

## 2.4.4 Task 4 – Whitewater River Cove Recreational Public Safety Evaluation

### 2.4.4.1 Overview

The operation of Bad Creek II could affect surface velocities in the Whitewater River cove downstream of the existing and proposed inlet/outlet structures. The goal of the Recreational Public Safety Evaluation is to assess potential public safety risks that may be created or exacerbated by proposed operations of Bad Creek II (i.e., pumping and generation), specifically those associated with recreational boating in Whitewater River cove.

Summaries of methods and results are provided below, and the final report, which includes Recreation & Visual Resources RC input, is included in **Appendix D, Attachment 4**.

### 2.4.4.2 Methods Summary

Task 4 integrated the findings of Task 3 (Whitewater River Cove Existing Recreational Use Evaluation) and Water Resources Study Task 3 (Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse) to evaluate recreational boating safety in the Whitewater River cove during Bad Creek II operations. Boating information gathered during the Whitewater River Cove Existing Recreational Use Evaluation activity was compared to expected velocities in the cove during periods of pumping and generation, as determined by the CFD model.

Potential boating safety concerns associated with water surface velocities at Lake Jocassee minimum and full pond elevations were identified and recommendations for public safety measures are provided in **Appendix D, Attachment 4**.

#### 2.4.4.3 Results Summary

Safety risks during construction of the Bad Creek II are not evaluated as the Whitewater River cove will be closed to public access during construction, thereby eliminating potential boater safety concerns during the construction phase.

The effects of Bad Creek II operations on recreational boating safety vary depending on Lake Jocassee elevation as described below:

- **Jocassee Normal Full Pond Elevation:** When pumping and generating at full pond elevation, the addition of Bad Creek II and the expanded weir are not anticipated to cause a significant change in water surface velocities in the Whitewater River cove. In general, no significant impacts to water surface flows are anticipated when Lake Jocassee is at full and intermediate pond elevations that would affect boating safety in the Whitewater River cove.
- **Jocassee Normal Minimum Pond Elevation:** When pumping at minimum pond elevation, the addition of Bad Creek II is anticipated to cause water surface velocities to double in areas immediately adjacent to the proposed inlet/outlet structure and expanded weir when compared to current conditions. Some localized areas of increased water velocities could result in hazardous boating conditions for non-motorized boats (i.e., kayaks) and inexperienced boaters in the recessed intake area immediately downstream of the proposed inlet/outlet structure. It is noteworthy that Lake Jocassee has never operated under maximum drawdown (i.e., 1,080 ft msl) and if these conditions were to occur, the northern portion of the Whitewater River cove would be mostly dewatered and would be inaccessible to boating, regardless of operations.

The final report included in **Appendix D, Attachment 4** details how water surface velocities are anticipated to change between the existing Project configuration and with the proposed addition of Bad Creek II during pumping and generating operations at various pond elevations.

### 2.4.5 Study Status

Duke Energy has completed the Recreational Resources Study in accordance with the RSP and the Commission's SPD and the final study report along with stakeholder consultation is included in **Appendix D**.

### 2.4.6 Variances from FERC-Approved Study Plan

This study was conducted in accordance with the FERC-approved RSP.

## 2.5 Cultural Resources Study

The main objective of the Cultural Resources Study is to evaluate the potential effects of Bad Creek II construction on sites eligible for inclusion in the National Register of Historic Places (NRHP) in consultation with the South Carolina State Historic Preservation Office (SHPO), Indian Tribes, and other stakeholders. Study goals and objectives were met through two main study tasks, which included determining the Area of Potential Effect (APE) for the Project as defined in 36 CFR § 800.16(d) and performing a cultural resources survey of the APE as briefly described below in Section 2.5.1 through Section 2.5.2.

The Cultural Resources Study was carried out in 2023 and the final study report is included in **Appendix E.** In 2024, the APE was expanded to accommodate additional areas at the Project that may be impacted by Bad Creek II construction; results of these recent 2024 surveys are presented in a supplemental document (i.e., addendum) attached to the Cultural Resources Study Report (**Appendix E)**. The Cultural Resources Study Report is being filed separately as CUI // PRIV pursuant to 18 CFR § 388.112, as this report contains information regarding the specific location and nature of historic and archaeological resources. Stakeholder consultation is provided in **Appendix E.**

### 2.5.1 Task 1 – APE Determination

#### 2.5.1.1 Overview

Duke Energy defined the APE in consultation with the SHPO and Indian Tribes as follows:

> "The APE includes all lands within the Project boundary. The APE also includes any lands outside the Project boundary where cultural resources may be affected by Project-related activities that are conducted in accordance with the FERC license."

#### 2.5.1.2 Methods Summary

Concurrence from the SHPO and participating Indian Tribes for the proposed APE was received in early 2022. Duke Energy requested concurrence to expand the APE to include the [no longer proposed] temporary access road and received concurrence in the fall of 2023. As Bad Creek II design progressed, Duke Energy proposed a further expansion of the APE to include the proposed widened corridor for the transmission line and a small portion of land to the east of Bad Creek Reservoir. Duke Energy notified the SC SHPO and Indian tribes of this expansion by letters transmitted September 11, 2024, and September 25, 2024, respectively.

#### 2.5.1.3 Results Summary

Stakeholder consultation associated with APE determinations is provided in **Appendix E.** SC SHPO issued a letter to Duke Energy on November 6, 2024 confirming the supplemental Cultural Resources study report was accepted as final, which included the revised expanded Project APE.

### 2.5.2 Task 2 – Cultural Resources Survey of the APE

#### 2.5.2.1 Overview

#### 2.5.2.2 Methods Summary

Terracon Consultants, Inc., on behalf of Duke Energy, completed a Phase I Archaeological Survey of approximately 946 acres (including 9.25 miles of transmission line corridor) and Phase II Testing of a previously recorded site near the Project. Initial fieldwork occurred from April to June 2023 and was supplemented with additional work along the approximately 9.3-mile-long 525-kV expanded transmission corridor in the summer of 2024. In addition, approximately 4.0 miles along the proposed temporary access road was surveyed. In addition to the archaeological investigations, an architectural survey was conducted to determine whether the proposed project would affect above-ground historic resources within the APE.

A supplemental Phase I archaeological investigation of approximately 87 acres and 6.3 miles of transmission line corridor was carried out in 2024 to include areas with potential to be impacted by proposed Bad Creek II 525-kv line corridor expansion. Fieldwork was conducted from August 19 through September 1, 2024. As noted above, the findings were included in an

addendum, which was submitted to the SC SHPO for their review on September 26, 2024. SHPO issued a letter to Duke Energy on November 6, 2024 confirming the supplemental Cultural Resources study report was accepted as final, which included the revised expanded Project APE. The supplemental draft report was also distributed to participating Indian Tribes on December 8, 2024. Survey methods for the initial and supplemental studies are included in **Appendix E (CUI // PRIV)**.

#### 2.5.2.3 Results Summary

One isolated find was identified during the archaeological survey. This resource, consisting of a single Middle Archaic Morrow Mountain point, is recommended as being ineligible for inclusion in the NRHP. Six previously recorded sites in the Project area could not be relocated.

Phase II testing at a previously identified site revealed the site to be a dense, multicomponent series of rockshelters containing evidence of Early Archaic through Mississippian period occupations. A possible Paleoindian component may also be present. The site is recommended as being eligible for inclusion in the NRHP under Criterion D[15] (National Register Bulletin[16] 15:21-24). The site is currently not affected by Project operations and current plans are to avoid the site during construction of Bad Creek II by directionally drilling several hundred feet below the site. If these plans change; consultation with the SHPO, Indian Tribes, and other consulting parties would be required and pursued.

The architectural survey identified four historic resources associated with Bad Creek: SHPO Site Nos. 0156–0159. None of these resources are 50 years of age nor are they considered exceptionally significant under Criteria Consideration G (National Register Bulletin 15:41-43). Therefore, these resources are recommended as being ineligible for inclusion in the NRHP but should be reevaluated once they reach 50 years of age. Lastly, although the Jocassee

[15] Criterion D. The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that have yielded or may be likely to yield, information important in prehistory or history.

[16] National Park Service. 1995. National Register Bulletin. How to Apply the National Register Criteria for Evaluation. Accessed 11/27/2023. URL: https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdfp

Hydroelectric Station (SHPO No. 0198) is eligible for the NRHP and is within the APE, the two projects are only functionally related to one another and there will be no effect on this resource.

The supplemental (2024) investigation in areas affected by the proposed expanded transmission corridor identified no new archaeological sites or above ground historic-age resources. Based on results of both studies, no historic properties will be affected by the Project. Details of the Cultural Resources survey and addendum are included in **Appendix E (CUI // PRIV)**.

### 2.5.3 Study Status

The Cultural Resources Study Report is complete and the final report with the study addendum is included in **Appendix E (CUI // PRIV)** along with consultation documentation.

### 2.5.4 Variances from FERC-Approved Study Plan

The study has been conducted in accordance with the FERC-approved RSP.

As noted above, the APE was expanded to incorporate effects of the [no longer proposed] temporary access road, transmission line corridor, and associated access roads to cultural resources.

## 2.6 Environmental Justice Study

### 2.6.1 Overview

The Environmental Justice (EJ) Study evaluates impacts to EJ communities as they relate to 1) relicensing the existing Project without construction of Bad Creek II, and 2) relicensing the existing Project and constructing and operating Bad Creek II. The goal of the EJ Study is to define the potential effects of continued Project operations during the term of a New License issued by FERC, including construction and operation of Bad Creek II, on disadvantaged EJ communities that may be present in the study area.

The final EJ Study report documenting methods and results of the completed study was included in **Appendix F** of the ISR. In their comments provided during the ISR meeting, FERC staff requested additional public outreach to engage the identified EJ communities in the relicensing process; therefore, an EJ Community Outreach Plan was developed to guide outreach activities and is summarized below. Additionally, FERC requested updated census bureau data be incorporated in the EJ analysis; recent census data will be provided in the FLA.

### 2.6.2 Methods Summary

The EJ Study identified EJ communities, non-English speaking populations, and sensitive receptor locations within the study areas. The study area is a one-mile radius and a five-mile radius of the Project. Potential effects resulting existing Project and Bad Creek II operations were evaluated within the one-mile radius while potential Bad Creek II construction effects were evaluated for the five-mile radius. An additional objective included identifying outreach strategies to engage EJ communities and non-English speaking populations in the relicensing if present within the study area. However, as discussed below, the need for additional outreach efforts beyond those currently being employed by Duke Energy as part of the relicensing process were not identified due to the distance between identified EJ communities and the potential for project-related impacts.

Although disproportionately high or adverse effects to EJ communities surrounding the Project were not identified through desktop analyses, FERC staff recommended additional outreach to the identified EJ communities. Accordingly, Duke Energy carried out public outreach efforts in late 2024 with a focus on the two geographic areas identified during the desktop analysis. Additional outreach planned in 2024 included the three EJ communities in Oconee and Transylvania counties identified during the relicensing; public meetings took place on December 10 and 11, 2024, in Salem, SC and Cashiers, NC, respectively and consisted of two town hall style public meetings. A summary of the public outreach, including the Outreach Plan, will be compiled for filing with the DLA.

### 2.6.3 Results Summary

Using the meaningfully greater analysis method, one EJ community based on race was identified out of the thirteen census block groups within the study area. Located in Transylvania County, North Carolina, the one race-related EJ community is primarily within the 5-mile zone around the Project, with the southwestern portion located within the 1-mile buffer. Two EJ communities were identified based on income below poverty level: one in Oconee County, South Carolina, and one in Transylvania County, North Carolina, both of which are located within the 5-mile zone. None of the identified EJ communities are in census block groups that border Project lands. Within the thirteen block groups in the study area, one block group includes a population of non-English speaking individuals. This block group is located in Pickens County, South

Carolina, with one percent of the population unable to speak English. No sensitive receptor locations are present within the 1-mile radius. Within the 5-mile radius, two sensitive receptor locations (schools) are on the southwestern extremity of the zone. Details and locations of each were included in Appendix F of the ISR. A summary of the 2024 public outreach will be compiled for filing with the DLA.

### 2.6.4 Study Status

The EJ Study is complete and the final technical report was filed with the ISR. In response to FERC comments on the ISR, an EJ Community Outreach Plan was developed. Public outreach is ongoing and a summary of public outreach and correspondence will be submitted with the DLA. FERC-requested updates incorporating more recent census statistics will be provided in the FLA.

### 2.6.5 Variances from FERC-Approved Study Plan

The EJ Study has been conducted in accordance with the FERC-approved RSP.

# 3 Upcoming ILP Milestones and Study Reporting

Table 4 presents upcoming ILP milestones.

**Table 4. Upcoming Major ILP Milestones Deadlines**

| Milestone | Date |
|---|---|
| Deadline to File Updated Study Report (USR) (18 CFR §5.15(f)) | January 4, 2025 |
| Deadline to Conduct USR Meeting (18 CFR §5.15(f)) | January 18, 2025 |
| File USR Meeting Summary (18 CFR §5.15(f)) | February 3, 2025 |
| Deadline to File Draft License Application (DLA) (18 CFR §5.16(a)) | March 3, 2025 |
| File Comments or Disagreements on USR Meeting Summary (18 CFR §5.15(f)) | March 4, 2025 |
| File Response to Comments on USR Meeting Summary (18 CFR §5.15(f)) | April 3, 2025 |
| Resolution of USR Meeting Summary Dispute (if necessary) (18 CFR §5.15(f)) | May 1, 2025 |
| Comments on Draft License Application (18 CFR §5.16(e)) | June 2, 2025 |
| Deadline to file Final License Application (18 CFR §5.17) | July 31, 2025 |
| Publish Public Notice of Final License Application Filing (18 CFR §5.17(d)(2)) | August 13, 2025 |

# 4 Notice of Intent to File Draft License Application

As required by 18 CFR §5.16(c), Duke Energy hereby advises the Commission of its intent to file a DLA, which will include the contents of a license application, rather than a Preliminary Licensing Proposal. The DLA will be filed no later than March 3, 2025.

# Attachment 1

Attachment 1 –
FERC
Correspondence

*(Post-ISR Filing)*

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| | |
|---|---|
| **From:** | Crutchfield Jr., John U |
| **To:** | Alex Pellett; Alison Jakupca; Amy Breedlove; Andrew Grosse; Austen Attaway; bereskind; Green, William G; caitlin.rogers; Christopher Moore; Churchill, Christy; Wes Cooler; RankinD; Andy Douglas; Bruce, Ed; Greg Mixon; jhains@g.clemson.edu; Erika Hollis; Jeff Phillips; Jennifer Kindel; EMJOHNSON@scdah.sc.gov; jtk7140@me.com; Keith A. Bradley; Kelly Kirven; Ken Forrester; Kulpa, Sarah; quattrol; Dunn, Lynne; Raber, Maverick James; McCarney-Castle, Kerry; Abney, Michael A; Elizabeth Miller; lputnammitchell@gmail.com; Amedee, Morgan D.; Morgan Kern; Mularski, Eric; Wahl, Nick; Olds, Melanie J; Pat Cloninger; More, Priyanka; Bill Ranson-Retired; SelfR; Rowdy Harris; Salazar, Maggie; Samantha Tessel; Fletcher, Scott T; Scott Harder; taylors@dnr.sc.gov; Settevendemio, Erin; Chris Starker; Stuart, Alan Witten; Tom Daniel; Wenonah Haire; Dale Wilde; William T. Wood; suewilliams130@gmail.com; simmonsw@dnr.sc.gov; gcyantis2@yahoo.com; Kevin Nebiolo |
| **Cc:** | Lineberger, Jeff |
| **Subject:** | Bad Creek Relicensing - Initial Study Report Meeting (SAVE THE DATE) |
| **Date:** | Monday, December 4, 2023 7:04:05 AM |
| **Importance:** | High |



Dear Bad Creek Relicensing Stakeholders:

Duke Energy will convene a meeting of all relicensing stakeholders to review the Initial Study Report (ISR) results to be filed with FERC on January 4, 2024. The meeting will occur on Wednesday, January 17, 2024, 9 am–5 pm, at the Duke Energy Wenwood Facility, 425 Fairforest Way, Greenville, SC 29607 (Conference Room 100). The meeting will cover all aspects of the six resource committee studies required and approved by FERC under the Integrated Licensing Process (ILP) and an overall update on the ILP schedule including a look ahead into 2024-2025. Lunch will be served at the meeting.

Duke Energy will send a separate meeting invitation so you can schedule on your Outlook calendar. We strongly encourage in-person participation but will offer a virtual Teams meeting link for those who cannot attend in person. If you do not plan to attend in person, please respond to me so I can ensure there is an accurate headcount for lunch.

A meeting agenda will be provided to participants prior the January 17 meeting date.

Thanks, and we look forward to seeing you at the meeting.

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

## McCarney-Castle, Kerry

**Subject:** Bad Creek Relicensing - Initial Study Report Meeting
**Location:** Duke Energy Wenwood Facility, 425 Fairforest Way, Greenville, SC 29607 (Conference Room 100)

**Start:** Wed 1/17/2024 9:00 AM
**End:** Wed 1/17/2024 5:00 PM

**Recurrence:** (none)

**Meeting Status:** Accepted

**Organizer:** Crutchfield Jr., John U



The meeting will cover all aspects of the six resource committee studies required and approved by FERC under the Integrated Licensing Process (ILP) and an overall update on the ILP schedule including a look ahead into 2024-2025.

Lunch will be served at the meeting. Please let John Crutchfield know if you will not attend the meeting in-person so an accurate headcount can be made for lunch.

An agenda will be distributed prior to the meeting date.

Contact Alan Stuart or John Crutchfield if you have any questions.

---

# Microsoft Teams meeting

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January 4, 2024

***Electronically Filed***

The Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
**Initial Study Report and Initial Study Report Meeting**

Dear Secretary Bose:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11, on December 5, 2022, Duke Energy filed the Revised Study Plan (RSP) describing the studies the Licensee is proposing to conduct in support of relicensing the Project. The Commission approved the RSP with modifications on January 4, 2023, in its Study Plan Determination (SPD).

**Initial Study Report**

As approved by the Commission in its SPD, Duke Energy is implementing the following six studies:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;

- Cultural Resources Study; and
- Environmental Justice Study.

During the 2023 field season, Duke Energy conducted studies in accordance with 18 CFR §5.15, as provided in the RSP and as subsequently modified by FERC's SPD. In accordance with 18 CFR §5.15, Duke Energy has provided the attached quarterly updates regarding study implementation and is hereby filing the Initial Study Report (ISR) with the Commission. The ISR describes the Licensee's overall progress in implementing the study plan and schedule, summarizes available data, and describes variances from the study plan and schedule approved by the Commission.

Duke Energy is filing the ISR with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing this letter via U.S. mail. Parties interested in the relicensing process may obtain a copy of the ISR electronically through FERC's eLibrary system[1], or from Duke Energy's public relicensing website.[2] If any party would like to request a CD containing a copy of the ISR, please contact the undersigned at the address listed below. Note that Critical Unclassified Information (CUI) pertaining to locations of protected archeological sites is being filed separately.

**ISR Meeting**

The Commission's regulations at 18 CFR §5.15(c) require Duke Energy to hold a meeting with relicensing participants and FERC staff within 15 days of filing the ISR. Accordingly, Duke Energy will hold an ISR Meeting from 9:00 AM to 5:00 PM (approximately) on Wednesday, January 17, 2024, at its Wenwood Operations Center in Greenville, SC. An agenda for the ISR Meeting is provided in Attachment 3. Participants are free to join the meeting in its entirety or in part based on interests or availability, but please note the agenda is intended as an approximation and more or less time may be spent on individual studies, as needed.

Duke Energy encourages in-person participation by stakeholders and Commission staff, but can provide a Microsoft Teams option for participants where needed. Stakeholders who are interested in participating via web meeting should contact John Crutchfield (john.crutchfield@duke-energy.com) by January 11, 2024, to request such accommodation.

Duke Energy respectfully requests that the stakeholders who will attend the meeting contact John Crutchfield (contact information provided above) before close of business on Thursday, January 11, 2024. Lunch will be provided for meeting attendees who register their attendance by that date.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of

[1] https://elibrary.ferc.gov/idmws/search/fercgensearch.asp under docket number P-2740-053
[2] https://badcreekpumpedstorage.com

the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

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Enclosures

cc (w/enclosures): Jeff Lineberger, Duke Energy
Garry Rice, Duke Energy

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**Sent:** Thursday, January 4, 2024 2:41 PM
**To:** Alexander, Thomas - SC Senate; Amedee, Morgan D.; Andrade, Kristin - USACE Greenville; Bailey, William - USACE Savannah; Barnhart, Jen - USFS Sumter NF; Bedenburgh, Michael - Palmetto Trust for Historic Preservation; bereskind; Bernhart, David - NOAA; Bobertz, Shannon - SCDNR; abrock@oconeesc.com; Caggiano, Annie - Oconee Economic Alliance; Carter, Jerry - SC House of Representatives; Case, Mike; Cato, Van - US Senate; Clampitt, Mike - NC House Representative; Colburn, Kevin - American Whitewater; Collins, Neal - SC House of Representatives; Mayor, Clemson - cityofclemson; Wes Cooler; Copelof, Maureen - City of Brevard; Corney, Michael; Corney, Steve; Cotton, Mark; Dach, Bob - USBIA NR; Davis, Amin - NCDNCR; Andy Douglas; Douglas, Heyward - Foothills Trail Conservancy; Duncan, Jeffrey - NPS; Edwards, Danny - City of Walhalla, SC; Farrell, Christine - NC State Parks; Fell, Aiden - SCDPRT; Gestwicki, Tim - NC Wildlife Federation; Gilstrap, David - Pickens Cty Water Auth; Andrew Gleason; Gledhill-Earley, Renee - NCSHPO; Gordon, Jeffrey - SC Office of Reg Staff; Goudreau, Chris, NCWRC; Green, Sara - SC Wildlife Federation; Griffin, Marvin - USACE Savannah; jhains@g.clemson.edu; Wenonah Haire; Rowdy Harris; Hawkins, Ray - Jocassee Outdoor Center; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives; Hoffstatter, Mike - National Wild Turkey Federation; Erika Hollis; Howell, Kelly - SCDPRT; Hreha, Lisa - USACE; Hughes, Jennifer - SCDHEC; Hunt, Turner - Muscogee (Creek) Nation; Jewsbury, Steve - Pickens Cty Water Auth; Johnson, Elizabeth - SCDAH; Keene, Terry - AQD; Kulpa, Sarah; Laughter, Jamie - Transylvanie Cty; Lineberger, Jeff; McCormack, Paul - SCDPRT; McNamara, Rachel - FERC; derrick.miller@usda.gov; Elizabeth Miller; Mindel, Howard - USACE; Mitchell, Phil - Fishers Knob Home Owners Group; Ntale, Kajumba - Chief - USEPA; Olds, Melanie J; Owen, Donna - City of Pickens; growens@gmail.com; Peterson, Harold - USBIA; Raabe, Peter - American Rivers; Ramsden, Simeon - Kipling Ventures; Bill Ranson-Retired; Rawlings, Leonard - USBIA; Rice, Garry S; Rice, Rex - SC Senate; Lorianne Riggin; Rimkunas, Matt - US Senate; Rohde, Fritz; Roper, Ken - Pickens County; Salter, Findlay - SC Office of Regulatory Staff; Sandifer, Bill - SC House of Representatives; Sneed, Richard (Chief) Cherokee Nation; Chris Starker; Strong, Brian - NC State Parks; Stuart, Alan Witten; Tarver, Fred - NCDEQ; Thayer, Anne - SC House of Representatives; Liz Thomas; Threatt-Taylor, Dale - Nature Conservancy; Toombs, Elizabeth - Cherokee Nation; Townsend, Russell - Eastern Band of Cherokee Indians; US Bureau of Land Management; Watt, Acee - United Keetoowah Band of Cherokee Indians; Weese, Elizabeth - NCDOJ; Whitmire, Bill - SC House of Representatives; Dale Wilde; Willett, Scott - Anderson Regional Joint Water System; suewilliams130 @gmail.com; Yantis, Gerry - AQD
**Subject:** P-2740 Bad Creek Relicensing - Initial Study Report Filing



Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new

license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of the next major ILP submittal, the Initial Study Report (ISR), which was electronically filed with FERC by Duke Energy on January 4, 2024. The ISR describes the Licensee's overall progress in implementing the study plan and schedule, summarizes available data, and describes variances from the study plan and schedule approved by the Commission. Duke Energy is distributing this letter to the parties listed on the attached distribution list. Please note that, due to file size restrictions, the ISR is not attached to this email. Duke Energy encourages stakeholders to view the filing on the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project).

In accordance with 18 CFR §5.15(c), Duke Energy intends to hold an ISR meeting with relicensing participants and FERC staff from 9:00 AM to 5:00 PM (approximately) on **Wednesday, January 17, 2024**, at our Wenwood Operations Center in Greenville, SC. Refer to the attached cover letter for additional meeting information and RSVP instructions.

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

| | |
|---|---|
| **From:** | Crutchfield Jr., John U |
| **To:** | Alex Pellett; Alison Jakupca; Amy Breedlove; Andrew Grosse; Austen Attaway; bereskind; Green, William G; caitlin.rogers; Christopher Moore; Churchill, Christy; Wes Cooler; Dan Rankin; Andy Douglas; Greg Mixon; jhains@g.clemson.edu; Erika Hollis; Jeff Phillips; Jennifer Kindel; EMJOHNSON@scdah.sc.gov; jtk7140@me.com; Keith A. Bradley; Kelly Kirven; Ken Forrester; Kulpa, Sarah; quattrol; Dunn, Lynne; Raber, Maverick James; McCarney-Castle, Kerry; Abney, Michael A; Elizabeth Miller; lputnammitchell@gmail.com; Amedee, Morgan D.; Morgan Kern; Mularski, Eric; Wahl, Nick; Olds, Melanie J; Pat Cloninger; More, Priyanka; Bill Ranson-Retired; SelfR; Rowdy Harris; Salazar, Maggie; Samantha Tessel; Fletcher, Scott T; Scott Harder; taylors@dnr.sc.gov; Settevendemio, Erin; Chris Starker; Stuart, Alan Witten; Tom Daniel; Wenonah Haire; Dale Wilde; William T. Wood; suewilliams130@gmail.com; simmonsw@dnr.sc.gov; gcyantis2@yahoo.com; Kevin Nebiolo |
| **Cc:** | Lineberger, Jeff |
| **Subject:** | RE: Bad Creek Relicensing - Initial Study Report Meeting Agenda |
| **Date:** | Monday, January 8, 2024 6:19:41 AM |
| **Attachments:** | Bad Creek Initial Study Report Meeting Agenda_01-17-2024.pdf |
| **Importance:** | High |



Dear Bad Creek Relicensing Stakeholders:

Please find attached the agenda for the upcoming Bad Creek Relicensing Initial Study Report (ISR) meeting to be held on Wednesday, January 17, 2024, 9 am–5 pm, at the Duke Energy Wenwood Operations Facility, 425 Fairforest Way, Greenville, SC 29607 (Conference Room 100).

Thanks, and we look forward to seeing you at the meeting.

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

# Meeting Agenda

**Bad Creek Pumped Storage Project Relicensing**
**Initial Study Report Meeting**

**January 17, 2024**
**9:00 am – 5:00 pm**

**Wenwood Operations Center**
**425 Fairforest Way, Greenville, SC 29607**

| | |
|---|---|
| **Introduction**<br>• Welcome and Agenda Review<br>• Safety Moment<br>• Introductions and FERC ILP Schedule Review | Alan Stuart |
| **Water Resources** | |
| • Task 1: Summary of Existing Water Quality Data and Standards | Maverick Raber |
| • Task 2: Water Quality Monitoring in Whitewater River Arm | |
| • Task 3: Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling) | Joe Dvorak |
| • Task 4: Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling) | Jen Huff |
| • Task 5: Water Quality Management Plan | Maverick Raber |
| **Break** | |
| **Recreational Resources**<br>• Task 1: Foothills Trail Recreation Use & Needs<br>• Task 2: Foothills Trail Conditions Assessment<br>• Task 3: Whitewater River Cove Existing Recreational Use<br>• Task 4: Whitewater River Cove Recreational Public Safety Evaluation | Kelly Kirven |
| **Lunch** | |
| **Aquatic Resources** | |
| • Task 1: Entrainment | Kevin Nebiolo |
| • Task 2: Desktop Studies on Pelagic & Littoral Habitat | Erin Settevendemio |
| • Task 3: Mussel Surveys & Stream Habitat Quality Surveys | Erin Settevendemio |
| **Break** | |
| **Environmental Justice** | Alison Jakupca |
| **Cultural Resources** | Christy Churchill |
| **Visual Resources** | Jen Huff |
| **Proposed Spoil Area Herptile Survey** | Scott Fletcher |
| **Closing** | Alan Stuart |

**From:** Crutchfield Jr., John U
**To:** McCarney-Castle, Kerry
**Subject:** FW: [EXTERNAL] Bad Creek ISR meeting
**Date:** Tuesday, January 9, 2024 1:34:25 PM



**From:** Allan Creamer <Allan.Creamer@ferc.gov>
**Sent:** Tuesday, January 9, 2024 10:32 AM
**To:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
**Subject:** [EXTERNAL] Bad Creek ISR meeting



Good Morning John,

I hope all is well with you, and you had a wonderful Christmas and New Year's.

I am working with David Dandy, our newest fish biologist in our group, on the Bad Creek Project. He will be attending the ISR in person. However, I will not be able to attend in person. However, I am letting you know that I would like to attend virtually, through the Microsoft Teams option. Please add me to your list of virtual attendees for this meeting.

Thank You!

Allan

| | |
|---|---|
| **From:** | Crutchfield Jr., John U |
| **To:** | Kulpa, Sarah; Huff, Jen; McCarney-Castle, Kerry; Settevendemio, Erin |
| **Cc:** | Stuart, Alan Witten |
| **Subject:** | FW: [EXTERNAL] Bad Creek ISR meeting |
| **Date:** | Tuesday, January 9, 2024 11:15:19 AM |
| **Attachments:** | Bad Creek Initial Study Report Meeting Agenda_01-17-2024.pdf |



FYI.

---

**From:** Crutchfield Jr., John U
**Sent:** Tuesday, January 9, 2024 10:41 AM
**To:** Allan Creamer <Allan.Creamer@ferc.gov>
**Cc:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Subject:** RE: [EXTERNAL] Bad Creek ISR meeting

Allan: One follow-up. Attached is the meeting agenda, FYI.

Thanks, John

---

**From:** Crutchfield Jr., John U
**Sent:** Tuesday, January 9, 2024 10:36 AM
**To:** Allan Creamer <Allan.Creamer@ferc.gov>
**Cc:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Subject:** RE: [EXTERNAL] Bad Creek ISR meeting

Allan: Thanks, Happy New Year and good to hear from you!

I will forward you the Outlook Calendar notice which contains the Microsoft Teams link so you can join virtually.

Let Alan Stuart or me know if you have any questions or any issues access the Teams link. My mobile number is in my title address below.

Take care,

***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:** Allan Creamer <Allan.Creamer@ferc.gov>
**Sent:** Tuesday, January 9, 2024 10:32 AM
**To:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
**Subject:** [EXTERNAL] Bad Creek ISR meeting



Good Morning John,

I hope all is well with you, and you had a wonderful Christmas and New Year's.

I am working with David Dandy, our newest fish biologist in our group, on the Bad Creek Project. He will be attending the ISR in person. However, I will not be able to attend in person. However, I am letting you know that I would like to attend virtually, through the Microsoft Teams option. Please add me to your list of virtual attendees for this meeting.

Thank You!

Allan

**Subject:** FW: [EXTERNAL] RE: Bad Creek Initial Study Report Meeting Summary

**From:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Sent:** Thursday, February 1, 2024 2:21 PM
**To:** Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Andrade, Kristin - USACE Greenville <SAC.RD.Greenville@usace.army.mil>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Shannon Bobertz <BobertzS@dnr.sc.gov>; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Carter, Jerry - SC House of Representatives <jerrycarter@schouse.gov>; Case, Mike <mgcase@icloud.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Wes Cooler <wes.cooler@mac.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Cotton, Mark <mark@cottonrealestate.com>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Edwards, Danny - City of Walhalla, SC <dannyedwards@bellsouth.net>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Fell, Aiden - SCDPRT <afell@scprt.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew Gleason <andrewandwilla@hotmail.com>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Green, Sara - SC Wildlife Federation <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hreha, Lisa - USACE <lisa.l.hreha@usace.army.mil>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; Olds, Melanie J <melanie_olds@fws.gov>; growens@gmail.com; Perry, Fletcher - City of Pickens <fperry@pickenscity.com>; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Raabe, Peter - American Rivers <praabe@americanrivers.org>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Lorianne Riggin <RigginL@dnr.sc.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; Chris Starker <cstarker@upstateforever.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Thayer, Anne - SC House of

Representatives <annethayer@schouse.gov>; Liz Thomas <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Townsend, Russell - Eastern Band of Cherokee Indians <syerka@nc-cherokee.com>; US Bureau of Land Management <BLM_ES_SSDO_Comments@blm.gov>; Watt, Acee - United Keetoowah Band of Cherokee Indians <awatt@ukb-nsn.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Dale Wilde <dwilde@keoweefolks.org>; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; suewilliams130@gmail.com; Wood, Chris J. <chris.wood@ncwildlife.org>; Yantis, Gerry - AQD <gcyantis2@yahoo.com>; Al Shadwick <shadwick@hotmail.com>
**Subject:** Bad Creek Initial Study Report Meeting Summary

Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. As required by the ILP schedule, within 15 days of the ISR filing, Duke Energy held an ISR Meeting at Duke Energy's Wenwood Operations Center in Greenville, South Carolina from 9 AM to 5 PM on Wednesday, January 17, 2024. The meeting included a virtual (Microsoft Teams) option for remote participants. On February 1, 2024, Duke Energy filed the ISR Meeting summary and a copy of the meeting presentation with FERC. The transmittal letter for this filing is attached. Please note that, due to file size restrictions, the meeting summary and presentation are not attached to this email. Duke Energy encourages stakeholders to view the filing on the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Regards,
Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

***WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES***

*Duke Energy Corporation*
*Regulated and Renewable Energy*
*525 South Tryon Street / Mail Code DEP-35B*
*Charlotte, NC 28202*

February 1, 2024

***Electronically Filed***

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
**Filing of Initial Study Report Meeting Summary**

Dear Acting Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. As required by the ILP schedule, within 15 days of the ISR filing, Duke Energy held an ISR Meeting at Duke Energy's Wenwood Operations Center in Greenville, South Carolina from 9 AM to 5 PM on Wednesday, January 17, 2024. The meeting included a virtual (Microsoft Teams) option for remote participants.

Pursuant to 18 CFR §5.15(c)(3), Duke Energy hereby files for Commission and stakeholder review the ISR Meeting summary. The ISR Meeting presentation is included as an attachment to the ISR Meeting summary. Duke Energy is filing the ISR Meeting summary with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, Duke Energy is distributing this letter via U.S. mail. Parties interested in the relicensing process may obtain a copy of the ISR Meeting summary electronically through FERC's eLibrary system, or from Duke Energy's public relicensing website (https://badcreekpumpedstorage.com).

Duke Energy is not proposing any substantive modifications to ongoing studies or new studies based on discussion during or feedback on the ISR. As described in Section 1.1 of the ISR, Duke Energy has and will continue to consult with the relicensing Resource Committees voluntarily convened by Duke Energy to facilitate implementation of the relicensing studies and development of Duke Energy's relicensing proposal in the future draft and final license applications. Minor modifications to study methodology as noted in the ISR, primarily including expansions of methods or geographic scope to address specific stakeholder interests or requests relevant to the future environmental analyses that will be performed by FERC and other agencies, have been and will continue to be, as practicable, accommodated by Duke Energy in consultation with the Resource Committees.

The enclosed meeting summary highlights action items (for Duke Energy) that arose from discussions at the ISR meeting. This filing directly addresses several requests from the Commission staff at the ISR meeting, except those that will be provided to FERC by Duke Energy with the Updated Study Report (USR), which is scheduled for filing in January 2025:

- Updated spatial (GIS) data corresponding to study boundaries and proposed project facilities.
- Raw data from the Water Quality Study field data collection effort (Excel file to be filed along with the USR).
- Updates to the Environmental Justice Study Report to account for the most current Census data practicably available.

Duke Energy appreciates the participation of and looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosures

cc (w/enclosures): Jeff Lineberger, Duke Energy
Garry Rice, Duke Energy

# Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

**Federal Agency**

Advisory Council on Historic Preservation
401 F St N.W.
Ste 308
Washington, D.C. 20001-2637

Bonneville Power Administration, Pacific NW
Hydrosite Database & Analysis Section
905 N.E. 11th Ave
Ste 7
Portland, OR 97232-4169

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
Washington, D.C. 20426

Recreation and Land Use Coordinator
Federal Energy Regulatory Commission
888 First St, N.E.
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Rachel.McNamara@ferc.gov

Federal Energy Regulatory Commission, Atlanta Regional Office, Gwinnett Commerce Center
3700 Crestwood Pkwy, N.W.
Ste 950
Duluth, GA 30096-7155

Federal Energy Regulatory Commission, Office of Energy Projects
888 First St, N.E.
Room 61-02
Washington, D.C. 20426

Federal Energy Regulatory Commission, Office of General Council - Energy
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Jeffrey Duncan
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lisa.l.hreha@usace.army.mil

Howard Mindel
U.S. Army Corps of Engineers
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Room IOM-15
Atlanta, GA 30303-8801
howard.p.mindel@usace.army.mil

U.S. Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403-0919

# Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

Kristin Andrade
U.S. Army Corps of Engineers, Greenville Office
Project Number SAC 2022-00413
SAC.RD.Greenville@usace.army.mil

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20 Massachusetts Ave N.W.
Washington, D.C. 20314-0001

William Bailey
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# Meeting Summary

| | |
|---|---|
| Project: | Bad Creek Pumped Storage Project Relicensing (FERC Project No. 2740) |
| Subject: | Initial Study Report Meeting |
| Date: | Wednesday, January 17, 2024 |
| Location: | Duke Energy Wenwood Operations Center, 425 Fairforest Way, Greenville, South Carolina and Teams Meeting (virtual option) |

**In-person Attendees**

Alan Stuart (Duke Energy)
John Crutchfield (Duke Energy)
Scott Fletcher (Duke Energy)
Nick Wahl (Duke Energy)
Mike Abney (Duke Energy)
Maverick Raber (Duke Energy)
Ethan Pardue (Duke Energy)
Garry Rice (Duke Energy)
Christy Churchill (Duke Energy)
Jeff Lineberger (Duke Energy)
Kelly Kirven (Kleinschmidt Assoc)
Kevin Nebiolo, PhD. (Kleinschmidt Assoc)
Todd Branham (Long Cane Trails)
Sarah Kulpa (HDR)
Ty Ziegler (HDR)
Joe Dvorak (HDR)
Eric Mularski (HDR)
Jen Huff (HDR)
Kerry McCarney-Castle (HDR)
Erin Settevendemio (HDR)
Bill Green (Terracon)
Mills Dorn (Terracon)
Erika Hollis (Upstate Forever)
Chris Starker (Upstate Forever)
Phil Mitchell (Fisher Knob HOA)
Jennifer Kindel (SCDNR)
Austen Attaway (SCDNR)
Pat Cloninger (SCDNR)
Alex Pellet (SCDNR)
Dan Rankin (SCDNR)
Lynn Quattro (SCDNR)
Sue Williams (AQD)
Gerry Yantis (AQD)
Terry Keane (AQD)
Wes Cooler (Naturaland Trust)
Glenn Hilliard (Foothills Trail Conservancy)
Rowdy Harris (SCPRT)
Andy Douglas (SC Wildlife Federation/ Jocassee Lake Tours)

**Virtual Attendees**

Alan Creamer (FERC)
Sarah Salazar (FERC)
David Gandy (FERC)
Dustin Wilson (FERC)
Catherine Roberts (FERC)
Mike Spencer (FERC)
Melanie Olds (USFWS)
Bill Ranson (Foothills Trail Conservancy/ Professor Emeritus Furman Univ.)
Jeff Phillips (Greenville Water)
Amy Chastain (SCDNR)
Elizabeth Miller (SCDNR)
Kelly Schaeffer (Kleinschmidt Assoc)
Alison Jakupca (Kleinschmidt Assoc)
Andrew Gleason (Foothills Trail Conservancy)
Lynne Dunn (Duke Energy)

# Introduction (9:00 am)

The Bad Creek Pumped Storage Project (Bad Creek) Initial Study Report (ISR) was filed with the Federal Energy Regulatory Commission (FERC) on January 4, 2024 – this meeting is being held to discuss the individual studies and study findings presented in the ISR and receive feedback from relicensing participants/stakeholders as well as FERC under the Integrated Licensing Process (ILP) 18 CFR §5.15.

Alan Stuart (Duke Energy Project Manager) opened the meeting, welcomed participants in the room and online, stated the meeting would be recorded, and provided an overview on meeting facility layout and emergency action responsibilities. He then stepped through the meeting agenda, facilitated participant introductions, and provided a safety moment (frostbite). Sarah Salazar (FERC Project Coordinator) requested that the list of meeting attendees be filed with the meeting summary. A. Stuart confirmed the list of attendees will be included with the filing.

Bill Ranson (via chat) requested a moment of silence in recognition of the passing of Malcolm Schaffer, a well-respected geologist, friend, and colleague who performed most of the geologic mapping and geotechnical investigations for the original Bad Creek Project as well as recent geotechnical feasibility studies for the proposed Bad Creek II Complex (Bad Creek II) while working for Duke Energy then HDR. The group held a moment of silence to honor his life and contributions.

A. Stuart provided a general summary of the project and an overview of specific Project-related components that have changed since filing of the revised study plan (RSP) on December 5, 2022.

## 1. Expanded Project Boundary

A. Stuart presented a slide showing the proposed expanded project boundary for the proposed second powerhouse Bad Creek Power Complex (Bad Creek II). The existing FERC project boundary is proposed to be expanded by approximately 210 acres to enclose Duke Energy-owned land necessary for construction and operation of the new project facilities and that could potentially be affected by spoil placement from materials excavated for the proposed project expansion.

- S. Salazar asked if Duke Energy could submit a GIS file of the proposed expanded project boundary. A. Stuart agreed. ACTION ITEM – Duke Energy to submit GIS files.
- Chris Starker asked if Duke Energy has ownership of all property in the transmission line corridor or only its rights-of-way, and if so, would lease agreements be needed for the expanded project. A. Stuart noted Duke Energy owns most of the land in-fee-simple, though there is an agreement in place with the George Family to secure five parcels of private land (under purchase option) consisting of approximately 2,100 acres (of which 88 acres is expected to be needed for the expanded transmission corridor). Other than the 88 acres needed, the powerlines will be located in the existing power lines' corridors. The general area of purchase option was highlighted in the Teams Meeting chat.

    - C. Starker asked for clarification that no other purchases would be necessary and that would be the only other land will be acquired for transmission lines. A. Stuart confirmed.
- Rowdy Harris indicated that property is managed as a Wildlife Management Area (WMA) and asked whether Duke Energy will use what they need (88 of the 2100 acres) and allow public access to the remaining portion of the properties. A. Stuart indicated that that is not known but is a possibility.

## 2. Additional Spoil Area

A. Stuart introduced an additional potential spoil area (Spoil Area J) that has been added since the filing of the RSP (it is an existing spoil area from original construction) and indicated Duke Energy is still evaluating which spoil areas to use for Bad Creek II spoil placement based on natural resources studies and minimizing impacts to those resources as practicable relative to the feasibility of expanded project construction.

## 3. Temporary Access Road/ Fisher Knob Access Road

A. Stuart described the potential new temporary access road to provide access for residents of the Fisher Knob community during construction of Bad Creek II (while Bad Creek Road is closed to the public). Fisher Knob Access Road will be a connector road extending from Whitewater River Road to the Fisher Knob Community. The road will be predominantly gravel, 3.7 miles long, and would only be maintained during construction. The road would be closed following project construction.

- S. Salazar asked Duke Energy for the GIS files with new proposed spoil area and Fisher Knob Access Road and any other updated GIS layers. A. Stuart noted Duke Energy will share with FERC and also place on the relicensing SharePoint Site for project stakeholders. ACTION ITEM – Duke Energy to submit GIS files.
- Phil Mitchell asked how long the temporary road would be in place and maintained. A. Stuart answered 6 to 7 years (for the duration of construction). P. Mitchell asked if Duke Energy plans on installing a gate from Whitewater River Road/ Rt 130. A. Stuart said while that level of detail hasn't been developed yet, it would be secured since it would provide alternate access to the construction/site.
- P. Mitchell asked where the turn off from Whitewater Road is located. A. Stuart indicated the location on the map and noted it is just above the entrance gate to Fisher Knob, near the Jersey barriers located along highway 130, and would extend south of the old laydown yard into Fisher Knob community (near the existing entrance gate). A. Stuart briefly noted there were two options for access roads and Duke Energy considered the one with the least impacts to streams and natural resources.
- Garry Rice asked for clarification on the length of the access road. (3.7 miles)
- Andrew Gleason asked, for trail maintenance reasons, would the Foothills Trail Conservancy (FTC) use the temporary access road to access Musterground Road site and is the plan to close hiking access during the construction period. A. Stuart noted the current plan is to close public access to Musterground Road because the entrance (parking) area will be part of the active construction site for 6 to 7 years.

- S. Salazar asked for a description of the Fisher Knob community. A Stuart noted it is a residential community with 22 houses (per P. Mitchell) in the community; four of those are rental homes and the rest are vacation homes. There is only one full-time resident (P. Mitchell). There are two new homes under construction for a total of 24 properties in the Fisher Knob Community.
- S. Salazar asked for confirmation that the justification for building the road is to provide access to the residents. A. Stuart noted yes, that is correct, as Duke Energy is concerned about construction traffic and the public sharing the same road. P. Mitchell added there is currently only one way off the peninsula (i.e., Bad Creek Road) and if Bad Creek Road would somehow fail or be impassable, there would be no way to access homes (residents or emergency services). Duke Energy agrees it is important to provide alternate access for homeowners and first responders, but also to minimize impacts to the extent feasible and reiterated the road will not be paved or permanent.
- P. Mitchell asked when Duke Energy anticipates closing Bad Creek Road. A. Stuart noted the access road would need to be developed and in place prior to Bad Creek II construction.
- E. Miller asked for confirmation that Musterground Road would be closed (to the public) for entire construction period (6-7 years). A. Stuart confirmed yes, access would be closed to through-traffic and recreation during construction period. There will be heavy construction traffic in that area due to proposed spoil location J and construction of the new powerhouse and switchyard in the area, therefore, due to safety reasons, Duke Energy plans to shut down access, and acknowledges this will be a temporary impact that needs to be considered in mitigation or enhancement plans for the new license.
- Pat Cloninger noted SCDNR owns land with lake access to Musterground Road. How would access be mitigated/how would DNR be able to access that site? A. Stuart said he was unaware there was access to the lake from Musterground Road and will need to discuss further with the SCDNR. However, A. Stuart noted that the concern is for public access and SCDNR should be able to maintain access in coordination with Duke Energy. ACTION ITEM – Duke Energy and SCDNR to further discuss.
- E. Miller stated that Duke Energy and SCDNR will also need to discuss SCDNR's prescribed burning schedule and management operations in the vicinity of Musterground Road. ACTION ITEM – Duke Energy and SCDNR to further discuss.
- Dan Rankin asked for confirmation that access to the Whitewater River Falls overlook and parking area would also be closed during the construction period. A. Stuart confirmed this is presently the plan and expectation.
- A. Stuart discussed the plan for temporary metal bridges crossing streams along the temporary access road to minimize impacts and added that Duke Energy has expanded relevant relicensing studies (change from RSP) to incorporate additional assessments for water, aquatic, visual, and cultural resources with potential to be impacted by the temporary access road. Additionally, work for Section 404/401 permitting has begun and will consider all potential impacts associated with the proposed temporary access road.

## 4. Increase in Hydraulic Capacity for Proposed Bad Creek II

A. Stuart noted the proposed maximum hydraulic capacity for Bad Creek II has changed since originally estimated in the Bad Creek II feasibility study for variable speed units, based on information provided by turbine manufacturers. There is a <2 percent difference (increase) in generation and an approximate 9 percent difference (increase) in pumping capacity than originally accounted for in design assumptions. Studies affected by this pumping change include the entrainment study and the CHEOPS study. Additionally, A. Stuart noted Duke Energy also plans to run model scenarios with a previously developed near-field CFD model to estimate the effects of increased pumping capacity (increased generation won't be considered due to marginal increase of <2 percent).

- Microsoft Teams Chat Conversation: S. Salazar asked SCDNR in their comments on the ISR for additional information regarding management goals for prescribed burning and typical frequency of controlled burns near Musterground Road. E. Miller replied SCDNR will need to discuss internally as this will be a 10-Year Plan.
- Erika Hollis asked for clarification that studies completed and included in the ISR did not take into consideration the recently revised generation/pumping capacities. A. Stuart confirmed.
- S. Salazar asked whether pumping/generation increases change the normal/maximum pool elevations for Bad Creek Reservoir or water fluctuation. A. Stuart stated that Duke Energy will continue to operate under the existing (160-foot) operating band for min elevation / max elevations (as defined by the existing license), but Bad Creek II will allow for faster water exchange between the upper and lower reservoirs.
- C. Starker asked whether additional studies (due to recently defined increases in pumping and generation) affect the relicensing timeline and whether there will be an updated ISR or additional studies. A. Stuart noted relevant reports would be updated and re-distributed (i.e., entrainment report is the only affected report that has been distributed thus far; CHEOPS report is not yet drafted and the CFD modelling will be a different effort from the original study under the Water Resources Task 3 report) to the resource committees. The relicensing timeline would not be affected. A. Stuart also stated that the updated reports and consultation with Resource Committees would be included with the Updated Study Report (USR) to be filed with FERC in January 2025. C. Starker asked if Duke Energy would like to see comments now, as well as on the revised report. A. Stuart encouraged submitting comments on the ISR now.
- S. Salazar stated a second season of studies is typical for relicensing through the ILP process; noted the table on page 43 of the ISR outlines the ILP milestones and encouraged stakeholders to refer to the schedule and be aware of milestones so opportunities aren't missed to submit comments and offered participants to reach out to her with process-related questions.

John Crutchfield introduced the individual studies and Duke Energy relicensing leads for each study and also stepped through the ILP Schedule, stating 2023 was the first year of studies and many update meetings were held throughout the year with various resource committees to

gather feedback and foster collaboration as part of the ILP process. Quarterly progress reports were also submitted per the ILP process in 2023.

He then turned the meeting over to Maverick Raber to begin the individual study discussions. The presentation is attached to this meeting summary.

# Water Resources (10:00 am)

### Task 1 – Existing Summary of Water Quality Data and Standards

M. Raber presented an overview of objectives, methods, and results of Task 1. Task 1 is complete and the final report was filed with the ISR.

- No comments/questions or discussion.

### Task 2 – Water Quality Monitoring in the Whitewater River arm

M. Raber presented an overview of objectives, methods, and results of Task 2. A draft report including results of Study Year 1 was filed with the ISR; results of Study Year 2 will be shared with the resource committees and a synthesis of both years of data will be provided in the USR.

- No comments/questions or discussion.

### Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee due to a Second Powerhouse

Joe Dvorak presented an overview of objectives, methods, and results of Task 3.

- C. Starker asked if the increased velocity (in Whitewater River cove flow over the expanded weir) is due to the increased pumping under Bad Creek II or if it is due to the extension of the weir. J. Dvorak noted it's a combination of both; expanding the weir doesn't have any impacts regarding mixing downstream under increased generation, however, it slightly accelerates flow across the top of the weir under maximum reservoir drawdown conditions, which haven't ever occurred.
- Wes Cooler asked what J. Dvorak's opinion on the cost-benefit of expanding the submerged weir. J. Dvorak stated that there are environmental and cost benefits regarding spoil placement and location of placement to consider; however, from a hydraulics standpoint, expanding the weir wouldn't have a significant effect either way. He noted Lake Jocassee has never been drawn down to minimum pond where changes in velocity magnitude would be most evident from the increased generation and pumping under the Bad Creek II scenarios modeled for the CFD studies.

### Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS modeling)

Jen Huff presented an overview of objectives of Task 4, work done thus far, and changes to the existing CHEOPS model originally used for Keowee-Toxaway Project relicensing. Sue Williams

confirmed units of measurement. J. Huff stated work is ongoing and results will be shared with resource committees in Spring 2024.

- No comments/questions or discussion.

## Task 5 – Future Water Quality Monitoring Plan

M. Raber stated Task 5 will begin this year (2024). Tasks 1-4 objectives were to assess current operations, while Task 5 will be carried out in coordination with resource committees and Section 404/401 permitting activities considering future activities. This task will be broader in scope and will incorporate potential spoil impacts.

- S. Salazar asked about the composition (size class and rock/mineral type) of the spoil materials that will be potentially placed. For example, concerning Spoil Location A on the downstream side of the weir and mixing on the downstream side of the weir, would that have implications for turbidity issues in the Whitewater River cove? (*Note – the word "backside" in reference to the weir was used in this comment; for clarity, significant vertical mixing in the Whitewater River cove is typically limited to the upstream side of the weir [the side closer to the Project], while there is very limited/localized mixing on the downstream side of the weir*). Also, would inherently low pH in the existing bedrock and weathered soils have implications for lowering pH in the water?
- M. Raber answered there is minor mixing (localized eddies) on the downstream side of the weir where rock spoils (mostly boulder-sized) would be potentially placed to extend the weir in the downstream direction. These are the types of impacts that will be addressed in the development of Task 5 of the Water Resources Study; the spoil make-up and locations will be further analyzed under this task. M. Raber agreed that the area is underlain by mostly granitoids with low alkalinity, which results in headwaters low in pH. A. Stuart prompted M. Raber to briefly describe a situation at the Cedar Cliff Hydro project where water quality during and after construction (including placement of rock spoil in a deep reservoir) was evaluated due to high pyrite content in the spoils placed in the reservoir; however, no changes to water quality resulting from placed spoils have been observed.
- E. Hollis asked where the other dam is located – M. Raber stated it is in Tuckaseegee, North Carolina (*for clarity – 16 miles north*) with similar geology and terrain as Bad Creek. R. Maber noted elevated turbidity was an issue at Cedar Cliff during placement of finer grained material. A. Stuart stated there were lessons learned at the Cedar Cliff project (fines were filtered from the rock before placing the rock) that may be applicable to Bad Creek, which could also include some sort of screening or separating out of fines prior to placement in the lake.
- B. Ranson noted the Bad Creek site is underlain predominantly by Toxaway Gneiss (granitic) and some schist, which would have naturally low pH/result in slightly acidic weathered rock/soils.
- S. Salazar mentioned she looks forward to further information and synthesis on these topics and wants to make sure studies or components of studies aren't considered in a vacuum.

- C. Starker asked out of the ten potential spoil sites, how would spoils be placed and is there purposeful intent on location placement, or is it based on convenience since many look like they are on streams/headwaters. M. Raber reiterated the steep topography of the site and associated streams are largely ephemeral and intermittent. Scott Fletcher stated there were eight terrestrial spoil areas assessed and the cover type of most spoil areas consists mostly of mixed hardwood-pine and several areas did have steep ephemeral streams bisecting the site. Most locations, except location J, are mature forested areas. Sarah Kulpa added many of the potential spoil areas correspond to areas of previously used spoil areas (associated with the original construction and noted that several of these areas were revegetated (forested) following Bad Creek Project construction. Placement of spoils also takes into consideration access to excavation areas as well as the limits of topography. M. Raber noted locations will be chosen to minimize impacts, to the extent possible, and these are items/impacts that will be considered under Task 5 (Future Water Quality Monitoring Plan) of the Water Resources Study in 2024.
- C. Starker clarified his earlier question that nothing “intentional” will be done with the spoil material for stream restoration or perhaps enhancements in the Foothills recreation trail corridor. M. Raber stated that from a water resources perspective, spoil placement will also be addressed under the 404/401 permitting, including alternatives analysis for different disposal options. Eric Mularski noted Duke Energy will be working through permitting process with the U.S. Army Corps this year – and not all spoil areas will be used. An Approval for Jurisdictional Determination (AJD) request will be submitted for the 404/401 application as well.
- S. Salazar asked about selection of spoil area placement areas vs. placement out of convenience and wouldn’t a goal of the modeling effort be to determine if adding to the existing submerged weir (Spoil Area A) would mitigate vertical mixing and exchange rates vs. not disposing anything along the weir.
- A. Stuart answered yes, one of the mitigative components to reduce spoils in the uplands is to place more spoils along the weir, which is why Duke Energy performed CFD modeling to ensure that placing spoil at the downstream side of the weir would not have adverse water quality impacts with regard to vertical mixing (per the results of the CFD modeling under Task 3 of the Water Resources Study).
- Sarah Kulpa noted the allocation of spoils in individual spoil locations would also be a function of the excavated material sizes (i.e., finer soils vs. large rock). A. Stuart agreed that the material size and quality will be a limiting factor and consideration in placement.
- S. Salazar noted that while spoils could be considered an impact, there are potential benefits associated with the spoils. A. Stuart noted these factors will be taken into consideration in consultation with stakeholders in the license application and 404/401 permit application.

*Break (11:18am)*

*John Crutchfield said due to short time period prior to the lunch break, the Cultural Resources presentation would occur before lunch rather than afterward, with the Recreation Resources*

*presentation to begin after lunch. The slight change in the agenda order was noted but otherwise the remaining Resource Committee presentations on the published agenda are in the presented order during the afternoon session.*

# Cultural Resources (11:29 am)

Christy Churchill provided an overview of the objective, methods, and results of the Cultural Resources Study and introduced Bill Green and Mills Dorn of Terracon who performed the Cultural Resources Survey. She noted the letter for the original Area of Potential Effects (APE) was filed with the State Historic Preservation Office (SHPO) in November of 2022, and in September of 2023, a subsequent letter asking for concurrence on the expanded APE (in alignment with the proposed expanded project boundary) was filed. (*Note: the figure on Slide 151 reads "original project boundary", however, it should read "proposed expanded project boundary"*).

- C. Churchill provided definitions for the SHPO and THPO (Tribal Historic Preservation Office) acronyms.
- Catherine Roberts provided clarification on the term "Paleoindian," which is a somewhat arbitrary term referring to the time around the last glacial maximum around (~10,000 years bp). She stated the ISR indicated this site may not be able to be avoided (Site 38OC249). C. Churchill noted no impact or disruption to this site is anticipated; it's on the edge of the APE and not near any construction.
- C. Roberts stated none of the artifacts shown in the report looked Paleoindian and are probably later as Paleoindian sites are rare. B. Green noted the projectile points shown on Slide 153 could be potential Haw River projectile points due to the distinct notches on the (pre-Clovis, Paleoindian, or early archaic) projectiles, which were found below early archaic points, which is why the report says possible Paleoindian.
- Jennifer Kindel asked if any bats / evidence of bats were noted in the rock shelter? S. Fletcher noted he would carry out a field reconnaissance to confirm bat evidence in the rock shelter and noted there was a bat survey done in 2021, however, this rock shelter was not included in the study. ACTION ITEM – Duke Energy to make a site visit to rock shelter to assess for evidence of bats.
- Andy Douglas mentioned drone sightings were reported over the summer by boaters. A. Stuart said those were probably the drones deployed for the Whitewater River Cove Boat Evaluation survey for the Recreation Study.
- S. Salazar made the correction that the boundary shown on the slide is the proposed expanded APE, not the existing APE. A. Stuart pointed out the two alternatives for Fisher Knob access road on the existing map.
- E. Miller asked for clarification if Duke Energy was going to carry out a full survey of the rock shelter for bats. S. Fletcher said they would add it to their field list and take it under consideration during upcoming study plan development for bat surveys for the 404/401 permit. E. Miller asked if the results would be included as an addendum to the original bat survey (done by ESI in 2021). A. Stuart clarified it might not be an addendum but would be made available the resource agencies.
- Jennifer Kindel reminded the group any bat surveys need to be timed surveys.

- S. Salazar reiterated stakeholder request for bat presence in the rock shelter. Bat presences should be considered along the access road as well since there would be some new clearing.
- S. Salazar noted that on the slide shown (Slide 151), the alternative temporary road access road options are both blue and purple lines. (*Note: the chosen access road option is the purple alternative (northern route), which minimizes impacts to the Howard Creek riparian buffer zone and therefore is the preferred alternative. Both routes are shown on the figure because both routes were surveyed for the Cultural Resources Study*).
- S. Salazar reiterated that any concerns or identification of data gaps should be filed in comments on the ISR meeting summary. And additional information requests or modifications to any of the existing studies need to be submitted in the ISR so modifications can be made in the second year of studies. Please file comments incorporating any additional information that needs to be collected in light of the changes to the Project since the RSP filing.
- S. Salazar asked, regarding drones and associated complaints, whether Duke Energy notifies the public and if not, is that something that can be done to alleviate concerns proactively.
- C. Churchill noted they do notify the FAA but don't notify individuals of the public. The drone Andy Douglas referenced earlier was study related and otherwise, Duke Energy drone surveys are limited to the transmission lines. Homeowners (Fisher Knob) were also made aware of the drones, stakeholders, as well as State Park representatives. Boaters are from all over (out of state) - R. Harris mentioned the only way to make the information available would be to place a flyer at the state park boat ramps, and these do not typically receive much attention from visitors.

*<<< Please Note: Duke Energy has redacted the photo of the rock shelter (Site 38OC249) from the ISR meeting presentation (Slide 154) to avoid public disclosure of potential location.>>>*

*Lunch 11:51 (S. Salazar asked Duke Energy to mute the Microsoft Teams meeting during the lunch break.)*

# Recreational Resources (12:35)

### Task 1 – Foothills Trail Recreation Use and Needs

Kelly Kirven gave an overview of the objectives, methods, and preliminary results of Task 1 of the Recreational Resources Study.

- G. Rice asked about QR codes for the surveys and how effective the QR code surveys were and if during the survey recreationists were asked if they scanned a QR code. K. Kirven noted responses vary depending on recreation site and the 61 surveys they did receive is a good dataset to work with. She indicated many folks don't like to stop to do an in-person survey, so facilitators let them know there were QR codes (and a website address) at the trail heads to take the survey later. K. Kirven noted that based on

Kleinschmidt's experience with these types of surveys, the quality of responses provided later in time (i.e., via QR code or website) can vary and also be disassociated with recreation location. As such, information will be analyzed separately as cell service is limited on the trail and surveys accessed via QR codes were likely filled out later. The carrying capacity will be done in collaboration with Jeremy Wimpey at Applied Trails Research.

- Dustin Wilson noted in the Study Plan Determination (SPD) FERC recommended Duke Energy develop a website for recreationists to access the survey in addition to providing the QR code in the field, mostly because sometimes QR codes aren't self-explanatory. He asked if specific instructions on how to access the survey after scanning the QR code were provided by the facilitators. K. Kirven noted they did not distribute instructions; however, when recreationists encountered a survey facilitator, the facilitator gave them instructions on how to access the survey via the QR code. K. Kirven stated in a previous meeting in consultation with the Recreation and Visual Resources Committee, Duke Energy decided it may be best to not include the survey on the website because that would allow people who had not actually been on the trail to fill out the survey. D. Wilson noted FERC does not recall reading about the decision not to include the surveys on the website and asked that future decisions be included in future filings. (*Note for clarification – not discussed directly during the meeting – while Duke Energy did not provide access to the survey on the relicensing website, the signs posted at trail access locations with the QR code also provided a website address [URL] that users could access directly instead of the QR code to complete the survey. Duke Energy believes that this fulfilled the intent of FERC's comment on the SPD.)*
- D. Wilson mentioned he had questions regarding trail carrying capacity and asked if any representatives from Applied Trails Research were present on the call. K. Kirven asked for FERC to submit their questions to her and she would distribute them to Applied Trails Research. D. Wilson noted that sometimes in order for a carrying capacity analysis to result in long term solutions and in consideration of the public and stakeholders, it is useful for stakeholders to see photographs of groups of hikers to help them provide input on carrying capacity. K. Kirven noted the study is still underway so any input or suggestions FERC has will be considered for incorporation into the study report.
- E. Miller asked if, in addition to the use data collected via traffic counters, there will be additional data collected on the type of recreation activities visitors are participating in on the land accessed via the Musterground Road. K. Kirven acknowledged there are a variety of activities that could potentially occur on the land accessed via Musterground Road, although no additional data collection is planned at this time. E. Miller stated during the study development there was no mention the site would be closed for 6-7 years, so that is a new impact that needs to be taken into consideration. K. Kiven acknowledged due to the evolving circumstances surrounding construction and spoil placement and the many unknowns surrounding the new powerhouse, the 6-7 year closure wasn't determined at of the time of the study plan development however, these impacts will certainly be acknowledged and addressed to the extent possible. *(Note for clarification – not discussed directly during the meeting – the RSP does acknowledge closure as a potential short-term impact to recreational resources, however at the time of*

*study plan development, it was anticipated that the Wildlife Management Area lands accessed via Musterground Road would not be affected.)*

- Duke Energy will hold a Recreation and Visual Resources Committee meeting to talk through some of the recent changes to plans for Musterground Road access, among other topics.

## Task 2 – Foothills Trail Conditions Assessment

K. Kirven gave an overview of the objectives, methods, and results of Task 2 of the Recreational Resources Study. The Foothills Trail (FHT) conditions assessment was performed by Long Cane Trails. She also noted this task is focused on the trail corridor; a draft report has been submitted and Duke Energy is working through submitted comments. Comments were received by the FTC, SCDNR, and Friends of Lake Keowee Society (FOLKS), however, due to the compressed timeline between receiving comments and the ISR filing, there was not enough time to meet with the resource committee, therefore, the draft report was filed with the ISR and a meeting will be held with the resource committee in the near-term to discuss study results and comments. A final report will be filled with the Updated Study Report.

- C. Churchill asked about figure and if the trail (blue line) follows the actual trail. K. Kirven answered it does roughly follow the trail but is not refined. The FTC provided a similar comment. The trail corridor displayed in the figures will be refined in the final report.
- Glenn Hilliard asked how and when will comments on the Task 2 report be considered for incorporation in the report – the FTC provided many additional items for consideration in areas that may need upgrades. K. Kirven noted Duke Energy will hold a resource committee meeting in the near-term to identify maintenance vs. improvements vs. PM&E measures so Duke Energy can decide what upgrades may be incorporated into the study report. ACTION ITEM – Resource and Visual Resources Committee meeting to be scheduled
- D. Wilson noted the FTC provided comments on the PSP stating Duke Energy was interested in transitioning ownership of the trail to the FTC; this should be kept in mind considering there are 89 items identified for improvement along the 43-mile-long section. A. Stuart clarified – Duke was/is considering turning maintenance over to the FTC but has not committed to anything and discussions will continue if that route is chosen; Duke Energy will update FERC on any changes.
- D. Wilson noted along those lines regarding the Whitewater River cove closure and potential mitigation measures to address lack of access to that area, to keep in mind the potential to transfer maintenance to an agency and let FERC know of any mitigatory measures suggested by the agencies so FERC is aware. A. Stuart reiterated Duke Energy's goal is to develop a stakeholder settlement agreement and effectively mitigate to the extent possible and will certainly let FERC know of any proposed mitigation measures.
- S. Salazar noted culvert cleaning is listed as a maintenance item; in the interest of synthesizing information to facilitate the NEPA document there may be a need to consider cleaning of culverts on wildlife (e.g., tricolored bats) and other species that may use culverts for habitat. Fallen trees that are halfway felled could be considered snags

for bat (roosting) habitat. S. Salazar offered that this is just a reminder to not consider any study results in a vacuum.

- Kelly noted SCDNR did provide comments on the study report and many of those comments were centered on bat habitat and culverts. License application will include a proposal of maintenance/upgrades for comment/review for FERC's NEPA analysis.
- S. Salazar stated the tricolored bat is now a proposed species for listing under the Endangered Species Act, so FERC will be analyzing that along with other proposed species. FERC plans to update the IPaC report for the project based on new GIS files to get on the record before the second study season begins since the original IPaC is now outdated.
- J. Kindel also mentioned consideration of the gray bat which is a new addition to the species list for South Carolina and agreed with concerns around culverts along the trail.
- E. Miller (via chat) asked if photos of the culverts will be provided. K. Kirven answered the photos are small in the draft report (as insets) but perhaps could include larger versions of photos in an appendix to the final report. ACTION ITEM – topic to be discussed/reviewed at the Resource and Visual Resources Committee meeting.
- A. Stuart asked if is there a certain size criterion for culverts for bat habitat? J. Kindel noted SCDNR and SCDOT have been working together to identify a size criteria. Culverts running under highways with water running through are of key concern. For large colonies, a larger culvert would be needed. A. Stuart asked if this would include all culverts along the 43-mile-long trail. K. Kirven noted the only culverts that would potentially be disturbed (or cleaned) are the ones that were identified as needing maintenance during the assessment and noted that some language could be added into the license that during the license term bat surveys should be conducted prior to culvert cleaning. Todd Branham (Long Cane Trails) indicated none of the culverts he saw along the trail were larger than 24 inches in diameter and all were made of plastic. J. Kindel indicated that plastic culverts are not typically favorable bat habitat, as bats are not likely able to grip plastic for roosting. K. Kirven noted this will be a point of discussion in the upcoming meeting. ACTION ITEM – topic to be discussed at the Resource and Visual Resources Committee meeting.
- Glen Hilliard said in the original Bad Creek license, Duke Energy reserved the right to open/close/move the FHT at any time. He suggested that preserving the trail in perpetuity (conservation easement) would be desirable mitigation for Bad Creek relicensing. C. Churchill mentioned the trail is part of the existing license agreement. K. Kirven noted Duke Energy doesn't plan on closing the trail for any reason (portions of the trail could be closed at times due to safety concerns or maintenance needs) but that a complete trail closure is not a realistic scenario.
- A. Stuart noted the current lease expires in 2027 and at that time another long-term lease would be executed. K. Kirven indicated the FHT is a unique and regionally important recreation source, and preliminary recreation study results support that. G. Hilliard provided clarification on moving the trail – K. Kirven noted the carrying capacity analysis could indicate a need for small portions of the trail being shifted if a rare plant population, safety issue or something similar is identified.

- A. Gleason added not only is the FHT regionally important, visitors from every state and some other countries visit the FHT, attesting to its national importance. K. Kirven agreed – quite a few surveys were submitted by people visiting from other regions.

## Task 3 – Whitewater River Cove Existing Recreational Use

Kelly Kirven gave an overview of the objectives, methods, and results of Task 3 of the Recreational Resources Study. This study task is complete.

- C. Churchill asked for confirmation if each dot on the figure shown on Slide 83 represents a boat. K. Kirven confirmed.
- In response to results of boats being displaced for the 5-7 years during Bad Creek II construction, C. Churchill asked if closures are from the entire lake or just Whitewater River cove, because there plenty of other things to do as far as recreating opportunities. Similarly, G. Rice added, boaters are not displaced from the lake, they are only displaced from the small portion of the lake (i.e., Whitewater River cove). K. Kirven clarified/agreed – the rest of Lake Jocassee will still be available to the public; displacement would only be from Whitewater River cove. Most recreationists in the Whitewater River cove were sightseeing as they spent less than an hour in the cove. There are similar types of sightseeing opportunities (i.e., other waterfalls) that would still be open to the public during Bad Creek II construction.
- C. Churchill asked how the study was conducted so the boats weren't counted more than one time. K. Kirven noted this was a challenging task carried out by a Duke Energy data analyst who devised a categorical system so that boats were assigned an identifier so they weren't counted twice.
- D. Wilson noted it would be a good idea as Duke Energy develops a construction/public safety/recreation plan for mitigation to consider different types of signage/online posting other types of recreation / scenic water falls in the area and even locations (lat/long coordinates) that the public could visit while they would not be able to recreate in Whitewater River cove. This is a potential mitigative measure Duke Energy could easily implement. K. Kirven agreed it would be a great idea to provide information on other lake features similar to viewing/recreation in the Whitewater River cove.
- A. Douglas added there is limited parking availability at Devils Fork State Park, which provides the only public access to Lake Jocassee and the Whitewater River cove. The SCPRT (Rowdy Harris) closes down the parking lot when it's full. Since there is limited public access to the lake, there is limited opportunity for increased use. There will be no more additional parking, no additional docks, in the next 5-7 years (i.e., usage is not likely to change). K. Kirven agreed – the lake has very low development and limited access so there's very little room for increased use.
- A. Gleason noted the parking capacity of Devils Fork State Park is not the only deciding factor regarding how many boats are on the lake. Rental boats have increased in the last few years (i.e., boaters who do not park in the lots).

### Task 4 – Whitewater River Cove Recreational Public Safety Evaluation

Kelly Kirven gave an overview of the objectives and methods of Task 4 of the Recreational Resources Study. This study will be conducted in 2024.

- C. Starker asked whether response rates were calculated for surveys under Task 1 of the Recreational Resources Study. K. Kirven noted as indicated in previous meetings, there was no response rate (except in person if a person declines the survey). Nothing was sent out with the expectation of getting responses back. Information documenting how many people declined and how many people had taken the survey before was captured. A. Stuart asked if there was a chance that the same person could be asked twice. By using the same three surveyors throughout the study, they were able to recognize folks who had taken the survey before so they weren't double counted; there was also a question on the survey asking visitors about timing or frequency of past visits.
- Gerry Yantis asked if there was a way to indicate how many actual people were in a group (e.g., one person may have done the survey in a group of 10). K. Kirven returned to an earlier slide under Task 1 (slide 67) showing the survey form which asks how many individuals are in the group. Traffic counters were used primarily to collect data about parking area usage to inform analysis of parking lot capacity and adequacy; trail counters were used to count individuals passing by the trail counter.
- No questions specific to Task 4 were received.

## Aquatic Resources (1:49)

Mike Abney introduced the Aquatic Resources Study and provided the tasks under the study.

- David Gandy – FERC requests all raw water quality data and any associated metadata (file with USR). ACTION ITEM – Duke Energy to provide raw data to FERC.

### Task 1 - Entrainment

Kevin Nebiolo discussed objectives, methods, and results of the Entrainment Study.

- C. Starker asked if regression models (or similar) were used to confirm there was an increased chance of entrainment at lower lake elevation levels? K. Nebiolo answered no, distributions were fit and medians were compared.
- A. Douglas asked about the total population of threadfin shad and how the total population of threadfin shad in the lake is known to estimate the total population that would be entrainable (12 percent). K. Nebiolo noted Duke Energy conducts annual hydroacoustic surveys of pelagic forage fish. A. Douglas noted shad are the primary prey for loons and stated that the majority of shad suffer mortality in the winter, and that is when the loons are present. K. Nebiolo said most shad are entrained in the meteorological fall, from September to November.
- D. Rankin asked if the use of American Shad as a surrogate for Threadfin Shad was based on swim speed or size. K. Nebiolo returned to an earlier slide to review the equation used which involves population growth rates and stated that there is not a discrete population growth rate available in literature or publicly available resources for

Threadfin Shad, therefore they identified several taxonomic surrogates and chose the most conservative option.

- A. Douglas asked if shad are put into the lake every year. D. Rankin answered shad are not stocked, they are a self-sustaining population.
- E. Hollis asked why only Threadfin Shad and Blueback Herring were considered. K. Nebiolo answered that these two species were the most susceptible to entrainment and those for which we have population data. Other species entrained at lower numbers would have to be evaluated as a qualitative analysis involving population parameters and intrinsic properties of the species. A. Stuart clarified that these species consisted of at least 90 percent of the species entrained.
- Jeff Lineberger asked about what sort of driver temperature is for entrainment loss since some large percentage of shad die anyway. K. Nebiolo noted that the analysis did not find a correlation trend between entrainment with temperature in this data set, however he acknowledged that it is a known problem and consideration in entrainment studies.
- A. Douglas asked what percentage of area Whitewater River cove is compared to the entire lake. A. Douglas indicated 12 percent seems very high. K. Nebiolo stated that the data set available is not spatially explicit, just the lake itself. (*Note: Whitewater River Cove is approximately 1.5% of the lake by surface area*)
- G. Rice asked whether the model predicts what does happen or what may happen. K. Nebiolo stated that this predicts what may happen. G. Rice asked if a large event (i.e., 12% of threadfin shad population entrained) happens every year? K. Nebiolo stated no, it does not happen with any regularity. M. Abney also clarified that this analysis assumes 100% mortality, which we know not to be true (another conservative measure). A. Stuart asked D. Rankin how long we have been monitoring the forage fish populations in the lake, which they said is around 30-40 years, and the operation of the facility does not appear to be a threat to the population. D. Rankin also stated that the hydroacoustic monitoring has shown the population to vary widely during that time and is unpredictable from year to year.
- D. Rankin asked, with such wide bounds on the population size, how did the study determine 12 percent? K. Nebiolo stated it was based on the median population size of the data set. D. Rankin wondered if it's the same amount (proportion) of the population every year.
- D. Gandy asked if estimated population growth rates were only from Fishbase or if there was a review of literature. K. Nebiolo indicated they used FishBase and USEPA 316b resources for growth estimates.

*Break*

## Task 2 – Desktop Studies on Pelagic and Littoral Habitat

Erin Settevendemio presented an overview of the objectives, methods, and results of Task 2 of the Aquatic Resources Study.

No further discussion.

### Task 3 – Mussel Surveys and Stream Habitat Quality Surveys

Erin Settevendemio presented an overview of the objectives and methods of Task 3 of the Aquatic Resources Study. The draft report has been submitted and comments have been received; Duke Energy will continue to address comments in consultation with the resource committee.

- E. Hollis asked whether mussels were expected to be found. Nick Wahl indicated there have been mussels observed in Lake Jocassee; however, no protected species. Simply because no mussels were found doesn't mean they aren't present.
- S. Salazar – did the stream habitat assessment methods include distinguishing between native and non-native vegetation and do survey reports make note of that? E. Mularski noted the habitat assessment forms didn't have any categories for native vs. non-native vegetation; however, as far as invasive species within the vegetation plots while carrying out the SQT study, no areas were noted where an infestation of non-native species occurred. S. Salazar commented Japanese stiltgrass (*Microstgium vimineum*) was observed and noted in the PAD (Natural Resources Assessment) (in the transmission line corridor); if the new access road is near these locations it would be prudent to keep in consideration of measures for disturbance and spread of non-native invasive species. E. Mularski noted stiltgrass is present all throughout the southeast. E. Settevendemio agreed there was no *Microstegium*, and noted if it's already onsite that Duke Energy would need to keep it in consideration to prevent spreading. E. Mularski mentioned that there are no obvious infestations of non-native species present in the forested areas. Non-native species were observed within disturbed areas on the project site particularly the maintained transmission right of way.

# Environmental Justice (2:43 pm)

Alison Jakupca presented an overview of the objectives, methods, and results of the Environmental Justice (EJ) Study and noted that no need was identified for additional outreach efforts beyond those currently being employed by Duke Energy as part of the relicensing. One EJ community based on race identified in Transylvania County, NC - primarily within 5-mile buffer zone (with SW portion in 1-mile buffer zone). Two EJ communities based on low income identified in Oconee County, SC and Transylvania County, NC (both within 5-mile buffer zone). Undeveloped (forested land) around Project and between the Project and EJ communities is an effective PM&E measure.

- D. Wilson noted that due to proposal of new construction (associated with Bad Creek II), FERC requires the larger 5-mile buffer for the EJ communities study. Additional outreach should be addressed for the Bad Creek Project. Typically, members of the EJ communities are not NGOs or member of groups with any type of standing; therefore, FERC would like to see some targeted public outreach in local communities.
    - ACTION ITEM – Duke Energy to conduct additional Public Outreach.
- D. Wilson stated new census data were just released for 2022; FERC suggests rerunning the EJ analysis to see if there are any changes from current results (which used 2020/2021 data). It is likely Duke Energy will need to re-run the EJ study as the

project progresses and census data are updated. D. Wilson suggested new data should be used in USR and again in the PLP/DLA. A. Jakupca noted that re-running the data would also necessitate extensive updates of data tables and maps and questioned the practicality or efficiency of making multiple updates.

  - ACTION ITEM – Duke Energy to identify plan and timing to rerun EJ analysis with updated census data. An updated EJ report will be submitted with the USR using updated census data.

- D. Wilson discussed the potential for adding the proposed Fisher Knob road into the analysis would that increase the radius for potential for EJ communities. A. Jakupca noted the Fisher Knob community is in the 5-mile buffer and the identified EJ communities are well away from Fisher Knob.
- FERC asks in the USR to describe public outreach (where, when, attendance). A. Jakupca asked about timing and when FERC recommends outreach to occur, when new EJ analyses should be run, and how that fits in with the regulatory schedule.
- D. Wilson answered when we reach FLA (which is used for NEPA), FERC would like to see outreach methods and outreach and comments at the FLA stage. So between the USR and FLA FERC would want to have revised map and table using the most updated census block data. In terms of outreach, D. Wilson suggested a community meeting (town hall, school, local community center) near to EJ communities and posting it in these areas (and perhaps not relying on online advertisement or notice). The reason for the meeting is to get some substantive feedback and this feedback could serve to develop a PM&E measure. FERC would like to see these steps taken during an EJ study and acknowledges this is a new resource area for analysis in relicensing so it is not as straightforward as the other studies.
- S. Salazar asked if the Fisher Knob access road is included in the buffer for EJ. A. Jakupca noted yes, it is in the buffer. If the radius were expanded down to the north and south, there would likely be no impacts to EJ communities due to their location in relation to Fisher Knob. S. Salazar asked whether EJ communities would be affected along the hauling routes used by construction vehicles.
- A. Jakupca said trucks would come down Bad Creek Road / Rt 130 and turn directly into the Project. A. Stuart noted any gravel delivered to the site would likely be transported down Rt 130 from the north, noting trucks will be accessing the site regardless of whether it's for the access road or the new construction.
- S. Salazar noted the access road will be built first when considering timing of impacts, and trucks may take a route that may go near one of the EJ communities in the north.
- G. Rice noted we can't control which way haul trucks come to the site. Traffic is generally sparse in the vicinity of the Bad Creek Project.
- S. Salazar noted on other projects, vehicle emissions associated with project construction is a concern (as well as impacts to EJ communities).
- A. Jakupca noted even if the boundary was expanded far beyond the 5-mile buffer, the classification would not fit the "disproportionately high" category.
- D. Wilson thanked S. Salazar for mentioning about haul trucks and haul roads and asks Duke Energy to keep in mind the location of the trucking company location used and quarry location to disclose in the FLA for FERC's NEPA analysis.

# Visual Resources (3:32 pm)

J. Huff presented an overview objectives, methods, and preliminary results of the Visual Resources Study; she gave a brief introduction of the nine tasks under the study. She presented preliminary results from early December field work to take day-time and night-time photos. This information was presented in a recent (early January 2024) resource committee meeting but was not provided in the ISR. Based on stakeholder input, key views have been selected and the study will use those confirmed views to perform the remaining study tasks regarding aesthetics for the Project.

- G. Rice asked if a person can only see Project-related features in leaf-off conditions, how important would that impact be if nobody is there to note that impact, and whether there is any way to address that. J. Huff noted we can describe that in the narrative of the report, however, if there were ever an event that would remove most of the vegetation (e.g., ice storm), then more terrain and features would become visible, so this is the conservative approach. G. Rice asked if the new transmission towers look similar to the existing and J. Huff confirmed that they do.
- W. Cooler mentioned a lighting ordinance on a different study stated light should be seen from a site but the source of light should not be seen and believes this to be a good definition for controlling light pollution. People living in remote areas like Bad Creek value darkness and would be happy for anything done to keep light on the Project property. J. Huff noted the site is very hard to see if you actually aren't there on site.
- C. Starker mentioned dark sky lighting and acknowledged there is some lighting necessary for safety. J. Huff noted you can see lights from the inlet/outlet portal, though this light is not as prominent as the house lights at Fisher Knob.
- D. Wilson added he is looking forward to seeing the selected key observation points and noted it would be helpful to have a sense of the height of the spoil site (not just aerial extend), and asked if this could be something (GIS/DEM or a visualization) submitted to FERC. J. Huff answered Duke Energy could include that in the report as a table with the heights – during the study solid structures were modeled as vertical slopes to be conservative (side slopes weren't taken into account). D. Wilson noted that would be very helpful for potential aesthetic impact along with long-term plans for spoils. ACTION ITEM – Duke Energy to include table of spoil pile height in the draft report.

# Herptile Survey (3:55 pm)

S. Fletcher presented an overview on objectives, methods, and findings of the Herptile Survey (reptile and amphibians). This survey was not a relicensing study but was performed to support Section 404/401 permitting and based on a request from the SCDNR to document any species listed in the S.C. Wildlife Action Plan (SWAP). A herptile study plan was developed in consultation with the resource committee, including SCDNR and USFWS, and the report was also reviewed by the resource committee. Terrestrial herptile field surveys were carried out on the eight terrestrial proposed spoil locations. During the survey 14 species were identified and the only SWAP species observed was the Eastern Box Turtle. This task is complete and was included as an attachment in the ISR.

Additionally, S. Fletcher indicated Duke Energy will be developing a study plan and carrying out an additional survey for bats due to potential clearing associated with the proposed temporary access road, spoil areas, transmission line, etc. This will also support Clean Water Act USACE 404 permitting to avoid impacts to endangered species, as well as preparation of the Biological Assessment (BA) for submittal to the USFWS [to comply with Section 7 of the ESA] for the 404 permitting. Duke Energy will target filing the study plan in line with the summer survey guidance (to be updated in March) to concentrate on proposed cleared areas. Acoustic work needs to be done in accordance with timing restrictions, so Duke Energy will prepare a study plan with HDR and will submit study plan to meet these time of year restrictions (targeting June). The study plan will include details from the soon-to-be revised (March 2024) Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidance. A. Stuart added that survey will be good for five years from time of survey. With the unified federal agenda, the tricolored bat will receive final listing and the little brown bat will have proposed rule in September 2024 (*Note: since 1/24/2024, the USFWS has stated that there is no current timeframe regarding the listing date*); the hoary bat will also be up for listing in the next couple years and all three of these species were identified in the 2021 bat survey.

Melanie Olds recommends sending proposed study plan to USFWS for approval. S. Fletcher acknowledged and agreed. Duke Energy will send the study plan to the USWFS, FERC, and the Wildlife & Botanical Resource Committee.

S. Salazar noted to SCDNR that FERC's list of comprehensive plans includes the 2015 SWAP and the 2008 SCORP. If these are not the current versions, please update. E. Miller verified the 2015 SWAP is the current version.

S. Salazar provided a segue to a question about tricolored bat seasonal population zones. S. Salazar asked for clarification from USFWS and SCDNR. On a different project, there have been comments on the seasonal population zones for tricolored bats but there were no sources provided where zones occur. Until there is an official publication for FERC to reference, zones need to be identified in coordination with M. Olds/USFWS in the Project vicinity so FERC can assess potential impacts. Duke Energy will take that into account and touch base with M. Olds.

M. Olds stated there is no map for distribution yet but hibernation range for NLEB will be same for tricolored (Blue Ridge portion of the state), and the rest of state will be year-round active for tricolored bat. This may change as more information comes in but that's the current consideration.

S. Salazar said for the other project, there were three zones identified – the true hibernation zone, year-round active zone, year-round zone 2. M. Olds stated South Carolina is year-round active zone 1. There is no zone 2 in the state of South Carolina (however other southern states have all three classifications). S. Fletcher noted this information will be important and will be considered in consultation with USFWS.

S. Salazar asked when Duke Energy plans to file the study plan with the USFWS as FERC will also need to review. Duke Energy is targeting April 15 for the study plan and completing the study in June.

M. Olds agreed it would be best to wait until the new version of the survey guidelines is available (in March) as it will have the dates/maps of seasonal population zones. ACTION ITEM – Duke Energy to file study plan with the USFWS and FERC targeting April 15, 2024.

# Additional Comments Submitted During Study Year 1

S. Fletcher presented comment submitted by the S.C. Wildlife Federation regarding blasting effects on wildlife. Duke Energy responded to the comment on December 19, 2023.

- The environmental report to be filed with the license application will contain information regarding blasting and impacts and proposed environmental measures and the BA will have a noise component as well.

S. Fletcher also presented a comment submitted by Advocates for Quality Development (AQD) regarding increased potential for increased runoff and erosion along new temporary roads and spoil areas.

- Most spoil placed in storage will be rock sized and materials will not be placed on slopes due to instability. French drains will be installed over aquatic resource areas. A sediment and erosion control plan will also be submitted for regulatory agency approval; implementing sediment and erosion control best management practices are a standard practice for Duke Energy construction sites.

J. Crutchfield and A. Stuart provided closing comments and reminded participants to sign the attendance sheet. Duke Energy will file the meeting summary and presentation with FERC and upload to the resource committee SharePoint site (along with the meeting recording) within 15 days as dictated by the ILP process.

A. Stuart presented the FERC ILP next steps and stated Duke Energy will start relicensing Settlement Agreement discussions with stakeholders in March. The goal is to have a final agreement by the end of November 2024 to support the Draft License Application development (filing expected March 2025). An independent facilitator will facilitate the discussions in-person. The Settlement Agreement trial balloon (i.e., Duke Energy's non-binding initial set of proposals is being drafted now and will be presented to relicensing participants/potential settlement parties in March 2024). By the end of September 2024, Duke Energy hopes to have the Agreement in Principle, which is the precursor to the Settlement Agreement. A. Stuart acknowledged Duke Energy may need to make some assumptions since not all studies will be complete.

E. Hollis asked how would we proceed if we don't know Bad Creek II will be built? A. Stuart answered we are presently moving under the assumption that Bad Creek II will be built and noted there is still a lot of work to be done.

S. Salazar thanked participants for participation and for questions and comments throughout the relicensing process. Later in the process (next year at this time) after the USR, the milestones won't let up, so everybody is encouraged to stay engaged and spoke a bit about upcoming tasks and milestones.

A. Stuart thanked the FERC staff for their suggestions and recommendations. Duke Energy's goal is to reduce the amount of Additional Information Requests (AIRs) after filing the license application. If Bad Creek II is going to be constructed, Duke Energy would like to start project expansion construction in 2027 to hit internal milestones to support its continued renewable energy commitment.

S. Salazar reminded the participants to feel free to contact her for any process-related questions and added her phone number and email in the meeting chat and requested Duke Energy include her contact information in the meeting summary as well. Sarah.Salazar@ferc.gov; 202-502-6863 ACTION ITEM – Include Sarah Salazar's contact information in meeting summary (completed herein).

Follow up – A. Stuart corrected himself from an earlier statement regarding construction activities related to rock quarry location – the McNeely Quarry is not in Cashiers, it is in the town of Sapphire, relatively close to the Project (9.4 miles northeast from Bad Creek).

A. Stuart offered final thanks and closed the meeting at 4:25 pm.

# Bad Creek Pumped Storage Project No. 2740

## Initial Study Report Meeting

DUKE ENERGY®

BUILDING A SMARTER ENERGY FUTURE®

JANUARY 17, 2024

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## Meeting Agenda

- Welcome and Meeting Purpose
- Safety Moment
- Water Resources Study
  - Break
- Recreational Resources Study
  - Lunch
- Aquatic Resources Study
  - Break
- Environmental Justice Study
- Cultural Resources Study
- Visual Resources Study
- Proposed Spoil Area Herptile Surveys
- Closing



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## Safety Moment – FROSTBITE

- **Frostbite** occurs when skin and tissue freezes; commonly affects fingers/toes/ears/extremities. Can cause permanent tissue damage or lead to amputation.
- **Temperatures** below 0°F can cause frostbite **within hours**, however, frostbite can occur over longer periods at temps as warm as 31°F. You cannot get frostbite in temperatures above 32°F (however, you are still at risk for hypothermia if body temperature falls below 95°F).

Stages of Frostbite


- **What to do** – If extremities turn red or numb, or you begin to experience pins and needles, get somewhere warm to avoid further damage. Frostnip (or 1st degree frostbite) is usually not permanent, but advanced stages require medical help.
- **Do not** touch or rub skin to try to warm it; unless in life threatening situation, **do not walk** if feet are affected by frostbite to avoid further damage.
- **Do not** place anything **hot** on areas affected by frostbite – skin needs to be warmed up slowly with consistent heat.



https://www.independent.co.uk/news/world/americas/frostbite-symptoms-how-cold-fast-b2002317.html

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## FERC ILP Schedule

| Activity | Responsible Parties | Timeframe | Estimated Filing Date or Deadline |
|---|---|---|---|
| File Notice of Intent (NOI) and 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 24, 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 7, 2022 |
| File Proposed Study Plan (PSP) (18 CFR §5.11) | Licensee | Within 45 days following deadline for filing comments on PAD/SD1 | Aug 7, 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 |



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## Resource Committees

**Lead Technical Manager**
- John Crutchfield

**Project Manager**
- Alan Stuart

### Aquatic Resources
- Mike Abney
- Nick Wahl

### Cultural Resources
- Christy Churchill

### Water Resources
- Maverick Raber

### Recreation & Aesthetics
- Alan Stuart
- Ethan Pardue

### Wildlife & Botanical Resources
- Scott Fletcher
- Mike Abney

### Operations
- Lynne Dunn
- Alan Stuart



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## Bad Creek II Complex –
General Overview and Project Update

- Proposed Expanded Project Boundary
- Proposed Temporary Access Road (Fisher Knob Access Road)
- Increased Hydraulic Capacity



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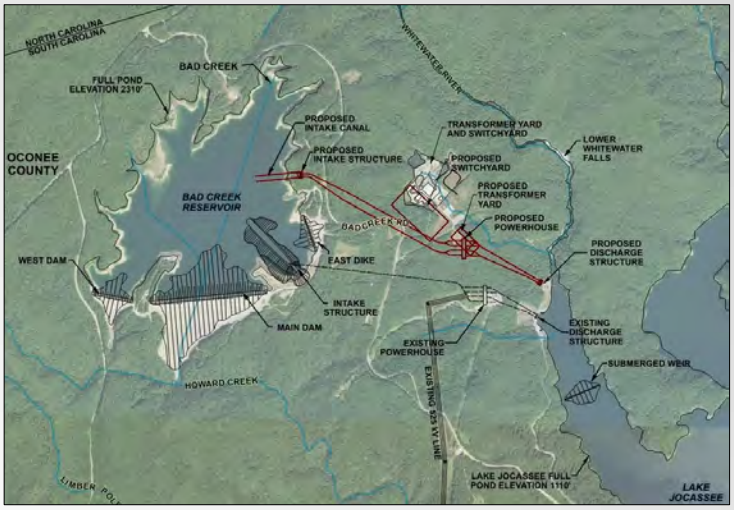
## General Project Overview

**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 night/weekend 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 ~3,360 MWs with 11 hours of storage

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## Proposed Expanded Project Boundary



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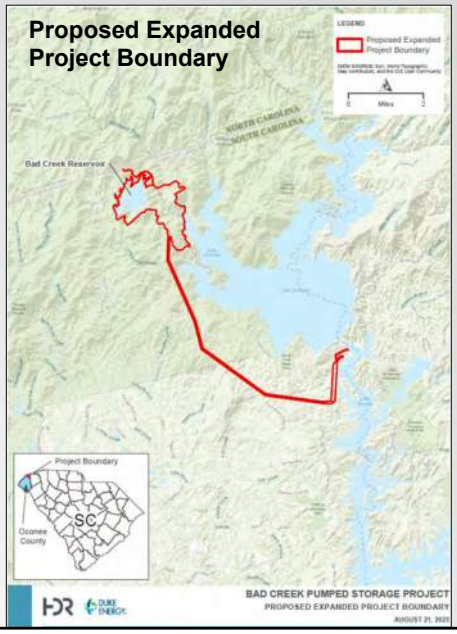
## Proposed Expanded Project Boundary for Bad Creek II


Project boundary expanded to include areas potentially impacted from spoil placement

**Original:** 1,280 acres
**Expanded:** 1,490 acres

Increase of ~210 acres

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## Proposed Expanded Project Boundary for Bad Creek II


- According to preliminary studies, approximately **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 submerged weir in Lake Jocassee.
- Since the RSP filing, **an additional spoil area** related to the construction of a proposed transformer yard (location J) was added and brings the total amount of material to 4.4 million cubic yards.
- Preferred potential areas for spoil placement are **currently under evaluation**.



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## Proposed Temporary Access Road



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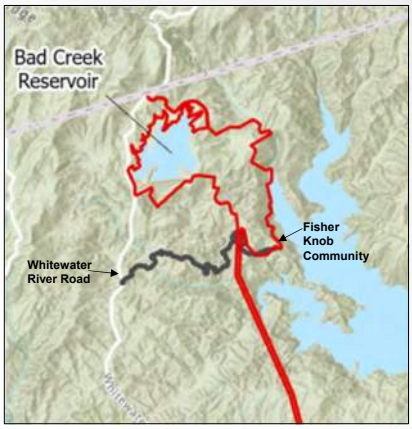
## Fisher Knob Temporary Access Road

- Duke Energy is proposing to develop an access road to provide an alternate route to the Fisher Knob Community for use during Bad Creek II construction.




- The proposed gravel service road would be approximately 3.7 miles long, primarily follow an existing unmaintained logging road on property owned by Duke Energy and would only be maintained during construction of Bad Creek II.



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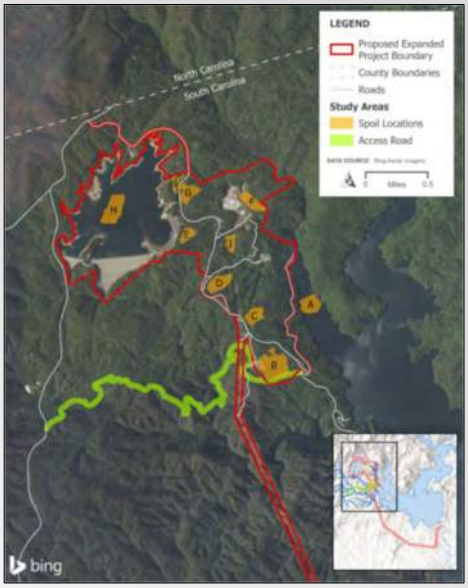
## Fisher Knob Temporary Access Road

- The temporary access road would necessarily be constructed in advance of construction for Bad Creek II and prior to the new license issuance – the road is not proposed to be part of the expanded FERC Project boundary.
- The road will use temporary bridges to cross on-site streams.
- Individual study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies have been expanded since the RSP filing to assess the potential effects of the Fisher Knob Access Road.



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## Bad Creek II Maximum Hydraulic Capacity



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## Bad Creek I and Proposed Bad Creek II Hydraulic Capacities

| | Bad Creek I | | | | Proposed Bad Creek II | | | |
|---|---|---|---|---|---|---|---|---|
| | Generation | | Pumping | | Generation | | Pumping | |
| | Original (cfs) | Upgraded (cfs) | Original (cfs) | Upgraded (cfs) | Original (cfs) | Updated (cfs) | Original (cfs) | Updated (cfs) |
| Unit 1 | 4,000 | 4,940 | 3,690 | 4,060 | 4,860 | 5,000 | 4,120 | 4,890 |
| Unit 2 | 4,000 | 4,940 | 3,690 | 4,060 | 4,860 | 5,000 | 4,120 | 4,890 |
| Unit 3 | 4,000 | 4,940 | 3,690 | 4,060 | 4,860 | 5,000 | 4,120 | 4,890 |
| Unit 4 | 4,000 | 4,940 | 3,690 | 4,060 | 4,860 | 5,000 | 4,120 | 4,890 |
| **Total** | 16,000 | **19,760** | 14,760 | **16,240** | 19,440 | **20,000** | 16,480 | **19,560** |

Total Generation Capacity (with BCII): 19,760 + 20,000 = 39,760 cfs
Total Pumping Capacity (with BCII): 16,240 + 19,560 = 35,800 cfs

- Modeled (CFD) versus updated generation capacity is similar (39,200 cfs vs. 39,760 cfs, **<2 percent difference**)
- CFD model to be re-run with updated pumping capacity (32,720 cfs vs. 35,800 cfs, **~9 percent difference**)
- Studies affected by this change (pumping): Entrainment study and CHEOPS study



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## Water Resources Study



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## Water Resources Study Task Refresher

| Study Task | Status |
|---|---|
| Task 1 – Summary of Existing Water Quality Data And Standards | **Complete** |
| Task 2 – Water Quality Monitoring in Whitewater River Arm | **Ongoing** |
| Task 3 – Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling) | **Complete** |
| Task 4 – Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling) | **Ongoing** |
| Task 5 – Future Water Quality Monitoring Plan Development | **Beginning in 2024** |



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## Task 1 - Summary of Existing Water Quality Data & Standards

- **Objective:** Compile previously collected water quality data and provide a summary of existing data from Lake Jocassee and Howard Creek under current Project operations and prior to Project operations.
- **Status:** **Complete**



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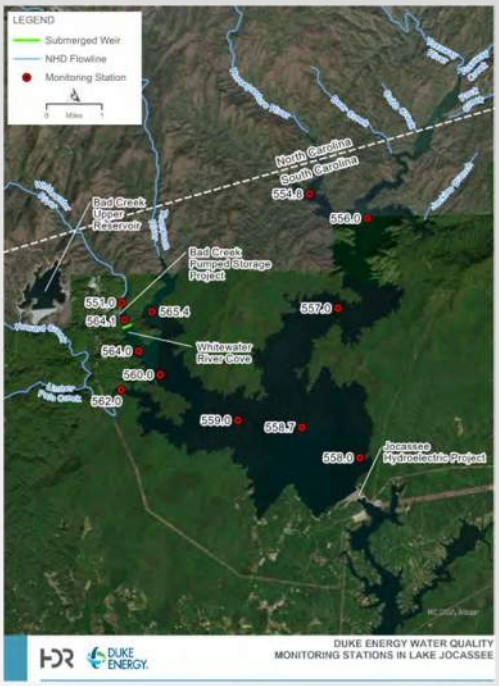
# Task 1 – Desktop Methods Summary

- ***Study Area***:
  - The study areas for this desktop review include **Lake Jocassee** and **Howard Creek**.
- ***Data Sources***:
  - Lake Jocassee: Duke Energy water quality data from 12 monitoring stations in Lake Jocassee
  - Howard Creek: Clemson University water quality data from Howard Creek (Abernathy et al. 1994)
- ***Water Quality Parameters***:
  - Temperature, Dissolved Oxygen, pH, Nitrogen, Phosphorus, Chlorophyll a, Conductivity, and Turbidity

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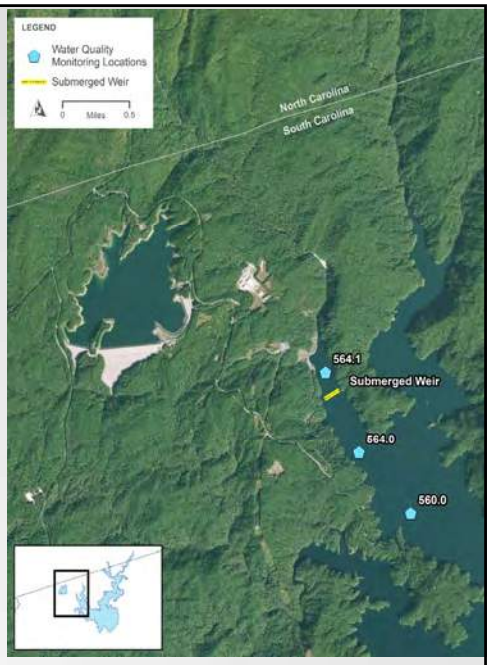
# Task 1 – Desktop Methods Summary

- ***Lake Jocassee -*** Data were separated into "pre operations" (<1991) and "post operations" (1991-present) to compare present-day water quality conditions with conditions that existed prior to operations.
  - For the three stations in the Whitewater River cove, a third time period was assessed (1985-1991) to cover the "construction" period upstream and downstream of the submerged weir.


- ***Howard Creek -*** Data were assessed between pre construction (1980/1981) and post construction (1993) downstream of Bad Creek to compare water quality.




Bad Creek Pumped Storage Project ISR Meeting | 20

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## Results Summary – Overall Lake Jocasee

1. There is very little difference in average/max/min values or standard deviations in water temperature or DO between pre and post Bad Creek operation (*with the exception of Station 564.1 discussed on next slide*).

2. There are no discernable patterns (over decades of data) that would suggest Lake Jocassee temperatures or DO are affected by operations or are outside the range of natural conditions.

*(Data for water temperature and DO are included below – all other parameters are included in the Final Report.)*

**Depth-Averaged Temperatures Pre vs. Post Operations**

| Monitoring Station | Temperature (°C) | | | | Difference |
|---|---|---|---|---|---|
| | Pre operations | | Post operations | | |
| | Average | Standard Deviation | Average | Standard Deviation | |
| 558.7 | 12.5 | 4.9 | 12.1 | 4.8 | -0.4 |
| 558.0 | 12.9 | 5.2 | 13.5 | 5.4 | +0.6 |
| 559.0 | 12.5 | 5.0 | 12.1 | 4.9 | -0.4 |
| 560.0 | 11.7 | 4.6 | 12.3 | 4.9 | +0.6 |
| 562.0 | 15.3 | 5.6 | 16.0 | 5.3 | +0.7 |
| 565.4 | 14.1 | 5.4 | 13.1 | 4.7 | -1.0 |
| 551.0 | 13.5 | 5.8 | 14.8 | 7.3 | +1.3 |
| 564.0 | 12.1 | 4.7 | 12.7 | 4.9 | +0.6 |
| 564.1 | 13.9 | 5.6 | 17.2 | 5.5 | +3.3 |
| 557.0 | 11.7 | 4.5 | 12.2 | 4.8 | +0.5 |
| 554.8 | 14.6 | 5.5 | 14.2 | 5.3 | -0.4 |
| 556.0 | 12.8 | 4.9 | 13.4 | 5.2 | +0.6 |

**Surface Dissolved Oxygen Pre vs. Post Operations**

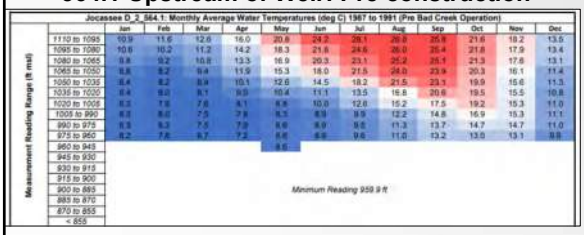
| Monitoring Station | Dissolved Oxygen (mg/L) | | | | Difference |
|---|---|---|---|---|---|
| | Pre operations | | Post operations | | |
| | Average | Standard Deviation | Average | Standard Deviation | |
| 558.7 | 6.9 | 2.4 | 6.9 | 1.9 | 0 |
| 558.0 | 6.5 | 2.8 | 7.0 | 1.8 | +0.5 |
| 559.0 | 6.5 | 2.7 | 6.5 | 2.2 | 0 |
| 560.0 | 6.7 | 2.5 | 6.4 | 2.3 | -0.3 |
| 562.0 | 7.8 | 2.7 | 7.9 | 2.0 | +0.1 |
| 565.4 | 7.3 | 2.9 | 7.1 | 2.5 | -0.2 |
| 551.0 | 9.9 | 1.3 | 9.6 | 1.6 | -0.3 |
| 564.0 | 6.4 | 3.0 | 6.2 | 2.6 | -0.2 |
| 564.1 | 7.4 | 3.2 | 8.5 | 0.8 | +1.1 |
| 557.0 | 6.8 | 2.9 | 6.8 | 2.3 | 0 |
| 554.8 | 7.7 | 3.1 | 7.4 | 2.8 | -0.3 |
| 556.0 | 7.4 | 2.9 | 7.3 | 2.6 | -0.1 |

21

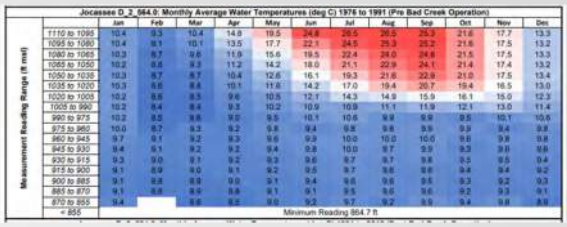
## Results Summary - Whitewater River Cove Temperature

- Upstream of the weir (left), the water column is stratified during pre construction but becomes well mixed under post construction.
- Downstream of weir (right), water column is stratified and is similar between pre and post construction.

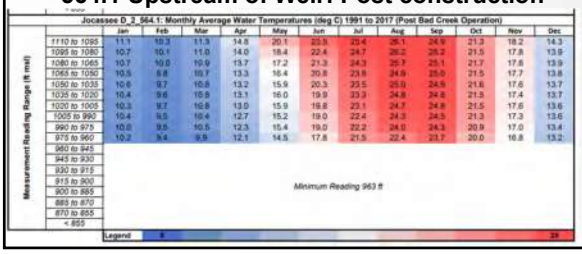
**564.1 Upstream of Weir: Pre construction**



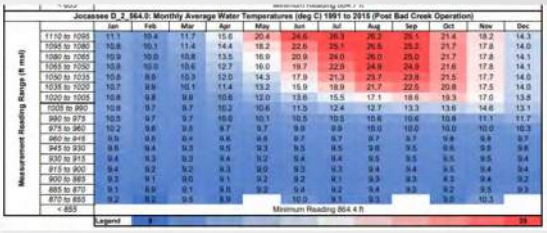
**564.0 Downstream of Weir: Pre construction**



**564.1 Upstream of Weir: Post construction**



**564.0 Downstream of Weir: Post construction**

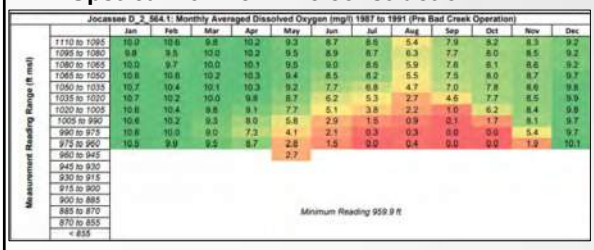


22

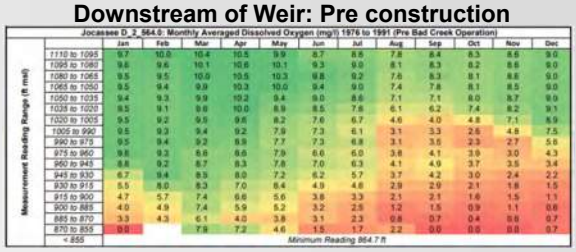
## Results Summary - Whitewater River Cove Dissolved Oxygen

- Upstream of the weir (left), the water column is stratified during pre construction but becomes well mixed under post construction.
- Downstream of weir (right), water column is stratified and is similar between pre and post construction.

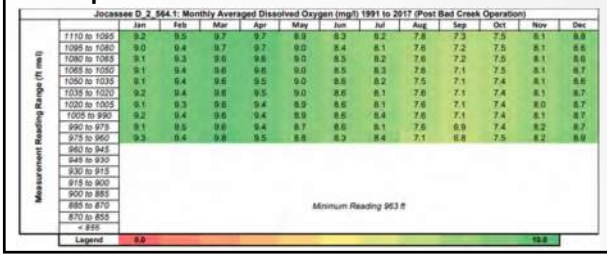
**Upstream of Weir: Pre construction**



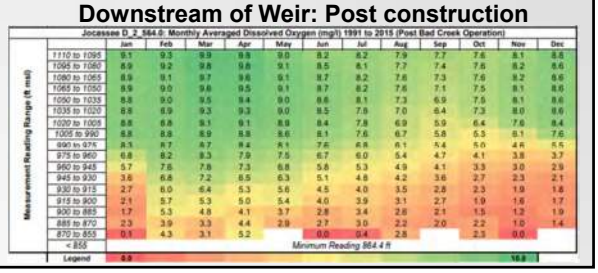

**Downstream of Weir: Pre construction**




**Upstream of Weir: Post construction**




**Downstream of Weir: Post construction**

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## State Water Quality Standards Compliance – Lake Jocassee

| Full period of record | Numeric Surface Criteria (SCDHEC) | No. Samples | Percent of dataset not meeting criteria | Fully Supporting? |
|---|---|---|---|---|
| DO | At or >6.0 mg/L | 4,241 | <1.0% | Yes |
| pH | 6-8 standard units | 4,253 | <1.0% | Yes |
| Phosphorus | At or <0.02 mg/L | 2,228 | 9.8% | Yes |
| Nitrogen | At or <0.35 mg/L | 545 | 6.1% | Yes |
| Chlorophyll a | At or <10 ug/L | 1,753 | <1.0% | Yes |
| Turbidity *(Whitewater River Cove only)* | At or <10 NTU | 550 | <1.0% | Yes |

- Parameters without numeric criteria (temperature, DO saturation, conductivity) meet narrative criteria where provided. Where criteria is not provided, because Lake Jocassee supports a diverse, healthy fish community, the water quality parameter is considered to be fully supporting.



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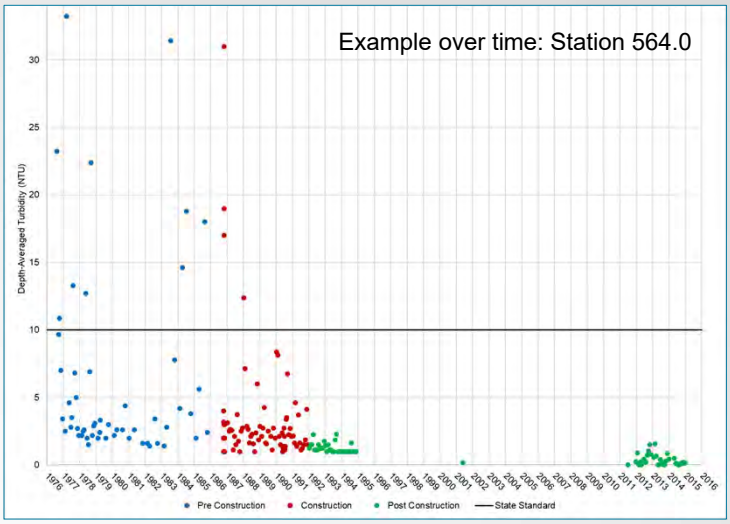
## Results Summary - Whitewater River Cove Turbidity

- Where data are available, NTU values are higher during pre construction periods than during construction and post construction periods (see graph below – example from Station 564.0).

- **Future construction activities** at Bad Creek could increase turbidity in the Whitewater River cove; however, these events would likely be short-lived and based on previous data, recovery in the water column is expected to be rapid.
- Along with appropriate BMP measures, impacts are expected to be **temporary and limited** to the Whitewater River cove.

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## Howard Creek Water Quality – Methods Summary

- Clemson University monitored water quality before and after Project construction – their results from 1993 are summarized in the Final Report and represent post operational conditions in Howard Creek to provide baseline (current-day) conditions.
- Water quality parameters and sampling locations were determined in coordination and agreement with FERC, SCDHEC, and SCDNR.




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## Howard Creek Water Quality

- Results (Abernathy et al. 1994) indicated that even with the major construction of the Project, most baseflow water quality conditions were relatively unchanged during and after construction and post construction water quality conditions were generally similar to pre construction.
- Notable changes included slightly elevated total alkalinity, total hardness, and specific conductance, which were linked to seepage through dams coming into contact with newly placed grout.

- During the 18-year study "Long-term Recovery Monitoring of the Howard Creek Fishery", results showed that Howard Creek has maintained a recovered condition from 1995 to at least 2015 (the last survey period), indicating suitable water quality and habitat.



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## Conclusions - Water Resources Task 1

- ***Lake Jocassee – Take home points***
  1. Upstream of the submerged weir, the water column undergoes vertical mixing and there is no indication of stratification (post 1991) regardless of season.
  2. Downstream of the submerged weir, stratification is observed and is consistent between pre and post operation conditions. These results show mixing is confined to the portion of the Whitewater River cove upstream of the submerged weir.
  3. All water quality parameters assessed in Lake Jocassee are fully supportive of designated use classifications.
- ***Howard Creek – Take home points***
  1. Results from Abernathy et al. (1994) indicate most water quality parameters under operational conditions are similar to and fall well within the range of natural/seasonal variation observed under pre operational conditions.
  2. Water quality conditions assessed are fully supportive of designated use (with the exception of pH at times, which is naturally low as mountain streams in the vicinity of Lake Jocassee are typically poorly buffered and have low pH values due to underlying bedrock.)

**Based on existing data, it is not expected that the addition of a second powerhouse will affect water quality in Lake Jocassee or Howard Creek.**



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# Task 2 – Water Quality Monitoring in Whitewater River Arm

- **Objective:** Collect continuous temperature data and periodic DO (bi-weekly) and temperature from three historical locations in the Whitewater River Cove to gather current-day representative (i.e., baseline) water quality information in Summer 2023 and 2024.
  - Intended to provide sufficient information to support an analysis of the potential Project-related effects on water resources in the Whitewater River arm under existing and upgraded unit operations. Specifically, the effectiveness of the existing submerged weir and vertical mixing will be assessed.
- **Status:** Ongoing



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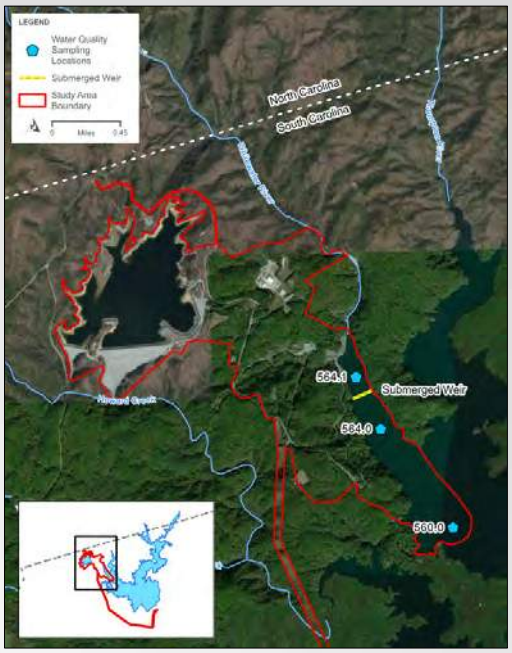
# Task 2 – Methods

- Duke Energy collected continuous water temperature data and periodic temp and DO concentrations (bi-weekly) from locations near three historic monitoring stations to determine current-day representative (i.e., baseline) water quality information during the summer of 2023.
- Data collected in 2023 represented conditions under two- and three-unit operations at the Project. Conditions in the Whitewater River arm are reflective of conditions in the upper reservoir.
- The **interim draft report** included in the ISR has preliminary results and a brief discussion from the year 1 study period (June 1 – October 11, 2023); the Updated Study Report will include results from study year 1 and study year 2 (June – September 2024) and will provide a complete assessment of results for both study years.



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# Task 2 – Methods








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# Task 2 – Methods


Field Dates for Water Quality Measurement

| Date | Details |
|---|---|
| June 1 | Datalogger deployment |
| June 13 | Data download and vertical profile |
| June 28 | Data download and vertical profile |
| July 12* | Data download and vertical profile |
| July 24 | Data download and vertical profile |
| August 10* | Data download and vertical profile |
| August 21 | Data download and vertical profile |
| September 7 | Data download and vertical profile |
| September 23 | Data download and vertical profile |
| October 11 | Datalogger removal |

Depth of VuLink Dataloggers

| Approximate Water Depth (ft) | Approximate Elevation (ft msl) | Notes |
|---|---|---|
| 3 | 1,107 | Near surface |
| 30 | 1,080 | Normal maximum Lake Jocassee drawdown elevation |
| 50 | 1,060 | Approximate crest of the submerged weir |
| 70 | 1,040 | Approximately 20 ft below the crest of the submerged weir |
| 100 | 1,010 | Approximate location of thermocline |

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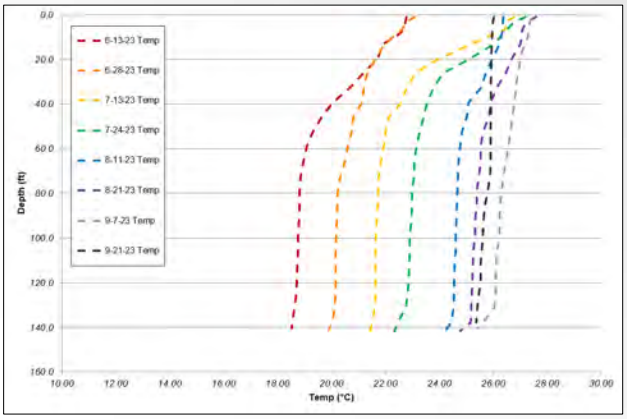
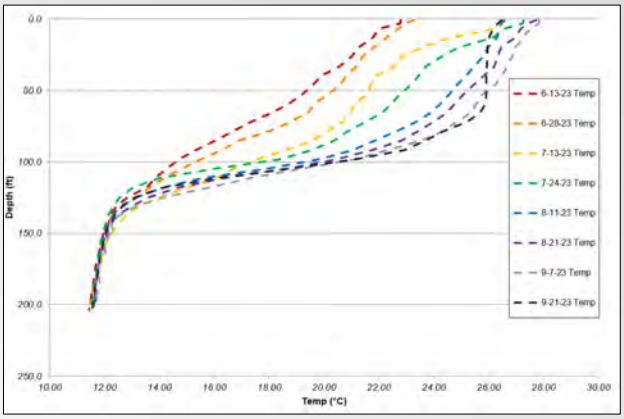
# Task 2 – Year 1 Results

**Temperature Summary:**

- Upstream of the weir (left) the water column is well mixed.
- Downstream of weir (right), stratification is noted.




Station 564.1




Station 564.0



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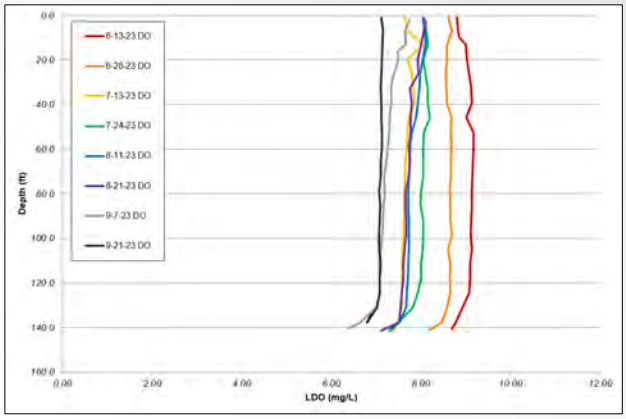
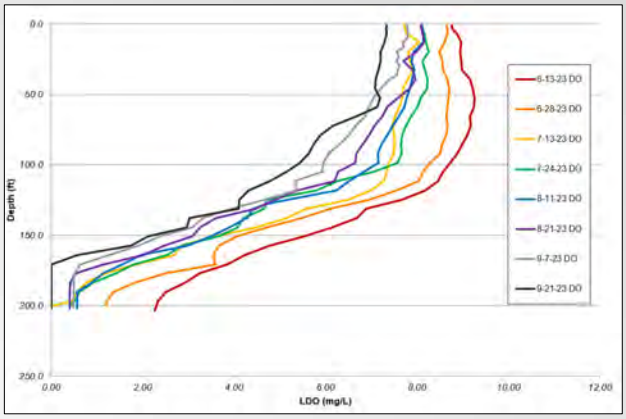
# Task 2 – Year 1 Results

**DO Summary:**

- Upstream of the weir (left) the water column is well mixed.
- Downstream of weir (right), stratification is noted.




Station 564.1




Station 564.0



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## Task 2 – Year 1 Conclusions

- Results from water quality monitoring in the Whitewater River cove indicate water upstream of the submerged weir is well-mixed and does not stratify during the summer. Data from monitoring locations downstream of the weir show stratification under all pumping and generation scenarios.
- The second study season (study year 2) will commence in June of 2024 through September 2024 to capture conditions in the Whitewater River cove with all four existing unit upgrades completed.
- A comprehensive data summary will be provided following collection of summer 2024 monitoring data, and the full two-year study report will be provided for resource committee review.



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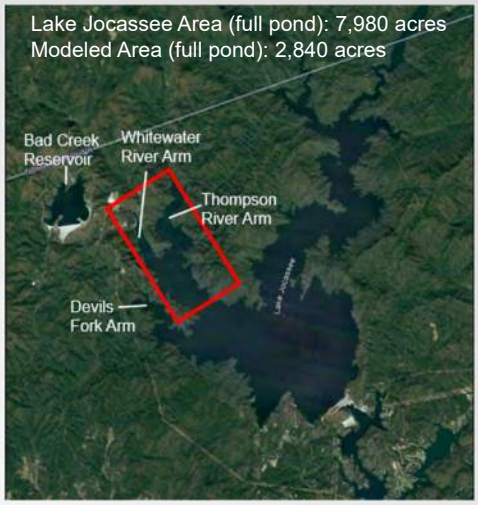
## Task 3 - Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)

- **Objective:** Develop CFD model to evaluate flows and extent of vertical mixing in the Whitewater River arm and downstream of the submerged weir due to the addition of Bad Creek II.
- **Status:** **Complete**



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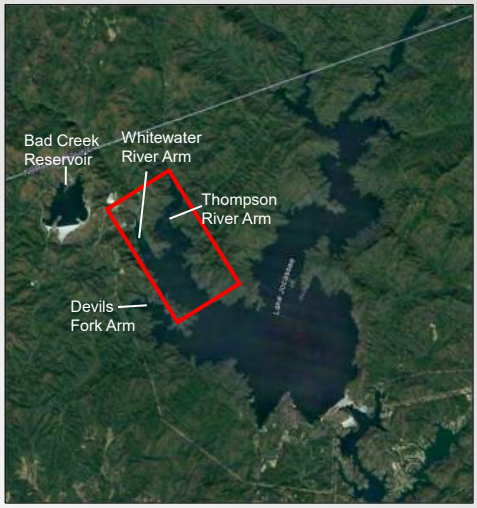
# Task 3 – Study Approach

1. 2-D hydraulic model (Innovyze) was developed to help determine the downstream modeling extent (model domain) required for the CFD model.
2. CFD model was developed to evaluate hydraulic effects (depth, velocity, flow patterns) of Bad Creek II operations on vertical mixing in the Whitewater River cove.
3. Sixteen scenarios were evaluated using pumping and generating modes under existing and proposed conditions (including potentially expanded weir).

Lake Jocassee Area (full pond): 7,980 acres
Modeled Area (full pond): 2,840 acres



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# Task 3 Methods – CFD Modeled Scenarios

| Station | Operating Mode | Submerged Weir Configuration | Scenario | Flow (cfs) | Jocassee Reservoir Elevation (ft msl) |
|---|---|---|---|---|---|
| Bad Creek Only | Generating | Existing | 1 | 16,000 | 1,110 |
| | | | 2 | 16,000 | 1,080 |
| | Pumping | | 7 | 13,780 | 1,110 |
| | | | 8 | 13,780 | 1,080 |
| | Upgraded Generation | Existing | 13 | 19,440 | 1,110 |
| | | | 14 | 19,440 | 1,080 |
| | Upgraded Pumping | | 15 | 15,000 | 1,110 |
| | | | 16 | 15,000 | 1,080 |
| Bad Creek and Bad Creek II | Generating | Existing | 3 | 39,200 | 1,110 |
| | | | 4 | 39,200 | 1,080 |
| | Pumping | | 9 | 32,720 | 1,110 |
| | | | 10 | 32,720 | 1,080 |
| | Generating | Expanded | 5 | 39,200 | 1,110 |
| | | | 6 | 39,200 | 1,080 |
| | Pumping | | 11 | 32,720 | 1,110 |
| | | | 12 | 32,720 | 1,080 |



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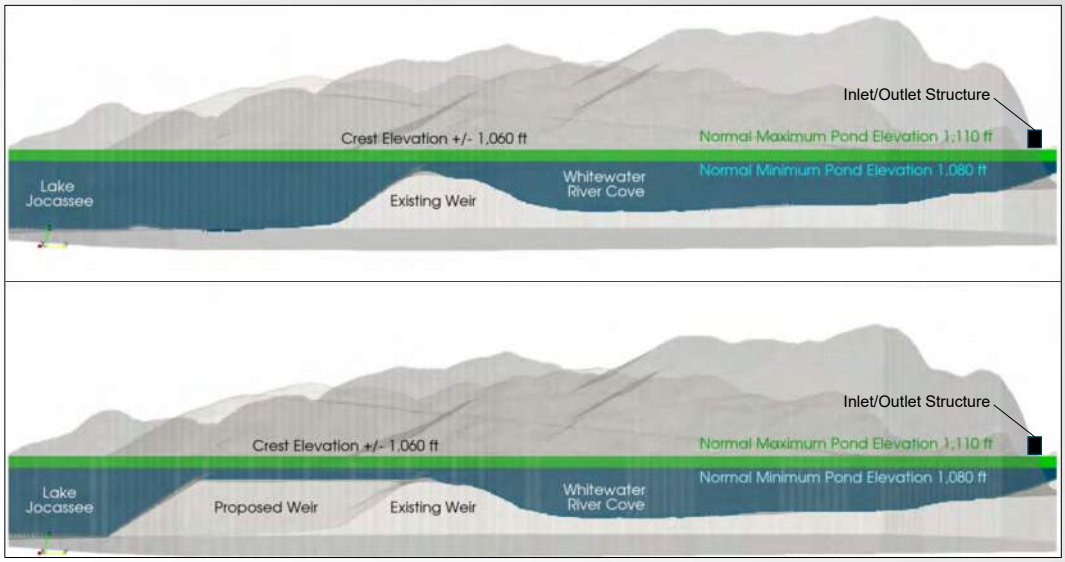
## Task 3 Methods – CFD Model Geometries & Scenarios



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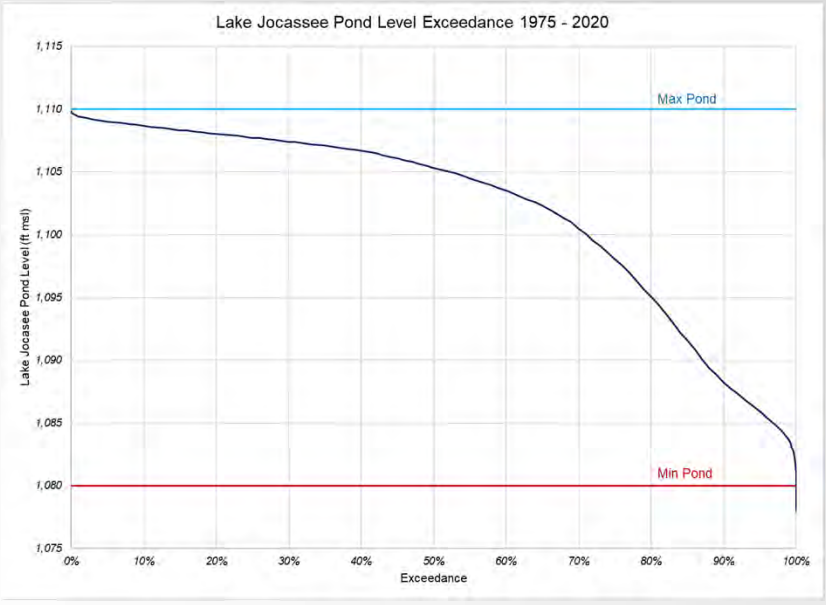
## Task 3 – Lake Jocassee Pond Level Exceedance Curve

Note: all modeled scenarios are either at min or max pond elevation.



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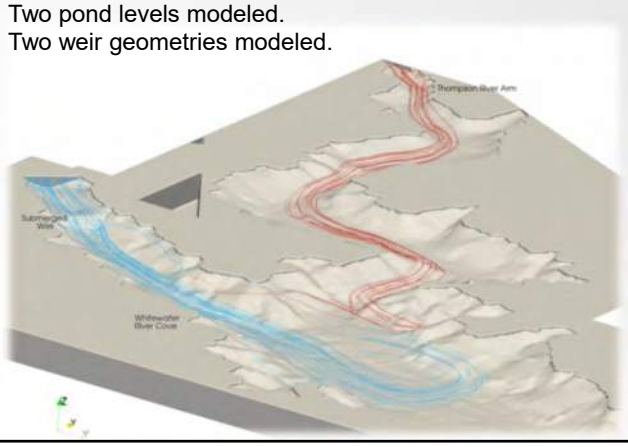
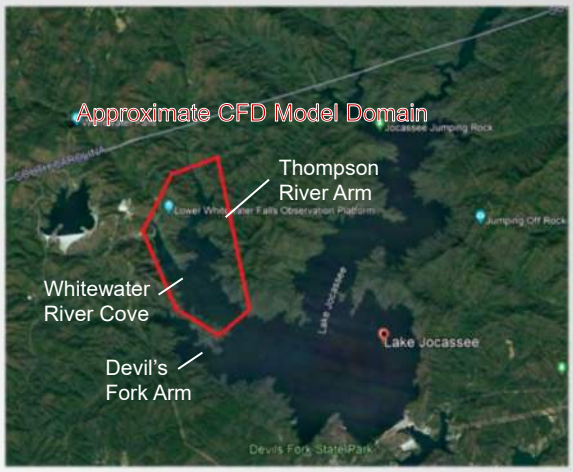
## Task 3 Methods – CFD Model Development

- Model domain extends just upstream of confluence with Devil's Fork Arm.
- Inflows and water surface elevations held constant at the inflow boundary.
- Maximum generating/pumping capacity simulated.
- Thompson River flow included (long term average flow).
- Two pond levels modeled.
- Two weir geometries modeled.





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## CFD Results



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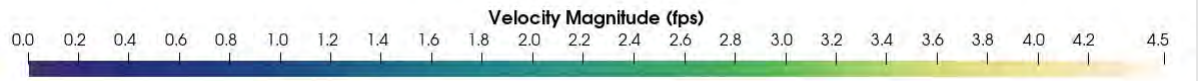
## Task 3 Results – Existing Generation

**Minimum Pond**

Pond Level
1,080 ft

**Full Pond**

Pond Level
1,110 ft



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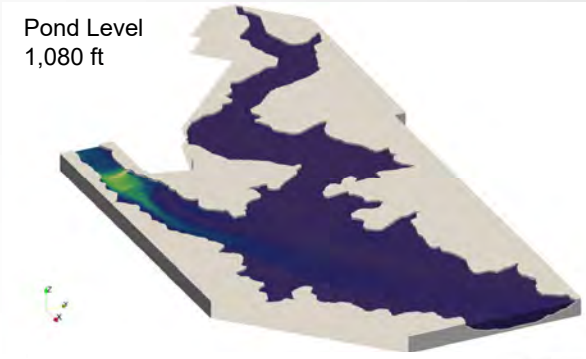
## Task 3 Results – Proposed Generation

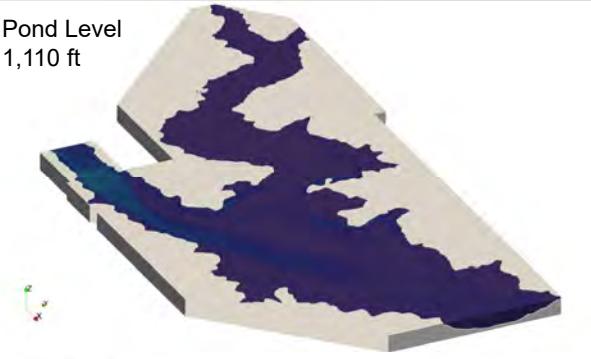
**Minimum Pond**

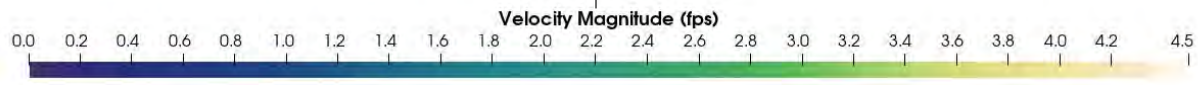
Pond Level
1,080 ft



**Full Pond**

Pond Level
1,110 ft





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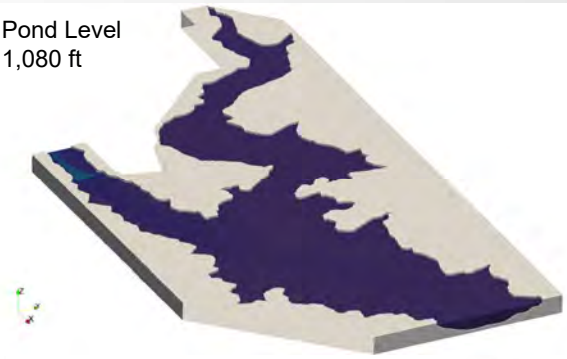
## Task 3 Results – Existing Pumping

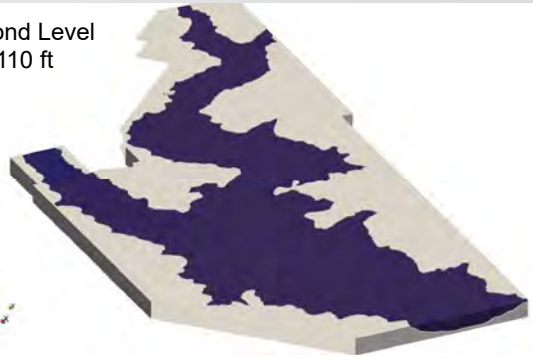
**Minimum Pond**

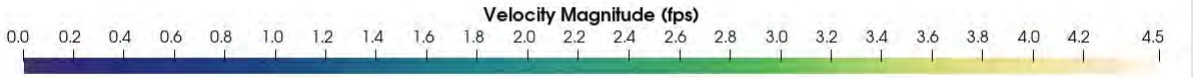
Pond Level
1,080 ft



**Full Pond**

Pond Level
1,110 ft





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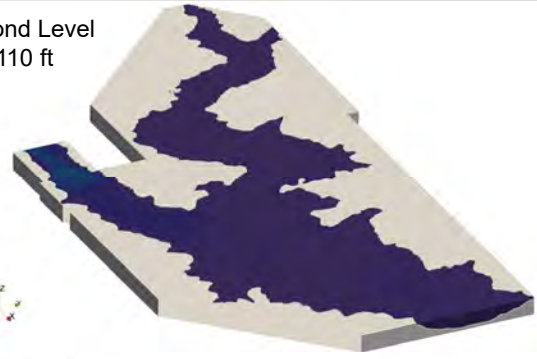
## Task 3 Results – Proposed Pumping

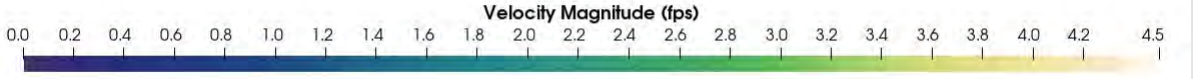
**Minimum Pond**

Pond Level
1,080 ft

**Full Pond**

Pond Level
1,110 ft





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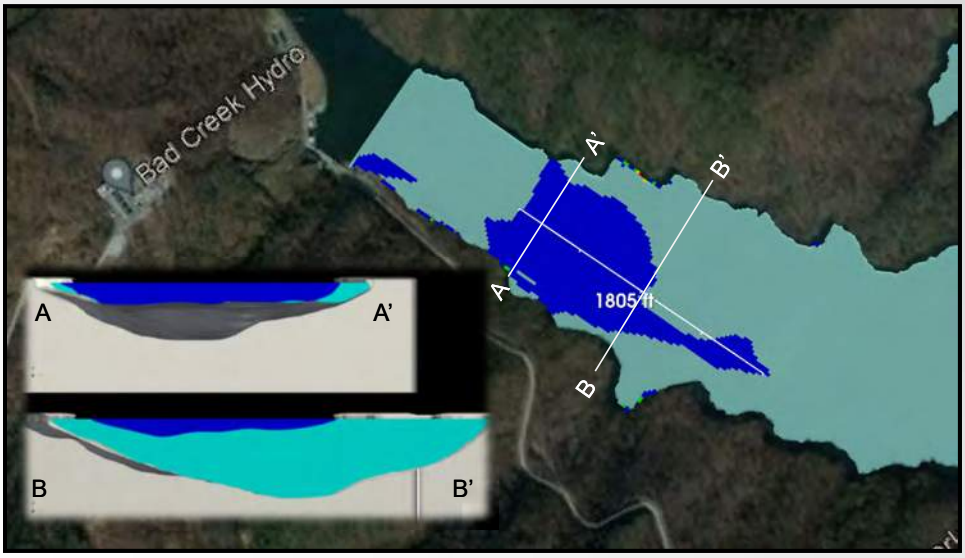
## Task 3 Results – Proposed Generation

Results – Proposed Generation at **Full Pond**

- Max velocity approx. 1.3 fps
- Teal: < 1.0 fps
- Blue: 1.0 – 2.0 fps

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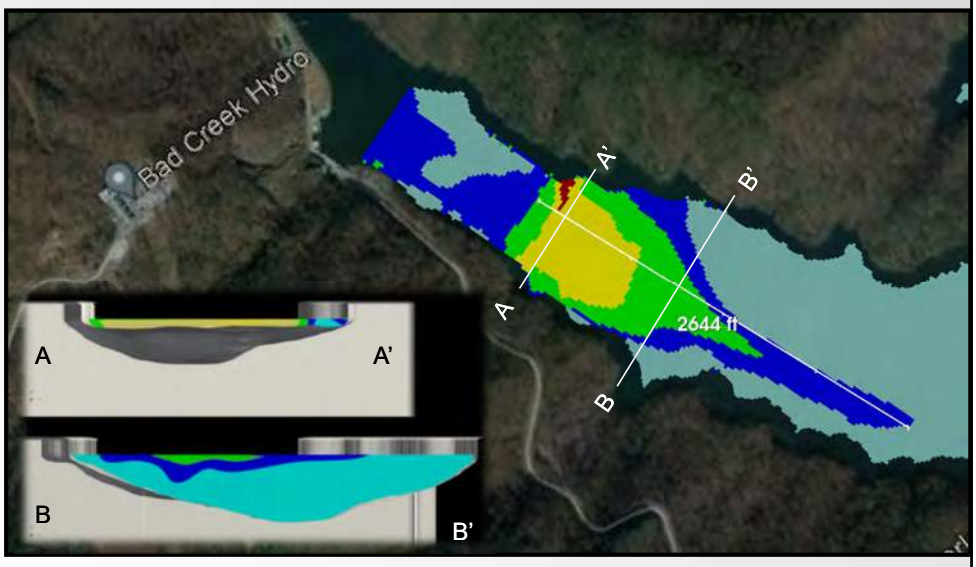
## Task 3 Results – Proposed Generation

Results – Proposed Generation at **Minimum Pond**

- Max velocity approx. 4.5 fps
- Teal: < 1.0 fps
- Blue: 1.0 – 2.0 fps
- Green: 2.0 – 3.0 fps
- Yellow: 3.0 – 4.0 fps
- Red: > 4.0 fps



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## Effect of Submerged Weir



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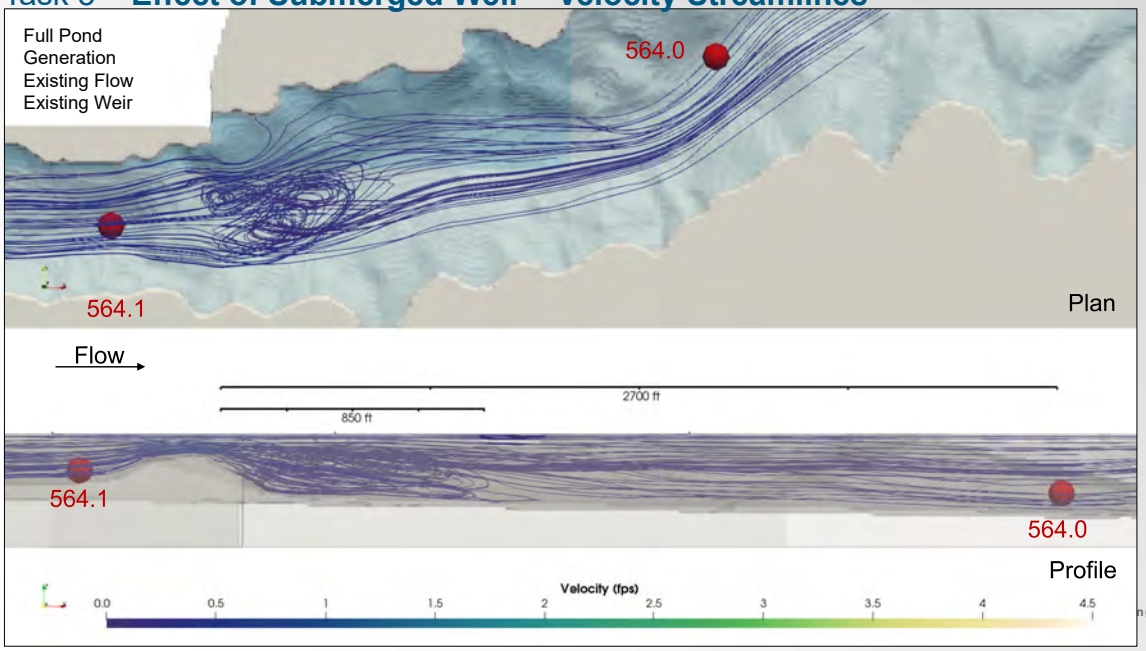
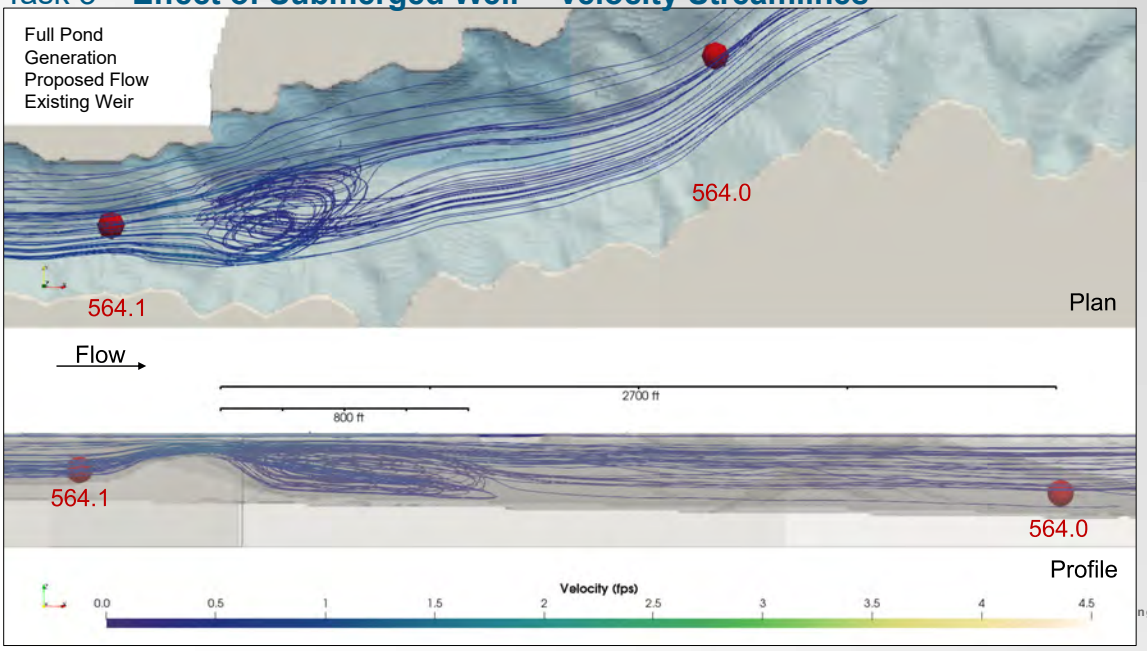
## Task 3 – **Effect of Submerged Weir – Velocity Streamlines**





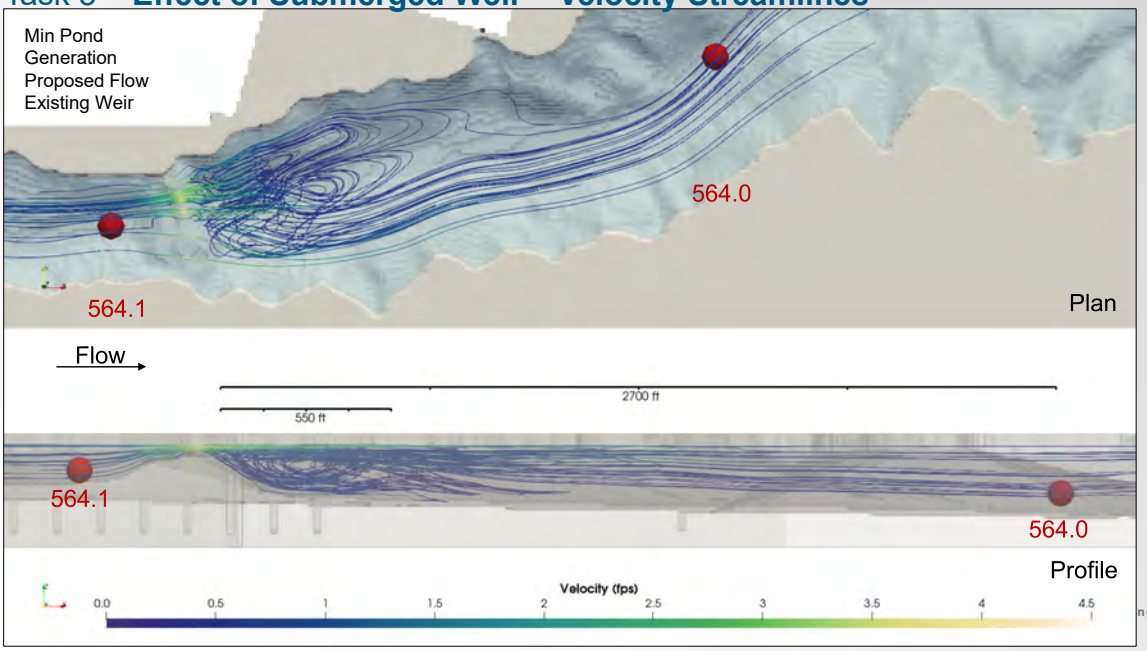

50

## Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



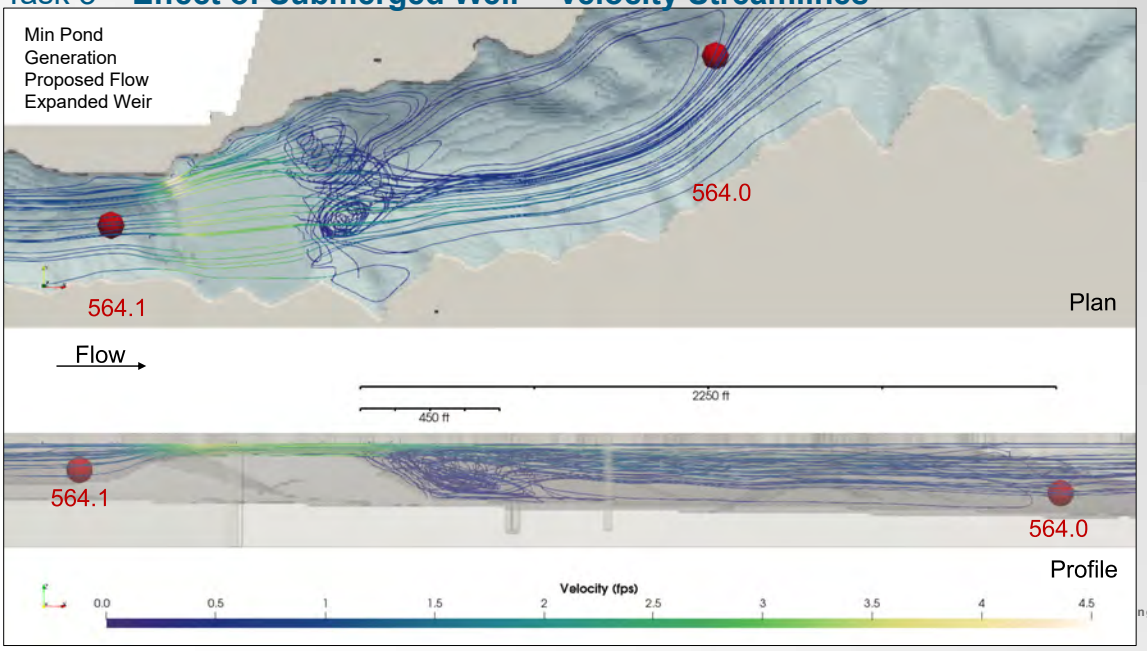

51

## Task 3 – **Effect of Submerged Weir – Velocity Streamlines**



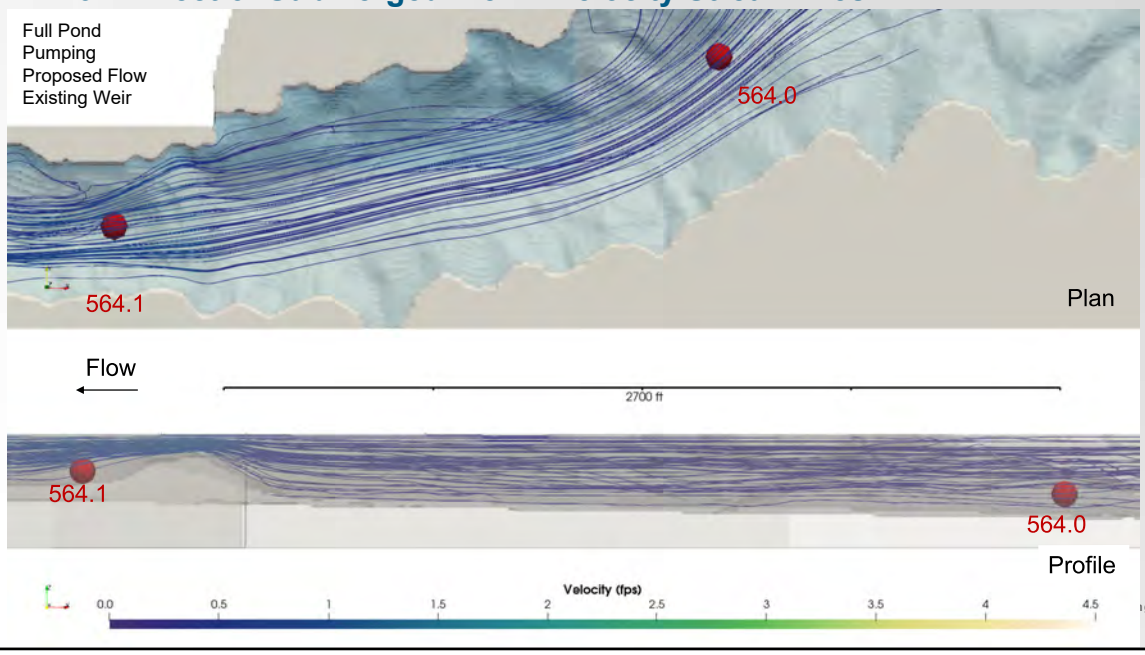

52

## Task 3 – **Effect of Submerged Weir – Velocity Streamlines**




53

## Task 3 – **Effect of Submerged Weir – Velocity Streamlines**

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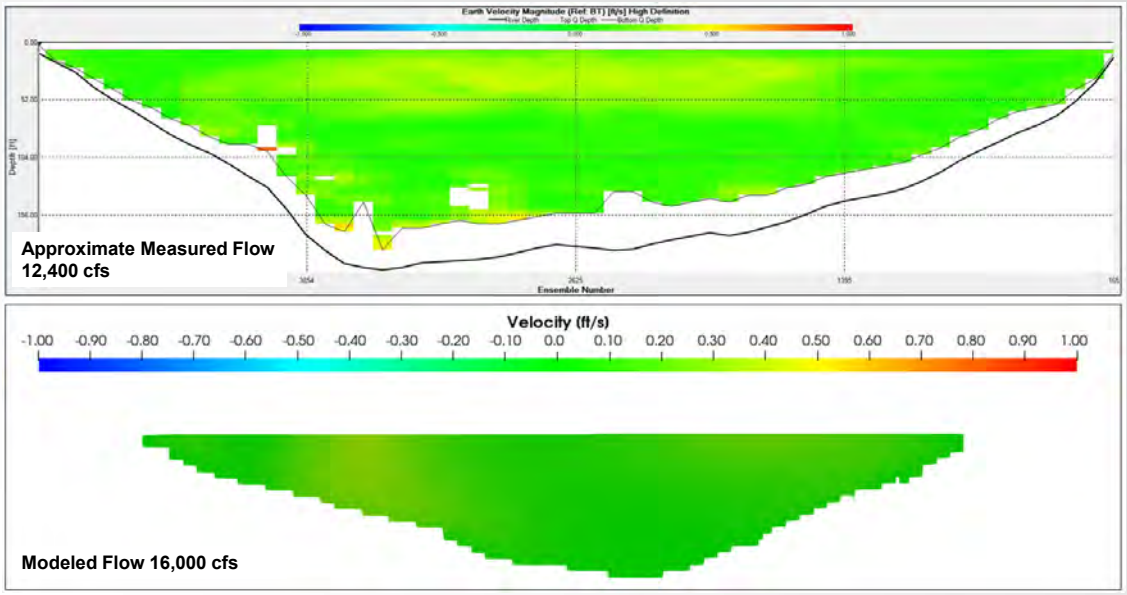
## Task 3 – CFD Verification – Station 564.0 Generation



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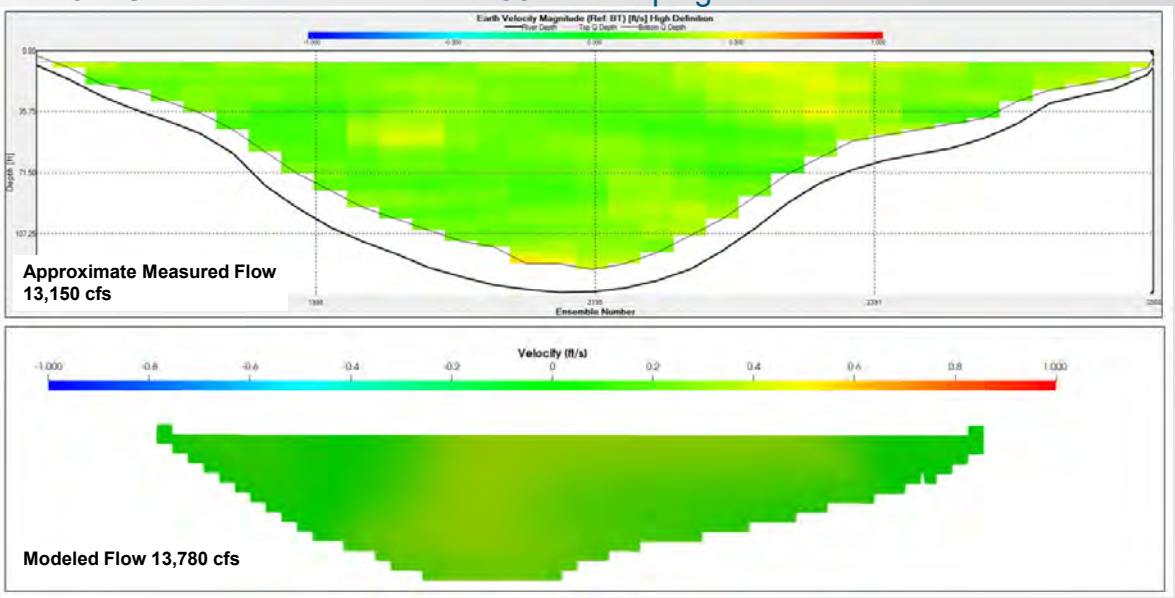
## Task 3 – CFD Verification – Station 564.1 Pumping



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## Task 3 - Conclusions

**Generation**

- The energy of the water discharged from Bad Creek is dissipated as it flows over the existing submerged weir.
- Similar vertical mixing and flow patterns result from flows over existing and expanded weir.
- Similar vertical mixing and flow patterns result from Bad Creek II powerhouse operations.
- Results indicate Bad Creek II powerhouse operations will not alter existing stratification patterns observed at Station 564.0 (downstream of weir).

**Pumping**

- Hydraulic impacts due to Bad Creek II pumping impacts limited to Whitewater River Cove upstream of submerged weir.
- Pumping in any configuration does not create mixing downstream of submerged weir.

**Take home message**: Of the "bookend" scenarios analyzed, combined Bad Creek and Bad Creek II operations (39,200 cfs) with Lake Jocassee at minimum pond elevation (1,080 ft msl) had the greatest effect on Whitewater River cove hydraulics (as expected), however at the downstream model boundary **that effect was negligible**.



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## Task 4 - Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)

- **Objectives:**
  - Use the existing CHEOPS model to evaluate the difference in water **exchange rate, frequency, and magnitude** between Bad Creek Reservoir and Lake Jocassee due to the addition of a second powerhouse.
  - Identify and evaluate impacts, if any, to Lake Keowee as a result of operating an additional powerhouse at the Project.
- **Status:** Ongoing

CHEOPS™
Operations and Planning Model



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# Task 4 - Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)

**Performance Measures Worksheet (Excerpt) – Report distributed in Spring 2024**

| Measure Number | Performance Measures | Criterion (Note 1) | Start Date | End Date | MISC (Note 2) | Baseline | BCII |
|---|---|---|---|---|---|---|---|
| | Lake Jocassee | | | | | | |
| | *Elevation - Storage Availability* | | | | | | |
| 1 | Maximize adherence to reliably meet all Project-related water demands | Number of years reservoir level at or above 1,108 ft AMSL on May 1 | 1-May | 1-May | 5 | | |
| | *Elevation - Recreation* | | | | | | |
| 2 | Minimize restricted recreation | Number of years where cove access (reservoir level below 1,090 ft AMSL) is restricted for more than 25 days (Note 3) | 1-Jan | 31-Dec | 2 | | |
| 3 | | Greatest number of days with restricted cove access (reservoir level below 1,090 ft AMSL) during higher use months in any calendar year (Note 3) | 1-Mar | 31-Oct | 5 | | |
| 4 | | Greatest number of days with restricted cove access (reservoir level below 1,090 ft AMSL) in any calendar year (Note 3) | 1-Jan | 31-Dec | 5 | | |
| 5 | Minimize restricted boat launching | Number of years where reservoir level is below boat ramp critical level (1,080 ft AMSL) during higher use months for more than 25 days (Note 4) | 1-Mar | 31-Oct | 2 | | |
| 6 | | Greatest number of days where reservoir level is below boat ramp critical level (1,080 ft AMSL) during higher use months in any calendar year (Note 4) | 1-Mar | 31-Oct | 5 | | |
| 7 | Minimize effects on recreational boating | Number of days where reservoir level changes more than 1.0 ft in one hour | 1-Jan | 31-Dec | 10 | | |
| | *Elevation - Natural Resources* | | | | | | |
| 8 | Maximize spawning success for black bass and blueback herring (2.5-ft fluctuation band) | Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once (Note 5) | 1-Apr | 31-May | 5% | | |
| 9 | | Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once (Note 5) | 1-Apr | 31-May | 5% | | |
| 10 | | Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once (Note 5) | 1-Apr | 31-May | 5% | | |
| 11 | | Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 30 consecutive days at least once (Note 5) | 1-Apr | 31-May | 5% | | |
| 12 | | Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 45 consecutive days at least once (Note 5) | 1-Apr | 31-May | 5% | | |



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# Task 5 – Future Water Quality Monitoring Plan Development

- Will be carried out in consultation with Resource Committees in 2024 and in coordination with Section 404/401 activities.



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# Recreational Resources Study



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## Recreational Resources Task Refresher

| Study Task | Status |
|---|---|
| Task 1 – Foothills Trail Corridor Recreation Use and Needs Study | **Ongoing** |
| Task 2 – Foothills Trail Corridor Conditions Assessment | **Ongoing** |
| Task 3 – Whitewater River Cove Existing Recreational Use Evaluation | **Complete** |
| Task 4 – Whitewater River Cove Recreational Public Safety Evaluation | **Begin in 2024** |



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# Task 1 – Foothills Trail Corridor Recreation Use and Needs Study

- **Objective(s):** The goals of the RUN Study are to assess current recreation use and identify any future recreation needs along the 43-mile-long segment of the Foothills Trail and associated access areas that are maintained by Duke Energy.
- **Status:** Ongoing




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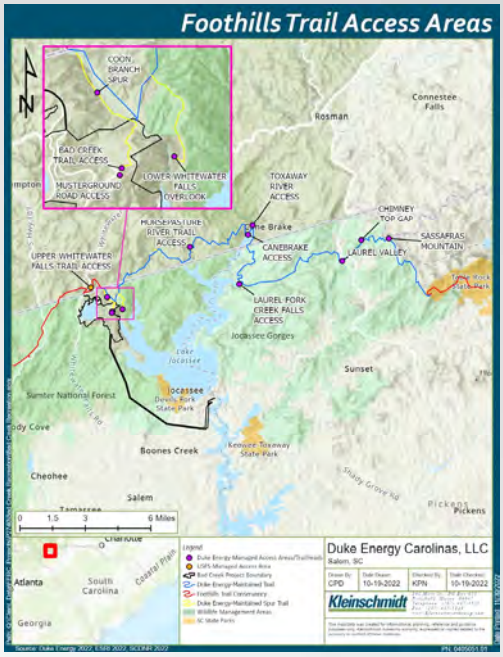
# Task 1 – RUN Study Methods Summary

**Study Area:**
- the 43-mile-long segment of the Foothills Trail and associated access areas on non-Project lands maintained by Duke Energy; the entrance road to Musterground Road; Upper Whitewater Falls Trail Access (US Forest Service)
- 4 trailheads provide vehicular access (Sassafras Mountain, Chimney Top Gap, Laurel Valley, and Bad Creek Hydro Project Trail Accesses)
- 4 trailheads provide boat-in and hike-in only trail access (Horsepasture, Toxaway River, Canebrake, and Laurel Fork Creek Trail Accesses)



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# Task 1 – RUN Study Methods

**Data Collection Methods:**

- Data collection methods include recreation site inventory, traffic counters, trail counters, in-person user surveys, and user surveys accessed via QR Code
- Spot counts were also conducted at Laurel Valley Trail Access to supplement the traffic counter data
- In-person surveys were collected on 30 days (4-hour shifts) between March and November at Laurel Valley, Toxaway River, Horsepasture River, and Bad Creek Hydro Project Trail Accesses
- Signs with QR codes that linked to an online version of the survey were posted at all trail access areas

**Table 6-1. Summary of Data Collection Methods**

| Access Area | Data Collection Methods | | | | |
|---|---|---|---|---|---|
| | Recreation Site Inventory | Traffic Counter | Trail Counter | In-Person User Surveys | User Surveys Accessed Via QR Code |
| Table Rock State Park[a] | | | * | | |
| Sassafras Mountain Trail Access | * | * | * | | * |
| Chimney Top Gap Trail Access | * | | * | | * |
| Laurel Valley Trail Access | * | * | * | * | * |
| Laurel Fork Creek Falls Spur Trail Access | * | | * | | * |
| Toxaway River Trail Access[b] | * | | * | * | * |
| Canebrake Trail Access | * | | * | | * |
| Horsepasture River Trail Access | * | | * | * | * |
| Lower Whitewater Falls Overlook | * | | * | | * |
| Bad Creek Hydro Project Trail Access[c] | * | * | * | * | * |
| Coon Branch Spur Trail | | | * | | * |
| Musterground Road[d] | | * | | | |
| Upper Whitewater Falls Trail Access[e] | | * | | | |

[a] This site is not maintained by Duke Energy.
[b] If water levels on Lake Jocassee do not allow for boat-in access to the Toxaway River Trail Access, surveys will be conducted at an alternative boat-in access point as identified in consultation with the Recreational Resource Committee.
[c] Two traffic counters will be installed near Bad Creek Hydro Project Trail Access, including one south of the parking area and one north of the parking area.
[d] This access road is managed via the Jocassee Gorges Road Management MOA between SCDNR and Duke Energy.



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# Task 1 – RUN Study Methods Summary

**Data Analysis:**

- Parking Demand Analysis
- Trail Carrying Capacity Analysis (conducted by Applied Trails Research)
- Future Recreation Use Analysis
- Recreation Needs Assessment




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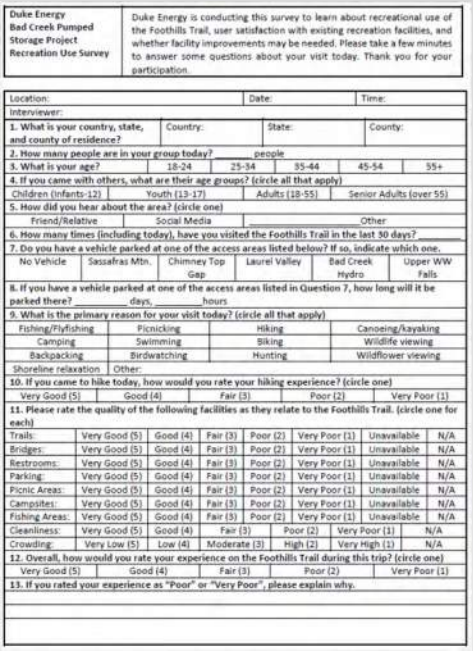
# Task 1 – RUN Study Progress

- Data collection is complete
  - Musterground Road counter was removed January 15th
- Preliminary Survey Totals
  - 259 in-person surveys collected
  - 61 QR code surveys collected
  - 320 surveys total
- Data analysis is underway
- Draft report will be submitted for Resource Committee review in 2024
- Final report will be submitted with the USR



| Duke Energy Bad Creek Pumped Storage Project Recreation Use Survey | Duke Energy is conducting this survey to learn about recreational use of the Foothills Trail, user satisfaction with existing recreation facilities, and whether facility improvements may be needed. Please take a few minutes to answer some questions about your visit today. Thank you for your participation. |
|---|---|

| Location: | | | Date: | | Time: | |
|---|---|---|---|---|---|---|
| Interviewer: | | | | | | |
| 1. What is your country, state, and county of residence? | Country: | | State: | | County: | |
| 2. How many people are in your group today? ____ people | | | | | | |
| 3. What is your age? | 18-24 | 25-34 | 35-44 | 45-54 | 55+ | |
| 4. If you came with others, what are their age groups? (circle all that apply) | | | | | | |
| Children (infants-12) | Youth (13-17) | Adults (18-55) | Senior Adults (over 55) | | | |
| 5. How did you hear about the area? (circle one) | | | | | | |
| Friend/Relative | Social Media | Other | | | | |
| 6. How many times (including today), have you visited the Foothills Trail in the last 30 days? ____ | | | | | | |
| 7. Do you have a vehicle parked at one of the access areas listed below? If so, indicate which one. | | | | | | |
| No Vehicle | Sassafras Mtn. | Chimney Top Gap | Laurel Valley | Bad Creek Hydro | Upper WW Falls | |
| 8. If you have a vehicle parked at one of the access areas listed in Question 7, how long will it be parked there? ____ days, ____ hours | | | | | | |
| 9. What is the primary reason for your visit today? (circle all that apply) | | | | | | |
| Fishing/Flyfishing | Picnicking | Hiking | Canoeing/kayaking | | | |
| Camping | Swimming | Biking | Wildlife viewing | | | |
| Backpacking | Birdwatching | Hunting | Wildflower viewing | | | |
| Shoreline relaxation | Other: | | | | | |
| 10. If you came to hike today, how would you rate your hiking experience? (circle one) | | | | | | |
| Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | | |

| 11. Please rate the quality of the following facilities as they relate to the Foothills Trail. (circle one for each) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Trails: | Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | Unavailable | N/A |
| Bridges: | Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | Unavailable | N/A |
| Restrooms: | Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | Unavailable | N/A |
| Parking: | Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | Unavailable | N/A |
| Picnic Areas: | Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | Unavailable | N/A |
| Campsites: | Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | Unavailable | N/A |
| Fishing Areas: | Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | Unavailable | N/A |
| Cleanliness: | Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | | N/A |
| Crowding: | Very Low (5) | Low (4) | Moderate (3) | High (2) | Very High (1) | | N/A |
| 12. Overall, how would you rate your experience on the Foothills Trail during this trip? (circle one) | | | | | | | |
| Very Good (5) | Good (4) | Fair (3) | Poor (2) | Very Poor (1) | | | |
| 13. If you rated your experience as "Poor" or "Very Poor", please explain why. | | | | | | | |



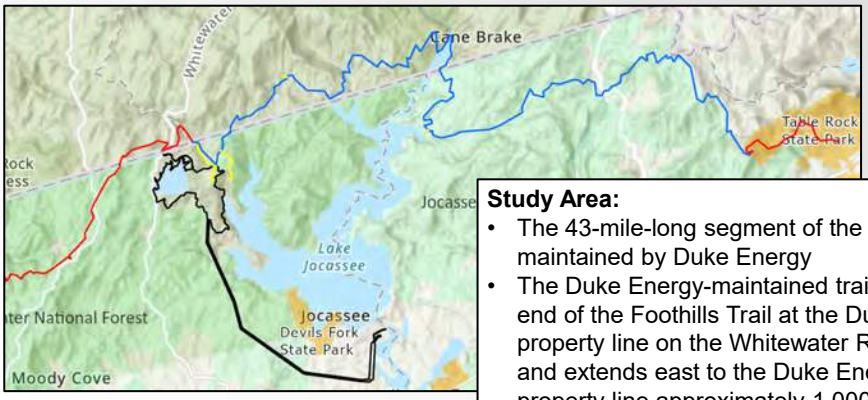


# Task 2 – Foothills Trail Corridor Conditions Assessment

- **Objective(s):** To evaluate the current condition of the trail surface and corridor included in the 43-mile segment and associated spur trails of the Foothills Trail maintained by Duke Energy and identify key areas of future maintenance needs or improvements.

- **Status:** Ongoing

# Task 2 – Foothills Trail Corridor Conditions Assessment




**Study Area:**

- The 43-mile-long segment of the Foothills Trail and five spur trails maintained by Duke Energy
- The Duke Energy-maintained trail segment begins on the western end of the Foothills Trail at the Duke Energy/US Forest Service property line on the Whitewater River near the Bad Creek Project and extends east to the Duke Energy/Table Rock State Park property line approximately 1,000 feet southwest of the top of Pinnacle Mountain
- The five spur trails include Laurel Fork Falls, Hilliard Falls, Lower Whitewater Falls Overlook, Bad Creek, and Coon Branch



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# Task 2 –Trail Conditions Assessment - Methods

- **Methods:**
  - Locate issue/structure along the trail and record GPS waypoint
  - Take photos of significant issues/features for documentation
  - Identify type of issue/structure using categories
  - Measure issue/structure (i.e., bridges, culverts, eroded sections, washouts, wet areas, and diameters of fallen trees)
  - If excessive grade is present (greater than 15 percent slop) in conjunction with erosion, utilize clinometer to measure percent slope
  - Provide additional description/comments about issues/structures identified
- Assessment was completed by Long Cane Trails
- Foothills Trail Guidebook was used as a reference for location descriptions

**Trail Assessment Descriptions:**

| Code | Description |
|---|---|
| B | Bridges, puncheon, bog bridges, turnpikes. ***Note construction material, length/width (feet) and condition of bridge.*** |
| UC | Unimproved Crossing (stream crossing). ***Note if wading or rock steps and any maintenance required (unstable stepping stones). Note the width of the stream at the crossing point.*** |
| C | Culvert – open or closed drain across the trail. ***Note condition of culvert, length/diameter and if sufficient size for situation.*** |
| E | Erosion - look for exposed roots, rocks, or gullies on trail. ***Describe situation (exposed roots, gullies on tread, located on fall line (going straight down a hill regardless of grade) and length of eroded section (if greater than 25 ft, approximate distance).*** ***If excessive grade (>15% slope) in conjunction with erosion: measure steep slopes with clinometer (if numerous steep rocky slopes, no need to measure each one – note that trail has numerous steep rocky sections)*** |
| EC | Erosion Control Devices – check dams, water bars. ***Note type and condition of structure.*** |
| WO | Washout - section of trail has been mostly/completely washed away. ***Note length/width/depth and any hazards associated with washout. Take photo.*** |
| WA | Wet Area/standing water (larger than 3ft diameter). ***Note length/width. Note any adjacent water feature.*** |
| OB | Obstacle – fallen tree or other obstacle blocking treadway (include broken branches or trees leaning above/across the trail ("widow makers"). ***Note diameter of fallen tree.*** |
| IB | Insufficient Blazing/Marking – if can't see next blaze/marker as you are moving past a blaze/marker or hard to locate next blaze/marker. ***Note if blazes/markers missing or worn off.*** |
| SI | Signage – ***Identify if Trailhead, Directional or Interpretive and if in need of repair. Note type of repair.*** |
| AC | Additional Comment – specific locations that warrant noting such as a scenic vista, unique feature (caves, mines, rock wall) and locations of invasive species. ***Note type of feature and associated details (such as name of invasive species and amount of plants (number, area).*** |



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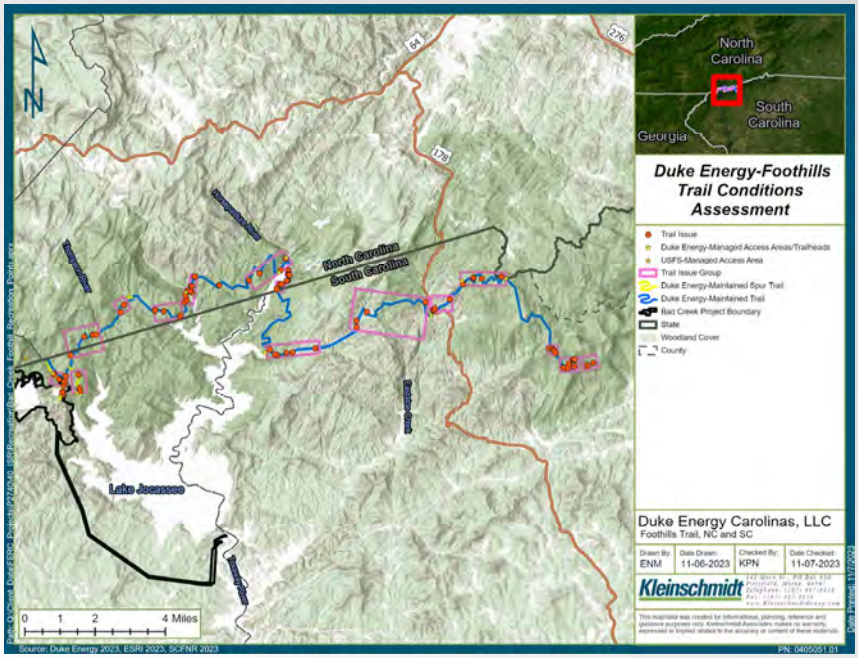
# Task 2 –Trail Conditions Assessment - Results

- **Results:**
  - Long Cane Trails identified 89 areas needing maintenance or improvement within the study area.



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| Trail Issue # | Figure # | Date Assessed | Trail Name | Mile Marker | Latitude | Longitude | Assessment Type | Description/Details |
|---|---|---|---|---|---|---|---|---|
| 1 | Figure 4-2 | 9/14/2023 | Bad Creek Access Spur | 0.1 | 35.01273631 | -82.99787808 | Culvert, Open Drain | Concrete culvert needs cleaning. Sediment has gathered and is sitting, not allowing water to run down the drain. |
| 2 | Figure 4-2 | 9/14/2023 | Bad Creek Access Spur | 0.1 | 35.01296829 | -82.99759536 | Wet Area / Standing Water | Gravel needs to be added to the section of the trail to raise it approximately 2 inches. This is a very low area with standing water most of the time. In fact, there is some drainage that seems to be serving a purpose in this area also. |
| 3 | Figure 4-2 | 9/14/2023 | Bad Creek Access Spur | 0.2 | 35.01339791 | -82.9977754 | Wet Area / Standing Water | Low part of the trail, and gravel needs to be brought in. Easily accessible from the parking lot. This trail has had gravel on it in the past. It just needs a topping. |
| 4 | Figure 4-2 | 9/14/2023 | Bad Creek Access Spur | 0.3 | 35.01449413 | -82.99786919 | Erosion Control Devices, Other | Someone is putting barricades on the side of the trail, and these need to be removed. There are several in this section of the trail. These, in fact, hold water on the trail versus letting water off the trail. There should be a series of knicks or grade reversals in this section to divert water. |
| 5 | Figure 4-2 | 9/14/2023 | Bad Creek Access Spur | 0.3 | 35.01413933 | -82.99811383 | Steps | The step is rotten and needs to be replaced. |
| 6 | Figure 4-3 | 9/14/2023 | Bad Creek Access Spur | 0.6 | 35.01723673 | -82.99744404 | Signage, Interpretive | Approximately 100 feet of trail has been rerouted. The user can still see the old relays in the corner as well as the old trail. The new trail is working great! The old trail needs to be closed, and the new trail needs to be blazed in the corner, so users know this is the trail. In this particular area, you have not seen a blaze in a while. Blue color is needed to apply a new blaze |
| 7 | Figure 4-3 | 9/14/2023 | Bad Creek Access Spur | 0.7 | 35.01869053 | -82.99718057 | Obstacle, Fallen Tree | A fallen tree across the trail needs to be removed. |
| 8 | Figure 4-3 | 9/18/2023 | Coon Branch | 0.2 | 35.01956213 | -82.99972003 | Bridge, Bridge | The upper railing needs to be replaced on both sides, and two decking boards need to be replaced. |
| 9 | Figure 4-3 | 9/18/2023 | Coon Branch | 0.2 | 35.01966168 | -82.9999907 | Bridge, Bridge | Two 2x4x12 railings need to be replaced. |
| 10 | Figure 4-3 | 9/18/2023 | Coon Branch | 0.4 | 35.02183009 | -83.00243764 | Bridge, Buncheon | Bog Bridge, two feet wide by four feet long, needs to be installed |
| 11 | Figure 4-3 | 9/18/2023 | Coon Branch | 0.4 | 35.02160249 | -83.00233517 | Erosion, Gullie | A major drain needs to be unclogged. It is overflowing and going down the trail. The solution is to simply open the drain up more and get rid of the sediment that is raising the drain up. |
| 12 | Figure 4-4 | 9/14/2023 | Lower Whitewater Falls Spur | 0.4 | 35.02155442 | -82.99014034 | Washout | Trail needs water diversion in the form of grade dips or knicks. |
| 13 | Figure 4-4 | 9/14/2023 | Lower Whitewater Falls Spur | 0.9 | 35.01623192 | -82.98947331 | Washout | Trail needs some steps and grade dips or water diversion features added. Approximately 20 steps needed. |
| 14 | Figure 4-4 | 9/14/2023 | Lower Whitewater Falls Spur | 1 | 35.01476505 | -82.98918722 | Erosion, Gullie | Trail is using an old roadbed that has a gully on each side and very few drains. all drains are clogged and need to be rerouted. New trail limit is very close to the old just elevated on the banks versus in the middle of the old roadbed. |
| 15 | Figure 4-3 | 9/14/2023 | Foothills Trail | 31.6 | 35.02092083 | -82.99665677 | Washout | The trail needs some grade reversals or knicks. Water has gotten on the trail and does not leave for some time, causing a gully if not fixed. |
| 16 | Figure 4-5 | 9/30/2023 | Foothills Trail | 32.4 | 35.02958049 | -82.99437631 | Steps | Replace three steps |
| 17 | Figure 4-5 | 9/30/2023 | Foothills Trail | 33.3 | 35.03730923 | -82.98769713 | Steps | Replace three steps |
| 18 | Figure 4-5 | 9/30/2023 | Foothills Trail | 33.9 | 35.03812814 | -82.98336354 | Steps | One step needs to be replaced. |
| 19 | Figure 4-5 | 9/30/2023 | Foothills Trail | 34.2 | 35.03822699 | -82.98165951 | Steps | Steps need to be replaced. |
| 20 | Figure 4-6 | 9/30/2023 | Foothills Trail | 35.5 | 35.04768531 | -82.96974848 | Obstacle, Fallen Tree | Tree across trail and needs to be removed. |
| 21 | Figure 4-6 | 9/18/2023 | Foothills Trail | 35.8 | 35.05077596 | -82.96808629 | Steps | Two steps need to be replaced. |

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# Task 2 –Trail Conditions Assessment – Results Summary

- **Summary:**
  - Long Cane Trails identified 89 items within the study area primarily related to trail maintenance and safety
    - 75 on the Foothills Trail
    - 7 on the Bad Creek Access Spur Trail
    - 4 on the Coon Branch Spur Trail
    - 3 on the Lower Whitewater Falls Spur Trail
  - Items identified include culvert cleaning, erosion control, steps replacement, signage improvement, bridge maintenance, fallen tree removal, and trail washout repair
  - The draft report was issued to the RC for review on November 21, 2023, and comments were received from the following entities:
    - Foothills Trail Conservancy
    - SCDNR
    - FOLKS
  - Duke Energy will meet with the RC to discuss study results
  - The final report will be filed with the USR

**Key Findings of Foothills Trail Conditions Assessment**

| Trail | Mile | Key Findings |
|---|---|---|
| Bad Creek Access Spur | 0.1-0.7 | • Culvert Maintenance: A culvert with a clogged drain spanning 80 feet requires cleaning to allow proper water flow.<br>• Wet Areas: Low areas on the trail with standing water need gravel addition to raise and level the path, covering 60 feet and 30 feet sections.<br>• Erosion Control: Removal of barricades placed on the side of the trail to address water retention issues.<br>• Steps Replacement: Several steps need replacement due to rot.<br>• Interpretive Signage: Approximately 100 feet of trail has been rerouted, and new blazes are needed to guide hikers. |
| Coon Branch Spur | 0.2 | • Bridge Maintenance: Railing and decking replacement for a bridge, involving handrails and decking boards.<br>• Railing Replacement: Two handrails need replacement. |
| Coon Branch Spur | 0.4 | • Bog Bridge Installation: Installation of a bog bridge measuring 4 feet x 2 feet.<br>• Drain Clearing: Major drain unclogging is required to prevent overflow onto the trail. |
| Foothills Trail | 31.6-72.8 | • Erosion Control: Multiple sections of the Foothills Trail require erosion control measures such as grade reversals, knicks, or drainage improvements.<br>• Steps Replacement: Various steps along the trail need replacement or repair due to damage.<br>• Fallen Trees: Several fallen trees across the trail need removal.<br>• Bog Bridges: Installation of new bog bridges.<br>• Signage: Adding new trail blazes and interpretive signage.<br>• Brush Removal: Clearing overgrown sections of the trail.<br>• Washout Repair: Addressing trail washouts and water diversion.<br>• New Trail Sections: Creating new trail segments to address erosion and trail conditions. |
| Lower Whitewater Falls Spur | 0.4-1.0 | • Washout and Erosion: Trail washouts, the need for stairs, and grade dips have been identified, impacting a significant portion of this spur. |



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# Task 3 – Whitewater River Cove Existing Recreational Use Evaluation

- **Objective(s):** Establish baseline recreational use within the study area, specifically the level of boating use in Whitewater River cove; and quantify recreational impacts of temporary closures of Whitewater River cove during construction of Bad Creek II Complex.
- **Status:** **Complete**



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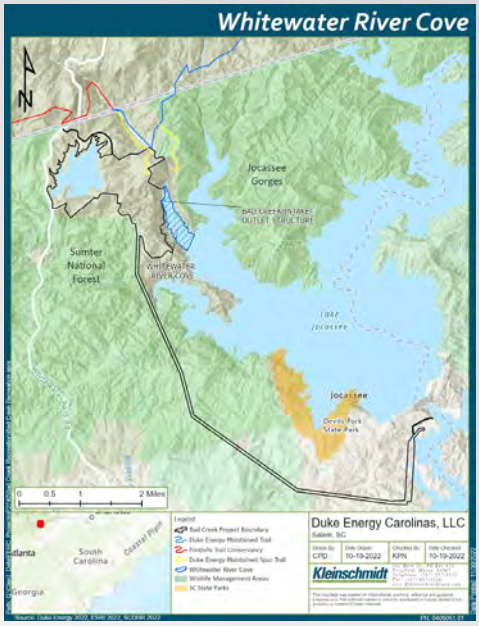
# Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Study Area:**
  - Whitewater River Cove of Lake Jocassee from 35.00.00.40N, 82.59.29.29W to 35.00.04.69N, 82.59.15.57W



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# Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Objective 1 Methods:**
  - Duke Energy deployed a drone over the Whitewater River cove to capture aerial images of recreation use and determine the number, type, and location of boats within the study area.
  - Drone flights occurred on 20 individual days between Memorial Day weekend and Labor Day weekend
  - Flights occurred on a mix of weekdays, weekends, and holidays
  - Images were collected approximately every hour generally between 9:00 AM and 4:00 PM.
  - Boats were categorized as:
    - Motorboat
    - Non-motorized boat (such as canoe or kayak)
    - Personal watercraft (such as Jet-Ski)
    - Paddleboard

| Flight/Survey Date | Daily High Temperature (°F) | Notes |
|---|---|---|
| Sunday, May 28, 2023 | 63 | |
| Wednesday, May 31, 2023 | 75 | |
| Friday, June 2, 2023 | 86 | |
| Saturday, June 3, 2023 | 88 | |
| Tuesday, June 13, 2023 | 79 | |
| Saturday, June 24, 2023 | 82 | |
| Wednesday, June 28, 2023 | 89 | |
| Saturday, July 1, 2023 | 93 | |
| Tuesday, July 4, 2023 | 89 | |
| Friday, July 14, 2023 | 92 | Due to lightning, flights ended at 2:30 pm |
| Saturday, July 15, 2023 | 95 | Due to storms, flights ended at 3:00 pm |
| Thursday, July 20, 2023 | 82 | |
| Saturday, July 29, 2023 | 90 | |
| Monday, July 31, 2023 | 89 | |
| Sunday, August 6, 2023 | 92 | |
| Monday, August 7, 2023 | 92 | |
| Wednesday, August 23, 2023 | 86 | |
| Sunday, August 27, 2023 | 94 | Due to weather, flights ended at 2:30 pm |
| Sunday, September 3, 2023 | 87 | |
| Monday, September 4, 2023 | 91 | |



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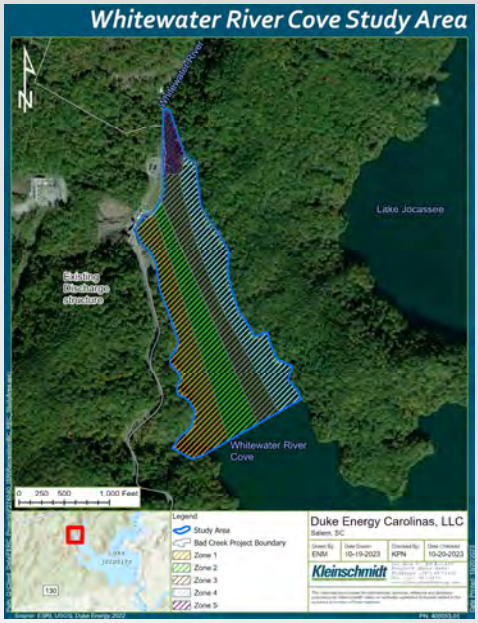
# Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Objective 1 Methods:**
  - Aerial imagery was analyzed to estimate:
    - Total number of boats present each day
    - Number of boat types captured each day
    - Approximate duration of time each boat spent in Whitewater River cove
  - Study area was divided into five distinct zones to further classify location of boats within Whitewater River cove



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# Task 3 – Whitewater River Cove Recreation Evaluation - Methods

- **Objective 2 Methods:**
  - Data were extrapolated to draw conclusions related to the rate and patterns of recreation use in Whitewater River cove
  - Estimates for nighttime and off-season use determined during the 2012 Keowee-Toxaway RUN Study were applied.
  - Estimates for nighttime and off-season use were combined with estimates for peak season daytime use to determine estimate for total use in the Whitewater River cove for 2023
  - Data were escalated based on population projections for 2030 in Oconee County, SC



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# Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

**Table 4-2 Total Number of Boats and Boat Types per Flight**

| Flight/Survey Date | Day Type | Total # of Boats | Total # of Each Boat Type | | | |
|---|---|---|---|---|---|---|
| | | | Kayak | Personal Watercraft | Canoe | Motorboat |
| Sunday, May 28, 2023 | Holiday | 4 | 0 | 2 | 0 | 2 |
| Wednesday, May 31, 2023 | Weekday | 4 | 0 | 0 | 0 | 4 |
| Friday, June 2, 2023 | Weekday | 8 | 4 | 1 | 0 | 3 |
| Saturday, June 3, 2023 | Weekend | 25 | 7 | 0 | 1 | 17 |
| Tuesday, June 13, 2023 | Weekday | 13 | 3 | 0 | 0 | 10 |
| Saturday, June 24, 2023 | Weekend | 34 | 2 | 1 | 0 | 31 |
| Wednesday, June 28, 2023 | Weekday | 20 | 0 | 0 | 1 | 19 |
| Saturday, July 1, 2023 | Weekend | 38 | 2 | 3 | 0 | 33 |
| Tuesday, July 4, 2023 | Holiday | 35 | 1 | 1 | 0 | 33 |
| Friday, July 14, 2023 | Weekday | 15 | 0 | 3 | 0 | 12 |
| Saturday, July 15, 2023 | Weekend | 47 | 0 | 10 | 0 | 37 |
| Thursday, July 20, 2023 | Weekday | 12 | 4 | 0 | 0 | 8 |
| Saturday, July 29, 2023 | Weekend | 41 | 0 | 1 | 1 | 39 |
| Monday, July 31, 2023 | Weekday | 21 | 1 | 0 | 0 | 20 |
| Sunday, August 6, 2023 | Weekend | 14 | 3 | 6 | 0 | 5 |
| Monday, August 7, 2023 | Weekday | 1 | 0 | 0 | 0 | 1 |
| Wednesday, August 23, 2023 | Weekday | 8 | 0 | 1 | 0 | 7 |
| Sunday, August 27, 2023 | Weekend | 22 | 0 | 1 | 0 | 21 |
| Sunday, September 3, 2023 | Holiday | 48 | 0 | 13 | 0 | 35 |
| Monday, September 4, 2023 | Holiday | 30 | 2 | 0 | 0 | 28 |
| **Total** | | **440** | **29** | **43** | **3** | **365** |



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# Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

- **Objective 1 Results:**
  - During the study period, boats in Whitewater River cove were:
    - Motorboats (83 percent)
    - Personal watercraft (10 percent)
    - Kayaks (7 percent)
    - Canoes (less than 1 percent)
    - No paddleboards observed
  - Majority of use was on weekends/holidays (day type) and July (month)
  - Duration of time in cove:
    - 90 percent were <1 hour
    - 9 percent were 1-2 hours
    - 1 percent were >2 hours



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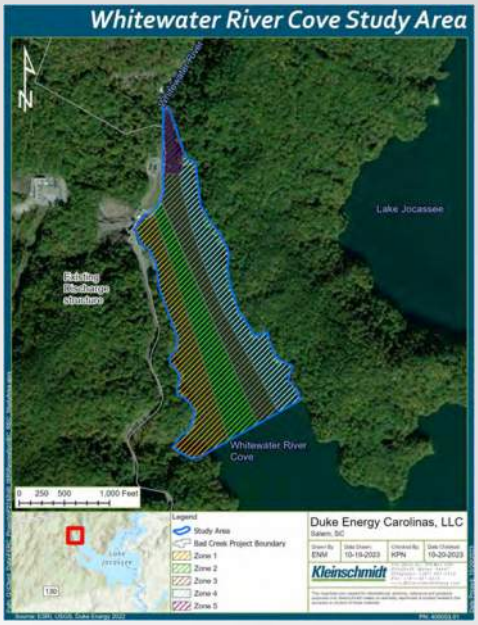
# Task 3 – Whitewater River Cove Recreation Evaluation – Objective 1 Results

- **Objective 1 Results:**
  - Boats were observed in the following zones:
    - **Zone 5** (49 percent)
    - **Zone 3** (20 percent)
    - **Zone 4** (17 percent)
    - **Zone 1** (9 percent)
    - **Zone 2** (5 percent)



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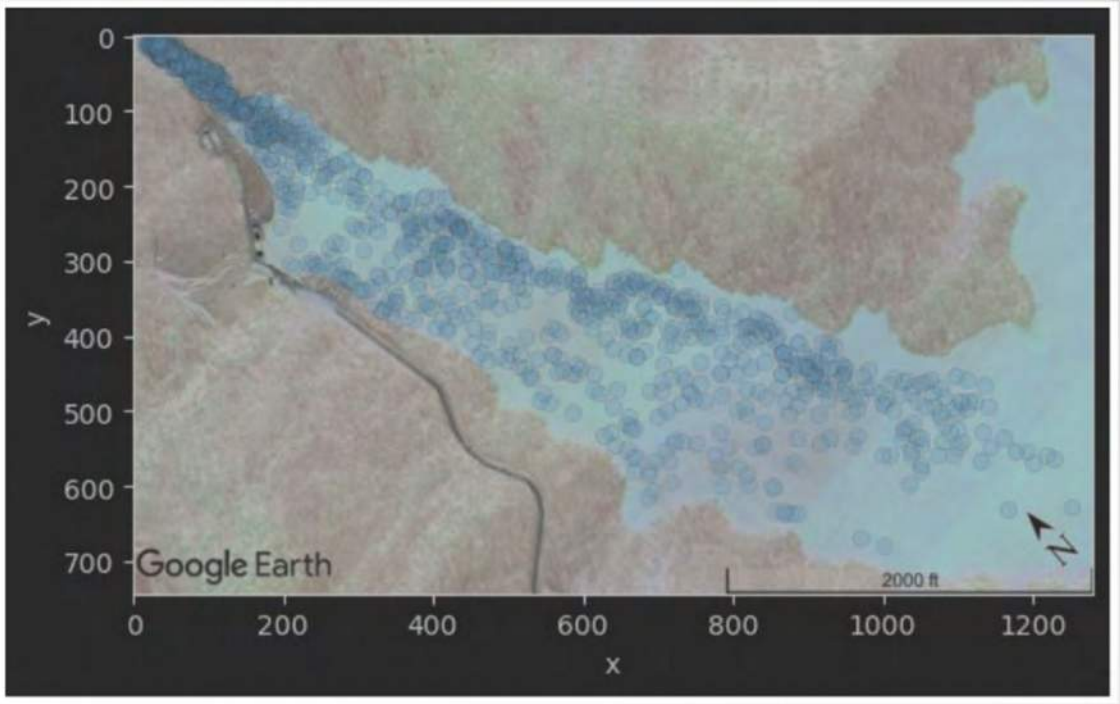




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## Task 3 – Whitewater River Cove Recreation Evaluation – Objective 2 Results

- **Objective 2 Results:**
  - Estimated Recreation Use in Whitewater River Cove
    - ~3,647 boats between April-October 2023
    - ~3,756 boats in 2023
  - During construction of Bad Creek II Complex, the cove would be closed to the public for 5-7 years
  - Closure of the cove could displace between approximately 19,895 and 27,852 boats during the construction period



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## Task 3 – Whitewater River Cove Recreation Evaluation – Summary

- **Summary:**
  - Whitewater River cove is primarily visited by recreators in motorboats
  - Boats tend to follow the eastern shoreline of the cove and congregate in the northern tip of the cove near the waterfall
  - Visitors are assumed to be primarily sightseers (viewing the waterfall) and secondarily fishermen
  - Recreation impacts from Bad Creek II Complex construction:
    - Between 19,895 and 27,852 boats displaced during 5–7-year construction period (approximately 4,000 boats per year)
    - Approximately **1-2 percent of recreation** days at Lake Jocassee lost each year



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## Task 4 – Whitewater River Cove Public Recreational Safety Evaluation

- **Objective(s):** Evaluate potential public safety risks that may be created or exacerbated by the Bad Creek II Complex during both the construction and operation phases. The evaluation will include but not be limited to identification of areas where access will be temporarily or permanently restricted to the public as well as a boater safety evaluation for the Whitewater River arm of Lake Jocassee.
  - The desktop study will evaluate impacts of operation of the expanded Project (i.e., two powerhouses) on water velocities released to the Whitewater River cove and impacts to water-based recreation using the CFD model.
- **Status: Future**



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# Aquatic Resources Study



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# Aquatic Resources Study Task Refresher

| Study Task | Status |
|---|---|
| Task 1 – Consultation on Entrainment | **Complete** |
| Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat | **Ongoing** |
| Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna | **Ongoing** |



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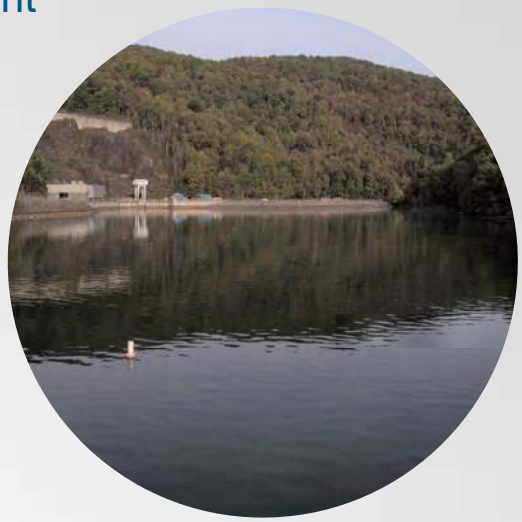
## Task 1 – Consultation on Entrainment

- **Objective(s):** Evaluate the potential for increased fish entrainment due to the addition of Bad Creek II Complex and consult with agencies and other Project stakeholders regarding results of the recent desktop Entrainment Study (Kleinschmidt 2021).
- **Status:** **Complete**





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## Task 1 – Consultation on Entrainment - Outline

1. Consultation with Stakeholders and Agencies
   a. Resource Committee Discussions held April 6, 2023 Guided Analysis
2. Data & Methods
3. Results
   1. Exploratory data analysis
   2. Simulation Results
   3. Risk
4. Discussion



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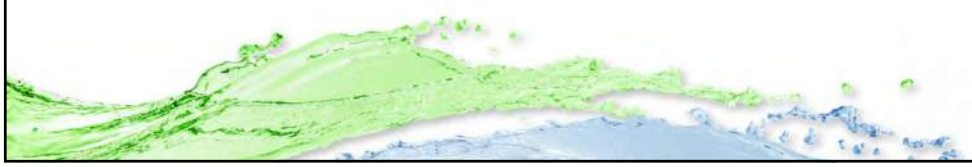
# Task 1 – Consultation on Entrainment - Data Sources

- 1973 – 2020 Lake Jocassee Water Quality
  - date\time\elevation\pH\DO\temperature\conductivity
- 1990 – 1994 Jocassee Hydro Plant Log
  - date\time\forebay elevation
- 1991 – 1993 Bad Creek Entrainment Observations
  - date\time\# of contacts
- 2012 – 2014 Operations Period of Record
  - date\time\Unit 1 MW\Unit 2 MW\Unit 3 MW\ Unit 4 MW



Kleinschmidt

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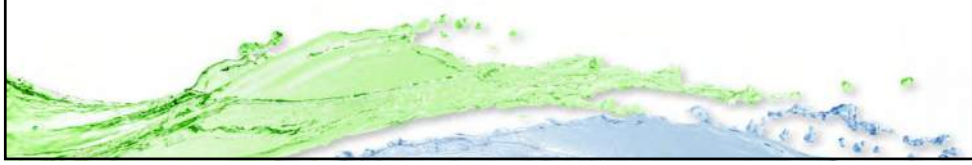
# Existing Entrainment Estimators

- Traditional methods multiply entrainment rate (fish/Mft^3) by the total volume of water discharged through a facility within some unit of time
- Produce single point estimate with no uncertainty
- Entrainment rates are highly variable with infrequent, but large events…

*Two Potential Problems:*

*1. If a large episodic event occurs while sampling, the estimate will be biased as this high rate is applied across an entire interval of time*

*2. Likewise, if no large event occurs while sampling the estimate may incorrectly characterize the facility as having little to no impact*



Kleinschmidt

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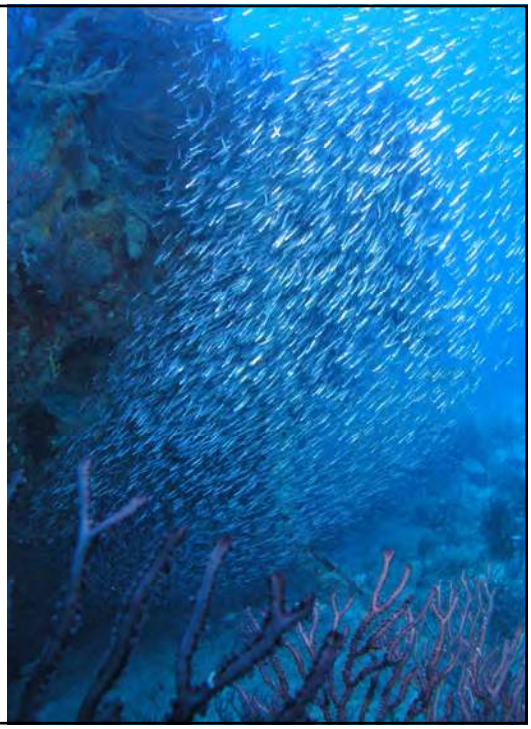
## stryke.py

- Individual based model – follows the fate of individual fish in a simulated population as they migrate through a hydroelectric facility
- Population size, entrainment rates, individual lengths, movement, and survival are simulated with Monte Carlo methods
- Python 3.7.x with MS Excel interface

https://github.com/knebiolo/stryke



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## Impacts Analysis: Describing Entrainment Events

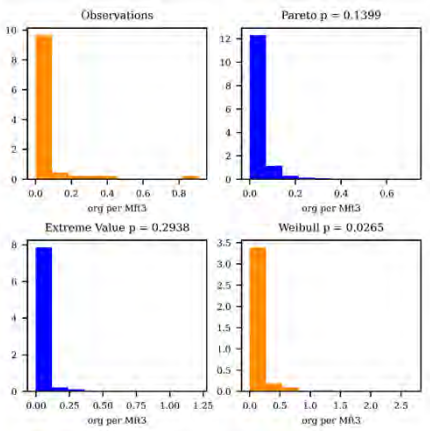
stryke simulates the *magnitude* and *frequency* of entrainment events by sampling from distributions fit to empirical observations

Database of monthly observations from 73 facilities (EPRI 1997)

- Normalized for discharge: fish per $Mft^3$

Pattern repeated across species and regions

EVT not CLT




how big can an event get and how frequently do they occur?

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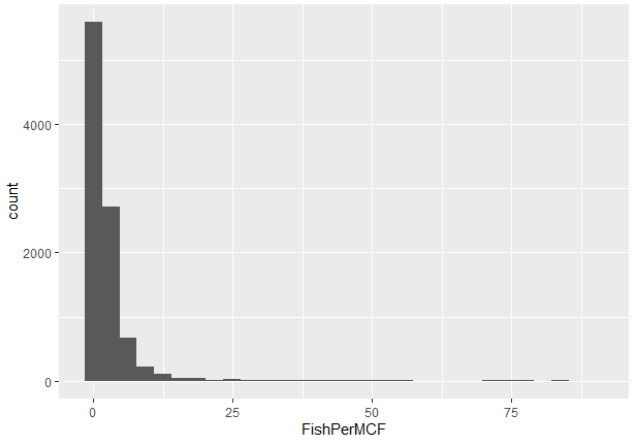
# Bad Creek Entrainment 1991 - 1993




Fish Mft$^3$ – acoustic imaging camera at Bad Creek Pumped Storage

Kleinschmidt

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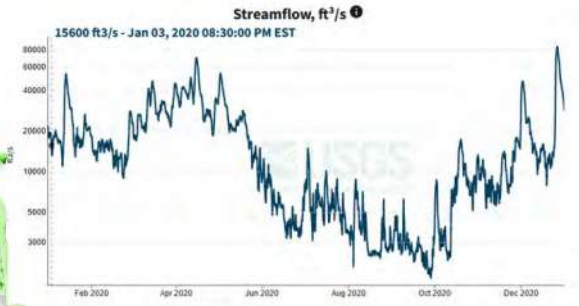
# Yearly Entrainment Estimate (Impact)




For every day in a hydrograph → Simulate presence → If present simulate entrainment event → For every fish in event, simulate movement and survival → Σ

X 1000's

Kleinschmidt

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# Effects Analysis – Population Resiliency

- Population is resilient if it can replace those lost
- Used population growth rates or doubling rates (FishBase)
- Assume population depleted relative to carrying capacity

$$N_{t+1} = N_t(1 + r) - (E_t + M_t)$$

Where:

- $N_t$ = population in year $t$
- $r$ = discrete population growth rate
- $E_t$ = entrainment mortality in year $t$
- $M_t$ = natural mortality in year $t$

Kleinschmidt

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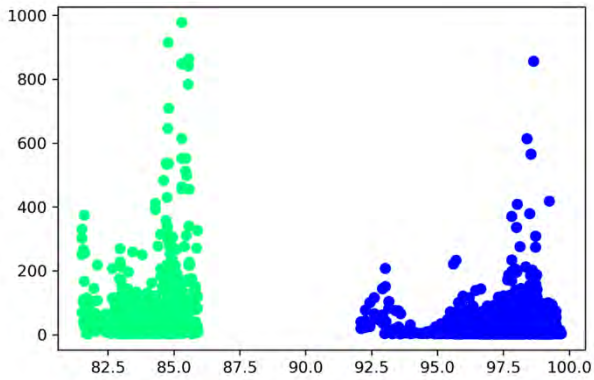
# Exploratory Data Analysis: Forebay Elevation

Forebay elevation collected 3 – 4x per day

Low variability within a day allows us to interpolate a forebay observation for every entrainment observation

2 observational modes identified with GMM




Low forebay elevations occurred during meteorological fall (Sep, Oct, Nov)

Kleinschmidt

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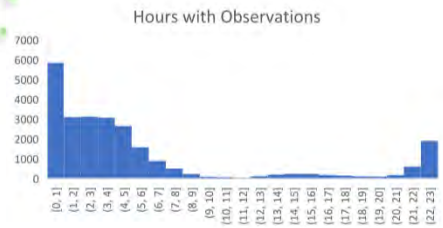
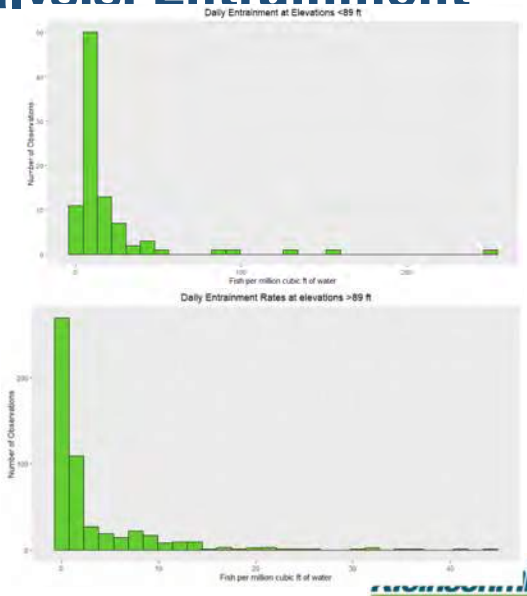
# Exploratory Data Analysis: Entrainment Observations

- Separate observations into two datasets (> 89', <= 89')
- Fit seasonal entrainment to log normal distributions

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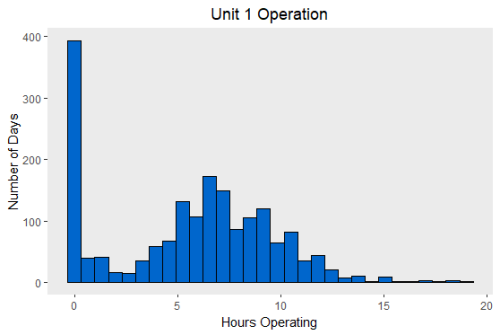
# Exploratory Data Analysis: Hours Operated per Unit

- Operations data from period of record indicative of future operations at Bad Creek
- Assume Bad Creek II operated in same manner as Bad Creek I
- Fit seasonal data to log normal distribution for simulation

| Season | Minimum | Maximum | Mean | Standard Deviation | Median |
|---|---|---|---|---|---|
| Winter | 0 | 19.00 | 5.34 | 4.09 | 5.25 |
| Spring | 0 | 16.80 | 4.41 | 3.89 | 5.25 |
| Summer | 0 | 13.00 | 7.65 | 2.95 | 8.25 |
| Fall | 0 | 17.80 | 5.13 | 4.12 | 5.75 |

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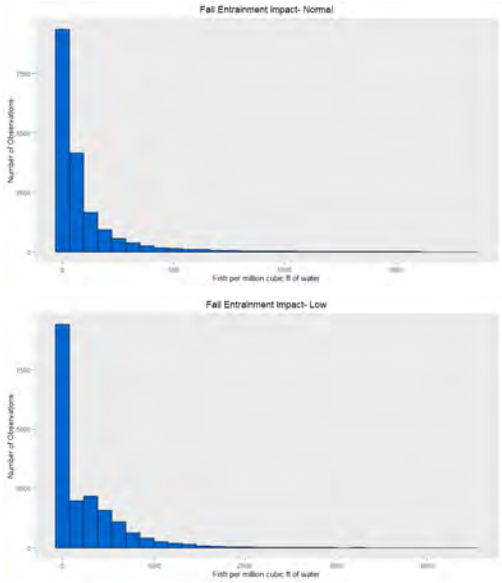
# Simulation Results

- Highest probability of entraining fish occurs in fall when forebay levels are low

| Season | Forebay level | Median Entrained | Probability 10 entrained | Probability 100 entrained | Probability 1000 entrained |
|---|---|---|---|---|---|
| Winter | High | 18,344 | 0.512 | 0.445 | 0.380 |
| Spring | High | 23,389 | 0.19 | 0.09 | 0.04 |
| Summer | High | 32,684 | 0.56 | 0.48 | 0.40 |
| Fall | High | 16,977.5 | 0.54 | 0.43 | 0.33 |
| Fall | Low | 46,052.5 | 0.56 | 0.51 | 0.45 |




Kleinschmidt

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# Population Vulnerability

- Potentially, up to 12% of threadfin shad population lost to entrainment every year
- < 1% of blueback herring population lost

| Species | Categorical discrete growth rate (min) | Species-specific discrete growth rate (min) | Estimated Population 2001-2020 (millions) | Annual Entrainment Loss Estimate | Proportion of Annual Population Lost to Entrainment (PL) | Annual population multiplier including entrainment (categorical) | Annual population multiplier including entrainment (species-specific) |
|---|---|---|---|---|---|---|---|
| Blueback Herring | 1.17 | 1.20 | 3.7 | 0.03 | 0.00 | 1.16 | 1.19 |
| Threadfin Shad | 1.17 | | 0.52 | 0.06 | 0.12 | 1.05 | |

Kleinschmidt

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# Conclusions

- **Exploratory data analysis shows that if Lake Jocassee operates at a lower elevation (< 89') probability of entrainment increases**
- ***"The expected entrainment rate of 12% for Threadfin Shad is close to the expected annual increase for the slowest recovery surrogate, American Shad, indicating that entrainment mortality may keep the population from substantial increase, but is not likely to cause the population to decrease, unless combined with other impacts."***

Kleinschmidt

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## Task 2 – Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat

- **Objective(s):** Assess changes to (1) pelagic and (2) littoral aquatic habitat in Lake Jocassee resulting from the expanded underwater weir and additional discharge, using models developed for the Water Resources Study and Keowee-Toxaway Hydroelectric Project (KT Project) relicensing.
- **Status:** Ongoing



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## Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

- **Objective(s):** Evaluate potential direct impacts to aquatic habitat (including wetlands) related to Bad Creek II Complex construction activities and weir expansion by quantifying and characterizing surface waters, including resource quality.
- **Status:** Ongoing



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## Task 3 – SCDNR Consultation

- **May 2023**: SCDNR requested that Duke Energy use the Stream Quantification Tool (SQT) to evaluate streams potentially impacted by Bad Creek II Complex construction activities
- **May 24 and June 21, 2023**: consultation calls held with SCDNR regarding SQT methodology and memo of proposed survey approach
- **July 12, 2023**: site visit with Lorianne Riggin (SCDNR) to streams within two representative potential spoil locations
- **August 3, 2023:** finalized stream survey approach memo shared with SCDNR and the Aquatic Resources Resource Committee

Note: consultation is ongoing



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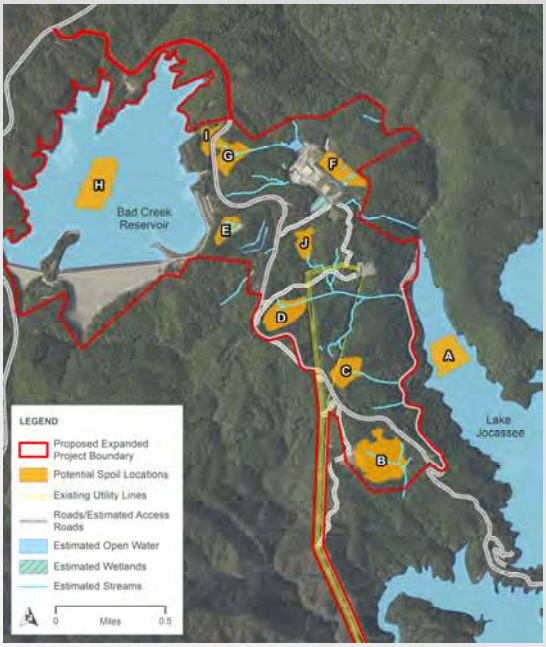
## Task 3 Methods – Potential Spoil Locations

- Stream habitat assessments
  - NC Stream Assessment Method (NCSAM) and USEPA Rapid Bioassessment Protocol (RBP)
- Mussel surveys
  - Streams within spoil locations
  - Lake Jocassee shoreline in the vicinity of Bad Creek II inlet/outlet and submerged weir



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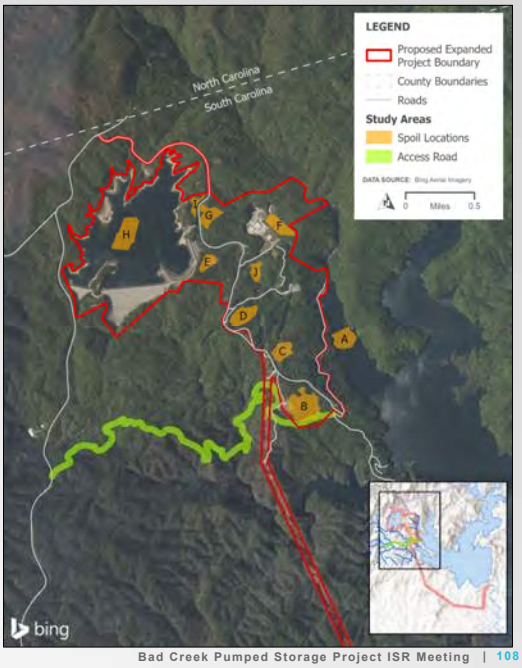
## Task 3 Methods – Potential Temporary Access Road

- Stream habitat assessments – all stream crossings
  - NCSAM & USEPA RBP
  - SC SQT
- Biological surveys - Howard Creek and Limber Pole Creek (in support of SQT)
  - Electrofishing surveys
  - Macroinvertebrate sampling

Sampling completed for reaches upstream and downstream of the potential temporary access road crossing.



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## Task 3 Results

### Completed Field Studies

| Location | Task | Timeframe | | | |
|---|---|---|---|---|---|
| | | July | August | September | October |
| Spoil Locations | Stream habitat assessments (NCSAM + USEPA RBP) | | | | |
| | Mussel surveys | | | | |
| Temporary Access Road | Stream habitat assessments (NCSAM + USEPA RBP) | | | | |
| | Stream geomorphic and riparian vegetation surveys (SQT) | | | | |
| | Fish community sampling (SQT) | | | | |
| | Macroinvertebrate sampling (SQT) | | | | |
| | Mussel surveys | | | | |



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## Task 3 Draft Results – Stream Habitat Assessments

### USEPA Rapid Bioassessment Protocol

| Stream Name / Location | Stream Type | Total Score | Condition Category* |
|---|---|---|---|
| **Streams within Potential Spoil Locations** | | | |
| Stream 4 - Spoil Location G | Intermittent | 105 | Suboptimal |
| Stream 4a - Spoil Location G | Perennial | 137 | Suboptimal |
| Stream 17 - Spoil Location C | Perennial | 143 | Suboptimal |
| Stream 19 (Devils Fork) - Spoil Location B | Perennial | 155 | Optimal |
| **Streams potentially crossed by the Temporary Access Road** | | | |
| Stream 1 (Limber Pole Creek) | Perennial | 170 | Optimal |
| Stream 7 (Howard Creek) | Perennial | 183 | Optimal |
| Stream 12 | Intermittent | 112 | Suboptimal |
| Stream 15 | Perennial | 119 | Suboptimal |
| Stream 16 | Intermittent | 117 | Suboptimal |
| Stream 17 (Devils Fork) | Perennial | 140 | Suboptimal |

*Condition categories include Poor, Marginal, Suboptimal, and Optimal



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## Task 3 Draft Results – Stream Habitat Assessments

**North Carolina Stream Assessment Method**

| Stream Name / Location | Stream Type | Overall Functional Rating |
|---|---|---|
| **Streams within Potential Spoil Locations** | | |
| Stream 4 - Spoil Location G | Intermittent | Medium |
| Stream 4a - Spoil Location G | Perennial | Medium |
| Stream 17 - Spoil Location C | Perennial | High |
| Stream 19 (Devils Fork) - Spoil Location B | Perennial | High |
| **Streams potentially crossed by the Temporary Access Road** | | |
| Stream 1 (Limber Pole Creek) | Perennial | High |
| Stream 7 (Howard Creek) | Perennial | High |
| Stream 12 | Intermittent | Medium |
| Stream 15 | Perennial | High |
| Stream 16 | Intermittent | High |
| Stream 17 (Devils Fork) | Perennial | High |

*Functional ratings include Low, Medium, or High



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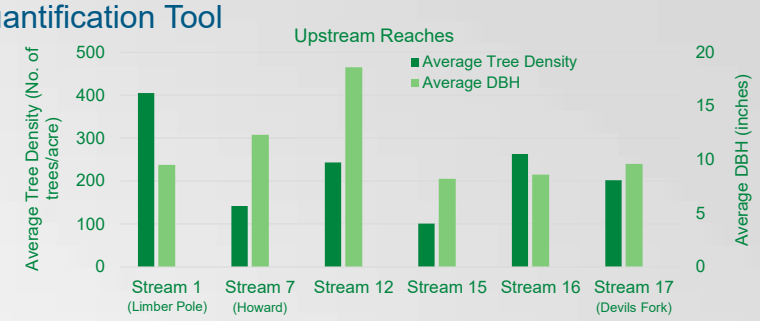
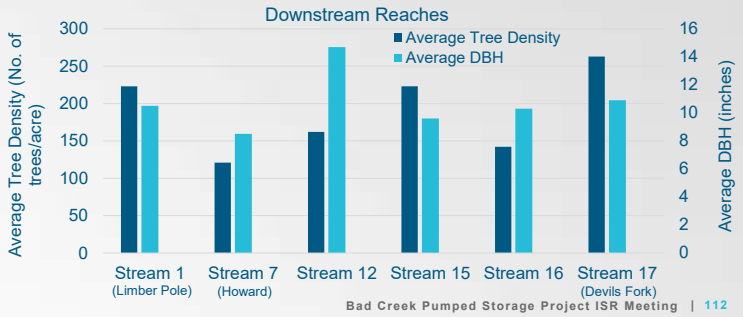
## Task 3 Draft Results – Stream Quantification Tool

**Riparian Vegetation Surveys**

- Stream buffers well vegetated
  - Mature trees
  - Some areas of dense shrubs (e.g., rhododendron)
- Average Tree Density
  - Upstream: 101 to 405 trees/ac.
  - Downstream: 121 to 263 trees/ac.
- Average DBH
  - Upstream: 8.2 to 18.6 inches
  - Downstream: 8.5 to 14.7 inches



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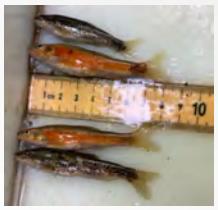
## Task 3 Draft Results – Stream Quantification Tool

### Fish Community Sampling

- Limber Pole Creek
  - No fish collected
- Howard Creek

| Reach | Average Density (No. fish/100 m) | |
|---|---|---|
| | Rainbow Trout | Western Blacknose Dace |
| Upstream | 17.2 | 57.7 |
| Downstream | 11.5 | 54.5 |





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## Task 3 Draft Results – Stream Quantification Tool

### Macroinvertebrate Sampling

| Metrics | Limber Pole Creek | | Howard Creek | |
|---|---|---|---|---|
| | Upstream | Downstream | Upstream | Downstream |
| Total No. of Organisms | 163 | 161 | 319 | 246 |
| Total No. of Taxa | 35 | 29 | 39 | 39 |
| EPT Index | 27 | 21 | 30 | 28 |
| South Carolina Bioclassification | Excellent/Fully Supporting | | | |

| Habitat Type | Limber Pole Creek | | Howard Creek | |
|---|---|---|---|---|
| | Upstream | Downstream | Upstream | Downstream |
| Root Banks | Good | Good-Fair | Good-Fair | Good |
| Logs, Sticks, Snags | Good | Good-Fair | Good-Fair | Good-Fair |
| Rock/Gravel Riffle | Good | Excellent | Excellent | Excellent |
| Mature Leaf Pack | Poor | Poor | Poor | Poor |
| Aquatic Vegetation | Good-Fair | Nonexistent | Poor | Poor |
| Braided Channel | Nonexistent | Nonexistent | Nonexistent | Nonexistent |
| Pine Needles in Stream | Nonexistent | Nonexistent | Nonexistent | Nonexistent |
| Velocity/Flow | Good | Good | Good | Good |
| Sedimentation | Little or none | Moderate | Little or none | Little or none |



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## Task 3 Draft Results – SQT Analysis*

### SQT Results

| Stream/Creek | Reach | Rosgen Classification | Catchment Assessment | SQT Existing Condition Score | Maximum SQT Existing Condition Score | Percent Stream Functionality |
|---|---|---|---|---|---|---|
| Stream 1 (Limber Pole Creek) | Upstream | B4c | Good | 0.58 | 0.8 | 73% |
| | Downstream | B4c | Good | 0.53 | 0.8 | 66% |
| Stream 7 (Howard Creek) | Upstream | B4c | Good | 0.60 | 0.8 | 75% |
| | Downstream | B4a | Good | 0.58 | 0.8 | 73% |
| Stream 12 (UT to Howard Creek) | Upstream | A4 | Good | 0.39 | 0.6 | 65% |
| | Downstream | B4a | Good | 0.47 | 0.6 | 78% |
| Stream 15 (UT to Devils Fork) | Upstream | G5 | Good | 0.36 | 0.6 | 60% |
| | Downstream | A1a+ | Good | 0.35 | 0.6 | 58% |
| Stream 16 (UT to Devils Fork) | Upstream | A4 | Good | 0.40 | 0.6 | 67% |
| | Downstream | G4 | Good | 0.37 | 0.6 | 62% |
| Stream 17 (Devils Fork) | Upstream | A4 | Good | 0.38 | 0.6 | 63% |
| | Downstream | B5a | Good | 0.43 | 0.6 | 72% |

*Consultation with the SCDNR is ongoing and final results will be presented in the USR.



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## Task 3 – Mussel Surveys

- Upland spoil locations
  - No suitable mussel habitat present
- Potential Temporary Access Road - Howard Creek + Limber Pole Creek
  - No mussels observed
- Lake Jocassee – shoreline in the vicinity of the proposed Bad Creek II inlet/outlet structure and in the vicinity of the underwater weir
  - No mussels observed



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## Task 3 Conclusions

- **Stream Habitat Assessments**
  - Streams within spoil locations and those potentially crossed by the temporary access road generally represent *stable, fully functioning conditions.*
  - Characteristics across stream habitat quality rating methods which reduced overall scores included lack of baseflow (i.e., intermittent streams), natural entrenchment, streambank erosion, and/or limited quantities of large woody debris.
- **Mussel Surveys**
  - No mussel habitat present in upland spoil locations
  - No mussels observed in Howard Creek, Limber Pole Creek, or Lake Jocassee



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## Environmental Justice Study



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# Environmental Justice Study

**Objective(s):** There are 5 main study objectives:

1. **Identify presence of environmental justice communities** that may be affected by the relicensing and proposed project expansion.
2. **Identify the presence of non-English speaking populations** that may be affected by the project.
3. **Identify the presence of sensitive receptor locations** in the geographic scope.
4. **Discuss the effects of the relicensing** on any identified environmental justice communities and any affects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
5. **Identify mitigation measures** to avoid or minimize project effects on environmental-justice communities, non-English speaking communities and sensitive receptor locations, if present within the geographic scope

- **Status: Complete**



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# Environmental Justice Study

FERC has identified that an Environmental Justice review is pertinent to its NEPA analysis for the relicensing and proposed Complex development.

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## What is Environmental Justice?

**Environmental Justice (EJ) -** The fair treatment and meaningful involvement of all people regardless of race, color, culture, national origin, income, and educational levels with respect to the development, implementation, and enforcement of protective environmental laws, regulations, and policies.

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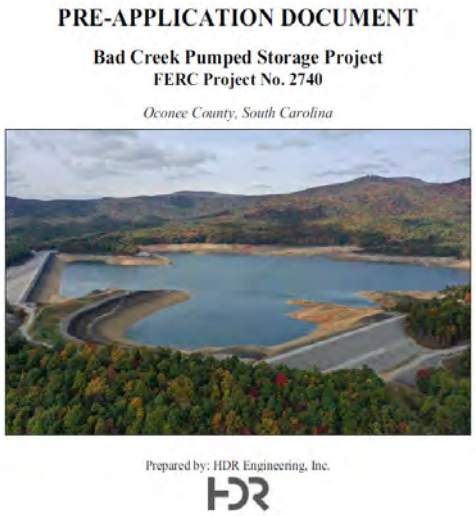
## Additional Terms Included in the Analysis

**Fair Treatment -** The principle that **no group of people**, including a racial, ethnic or a socioeconomic group, **should bear a disproportionate share of the negative environmental consequences** from industrial, municipal and commercial operations or the execution of federal, state, local and tribal programs and policies.

**Disproportionate Effects -** Term used in Executive Order 12898 to describe situations of concern **where there exists significantly higher and more adverse health and environmental effects on minority populations, low-income populations or indigenous peoples**.

**Sensitive Receptor Locations** - Sensitive receptors include, but are not limited to, **hospitals, schools, daycare facilities, elderly housing and convalescent facilities**. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants.

122




# Background and Existing Information

123

## Study Goals and Objectives

As previous noted, there are 5 main study objectives:

1. **Identify presence of environmental justice communities** that may be affected by the relicensing and proposed project expansion.
2. **Identify the presence of non-English speaking populations** that may be affected by the project.
3. **Identify the presence of sensitive receptor locations** in the geographic scope.
4. **Discuss the effects of the relicensing** on any identified environmental justice communities and any affects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
5. **Identify mitigation measures** to avoid or minimize project effects on environmental-justice communities, non-English speaking communities and sensitive receptor locations, if present within the geographic scope

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## Study Area

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# Project Nexus

- Project construction, operation, and maintenance has the potential to affect human health or the environment in environmental justice communities.
- Examples of resource impacts may include, but are not necessarily limited to, project-related effects on: subsistence fishing, hunting, or plant gathering; access for recreation; and construction-or operation-related air quality, noise, and traffic.

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# Methodology

Consistent with Environmental Protection Agency's *Promising Practices for EJ Methodologies in NEPA Reviews* (2016), the EJ Report will include the following:

Step 1: A table of racial, ethnic, and poverty statistics for each state, county, and census block group within the geographic scope of analysis. (Source: U.S. Census Bureau Data).

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| | RACE AND ETHNICITY DATA | | | | | | | | | | LOW-INCOME DATA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Geography | Total Population (count) | White Alone Not Hispanic (count) | African American (count) | Native American/ Alaska Native (count) | Asian (count) | Native Hawaiian & Other Pacific Islander (count) | Some Other Race (count) | Two or More Races (count) | Hispanic or Latino (count) | Total Minority (%) | Below Poverty Level (%) |
| State | | | | | | | | | | | |
| County or Parish | | | | | | | | | | | |
| Census Tract X, Block Group X | | | | | | | | | | | |

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# Methodology (cont.)

**Step 2**: Utilizing data within Step 1 to identify environmental justice populations by block group by applying the following methods to minority populations:

- 50% Analysis Method
- Meaningfully Greater Analysis Method

**Step 3:** Utilizing data within Step 1 to use the "low-income threshold criteria" method to identify environmental justice communities based on the presence of low-income populations.

- the percent of the population below the poverty level in the identified block group must be equal to or greater than that of the reference population (county)

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# Methodology (cont.)

**Step 4**: Identify non-English speaking groups within the geographic scope of analysis **that would be affected by the project**.

Describe planned outreach efforts if these groups exist within the geographic scope.

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# Reporting: Map Development

Map Components

- FERC Project Boundary
- Project construction areas
- Identify block groups of EJ communities based on the presence of minority population, low-income population, or both
- Sensitive receptor locations (e.g., schools, day care centers, hospitals, etc.)

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# Reporting: Sensitive Receptor Locations

A table of distances of sensitive receptor locations from project facilities and proposed facilities.

Discussion of project-related effects on these locations.

Discussions of PM&E measures to avoid or minimize potential effects.

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# Reporting: Potential Project Effects Discussion

A discussion of potential project-related effects on any environmental justice communities, non-English speaking groups and sensitive receptor locations for all resources where there is a potential nexus between effects and communities/locations.

For any identified effects, describe whether or not any of the effects would be disproportionately high and adverse on environmental justice communities.

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# Public Outreach

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# Protection Mitigation and Enhancement Measures

To avoid and/or minimize project effects on identified communities:

- Environmental justice communities
- Non-English speaking groups
- Sensitive receptor locations

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# RESULTS

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# Results

One EJ community based on race identified in Transylvania County (NC) – primarily within the 5-mile buffer zone, with southwest portion in 1-mile buffer zone

Two EJ communities based on low income identified in Oconee County (SC) and Transylvania County (NC) – both within 5-mile buffer zone

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Table 6.1 Race and Ethnicity, Low Income, and English-Speaking Data for the 5-Mile Radius Around the Bad Creek Project

| Geographic Area | Total Population (count) | White Alone, not Hispanic (count) | African American/ Black (count) | Native American/ Alaska Native (count) | Asian (count) | Native Hawaiian & Other Pacific Islander (count) | Some Other Race (count) | Two or More Races (count) | Hispanic or Latino (count) | Total Minority Population (%) | Below Poverty Data (%) | Non-English Speaking Persons Aged 5 Years and Greater (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Georgia** | 10403847 | 5485855 | 3244348 | 19382 | 410705 | 5164 | 32810 | 213189 | 992394 | 47% | 14% | 1% |
| **Rabun County** | 16645 | 14598 | 316 | 55 | 188 | 0 | 41 | 113 | 1334 | 12% | 16% | 0% |
| Census Tract 970202, Block Group 1 | 1348 | 1335 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 1% | 14% | 0% |
| **North Carolina** | 10264876 | 6474688 | 2165301 | 112504 | 290525 | 5640 | 22962 | 230591 | 962665 | 37% | 14% | 1% |
| **Jackson County** | 42938 | 34635 | 928 | 3283 | 302 | 0 | 56 | 1182 | 2552 | 19% | 18% | 0% |
| Census Tract 950900, Block Group 2 | 1425 | 1410 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 1% | 9% | 0% |
| **Macon County** | 34813 | 30998 | 541 | 240 | 302 | 0 | 91 | 201 | 2440 | 11% | 14% | 0% |
| Census Tract 970502, Block Group 1 | 2128 | 2023 | 6 | 0 | 18 | 0 | 0 | 0 | 81 | 5% | 9% | 0% |
| **Transylvania County** | 33775 | 30528 | 1560 | 89 | 47 | 17 | 0 | 410 | 1124 | 10% | 13% | 0% |
| Census Tract 960600, Block Group 3 | 1143 | 1019 | 0 | 0 | 19 | 0 | 0 | 0 | 105 | 11% | 18% | 0% |
| **South Carolina** | 5020806 | 3196421 | 1333876 | 14748 | 78102 | 3784 | 9139 | 99278 | 285458 | 36% | 15% | 0% |
| **Oconee County** | 77528 | 65463 | 5288 | 231 | 570 | 11 | 44 | 1686 | 4235 | 16% | 16% | 0% |
| Census Tract 030200, Block Group 1 | 1340 | 1261 | 0 | 0 | 0 | 0 | 15 | 36 | 28 | 6% | 9% | 0% |
| Census Tract 030100, Block Group 2 | 679 | 671 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 1% | 12% | 0% |
| Census Tract 030100, Block Group 1 | 1167 | 1142 | 7 | 0 | 0 | 0 | 0 | 4 | 14 | 2% | 8% | 0% |
| Census Tract 030200, Block Group 5 | 872 | 872 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0% | 6% | 0% |
| Census Tract 030200, Block Group 2 | 1109 | 1090 | 16 | 0 | 0 | 0 | 0 | 3 | 0 | 2% | 25% | 0% |
| Census Tract 030200, Block Group 3 | 1201 | 1201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0% | 8% | 0% |
| **Pickens County** | 124029 | 106292 | 8392 | 306 | 2424 | 26 | 178 | 1854 | 4557 | 14% | 17% | 0% |
| Census Tract 010200, Block Group 2 | 2267 | 2216 | 24 | 0 | 0 | 0 | 0 | 0 | 27 | 2% | 9% | 0% |
| Census Tract 010100, Block Group 1 | 1443 | 1331 | 76 | 0 | 16 | 0 | 0 | 20 | 0 | 8% | 4% | 0% |
| Census Tract 010200, Block Group 1 | 2279 | 2164 | 27 | 0 | 0 | 0 | 0 | 20 | 68 | 5% | 14% | 1% |

Source: U.S. Census Bureau 2020a, 2020b, 2020c

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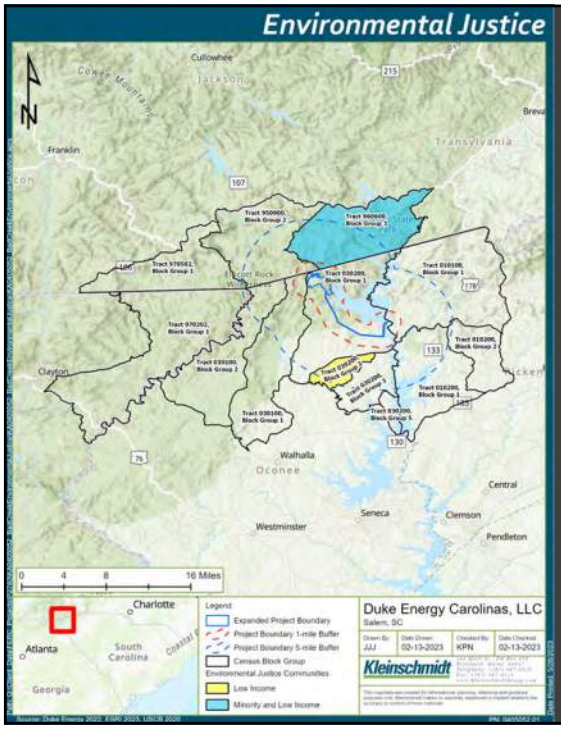
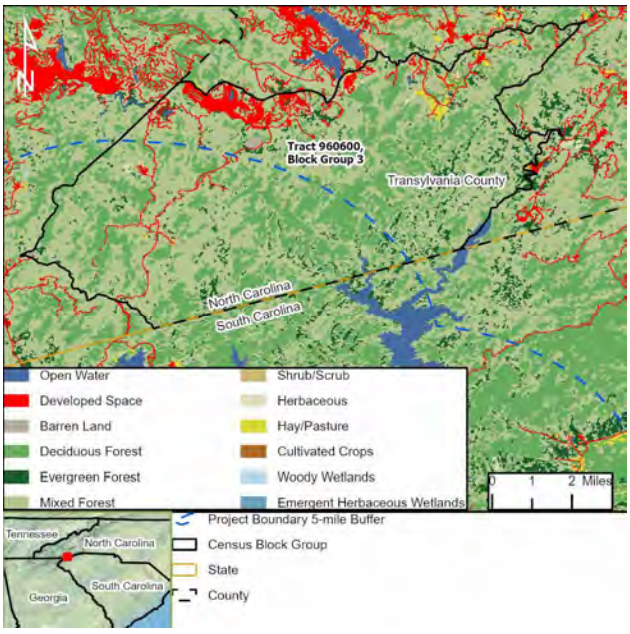



# Environmental Justice Communities

139

## Land Cover Data Surrounding EJ Census Block – Transylvania County




140

Development Surrounding Oconee County Low Income Census Block

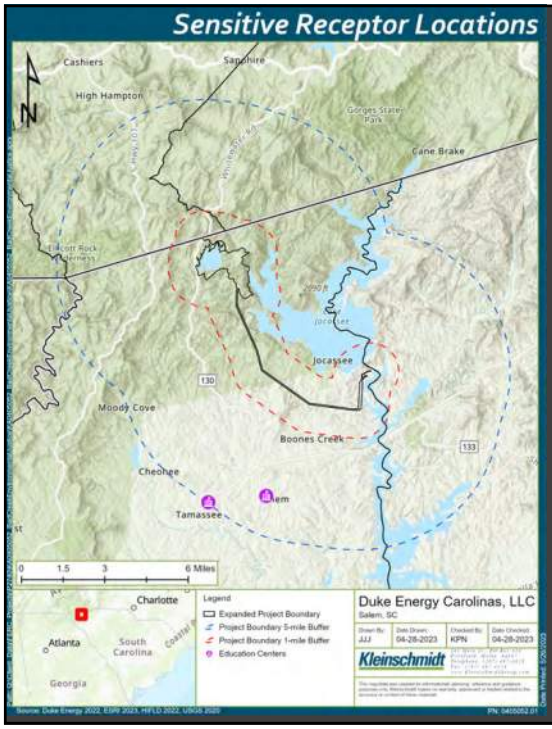
141

## Results (cont.)

One block group includes a small population of non-English speaking individuals in Pickens County (SC) representing 1% of the population (23 people).

Two sensitive receptor locations within the 5-mile buffer zone; none within the 1-mile radius

142




## Sensitive Receptor Locations

143

## Analysis of Relicensing the Project as it Currently Operates on EJ Communities

- No substantive impacts from noise.
- No impacts to air quality, subsistence fishing, traffic, or aesthetics.
- No impacts to non-English-speaking communities and sensitive receptor locations.

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## Analysis of Relicensing the Project with Construction of Bad Creek II Complex on EJ Communities

**NOISE**

- Direct impacts from noise isolated to upper reservoir inlet/outlet construction.
- Land use surrounding upper reservoir within identified EJ community indicates little to no residential development.
- Indirect and cumulative impacts not anticipated.

**AIR QUALITY**

- Short-term construction-related air pollution has the potential to impact EJ communities in the vicinity of the upper reservoir inlet/outlet work.
- The distance between EJ populations and the construction site, generally greater than one mile, will serve to mitigate potential direct and indirect impacts.
- Not likely that short duration of exposure from construction will contribute to cumulative impacts.

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## Subsistence Fishing

Fishing not permitted within upper reservoir but nearby sites within the buffer zone provide potential opportunities.

No direct, indirect, or cumulative impacts anticipated.

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## Effects of Project Construction on Local Traffic, Road Networks, and Aesthetics

- Unlikely EJ communities impacted by work at the powerhouse location due to the distance between construction and identified EJ populations.
- Impact to traffic and local roads from work conducted at the upper reservoir inlet/outlet location within identified EJ census blocks is anticipated to be minimal.
- Disposal of excavated soils may temporarily impact aesthetics, streams and lands in the expanded Project Boundary, local water quality in and immediate downstream of the Whitewater River cove, or construction traffic.
- Following construction there will be no impact to local roads or traffic.

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## Analysis of Relicensing the Project with Construction of Bad Creek II Complex on EJ Communities (cont.)

**NON-ENGLISH-SPEAKING COMMUNITIES**

- One small population located in Pickens County (SC) representing one percent of the population block group (approx. 23 people).
- Primarily outside of the 5-mile radius – impacts not anticipated to this group.

**SENSITIVE RECEPTOR LOCATIONS**

- Nearest sensitive receptor location is a school located approximately four miles from proposed construction site.
- Unlikely that construction would have an effect on the sensitive receptor location due to the distance between the two sites.

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# Summary

- The existing Bad Creek Project's continued operation is not expected to cause any effects on the parameters analyzed.
- The impacts to EJ communities from construction of the Bad Creek II Complex would be minimal due to the distance between construction activities and the nearest residential areas with EJ populations.
- No need was identified for additional outreach efforts beyond those currently being employed by Duke Energy as a part of the relicensing process.

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## Cultural Resources Study



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# Task 1 – Area of Potential Effects Determination

- **Objective:** In consultation with the State Historic Preservation Officer (SHPO), Indian Tribes, and other stakeholders, Duke Energy will determine and document the Area of Potential Effects (APE).
- Initial consultation letter submitted on November 28, 2022. Revised letter submitted on September 25, 2023, that expanded the APE to include Fisher's Knob Access Road.
- In consultation with the above, the APE is defined as all lands within the project boundary
- **Status:** **Complete**




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# Task 2 – Cultural Resources Survey

- **Objective:** Identify historic properties within the APE.
- Archaeological and architectural surveys conducted between April 17 and June 10, 2023.
- Archaeological methods included the excavation of 3,026 shovel tests in areas containing slopes of less than 15%.
- This was supplemented by pedestrian survey in areas where slopes were not dangerous, as well as drone and helicopter surveys to look for rockshelters and large outcrops that could contain petroglyphs.
- Phase II testing conducted at site 38OC249.
- **Results:** Identified one isolated find – a Middle Archaic projectile point, tested site 38OC249, and identified five historic-age architectural resources in the APE.



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# Task 2 – Cultural Resources Survey

**Table 1. Cultural Resources within the APE.**

| Resource No. | Description | NRHP Eligibility | Management Recommendation |
|---|---|---|---|
| 38OC249 | Early Archaic through Mississippian rockshelters | Eligible | Avoidance or Mitigation |
| 38OC250 | Mississippian habitation site | Not Relocated | No Effect |
| IF-1 | Morrow Mountain point | Not Eligible | No Additional Work |
| 0156 | Bad Creek Reservoir | Not Eligible | No Additional Work |
| 0157 | Bad Creek Powerhouse | Not Eligible | No Additional Work |
| 0158 | Control Room Building | Not Eligible | No Additional Work |
| 0159 | Laydown Yard Building | Not Eligible | No Additional Work |
| 0198 | Jocassee Hydroelectric Station | Eligible | No Effect |



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# Task 2 – Cultural Resources Survey

- Site 38OC249 – Paleoindian(?) through Mississippian Period series of rockshelters.
- Excavated six 1-x-1-meter units.
- A total of 585 artifacts were found in stratigraphically intact deposits up to 120 cm deep (the maximum depth we were allowed to excavate).
- Botanical samples submitted to the University of Tennessee. Wood samples identified as yellow pine, red oak, chestnut, hemlock, and interestingly spruce/larch that is indicative of colder climates. Also recovered hickory nutshell and one plum pit.
- **Results:** Site is eligible for inclusion in the National Register of Historic Places. Site will be avoided by any ground disturbing activities but periodically monitored for unlawful artifact collecting.

Photo Redacted

*(CUI/PRIV)*



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# Visual Resources Study



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# Visual Resources Study Task Refresher

| Study Task | Status |
|---|---|
| Task 1 – Existing Landscape Description | Complete |
| Task 2 – Seen Area Analysis | Complete |
| Task 3 – Field Investigation | Complete |
| Task 4 – Key Views Selection | Ongoing |
| Task 5 – Existing Visual Quality Assessment | Ongoing |
| Task 6 – Visual Analysis | Ongoing |
| Task 7 – Visual Management Consistency Review | Ongoing |
| Task 8 – Mitigation Assessment | Ongoing |
| Task 9 – Conceptual Design of the Bad Creek II Complex | Ongoing |



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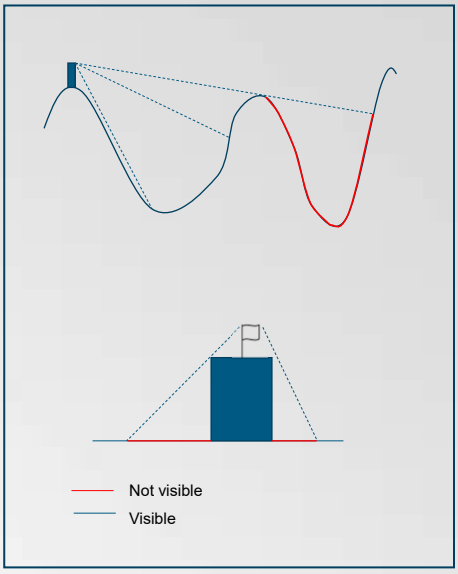
# Tasks 2 - Seen Area Analysis

**Objective:** Identify areas from which Bad Creek II would be visible

**Methodology:**

- Geographic Information System (GIS): ESRI ArcGIS Pro Viewshed Analysis Spatial Analyst Tool
- USGS Digital Elevation Model (DEM)
- Conservative analysis
  - Bare earth basis (trees, structures)
  - Atmospheric effects (clouds, humidity, fog)
  - Revegetation of spoils area
  - Structure design



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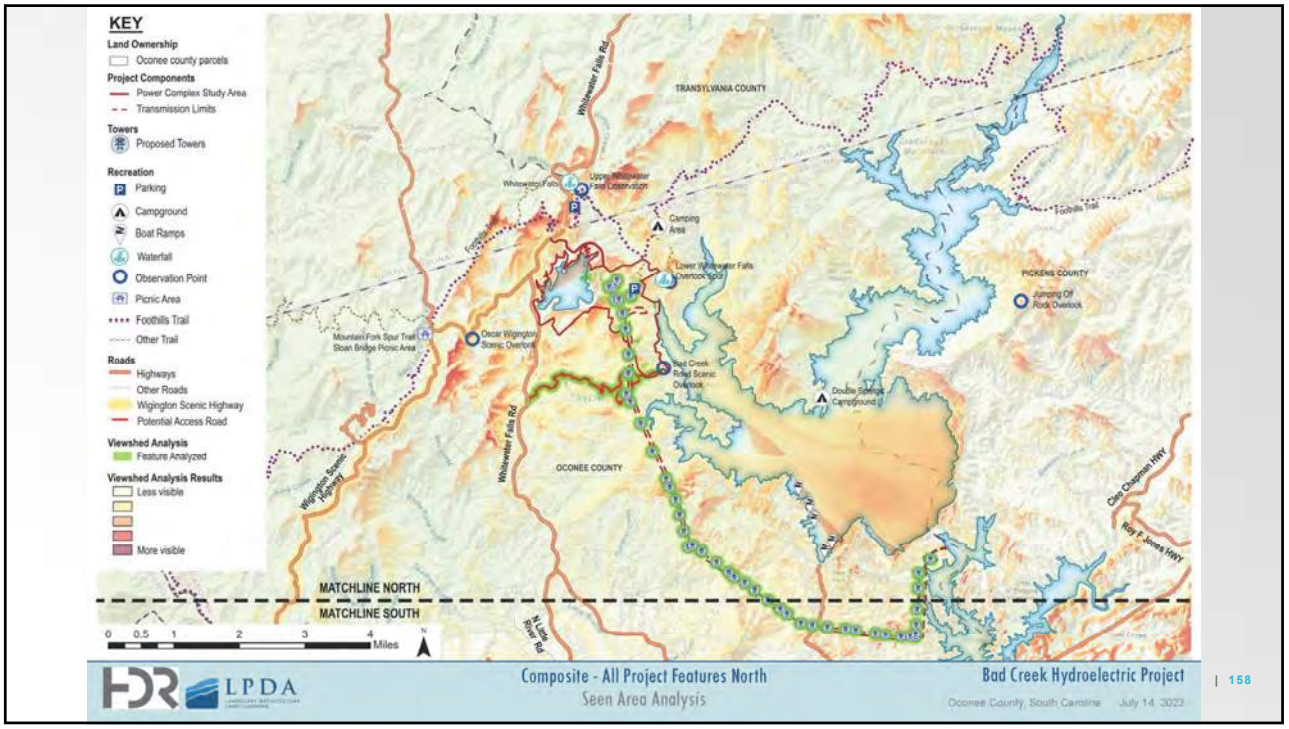




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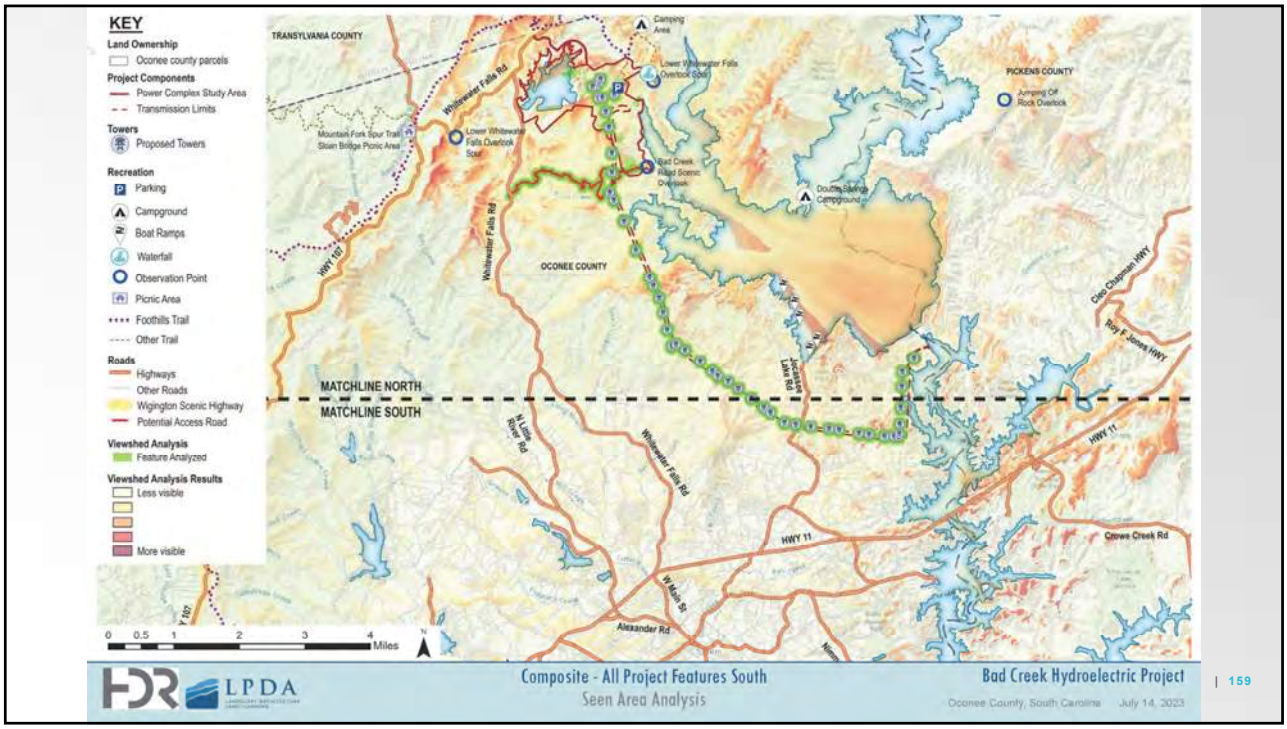
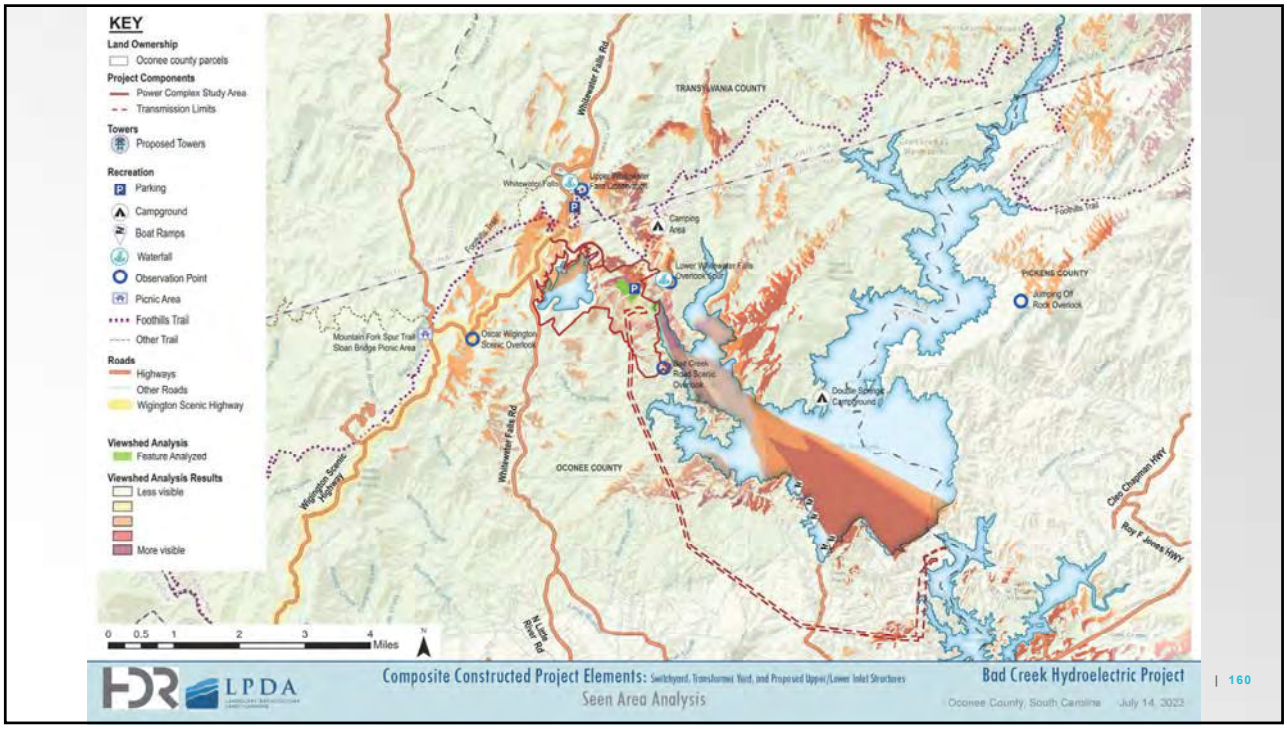

KEY
Land Ownership
Oconee county parcels
Project Components
Power Complex Study Area
Transmission Limits
Towers
Proposed Towers
Recreation
Parking
Campground
Boat Ramps
Waterfall
Observation Point
Picnic Area
Foothills Trail
Other Trail
Roads
Highways
Other Roads
Wigington Scenic Highway
Potential Access Road
Viewshed Analysis
Feature Analyzed
Viewshed Analysis Results
Less visible
More visible
TRANSYLVANIA COUNTY
PICKENS COUNTY
OCONEE COUNTY
MATCHLINE NORTH
MATCHLINE SOUTH
Whitewater Falls Rd
HWY 11
Crowe Creek Rd
Alexander Rd
Cleo Chapman HWY
Roy F Jones HWY
0 0.5 1 2 3 4 Miles
Composite - All Project Features South
Seen Area Analysis
Bad Creek Hydroelectric Project
Oconee County, South Carolina July 14, 2023
159

159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Other Trail
Roads
Highways
Other Roads
Wigington Scenic Highway
Viewshed Analysis
Feature Analyzed
Viewshed Analysis Results
Less visible
More visible
TRANSYLVANIA COUNTY
PICKENS COUNTY
OCONEE COUNTY
Whitewater Falls Rd
Cleo Chapman HWY
Roy F Jones HWY
0 0.5 1 2 3 4 Miles
Composite Constructed Project Elements: Switchyard, Transformer Yard, and Proposed Upper/Lower Inlet Structures
Seen Area Analysis
Bad Creek Hydroelectric Project
Oconee County, South Carolina July 14, 2023
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# Task 4 – Key Views Selection

## 2-Step Process

- Initial pre-selection by Resource Committee (July 27, 2023)
- Finalized following fieldwork (January 11, 2024)

"The objective will be to identify a set of Key Views (**up to four**) that adequately covers the range of visibility and potential scenic and visual impacts for the Project. Considerations that will be used in selecting specific Key Views **include viewing distance, to ensure adequate representation of potential foreground, middleground, and background views of the Project features; viewing direction; and the types of viewer groups** (typically including residents, recreational users and motorists) that might experience views of the Project facilities."



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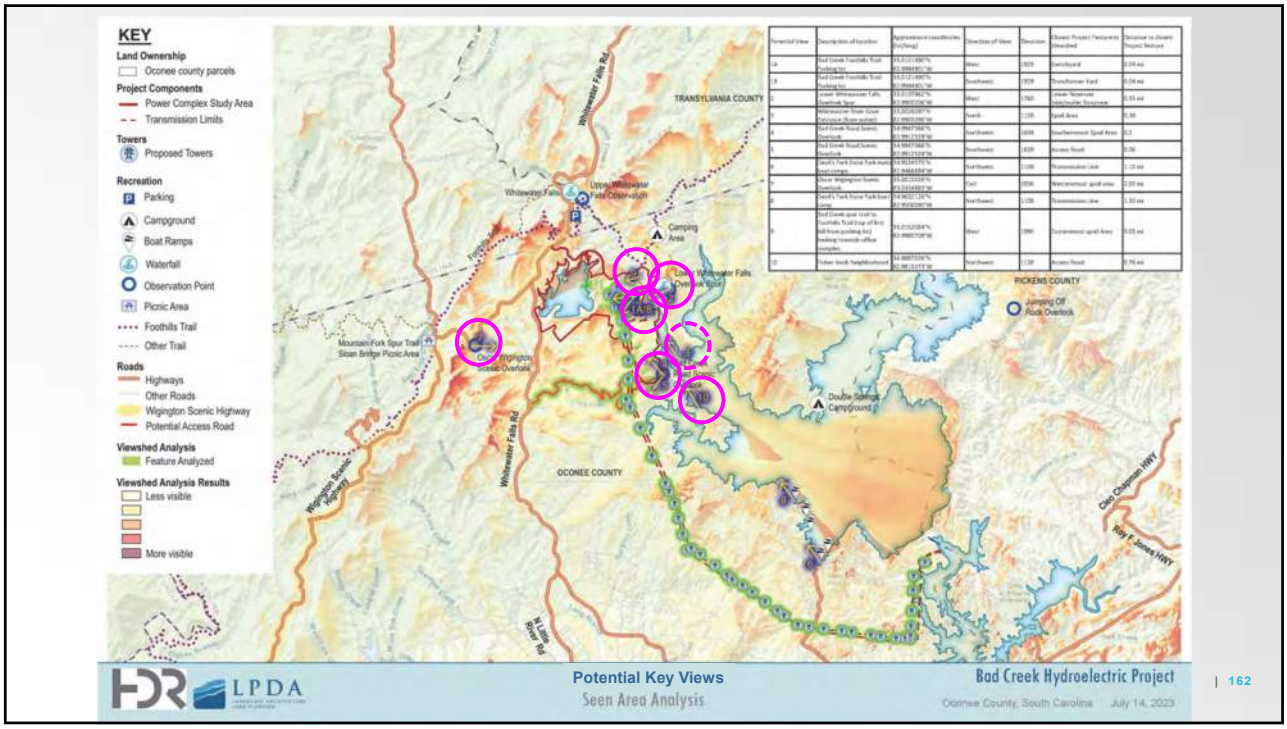




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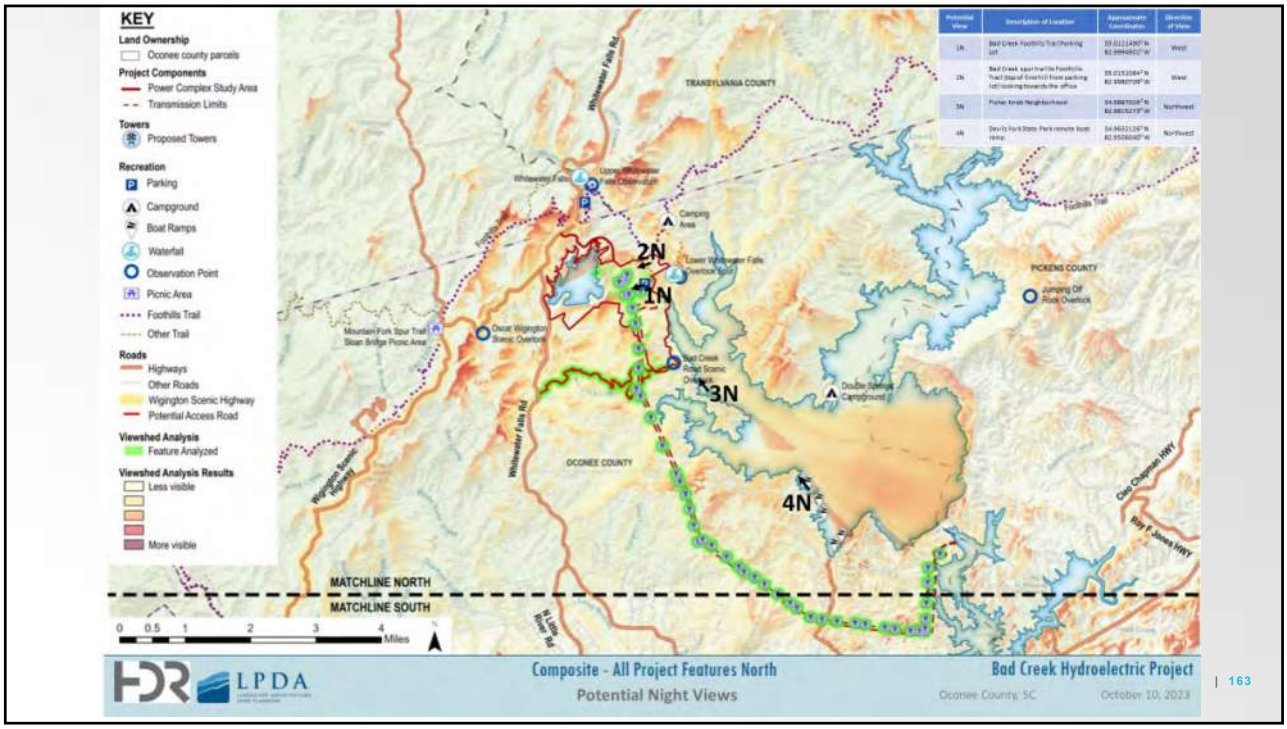


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# Task 3 – Field Investigations

- **Date: December 6, 2023**
- Time:
  - Daytime session 10:00 am – 1:30 pm
  - Night session 6:00 pm – 9:30 pm
- Conditions:
  - Daytime session: Sunny with scattered cloud cover; 50-60% humidity; winds 10-20 mph
  - Night session: Clear with thin clouds; 60-70% humidity; winds 7-8 mph; no moonlight



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## Visual Resources Study: Next Steps

- Task 5 – Existing Visual Quality Assessment
- Task 6 – Visual Analysis
  - Develop visualizations
- Task 7 – Visual Management Consistency Review
- Task 8 – Mitigation Assessment
- Task 9 – Conceptual Design of Bad Creek II Complex
- Task 10 – Report (2nd quarter, 2024)



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## Additional Field Surveys



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## Proposed Spoil Area Herptile Surveys



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## Proposed Spoil Area Herptile Surveys

Based on a request from the SCDNR and to support Clean Water Act Section 404 U.S. Army Corps of Engineers permitting, Duke Energy and HDR evaluated the terrestrial reptile and amphibian (i.e., herptile) resources that may experience direct impacts from the proposed construction of an additional power plant complex adjacent to the existing facility (i.e., Bad Creek II Power Complex). These impacts would be associated with spoil placement of excavated material from construction of the Bad Creek II Complex.

- **Objective(s):** The objective of the herptile survey is to document any South Carolina Wildlife Action Plan (SWAP) Herptile Species of Concern and other reptile and amphibian species that occur within the proposed spoil areas and in the project vicinity.
- **Status:** **Complete**

**Southern Gray-Cheeked Salamander-Area I**



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# Proposed Spoil Area Herptile Surveys

**Methodology**

- Terrestrial herptile field surveys of the eight proposed terrestrial spoil areas (Proposed Spoil Areas B, C, D, E, F, G, I, and J) were conducted from September 11-13, 2023.
- The survey methodology consisted of traversing transects through the specified areas to ensure that sufficient visual coverage was obtained. The herptile surveys were conducted through visual encounter or patch sampling at specific microhabitats (e.g., rock ledges, rock piles, logs, wet depressions). Transects were generally spaced 75-feet apart depending on habitat type and/or visibility.

**Representative Habitat-Area C**



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# Proposed Spoil Area Herptile Surveys

**Methodology**

- Observed species and their locations were recorded using a handheld GPS. Vegetation cover type and specific habitats/substrates were noted for individual spoil areas, as well as incident observations of other wildlife species.
- Observed specimens that could be captured were taxonomically identified with photographic documentation. No voucher specimens were collected as part of this survey.
- Herps were also documented during the aquatic surveys conducted in the summer and fall of 2023. Survey study plan and results were reviewed by the SCDNR and the Wildlife & Botanical Committee.

**Representative Habitat-Area B**



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# Proposed Spoil Area Herptile Surveys

**Results:** Over the three-day survey period, all eight terrestrial potential spoil sites were surveyed by Duke Energy and HDR personnel. The only herptile species observed on the SWAP Priority Herptile Species List was the Eastern Box Turtle. The table below provides all 14 amphibian and reptile species observed and the proposed spoil area in which they were observed.

| Common Name | Scientific Name | Spoil Areas* |
|---|---|---|
| Green Anole | *Anolis carolinensis* | B and G |
| Eastern Fence Lizard | *Sceloporus undulatus* | B |
| Red-spotted Newt | *Notophthalmus viriascens* | D |
| Red Salamander | *Pseudotriton ruber* | G |
| Southern Gray-cheeked Salamander | *Plethodon metcalfi* | C, D, G, and I |
| Southern Appalachian Salamander | *Plethodon teyahalee* | E |
| Chattooga Dusky Salamander | *Desmognathus perlapsus* | C and G |
| Seal Salamander | *Desmognathus monticola* | B and I |
| Black-bellied Salamander | *Desmognathus quadramaculatus* | G and I |
| Eastern Copperhead | *Agkistrodon contortrix* | B |
| Black Racer | *Coluber constrictor* | E |
| Eastern Box Turtle | *Terrapene carolina* | B and I |
| Fowler's Toad | *Anaxyrus fowleri* | I |
| Green Frog | *Rana [Lithobates] clamitans* | G |

**Chattooga Dusky Salamander-Area G**



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# Additional Comments for Discussion



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## Additional Comments for Discussion

| Agency | Date | Comment |
|---|---|---|
| SC Wildlife Federation | 12/4/2023 | Has Duke Energy determined the impact of any potential seismic activity (non earthquake type disturbances such as blasting for the new turbine project). concern was impact on birds, aquatic critters, mammals, etc. The concern is regarding disruption during the critical springtime mating and nesting season. |

Response sent December 19, 2023 to Wildlife and Botanical RC

Potential impacts to wildlife resources as a result of seismic activity from underground blasting for the proposed Bad Creek II Complex were not directly identified by the FERC in their Scoping Document 1 or Study Plan Determination. In Scoping Document 1, FERC staff did identify effects of noise during Bad Creek II construction, and Project operation and maintenance activities on wildlife as a Terrestrial Resources potential impact. **The environmental report (18 CFR §5.18(b)) to be filed with the license application will contain information about the affected environment; analysis of anticipated continuing or new environmental impacts due to operation or proposed changes thereto; proposed environmental measures and measures recommended by relicensing participants; and unavoidable adverse impacts that may occur despite recommended or proposed environmental measures.**

Blasting associated with construction of the new underground powerhouse would be a **temporary impact** and will be evaluated through review of relevant published research on the effects of noise on wildlife (e.g., Shannon et al. 2016), anticipated noise levels (decibels) associated with the type of blasting expected at the Project, projected frequency of blasting, and considering of time of year.

Effects of Bad Creek II construction on seismic activity in the project area was identified by FERC as a potential Geology and Soil Resources impact in Scoping Document 1. Duke Energy notes that prior to construction, detailed construction plans in conformance with FERC's dam safety regulations and guidelines will be prepared for review by FERC's Division of Dam Safety and Inspections.



Graeme Shannon, Megan F. McKenna, Lisa M. Angeloni, Kevin R. Crooks, Kurt M. Fristrup, Emma Brown, Katy A. Warner, Misty D. Nelson, Cecilia White, Jessica Briggs, Scott McFarland and George Wittemyer. 2016. A Synthesis of two decades of research documenting the effects of noise on wildlife. Biol. Rev. 91, pp. 982-1005. Doi: 10.1111/brv.12207.

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## Additional Comments for Discussion

| Agency | Date | Comment |
|---|---|---|
| AQD | 12/5/2023 | Was there any assessment of the terrain around the spoils areas and the temporary roads that would identify higher risk area (e.g., extremely steep drops and/or channels that would cause high velocity of water risking erosion and silt entering the streambeds)? For such high-risk area, would there be additional measures installed to prevent disturbance or damage to the streambeds and the aquatic life? |

Response for discussion:

- The majority of excavated material will be rock, which will be deposited in potential spoil areas and designed to decrease the potential for runoff and sedimentation to adjacent waters. Materials will not be placed on slopes with high gradient due to instability. French drains will be installed over aquatic resources impacted (filled) by overburden materials to maintain downstream flows.
- Hydrologic analyses will be conducted to accurately size pipes and implement outfall protection measures to reduce velocities during storm events and disturbance to downstream streambeds to help protect instream habitats for aquatic life.



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## FERC ILP Schedule Next Steps

| 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 18, 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 |



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## Questions and Action Items



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CAUTION: [EXTERNAL] This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

**From:** Stuart, Alan Witten
**Sent:** Friday, February 23, 2024 8:14 AM
**To:** Elizabeth Miller <MillerE@dnr.sc.gov>
**Cc:** sarah.salazar@ferc.gov
**Subject:** RE: [EXTERNAL] RE: Bad Creek Initial Study Report Meeting Summary

Hi Elizabeth,

March 1 is the deadline for comments. See the table below for additional details. Questions, please let me know.
Thanks !
Alan

## FERC ILP Schedule Next Steps

| 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 18, 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 |

**From:** Elizabeth Miller <MillerE@dnr.sc.gov>
**Sent:** Thursday, February 22, 2024 11:16 AM
**To:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Cc:** sarah.salazar@ferc.gov
**Subject:** [EXTERNAL] RE: Bad Creek Initial Study Report Meeting Summary

***** CAUTION! EXTERNAL SENDER *** STOP. ASSESS. VERIFY!!** Were you expecting this email? Are grammar and spelling correct? Does the content make sense? Can you verify the sender? If suspicious report it, then do not click links, open attachments or enter your ID or password.

Hi Alan,

When is the deadline for comments on the meeting summary?

Thank you,

Elizabeth

Elizabeth C. Miller
SCDNR
Office: 843-953-3881
Cell: 843-729-4636

**From:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Sent:** Thursday, February 1, 2024 2:21 PM
**To:** Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Andrade, Kristin - USACE Greenville <SAC.RD.Greenville@usace.army.mil>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Shannon Bobertz <BobertzS@dnr.sc.gov>; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; Carter, Jerry - SC House of Representatives <jerrycarter@schouse.gov>; Case, Mike <mgcase@icloud.com>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Wes Cooler <wes.cooler@mac.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Corney, Michael <mike_corney@yahoo.com>; Corney, Steve <steve@corney.org>; Cotton, Mark <mark@cottonrealestate.com>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Andy Douglas <adoug41@att.net>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Edwards, Danny - City of Walhalla, SC <dannyedwards@bellsouth.net>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Fell, Aiden - SCDPRT <afell@scprt.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Andrew

Gleason <andrewandwilla@hotmail.com>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Green, Sara - SC Wildlife Federation <sara@scwf.org>; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; jhains@g.clemson.edu; Wenonah Haire <wenonah.haire@catawba.com>; Rowdy Harris <charris@scprt.com>; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Erika Hollis <ehollis@upstateforever.org>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Hreha, Lisa - USACE <lisa.l.hreha@usace.army.mil>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Keene, Terry - AQD <jtk7140@me.com>; Kulpa, Sarah <sarah.kulpa@hdrinc.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; derrick.miller@usda.gov; Elizabeth Miller <MillerE@dnr.sc.gov>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Mitchell, Phil - Fishers Knob Home Owners Group <lputnammitchell@gmail.com>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; Olds, Melanie J <melanie_olds@fws.gov>; growens@gmail.com; Perry, Fletcher - City of Pickens <fperry@pickenscity.com>; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Raabe, Peter - American Rivers <praabe@americanrivers.org>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Lorianne Riggin <RigginL@dnr.sc.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Rohde, Fritz <fritz.rohde@noaa.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; Chris Starker <cstarker@upstateforever.org>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Liz Thomas <liz.thomas@klgates.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Townsend, Russell - Eastern Band of Cherokee Indians <sverka@nc-cherokee.com>; US Bureau of Land Management <BLM_ES_SSDO_Comments@blm.gov>; Watt, Acee - United Keetoowah Band of Cherokee Indians <awatt@ukb-nsn.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Dale Wilde <dwilde@keoweefolks.org>; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; suewilliams130@gmail.com; Wood, Chris J. <chris.wood@ncwildlife.org>; Yantis, Gerry - AQD <gcyantis2@yahoo.com>; Al Shadwick <shadwick@hotmail.com>

**Subject:** Bad Creek Initial Study Report Meeting Summary

Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. As required by the ILP schedule, within 15 days of the ISR filing, Duke Energy held an ISR Meeting at Duke Energy's Wenwood Operations Center in Greenville, South Carolina from 9 AM to 5 PM on Wednesday, January 17, 2024. The meeting included a virtual (Microsoft Teams) option for remote participants. On February 1, 2024, Duke Energy filed the ISR Meeting summary and a copy of the meeting presentation with FERC. The transmittal letter for this filing is attached. Please note that, due to file size restrictions, the meeting summary and presentation are not attached to this email. Duke Energy encourages stakeholders to view the filing on the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Regards,

Alan Stuart
Senior Project Manager, Regulated & Renewable Energy
Duke Energy
525 S.Tryon St., DEP – 35B | Charlotte, NC 28202
Office 980-373-2079 |Cell 803-640-8765

***WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES***

*Duke Energy Corporation*
*Regulated and Renewable Energy*
*526 South Tryon Street / Mail Code DEP-35B*
*Charlotte, NC 28202*

April 1, 2024

***Electronically Filed***

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
**Relicensing Study Progress Report No. 4**

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977 by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

**Relicensing Studies**

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024. This Fourth Quarterly Study Progress Report describes the activities performed since the ISR was filed, including activities that occurred in quarter 1 (Q1) of 2024 and activities expected to be conducted in quarter 2 (Q2) of 2024. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

Duke Energy is filing this Study Progress report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public

throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

Alan Stuart
Senior Project Manager
Water Strategy, Hydro Licensing & Lake Services
Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

# Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

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Portland, OR 97232-4169

Recreation and Land Use Coordinator
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Washington, D.C. 20426

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Room 61-02
Washington, D.C. 20426

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# Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

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SAC.RD.Greenville@usace.army.mil

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U.S. Bureau of Land Management
273 Market Street
Flowood, MS 39232
BLM_ES_SSDO_Comments@blm.gov

U.S. Department of Agriculture, Office of Chief Economist-OEPNUE
1400 Independence Ave N.W.
MS 3815
Washington, D.C. 20250-0001

U.S. Department of Interior
75 Spring St S.W.
Ste 304
Atlanta, GA 30303

U.S. Department of Interior, Office of Environmental Policy & Compliance
1849 C St N.W.
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U.S. House of Representatives (CD7)
1626 Longworth House Office Building
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Office of Senator Scott
U.S. Senate
520 Hart Senate Office Building
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Office of Senator Tillis
U.S. Senate
185 Dirksen Senate Office Building
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U.S. Senator Lindsey Graham
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North Carolina Department of Environmental Quality, Division of Land Resources
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North Carolina Department of Environmental Quality, Environmental Management Commission
1617 Mail Service Center
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# Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

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**Bad Creek Pumped Storage Project**
**Relicensing Study Progress Report No. 4**
**April 1, 2024**

## 1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

## 2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the

Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination (SPD) letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access.[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines.

In addition, Duke Energy provided the following clarifications regarding the Discussion and Staff Recommendations included in the SPD in Study Progress Report No. 1:

- FERC recommended that Duke Energy modify the Recreation Study Plan to include the additional counties that will be used during the future recreation use analysis. Duke Energy will include Oconee and Pickens counties, SC and Jackson and Transylvania counties, NC and additional counties in SC, NC, and GA that are reported on the recreation user surveys. Since recreation user surveys had not yet been completed yet, Duke Energy was unable to list what counties would be reported at that time.
- FERC recommended that Duke Energy include the 14.8 miles of trail that follows logging and access roads in the Conditions Assessment. Duke Energy is evaluating the entire 43

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

miles of trail, including 28.2 miles of single-track trail segments and 14.8 miles of trail that follow logging and access roads in the Conditions Assessment.

- FERC recommended that the Recreation Use and Needs (RUN) Study include detail boxes and labels for all spur trails within the 43-mile portion of trail to be studied by Duke Energy. Duke Energy will prepare detailed maps of the Duke Energy-maintained, 43-mile portion of the Foothills Trail that identify parcel boundaries, current property owner(s), access locations, spur trails, structures, and facilities/amenities. Two traffic counters have been installed at the Bad Creek Hydro Project Trail Access (i.e., Bad Creek Parking Access Area and Bad Creek Road) and user surveys are being collected at this site.
- FERC requested additional details on the standards used to define the minimum acceptable values of the indicator variables used to estimate the trail's carrying capacity. Duke Energy held a Recreational Resources Study Resource Committee (RC) meeting on March 28, 2023, to discuss the carrying capacity methodology.

As discussed in Study Progress Report No. 2 and No. 3, Duke Energy provided information on a potential temporary access road to the Fisher Knob community. The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies have been expanded to incorporate the areas potentially affected by the temporary road.

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024 and the ISR Meeting Summary was filed with FERC on February 1, 2024. In response to comments provided on the ISR and ISR Meeting Summary, Duke Energy is submitting its reply concurrent with this Study Progress Report.

The following sections summarize progress implementing the relicensing studies since the ISR was filed.

## 3.0 WATER RESOURCES STUDY

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: No additional work for this study task is anticipated; the final study report was provided in the ISR as Appendix A, Attachment 1.
- **Water Quality Monitoring in the Whitewater River Arm**: A draft interim report with preliminary water quality results from study year 1 was included in the ISR as Appendix A, Attachment 2. Activities for study year 2 will commence in Q2 (June 2024) with redeployment of water quality instrumentation in the Whitewater River arm to collect water quality information now that all four Bad Creek units have been upgraded.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** A final study report was provided in the ISR as Appendix A, Attachment 3. While the original scope and objectives of this study task have been met, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled. Therefore, additional CFD modeling is being carried out to incorporate these updated hydraulic capacities. Since the increased hydraulic capacity during generation is less than 2 percent overall (Bad Creek plus Bad Creek II combined) and would result in flows comparable to previously modeled generation flows, only operations under pumping will be evaluated (the updated pumping capacity is increased approximately 9 percent overall). A summary report presenting the effects of updated pumping capacities on Whitewater River flows will be developed and distributed for stakeholder review. This evaluation will implement the same CFD model used during the feasibility study to estimate near-field (i.e., immediately downstream of inlet/outlet structures) changes in flows due to Bad Creek II operations. The final report will be attached as an addendum to the CFD study report (Appendix A, Attachment 3) in the Updated Study Report (USR).
- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The CHEOPS model has been used to evaluate potential effects of Bad Creek II on the frequency, timing, and range of Lake Jocassee and Lake Keowee reservoir level fluctuations. Duke Energy has a scheduled a meeting with the Water Resources, Aquatic Resources, Operations, and Recreational & Visual Resources RCs in April to review model

results. Following the meeting, Duke Energy will provide a draft report to the RCs for review and comment.

- **Future Water Quality Management Plan (WQMP) Development:** Work to develop the WQMP will begin in Q2 of 2024.

**Variance from Approved Study Plan**

The study is proceeding in accordance with the approved study plan except the study area has expanded to incorporate a temporary access road. Potential water quality effects associated with construction of the temporary access road will be addressed in the WQMP.

## 4.0 AQUATIC RESOURCES STUDY

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment Study:** The desktop entrainment study report was revised to include historical operations data, an assessment of the influence of operations with the increase of renewable energy production, pumping periods (2, 4, 6, 8, 10, and 12 hours), diurnal periods (day versus night), lake levels, and water temperature. The final report was reviewed by stakeholders and provided in the Initial Study Report as Appendix B, Attachment 1. As described above, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled for entrainment. Therefore, additional modeling is being carried out to incorporate these updated hydraulic capacities and an addendum to the final report will be included in the USR (Appendix B, Attachment 1). Also, per the Commission's request in their ISR comments, a literature review will be carried out for the intrinsic population growth rate of threadfin shad. If recent literature is identified with this information, it will be considered for inclusion in the entrainment analysis and presented in the USR.
- **Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat:** This effort will use results of the CFD and CHEOPS modeling from the Water Resources Study. CFD modeling results will be used to qualitatively evaluate potential effects to Lake Jocassee stratification, dissolved oxygen, and temperatures throughout the water column. CHEOPS modeling results will be used to assess potential effects within the littoral zone with a focus on lake level fluctuation effects. See Section 3.0 for an update on the CFD and CHEOPS

modeling. Preliminary work on the analysis and study report has begun; a draft report will be provided to the Aquatic Resources RC in Q2 2024.

- **Impacts to Surface Waters and Associated Aquatic Fauna:** The third and final fish survey at Limber Pole and Howard creeks was completed on October 9 and 10, 2023. Hydrology, hydraulics, and geomorphology surveys in support of the Stream Quantification Tool, including riparian vegetation surveys, and stream habitat data forms consisting of the North Carolina Stream Assessment Method and U.S. Environmental Protection Agency Rapid Bioassessment Protocol were completed at all streams crossed by the proposed temporary access road on October 2 and 3, 2023. Results of the mussel, fish, and stream habitat surveys were summarized in a draft report and shared with the Aquatic Resources RC on November 11, 2023, and included as Appendix B, Attachment 3 of the ISR filed with FERC on January 4, 2024. Comments on the draft report were received from the South Carolina Department of Natural Resources (SCDNR) on December 21, 2023. The draft results were also presented at the January 17, 2024, ISR meeting. A final report was distributed to the Aquatic Resources RC on February 14, 2024, and is being filed as Attachment A of this progress report.

**Variance from Approved Study Plan**

The Entrainment Study and Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat were completed in accordance with the approved study plan. The Impacts to Surface Waters and Associated Aquatic Fauna study area was expanded to include the temporary access road. Stream habitat surveys for five streams within spoil locations were not completed due to safety concerns related to inclement weather. These variances were reported in the ISR.

## 5.0 VISUAL RESOURCES STUDY

Duke Energy has completed the visualizations identified in the study plan and is finalizing the draft study report for RC review. As has been discussed with the RC and at the ISR meeting, a lighting evaluation will be included in the study report. This will include an overview of the International Dark Sky program and guidelines but will not include an evaluation of Bad Creek II against International Dark Sky standards since Duke Energy has been unable to locate such standards for power generating facilities. The draft study report will be provided to the Recreation & Visual Resources RC during Q2 2024.

**Variance from Approved Study Plan**

The study is proceeding in accordance with the approved study plan. The temporary access road route has been incorporated into the viewshed model.

## 6.0 RECREATIONAL RESOURCES STUDY

The Recreational & Visual Resources RC met on February 29, 2024, to discuss the status of the Recreational Resources Study as described below.

- **Foothills Trail Recreation Use and Needs (RUN) Study**: Data collection including traffic and trail counts, in-person and online user surveys, and spot counts was completed in 2023. The data are currently being processed. The Foothills Trail carrying capacity analysis is under development. The draft study report will be provided to the RC in Q2 2024.
- **Foothills Trail Condition Assessment**: Fieldwork was completed in 2023 and the draft study report was submitted to the RC in November 2023 as well as included in the ISR. Duke Energy received comments on the draft report from the Foothills Trail Conservancy, SCDNR, and Friends of Lake Keowee Society. The RC discussed these comments during the February 2024 meeting. All comments will be considered and included in the consultation documentation with the final report. The final report will be filed with the USR.
- **Whitewater River Cove Existing Recreational Use Evaluation**: This effort has been completed and the final report was included in the ISR as Appendix D, Attachment 3. No further work in association with this task is planned.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling surface velocity data developed in the Water Resources Study with the Whitewater River cove recreational use data captured during the 2023 boating season. This effort is dependent upon updated CFD modeling of surface velocities in the Whitewater River Cove (see Section 3.0) which is on-going. The draft report will be distributed to Recreational & Visual Resources RC members in Q2 2024.

### Variance from Approved Study Plan

The study is proceeding in accordance with the study plan as modified by FERC.

## 7.0 CULTURAL RESOURCES STUDY

The draft report was filed as Appendix E of the ISR and on January 22, 2024, the final report was distributed to the SC State Preservation Historic Office and the Catawba Indian Nation. On March 6, 2024, the Catawba Indian Nation responded with their concurrence with the final report. The final report is attached as Attachment B of this progress report[2]. This study has been completed in accordance with the approved study plan.

### Variance from Approved Study Plan

The study was completed in accordance with the approved study plan; the geographic scope of the study area was expanded to encompass the proposed temporary access road.

## 8.0 ENVIRONMENTAL JUSTICE STUDY

The final report was filed as Appendix F of the ISR. No written comments were provided requesting modifications to the final study report. Duke Energy will continue to evaluate the need for additional outreach activities prior to the filing of the final license application.

### Variance from Approved Study Plan

The study was conducted in accordance with the study plan as modified by FERC.

## 9.0 WILDLIFE AND BOTANICAL UPDATE

Duke Energy has proposed to develop a bat study plan and carry out additional surveys for bats at the Project due to potential clearing associated with the proposed temporary access road, spoil areas, transmission line, and other areas of proposed power complex infrastructure. This will also support Clean Water Act 404 permitting to avoid and minimize impacts to endangered species, as well as preparation of the Biological Assessment (BA) for submittal to the U.S. Fish and Wildlife Service (USFWS) [to comply with Section 7 of the Endangered Species Act] for the 404 permitting. Duke Energy will target finalizing the study plan in line with the summer survey guidance in April 2024. Duke Energy will submit the study plan to the USWFS, FERC, SCDNR, and the Wildlife & Botanical RC.

[2] Consistent with FERC policy, the Cultural Resources report is being submitted as Controlled Unclassified Information (CUI)/Privileged information.

## 10.0 PERMITTING ACTIVITIES

Initial work in support of Clean Water Act Section 404 / 401 permitting has begun; a pre-application meeting request was submitted to the U.S. Army Corps of Engineers (USACE) on February 23, 2024 and the meeting was held on March 28, 2024, in Columbia, South Carolina. Attendees includes representatives from USACE, USFWS, SCDNR, S.C. Department of Health and Environmental Control (SCDHEC), Catawba Indian Nation, Duke Energy, and Duke Energy's consultant (HDR Engineering, Inc.).

# Attachment A: Impacts to Surface Waters and Associated Aquatic Fauna (Final Report)

**CUI/Privileged**

# Attachment B: Cultural Resource Investigations at the Bad Creek Hydroelectric Project (Final Report Filed Separately)

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**Subject:** P-2740 Bad Creek Relicensing – Filing of ILP Progress Report and Response to Comments on Initial Study Report

**Categories:** Stakeholder



Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission

(FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of two new ILP submittals, both of which were electronically filed with FERC by Duke Energy on April 1, 2024:

- Relicensing Study Progress Report No. 4 - describes the activities performed since the ISR was filed, including activities that occurred in quarter 1 (Q1) of 2024 and activities expected to be conducted in quarter 2 (Q2) of 2024.
- Response to Comments on the Initial Study Report – provides Duke Energy's responses to comments provided by FERC staff and stakeholders on the Initial Study Report (ISR) and ISR Meeting Summary.

These documents are available from FERC's eLibrary system, and the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project). Please note that for the ILP Study Progress Report, Attachment B (Final Cultural Resources Survey Report) has been filed with FERC as CUI\\Privileged and is not publicly available.

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

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April 1, 2024

***Electronically Filed***

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
**Response to Comments on the Initial Study Report**

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current 50-year operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

In accordance with 18 CFR §5.11, on December 5, 2022, Duke Energy filed the Revised Study Plan (RSP) describing the studies the Licensee is proposing to conduct in support of relicensing the Project. The Commission approved the RSP with modifications on January 4, 2023, in its Study Plan Determination (SPD). In accordance with 18 CFR §5.15, Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024. The ISR describes the Licensee's overall progress in implementing the study plan and schedule, summarizes available data, and describes variances from the study plan and schedule approved by the Commission. As required by the ILP rules, Duke Energy hosted the ISR meeting on January 17, 2024, within 15 days following submittal of the ISR. The ISR Meeting summary was filed on February 1, 2024. Stakeholder comments on the ISR Meeting summary, requests for modifications to the RSP, and proposals for new studies were due by March 4, 2024.

FERC staff, the South Carolina Department of Natural Resources (SCDNR), and Upstate Forever filed written comments by the deadline. Duke Energy appreciates the comments provided by relicensing stakeholders and has carefully considered its responses below. Duke Energy is hereby providing its responses to those comments relating to implementation of the RSP or recommendations for new

studies. Duke Energy has summarized the comments it received and provided its responses to those comments in Attachment 1.

SCDNR provided comments regarding bat and small whorled pogonia surveys that are not included in the RSP but will be implemented in support of U.S. Army Corps of Engineers (USACE) Section 404 permitting. The methodology for these surveys is still under development in collaboration with the USACE, SCDNR, U.S. Fish and Wildlife Service (USFWS), South Carolina Department of Health and Environmental Control, and the Wildlife & Botanical Resource Committee (RC); therefore, Duke Energy will consider these recommendations during study development. Duke Energy will also provide the final bat study plan and methodology to FERC staff as discussed during the ISR meeting.

Duke Energy notes that SCDNR and Upstate Forever provided recommended protection, mitigation, and enhancement (PM&E) measures in their comments. Duke Energy is not responding to such recommendations in this filing other than to note these recommendations will be considered during the development of the Bad Creek Relicensing Agreement and Draft License Application.

## ISR Meeting Action Items and Status

The status of each action item identified during the ISR Meeting is as follows:

- Duke Energy to submit updated GIS data depicting the expanded Project Boundary to FERC.

  *Status*: Requested data will be included in the Updated Study Report (USR).

- Duke Energy to provide updated GIS data depicting new spoil areas, the temporary Fisher Knob Road, and other updated GIS information to FERC and relicensing participants (via the SharePoint site):

  *Status:* Requested data will be included in the USR.

- Duke Energy and SCDNR to continue discussing SCDNR access to the Musterground Road recreation area during Bad Creek II construction, SCDNR's prescribed burn schedule for the Musterground area, and SCDNR management activities in the Musterground Road area.

  *Status*: Discussions between Duke Energy and SCDNR are ongoing.

- Duke Energy to evaluate a rock shelter near the Project (identified during the Cultural Resources Study) for use by bats as part of the 2024 proposed bat study.

  *Status*: Evaluation of the rock shelter will be included in the bat study plan and survey.

- Duke Energy to schedule a meeting with the Recreation and Visual Resources RC to discuss the Foothills Trail Conservancy's comments on the Foothills Trail Conditions Assessment.

  *Status*: Complete. The meeting was held on February 29, 2024.

- The Recreation and Visual Resources RC to discuss the potential use of Foothills Trail culverts by bats.

*Status*: Complete. RC members discussed this issue during the February 2024 RC meeting and determined most of the culverts are smaller than the minimum size SCDNR uses for recommending bat use evaluations.

- Duke Energy to provide raw water quality data to FERC.

  *Status*: Requested data will be included in the USR.

- Duke Energy to identify a plan and timing to rerun the Environmental Justice analysis with updated census data.

  *Status:* An updated Environmental Justice report will be submitted with the USR using updated census data. Additionally, Duke Energy will explore the need for environmental justice-related public outreach associated with the construction of Bad Creek II subsequent to the review of updated census data submitted with the USR.

- Duke Energy to include a table of spoil pile heights in the draft Visual Resources report.

  *Status:* The information will be provided in the draft study report which is currently under development.

- Duke Energy to file a bat study plan with the USFWS and FERC targeting April 15, 2024.

  *Status*: The USFWS's 2024 Range-wide Indiana Bat and Northern long-eared bat Guidelines is anticipated to be released at the end of March. The bat study plan will incorporate processes detailed in the 2024 guidance protocols.

**Closing**

Duke Energy appreciates the detailed review of the ISR by relicensing process participants and looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

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cc (w/enclosure): Jeff Lineberger, Duke Energy

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# ATTACHMENT 1 - BAD CREEK INITIAL STUDY REPORT STAKEHOLDER COMMENTS AND DUKE ENERGY RESPONSES

| Comment | Duke Energy Response |
|---|---|
| ***Federal Energy Regulatory Commission (letter dated March 1, 2024)*** | |
| Within 30 days of the date of this letter, describe:<br>1) how many samples were collected versus not collected in the five streams mentioned above;<br>2) the names and locations of the streams where sampling did not occur because of inclement weather;<br>3) how these streams were determined to be fully functioning; and<br>4) whether these sites will be sampled in the 2024 sampling season. | The purpose of the stream habitat quality surveys was to provide a physical assessment of the existing conditions of streams that have the potential to be impacted in spoil locations. The assessments were conducted by completing data forms describing the existing functional conditions of the streams- specifically, USEPA Rapid Bioassessment Protocol - Habitat Assessment for High Gradient Streams, and NC Stream Assessment Method forms. No sampling is conducted to complete these stream habitat evaluations. One data form for each method is completed per stream.<br>1) As stated in the Impacts to Surface Waters and Associated Aquatic Fauna Draft Report (ISR Appendix B, Attachment 3), assessments were conducted at 10 stream locations, four (4) within the proposed spoil area alternative locations and six (6) at stream locations potentially crossed by the Fisher Knob temporary access road.<br>2) The streams for which data forms were not completed include Stream 11 (spoil area J), Streams 13 and 14 (spoil area D), or 20 and 21 (spoil location B). *See Attachment 2 for spoil area locations as provided in the ISR.*<br>3) In July 2023, Duke Energy and HDR conducted a site visit to streams within two spoil locations with the South Carolina Department of Natural Resources (SCDNR). The locations visited were considered representative of stream and riparian conditions in most spoil areas and consisted of spoil areas B and D (which contain streams 13, 14, 20, and 21 mentioned above). As stated in the Stream Survey Approach Memo distributed to stakeholders on August 3, 2023, and filed with the ISR, the SCDNR and Duke Energy "agreed that the streams with spoil locations are generally high functioning with limited (if any) anthropogenically caused degradation" based on site visit observations.<br>4) Duke Energy is not proposing to conduct assessments in 2024 since these features are similar to those evaluated in 2023 and will assume a fully functional existing condition rating to determine stream mitigation credits for avoidable impacts to these resources during the Clean Water Act permitting process.<br><br>This information will also be included in the USR. |
| For the USR, conduct a broader literature review (including both peer reviewed and gray/agency literature) to ensure the best available scientific data is being used for each species of interest to derive accurate population growth rate estimates for the entrainment analysis. | Duke Energy will provide the requested information in the USR. |

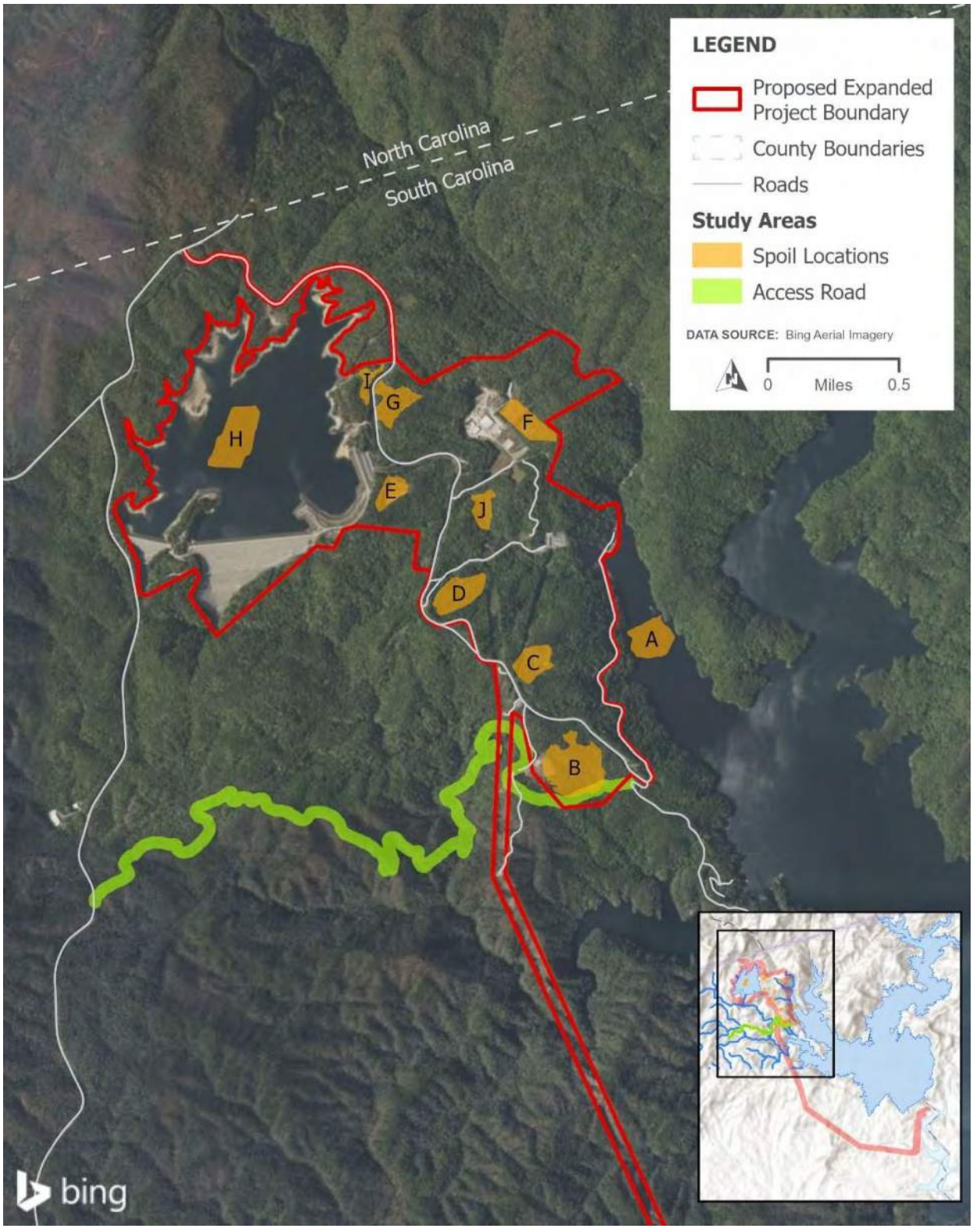
| Comment | Duke Energy Response |
|---|---|
| Provide a map of the waterbodies listed in Table 4-2 with their surface water classifications in the USR. Include the corresponding georeferenced datasets (GIS shapefiles) that show these features. | Duke Energy will provide the requested information in the USR. |
| With the USR submission, provide un-summarized raw data of all water quality data in electronic format (e.g., Microsoft Excel spreadsheet, or delimited text file), and include all associated metadata. | Duke Energy will provide the requested information in the USR. |
| Replace Figures 6.1 through 6.7 with higher resolution images in the USR. | The final Summary of Existing Water Quality and Standards Report was filed with ILP Progress Report in September 2023 and incorporated stakeholder feedback. Figures 6-1 through 6-7 of this report are water quality figures taken directly from Abernathy et al. 1994 to support general water quality descriptions in Howard Creek, a tributary to Lake Jocassee. Figure 6-1 is a map showing historical monitoring locations and Figures 6-2 through 6-7 are simple color point graphs from Abernathy et al. (1994) showing compiled data over five years from individual historical study reports (work performed by Clemson University). Duke Energy included these graphs to show general trends from previous studies and while the figure quality is indicative of a report from the early 1990s, Duke Energy believes the information is clearly conveyed and no changes to these figures are necessary to support the main findings of the relicensing study task. |
| Incorporate computer-edited representative photographs into the Foothills Trail Carrying Capacity evaluation because it is a widely used and accepted method and would show the recreation resource committee members conditions at potential use levels, such as the number of people per viewscape, to help determine how much use is acceptable. | Duke Energy recognizes the use of computer simulated photos for evaluating crowding, conflict, and visitor preferences related to carrying capacities within public lands as appropriate in many recreational settings. However, the Foothills trail corridor managed by Duke Energy lacks strong anchor sites where measures of people per viewshed or people at one time would be appropriate at this time. Duke Energy is relying on measures and estimates of use distribution and related facilities (campsites, trailheads, etc.) along the trail corridor and review of natural resource impacts at camping locations to provide carrying capacity guidance. Estimates of facility utilization, encounters (solitude), and camping capacity along the corridor will be reviewed and integrated with trail condition assessment and survey response data. |
| ***South Carolina Department of Natural Resources (letter dated February 28, 2024)*** | |
| Duke Energy should provide additional protective measures to prevent the unlawful take of a state endangered species including the known occurrence of the state-endangered American peregrine falcon less than two miles from the Project's proposed transmission ROW expansion project. | This comment identifies a potential protection, mitigation, and enhancement (PM&E) measure. Duke Energy will consider recommended PM&E measures during development of the Bad Creek Relicensing Agreement (BCRA) and the Draft License Application. |
| Duke Energy should provide additional protective measures to prevent impacts to migrating birds from artificial lighting during the construction and operation of Bad Creek II. | This comment identifies a potential PM&E measure. Duke Energy will consider recommended PM&E measures during development of the BCRA and the Draft License Application. |

| Comment | Duke Energy Response |
|---|---|
| Duke Energy should expand the scope of the 2021 bat survey to evaluate the presence of bat species and their utilization of habitat by conducting acoustic monitoring and mist net surveys in the expanded transmission line corridor and temporary Fisher Knob access road. | Duke Energy is in the process of developing a bat study plan to support the development of spoil areas, construction of the temporary Fisher Knob access road, construction of the new Bad Creek II transmission line, and improvements to existing transmission tower access roads. Survey findings will be used for Endangered Species Act compliance as part of the USACE Section 404 permitting process but will also inform the FERC licensing process. Study methodology is being developed in consultation with the USFWS and SCDNR. |
| Survey the rock shelter identified during the Cultural Resources survey during the bat survey. | Duke Energy to evaluate the referenced rock shelter near the Project for use by bats as part of the proposed 2024 bat study. |
| Conduct a visual survey to determine bat usage of the powerhouse access tunnel. | The Powerhouse Access Tunnel was inspected on March 4, 2024, and found to not offer suitable habitat for bat roosting or hibernacula. The tunnel is artificially illuminated, generally loud due to vehicle and equipment operation, and warmer and dryer than typically preferred by bats. No evidence of bat usage of the tunnel was identified; no further evaluation is warranted. |
| Bat surveys should be timed surveys conducted during appropriate time windows. Bat surveys be conducted from November 15 to March 15 (December or January are preferred for the increased likelihood of detection) and May 1 to July 31 (June or July are preferred). The SCDNR requests a survey plan be provided to SCDNR for review prior to the bat survey being conducted. | Duke Energy will continue to work with SCDNR and the USFWS to refine the bat study methodology. |
| Impacts related to the closure of Musterground Road for the proposed seven-year construction period were not adequately accounted for in the Recreation Study Plan. | Duke Energy agrees that evaluating the effects of eliminating public access to the Musterground Road through the Bad Creek site during the entire construction period was not identified as a possibility during development of the RSP. However, the Recreational Use and Needs (RUN) Study did capture vehicular use of the Musterground Road access through use of traffic counters; these data can be used to inform potential effects of limiting public access to Musterground Road. Duke Energy does not believe additional data collection efforts are necessary to assess the potential effects of limiting public access to Musterground Road during construction of Bad Creek II. However, Duke Energy welcomes SCDNR's input on potential PM&E measures to address such effects. |
| SCDNR's ability to manage prescribed burns at the property should be assessed. | Duke Energy fully recognizes SCDNR's need to access its lands for management activities including prescribed burns. As Duke Energy stated during the ISR Meeting and subsequent meetings, Duke Energy will accommodate SCDNR access to Musterground Road during Bad Creek II construction. |
| SCDNR requests additional measures to mitigate for impacts to public access associated with the closure of Musterground Road. | This comment identifies a potential PM&E measure. Duke Energy will consider recommended PM&E measures during development of the BCRA and the Draft License Application. |

| Comment | Duke Energy Response |
|---|---|
| Conduct an additional survey for the presence of small whorled pogonia mid-May through early July prior to any ground disturbing activities take place. Report additional incidental observations of plants identified in the SC State Wildlife Action Plan as priority species to SCDNR. | Duke Energy will conduct presence/absence field surveys for small whorled pogonia during this species optimal survey window (mid-May to early July) along the Fisher Knob Access Road corridor and will report additional incidental observations of plants identified in the SC State Wildlife Action Plan during 2024 field surveys. |
| ***Upstate Forever (letter dated March 1, 2024)*** | |
| Insufficient detail on potential spoil areas was made available for stakeholders to further assess the spoil locations and potential impacts to resources at those sites. Duke Energy has stated some spoils would be used for stream restoration, revetment, and other maintenance, but off-site material disposal for excavated materials should be the only consideration and other disposal methods or uses considered only after proper justification. | Duke Energy acknowledges the number and location of spoils areas has been revised since development of the RSP. However, all spoil disposal sites that would affect waters or other sensitive resources will be evaluated in conjunction with the USACE permitting as well as development of the proposed Biological Assessment in consultation with the USFWS. These evaluations will include an assessment of the effects of alternative disposal locations. Based on present evaluations, due to the quantity of materials for disposal, Duke Energy does not believe that off-site disposal is a practical, environmentally protective, or cost-effective alternative, but such alternatives will be evaluated in association with the USACE permitting. |
| The Visual Resources Study lighting evaluation should evaluate effects including but not limited to bird migration, aquatic species behavior, and noise disturbances. | The FERC-approved Visual Resources study plan does not include an evaluation of lighting effects on bird migration, aquatic species behavior, and noise disturbance. As Upstate Forever notes in its comments, potential lighting effects that may attract fish to the existing inlet/outlet portal when Jocassee Lake levels fall below 1099 ft msl are already addressed. These measures are included in the Fishery Resources Work Plan (2017-2027) between SCDNR and Duke Energy. |
| The Visual Resources Study lighting evaluation should conduct these evaluations based on International Dark Sky standards | The FERC-approved Visual Resources study plan does not specify evaluations should be based on "International Dark Sky standards" and Duke Energy has been unable to locate such standards. Regardless, the study report will provide a high-level overview of International Dark Sky concepts, identify potential sources of additional lighting associated with the construction and operation of Bad Creek II, and discuss potential PM&E measures that could address lighting impacts. |
| Enabling the Foothills Trail to continue to grow to meet additional demand should be paramount in this licensing as should increasing options for meaningful recreation experiences on adjoining lands. | This comment identifies a potential PM&E measure. Duke Energy will consider recommended PM&E measures during development of the BCRA and the Draft License Application. |
| Duke Energy should:<br>1. Designate the Project through the International Dark Sky Places conservation program<br>2. Grant Conservation easements on lands owned by Duke Energy, including the 6,700-ac tract surrounding the Project, which would protect the Foothills Trail corridor and allow for additional recreation opportunities | These comments identify potential PM&E measures. Duke Energy will consider recommended PM&E measures during development of the BCRA and the Draft License Application. |

| Comment | Duke Energy Response |
|---|---|
| 3. Donate land to be included in the Foothills Trail system, or to State resource agencies for various purposes<br>4. Expand the Foothills Trail system to connect with other trail systems<br>5. Endow the Foothills Trail Conservancy for ongoing management and maintenance of the Foothills Trail system<br>6. Provide funding to the Oconee County Conservation Bank for land conservation near the Project boundary<br><br>Develop a land management plan that supports recreation activities | |

# ATTACHMENT 2 - POTENTIAL SPOIL AREA LOCATIONS



FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
May 9, 2024

OFFICE OF ENERGY PROJECTS

Project No. 2740-053 – South Carolina
Bad Creek Pumped Storage Project
Duke Energy Carolinas, LLC

VIA FERC SERVICE

Alan Stuart
Duke Energy Carolinas, LLC
525 S Tryon St, Mail Code DEP-35B
Charlotte, NC 28202

**Subject: Additional Information Request**

Dear Mr. Stuart:

Based on our review of Duke Energy Carolina, LLC's (Duke Energy) Initial Study Report (ISR) and associated study reports for the Bad Creek Pumped Storage Project (Bad Creek Project) and Duke Energy's responses to comments on the Initial Study Report, we have questions regarding your project proposal, the answers to which are needed to bring clarity to the remainder of the ILP pre-filing process. Therefore, please file responses to the additional information requests in the enclosed Schedule A within 45 days.

If you have questions please contact Sarah Salazar at (202) 502-6863, or at sarah.salazar@ferc.gov.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Attachment: Schedule A – Request for Additional Information

**SCHEDULE A**
**REQUEST FOR ADDITIONAL INFORMATION**

Temporary Access Road

1. In section 1.3 of the Initial Study Report (ISR), Duke Energy states that it is evaluating the need to construct a 3.7-mile-long gravel access road to the Fisher Knob community for use during the Bad Creek II Complex construction. Duke Energy states that the access road would: (1) "…*necessarily be constructed* in advance of the start of construction for Bad Creek II and *prior to the new license issuance*…" [emphasis added]; (2) primarily follow an existing, unmaintained logging road on Duke Energy-owned property; (3) only be maintained during construction of Bad Creek II; and (4) *not become part of the expanded FERC project boundary* [emphasis added]. Duke Energy provided maps of the proposed access road in Appendix B, Attachment 3 of the ISR. Based on the information provided in the ISR, it is not clear what project purposes the existing project access road provides, which of those purposes the proposed temporary access road would replace, and any other project purposes the temporary road would serve before, during, or after construction of Bad Creek II, if any. Therefore, please clarify:

(1) the current uses, users, and purposes of the existing project access road;
(2) the proposed uses, users, and purposes of the proposed temporary access road before, during, and after Bad Creek II construction; and
(3) please indicate whether there would be any recreation access or property access limitations due to the proposed temporary access road and construction of the Bad Creek II Project. If so, please submit, in tabular form, a list of private properties (such as any along Fisher Knob Road), recreational trails, including any Foothills Trail spur trails, and/or recreation access areas that would be closed and the period of closure(s).

Please note that Commission regulations require that all land and water necessary for the operation and maintenance of the project be included in the project boundary[1] and therefore, if the temporary access road would serve a project purpose, it would need to be included in the proposed project boundary and would have to be approved in a license.

[1] Project boundaries must enclose the project works that are to be licensed and are to include "only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources." *See* 18 C.F.R. § 4.41(h)(2) (2023).

Musterground Road Closure

2. During the ISR Meeting, the Foothills Trail Conservancy and the South Carolina DNR expressed concerns with the closure of Musterground Road for the entire construction period of the proposed Bad Creek II Project (approximately 6-7 years). In its response to ISR comments, Duke Energy describes ongoing access discussions with South Carolina DNR for the Musterground Road Recreation Area. Noting that there seems to be no alternate means of access to the Musterground Road Recreation Area, including to Hunt Camp 5, please indicate if Duke Energy plans to explore periodic open access to Musterground Road Recreation Area during the construction period (e.g., perhaps associated with a phased construction period).

***WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES***

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*Regulated and Renewable Energy*
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*Charlotte, NC 28202*

June 12, 2024

***Electronically Filed***

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
**Initial Study Report Additional Information Request**

Dear Acting-Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC No. 2740) (Project), located in Oconee County, South Carolina. The Project is currently licensed by the Federal Energy Regulatory Commission (FERC or Commission), and the current operating license for the Project expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5. As an alternative relicensing proposal, Duke Energy is evaluating the addition of a second underground powerhouse (Bad Creek II Power Complex or Bad Creek II) adjacent to the existing facility to increase renewable energy storage and generation in the region.

In accordance with 18 CFR §5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024. On May 9, 2024, FERC issued a letter requesting additional information (within 45 days) related to the ISR. Duke Energy is hereby providing the additional information requested by FERC. FERC's requests are repeated below for reference.

## ***Additional Information Request 1***

1. ***Temporary Access Road***: In section 1.3 of the Initial Study Report (ISR), Duke Energy states that it is evaluating the need to construct a 3.7-mile-long gravel access road to the Fisher Knob community for use during the Bad Creek II Complex construction. Duke Energy states that the access road would: (1) "…*necessarily be constructed* in advance of the start of construction for Bad Creek II and *prior to the new license issuance*…" [emphasis added]; (2) primarily follow an existing,

unmaintained logging road on Duke Energy-owned property; (3) only be maintained during construction of Bad Creek II; and (4) *not become part of the expanded FERC project boundary* [emphasis added]. Duke Energy provided maps of the proposed access road in Appendix B, Attachment 3 of the ISR. Based on the information provided in the ISR, it is not clear what project purposes the existing project access road provides, which of those purposes the proposed temporary access road would replace, and any other project purposes the temporary road would serve before, during, or after construction of Bad Creek II, if any. Therefore, please clarify:

(1) the current uses, users, and purposes of the existing project access road;

(2) the proposed uses, users, and purposes of the proposed temporary access road before, during, and after Bad Creek II construction; and

(3) please indicate whether there would be any recreation access or property access limitations due to the proposed temporary access road and construction of the Bad Creek II Project. If so, please submit, in tabular form, a list of private properties (such as any along Fisher Knob Road), recreational trails, including any Foothills Trail spur trails, and/or recreation access areas that would be closed and the period of closure(s).

Please note that Commission regulations require that all land and water necessary for the operation and maintenance of the project be included in the project boundary and therefore, if the temporary access road would serve a project purpose, it would need to be included in the proposed project boundary and would have to be approved in a license.

**Duke Energy's Response:**

(1) The existing Project access road is used to access both Project facilities and non-Project resources including residences at the Fisher Knob community, the South Carolina Department of Natural Resources' (SCDNR) Musterground Wildlife Management Area (WMA), and visitors accessing the Foothills Trail. Road users include:
- Duke Energy personnel and contractors,
- Fisher Knob community property owners and their guests,
- SCDNR for accessing Musterground WMA for management activities,
- Foothills Trail Conservancy for Foothills Trail maintenance activities,
- First responders, and
- The public while accessing the Foothills Trail and Musterground WMA for recreational purposes including hiking, hunting, and fishing.

(2) The proposed temporary access road would provide access to the Fisher Knob community during Bad Creek II construction. It is envisioned to be gated with access granted solely to property owners at Fisher Knob. Construction would be timed such that the road would be usable before intensive Bad Creek II construction activities commence and public use of Bad Creek Road is limited. At the conclusion of

construction activities following demobilization, the temporary access road would be abandoned and no longer available for use.

(3) There would be no recreational access or property access limitations due to the construction of the temporary access road since the road currently is not used for either purpose.

During construction of Bad Creek II, Bad Creek Road may be closed to public use. Trails and recreational features that would be affected by this closure are identified in the table below. As presently proposed, private properties would not be affected by the temporary closure due to the construction of the temporary access road. Duke Energy would continue to allow both SCDNR and Foothills Trail Conservancy access to support Musterground WMA and Foothills Trail maintenance activities. Duke Energy would also allow first responders to use the road to support emergency response.

| Lands with Restricted Access | Owner | Closure Period |
|---|---|---|
| Bad Creek Hydro Access to the Foothills Trail | Duke Energy | During construction |
| Musterground Road Access | Duke Energy | During construction |
| Musterground WMA (Note 1) | Duke Energy (leased to SCDNR) and SCDNR | During construction |
| Bad Creek Project Overlook | Duke Energy | During construction |

Note 1: The Musterground WMA would still be available to the public by foot from the Foothills Trail or by boat from Lake Jocassee.

As an update since the ISR, Duke Energy is no longer proposing or requesting to construct the temporary Fisher Knob access road prior to license issuance.

***Additional Information Request 2***

2. ***Musterground Road Closure****:* During the ISR Meeting, the Foothills Trail Conservancy and the South Carolina DNR expressed concerns with the closure of Musterground Road for the entire construction period of the proposed Bad Creek II Project (approximately 6-7 years). In its response to ISR comments, Duke Energy describes ongoing access discussions with South Carolina DNR for the Musterground Road Recreation Area. Noting that there seems to be no alternate means of access to the Musterground Road Recreation Area, including to Hunt Camp 5, please indicate if Duke Energy plans to explore periodic open access to Musterground Road Recreation Area during the construction period (e.g., perhaps associated with a phased construction period).

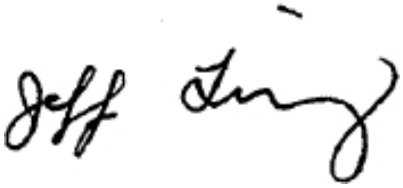
**Duke Energy's Response**

Duke Energy continues to consult with SCDNR and other relicensing stakeholders regarding potential alternatives for public access to the Musterground WMA during Bad

Creek II construction. These alternatives include potential alternative roads and could potentially include periodic open periods should an alternative route not be identified. Measures that may be agreed upon are expected to be described as part of Duke Energy's relicensing proposal in the draft and final license application.

If there are questions regarding this filing, please contact Alan Stuart, Senior Project Manager, at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,



Jeffrey G. Lineberger, PE
Water Strategy, Hydro Licensing & Lake Services
Duke Energy

cc: Alan Stuart, Duke Energy
Garry Rice, Duke Energy
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**Subject:** P-2740 Bad Creek Relicensing – Filing of ILP Progress Report and Response to Comments on Initial Study Report
**Attachments:** 20240612_Bad Creek P-2740_ FERC AIRs_ISR.pdf

Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

Attached please find Duke Energy's response to FERC's Additional Information Requests resulting from the Initial Study Report and Initial Study Report meeting.

This submittal was also electronically filed with FERC and is available on FERC's eLibrary system and the Project's public relicensing website under Documents (Bad Creek Pumped Storage Project).

Should you have questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

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June 28, 2024

***Electronically Filed***

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
**Relicensing Study Progress Report No. 5**

Dear Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

**Relicensing Studies**

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024. A fourth Quarterly Study Progress Report was filed on April 1, 2024, detailing activities performed since the ISR was filed. This fifth Quarterly Study Progress Report describes activities performed since the fourth Quarterly Study Progress Report, including activities that occurred in quarter 2 (Q2) of 2024 and activities expected to be conducted in quarter 3 (Q3) of 2024. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

Duke Energy is filing this Quarterly Study Progress Report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

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Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

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# Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

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**Bad Creek Pumped Storage Project**

**Relicensing Study Progress Report No. 5**

**June 28, 2024**

## 1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

## 2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the

Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination (SPD) letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access.[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines.

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024 and the ISR Meeting Summary was filed with FERC on February 1, 2024. The following sections summarize progress implementing the relicensing studies since the April 1, 2024 Study Progress Report.

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

## 3.0 ACCESS ROADS

In its Study Progress Report No. 2, Duke Energy provided information on a potential temporary access road to the Fisher Knob community (Fisher Knob Access Road). The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies were expanded to incorporate the areas potentially affected by the road. Duke Energy initially proposed activities for Fisher Knob Access Road construction to occur prior to license issuance; however, early construction of the Fisher Knob Access Road is no longer part of the licensing proposal and road development, if proposed, will follow license issuance. Studies are unaffected by this change in schedule and still incorporate the areas potentially affected by the proposed Fisher Knob Access Road.

Primary site access for construction is provided by the existing Bad Creek Road. Duke Energy is presently evaluating and siting additional access roads on property owned by Duke Energy or under easement, or existing U.S. Forest Service roads that would be subject to authorization under a non-commercial/road use agreement, for construction of the proposed additional 9.3-mile-long 525-kV transmission line for Bad Creek II.

## 4.0 WATER RESOURCES STUDY

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: No additional work for this study task is anticipated; the final study report was provided in the ISR as Appendix A, Attachment 1.
- **Water Quality Monitoring in the Whitewater River Arm**: A draft interim report with preliminary water quality results from study year 1 was included in the ISR as Appendix A, Attachment 2. Activities for the second study year commenced in June 2024 with redeployment of water quality instrumentation in the Whitewater River arm to collect water quality information. A draft report will be distributed in Q4 and will include a summary of data for both study years.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** A final study report was provided in the ISR as Appendix A, Attachment 3. While the original scope and objectives of this study task have been met, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II

instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled. Therefore, additional CFD modeling has been carried out to incorporate these updated hydraulic capacities. A summary report presenting the effects of updated pumping capacities in Whitewater River cove was developed for Duke Energy and distributed for 30-day stakeholder review on June 12, 2024. The final report will be attached as an addendum to the CFD study report (Appendix A, Attachment 3) in the Updated Study Report (USR).

- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The CHEOPS model was used to evaluate potential effects of Bad Creek II on the frequency, timing, and range of Lake Jocassee and Lake Keowee reservoir level fluctuations. Duke Energy held a joint meeting with the Water Resources, Aquatic Resources, Operations, and Recreational & Visual Resources RCs on April 4, 2024, to review model results. Following the meeting, Duke Energy provided a draft report to the RCs for review and comment (no comments were received). The final CHEOPS report was distributed to the RCs on April 27, 2024, and is provided as Attachment A to this Study Progress Report.
- **Future Water Quality Management Plan (WQMP) Development:** Initial work to develop the WQMP began in Q2 and a draft plan will be presented to the Water and Aquatics RCs for input in Q4 of 2024.

**Variance from Approved Study Plan**

The study is proceeding in accordance with the approved study plan except the study area has expanded to incorporate the proposed Fisher Knob Access Road. Additional CFD modeling was carried out to incorporate increased hydraulic pumping capacities associated with recently proposed variable-speed units at Bad Creek II, as described above.

## 5.0 AQUATIC RESOURCES STUDY

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment Study:** The final report was reviewed by stakeholders and provided in the ISR as Appendix B, Attachment 1. As described above, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled for entrainment. Therefore, additional modeling

is being carried out to incorporate these updated hydraulic capacities and an addendum to the final report will be distributed to the Aquatic Resources RC by August 31, 2024, and included in the USR (Appendix B, Attachment 1). Also, per the Commission's request in their ISR comments, a literature review will be carried out for the intrinsic population growth rate of threadfin shad. If recent literature is identified with this information, it will be considered for inclusion in the entrainment analysis and presented in the USR.

- **Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat:** CFD modeling results were used to qualitatively evaluate potential effects to Lake Jocassee stratification, dissolved oxygen, and temperatures throughout the water column. CHEOPS modeling results were used to assess potential effects within the littoral zone with a focus on lake level fluctuation effects. The draft report was provided to the Aquatic Resources RC for review on May 3, 2024. No comments were received; the final report was issued to the RC on June 3, 2024 and is included as Attachment B to this Study Progress Report.
- **Impacts to Surface Waters and Associated Aquatic Fauna:** A final report was distributed to the Aquatic Resources RC on February 14, 2024, and was filed as Attachment A of the fourth Quarterly Study Progress Report.

**Variance from Approved Study Plan**

The Entrainment Study and Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat were completed in accordance with the approved study plan. The Impacts to Surface Waters and Associated Aquatic Fauna study area was expanded to include the proposed Fisher Knob Access Road. Stream habitat surveys for five streams within spoil locations were not completed due to safety concerns related to inclement weather. These variances were reported in the ISR.

## 6.0 VISUAL RESOURCES STUDY

Duke Energy provided the draft study report to the Recreation and Visual Resources RC on May 22, 2024. No comments requiring revision to the study report were provided during the 30-day comment period. The final study report is attached to this report as Attachment C.

**Variance from Approved Study Plan**

The study is proceeding in accordance with the approved study plan. The proposed Fisher Knob Access Road has been incorporated into the viewshed model.

## 7.0 RECREATIONAL RESOURCES STUDY

The Recreational & Visual Resources RC met on May 9, 2024, to discuss the status of the Recreational Resources Study as described below.

- **Foothills Trail Recreation Use and Needs (RUN) Study**: Data collection including traffic and trail counts, in-person and online user surveys, and spot counts was completed in 2023 and data were processed in early 2024. During the May 9, 2024 meeting, results of the study were discussed, and the draft study report was provided to the RC for review on May 16, 2024 with comments due on June 16, 2024. Comments were received from the Foothills Trail Conservancy (FTC) and will be addressed in the USR. The draft Foothills Trail carrying capacity analysis report (to be included with the RUN Study Report as Appendix F) is complete and was distributed to the RC for review on June 26, 2024.
- **Foothills Trail Condition Assessment**: Fieldwork was completed in 2023 and the draft study report was submitted to the RC in November 2023 as well as included in the ISR. Duke Energy received comments on the draft report from the FTC, SCDNR, and Friends of Lake Keowee Society. The RC discussed these comments during the February 2024 meeting. Additional information was collected by Long Cane Trails to address some of the RC comments. A memo summarizing the additional information was prepared and distributed to the RC for review on June 26, 2024. The final report, which will include the additional information memo as an appendix, will be filed with the USR.
- **Whitewater River Cove Existing Recreational Use Evaluation**: This effort has been completed and the final report was included in the ISR as Appendix D, Attachment 3. No further work in association with this task is planned.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling surface velocity data developed in the Water Resources Study with the Whitewater River cove recreational use data captured during the 2023 boating season. Development of the draft report is underway and distribution to Recreational & Visual Resources RC members will occur in Q3 2024.

### Variance from Approved Study Plan

The study is proceeding in accordance with the study plan as modified by FERC.

## 8.0 CULTURAL RESOURCES STUDY

The final report was attached as Attachment B of the fourth Quarterly Progress Report[2].

### Variance from Approved Study Plan

The study was completed in accordance with the approved study plan; the geographic scope of the study area was expanded to encompass the proposed Fisher Knob Access Road.

## 9.0 ENVIRONMENTAL JUSTICE STUDY

The final report was filed as Appendix F of the ISR. No written comments were provided requesting modifications to the final study report. Duke Energy will continue to evaluate the need for additional outreach activities prior to the filing of the final license application.

### Variance from Approved Study Plan

The study was conducted in accordance with the study plan as modified by FERC.

## 10.0 WILDLIFE AND BOTANICAL UPDATE

Duke Energy has developed a bat study plan in consultation with the South Carolina Department of Natural Resources (SCDNR) and U.S. Fish and Wildlife Service (USFWS) to carry out additional surveys for bats at the Project due to potential clearing associated with the proposed Fisher Knob Access Road, spoil areas, transmission line, and other areas of proposed power complex infrastructure. The final bat study plan was distributed to the Wildlife and Botanical RC on May 31, 2024. Copies of the study plan were also distributed to the U.S. Department of Agriculture (J. Magniez) and FERC staff (S. Salazar), per individual requests. Surveys were carried out between June 1 and June 20 in proposed impact areas including potential spoil sites and the proposed Fisher Knob Access Road, as well as areas potentially impacted by the proposed transmission line construction and maintenance. The potential impact areas contain 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. Bat surveys followed the 2024 Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines.[3] The final Bat Study Plan prepared is provided with this Study Progress Report as Attachment D.

[2] Consistent with FERC policy, the Cultural Resources report was submitted as Controlled Unclassified Information (CUI)/Privileged information.
[3] Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines | FWS.gov

In response to a written request from the SCDNR in comments submitted to the Commission on the ISR, Duke Energy developed a study plan for the federally threatened small whorled pogonia. This study was designed to determine the presence or absence of this protected species prior to land disturbance activities associated with the access road and overall construction of the Bad Creek II Power Complex and to aid in the quality and comprehensiveness of the statewide dataset for rare, threatened, and endangered species. This survey and other fieldwork components were completed in June, 20024. Additionally, field biologists recorded incidental observations of priority plant species identified in the SC Wildlife Action Plan (SWAP) during the survey. The small whorled pogonia draft study plan was distributed to the SCDNR and USFWS for review and comment on May 24, 2024; neither agency had comment on the draft study plan, therefore, the final study plan was distributed to the Wildlife and Botanical RC on June 5, 2024 for review and comment. The final Small Whorled Pogonia Study Plan is provided with this Study Progress Report as Attachment E.

These studies will also support Clean Water Act 404 permitting to avoid and minimize impacts to endangered species, as well as preparation of the Biological Assessment (BA) for submittal to the USFWS [to comply with Section 7 of the Endangered Species Act] for the 404 permitting and license application.

## 11.0 PERMITTING ACTIVITIES

Initial work in support of Clean Water Act Section 404 / 401 permitting has begun; a pre-application meeting request was submitted to the U.S. Army Corps of Engineers (USACE) on February 23, 2024, and the meeting was held on March 28, 2024, in Columbia, South Carolina. Attendees includes representatives from USACE, USFWS, SCDNR, S.C. Department of Health and Environmental Control (SCDHEC), Catawba Indian Nation, Duke Energy, and Duke Energy's consultant (HDR Engineering, Inc.). The final meeting summary, which incorporated comments and feedback from the SCNDR and USACE, was distributed to meeting participants on June 7, 2024. A follow-up meeting with additional USACE staff was held at the USACE office in Columbia, SC on April 11, 2024, to discuss permitting activities and strategies associated with Bad Creek II Complex.

# Attachment A: Water Exchange Rates and Lake Jocassee Reservoir Levels

# (Final Report)

# Attachment B: Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat

## (Final Report)

# Attachment C: Visual Resources Study Report

# (Final Report)

# Attachment D: Bat Study Plan

# Attachment E: Small Whorled Pogonia Study Plan

***WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES***

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October 2, 2024

***Electronically Filed***

Debbie-Anne A. Reese, Acting Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Bad Creek Pumped Storage Project (P-2740-053)**
**Relicensing Study Progress Report No. 6**

Dear Acting Secretary Reese:

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

**Relicensing Studies**

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024. This sixth Quarterly Study Progress Report describes activities performed since the fifth Quarterly Study Progress Report, including activities that occurred in quarter 3 (Q3) of 2024 and activities expected to be conducted in quarter 4 (Q4) of 2024. Unless otherwise described, all relicensing studies are being conducted in conformance with the approved Revised Study Plan (RSP) and the Commission's Study Plan Determination (SPD).

Duke Energy is filing this Quarterly Study Progress Report with the Commission electronically and is distributing this letter to the parties listed on the attached distribution list. For parties listed on the attached distribution list who have provided an email address, Duke Energy is distributing this letter via email; otherwise, it will be distributed via U.S. mail.

Duke Energy looks forward to continuing to work with Commission staff, resource agencies, Indian Tribes, local governments, non-governmental organizations, and interested members of the public

throughout the relicensing process. If there are questions regarding this filing, please contact me at Alan.Stuart@duke-energy.com or via phone at 980-373-2079.

Sincerely,

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Duke Energy Carolinas, LLC

Enclosure

cc (w/enclosure): Jeff Lineberger, Duke Energy

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# Bad Creek Pumped Storage Project (FERC No. 2740) Distribution List

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# Bad Creek Pumped Storage Project
# Relicensing Study Progress Report No. 6
# October 2, 2024

## 1.0 BACKGROUND

Duke Energy Carolinas, LLC (Duke Energy or Licensee) is the Licensee, owner, and operator of the 1,400-megawatt (MW) Bad Creek Pumped Storage Project (FERC Project No. 2740) (Project), 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 serves as the lower reservoir and is licensed separately as part of Duke Energy's Keowee-Toxaway Hydroelectric Project (FERC Project No. 2503).

The existing (original) license for the Project was issued on August 1, 1977, by the Federal Energy Regulatory Commission (FERC or Commission) and expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

## 2.0 STUDY PLAN DEVELOPMENT

In accordance with 18 CFR §5.11, Duke Energy developed a Proposed Study Plan (PSP) in consultation with agencies and stakeholders and filed it on August 5, 2022. After the filing of the PSP, Duke Energy held a site visit and Project tour on August 16, 2022, and the PSP meeting on September 7, 2022. Duke Energy also continued to consult with agencies and other stakeholders regarding its proposed studies.

Duke Energy evaluated the comments submitted by the Commission and stakeholders in response to the PSP. Based on Duke Energy's review of these comments, FERC criteria for study requests under the ILP, and readily available information (e.g., associated with the previous licensing effort or resulting from ongoing monitoring activities), Duke Energy proposed six resource studies in the

Revised Study Plan (RSP) filed with FERC on December 5, 2022. The RSP includes copies of and summarizes comments received and Duke Energy's responses.

The six studies in the RSP will support evaluation of the potential effects of continued operation of the Project as well as potential effects of construction and operation of the proposed Bad Creek II complex. These studies are:

- Water Resources Study;
- Aquatic Resources Study;
- Visual Resources Study;
- Recreational Resources Study;
- Cultural Resources Study; and
- Environmental Justice Study.

In FERC's Study Plan Determination (SPD) letter on January 4, 2023, FERC approved the proposed studies as submitted in the RSP except the Recreational Resources Study which was approved with modifications. The Recreational Resources Study was modified to include the following:

- An additional traffic counter was added at the Laurel Valley Trail Access.[1]
- Revisions to the Recreation Site Inventory Form to include the number and height of bear cables and number of latrines.

Pursuant to 18 Code of Federal Regulations (CFR) § 5.15(c), Duke Energy filed the Initial Study Report (ISR) with the Commission on January 4, 2024, which summarized study activities performed in 2023, as well as ILP activities expected to be completed in 2024. An ISR meeting was held on January 17, 2024, and the ISR Meeting Summary was filed with FERC on February 1, 2024. The following sections summarize progress implementing the relicensing studies since the June 28, 2024, Study Progress Report.

[1] Although the SPD referenced "Laurel Fork Gap", Duke Energy assumes the Foothills Trail Conservancy and FERC meant to reference the Laurel Valley Trail Access.

## 3.0 ACCESS ROADS

In its Study Progress Report No. 2, Duke Energy first provided information on a potential temporary access road to the Fisher Knob community (Fisher Knob Access Road). The study areas for the Water Resources, Aquatic Resources, Visual Resources, and Cultural Resources studies were expanded to incorporate the areas potentially affected by the road. Duke Energy initially proposed activities for Fisher Knob Access Road construction to occur prior to license issuance; however, early construction of the Fisher Knob Access Road is no longer part of the licensing proposal and road development, if proposed, will follow license issuance. Studies are unaffected by this change in schedule and still incorporate the areas potentially affected by the proposed Fisher Knob Access Road.

Primary site access for construction is provided by the existing Bad Creek Road. Duke Energy is presently evaluating potential improvements to existing access roads for use during construction of the proposed additional 9.3-mile-long 525-kV transmission line for Bad Creek II. These non-project access roads are located outside the FERC Project Boundary, owned by Duke Energy, subject to Duke Energy-held easements, or are existing U.S. Forest Service roads that would be subject to federal authorization under a non-commercial/road use agreement.

## 4.0 WATER RESOURCES STUDY

The components of the Water Resources Study and status of each are provided below:

- **Summary of Existing Water Quality Data and Standards**: The final study report was provided in the ISR as Appendix A, Attachment 1.
- **Water Quality Monitoring in the Whitewater River Arm**: A draft interim report with preliminary water quality results from study year 1 was included in the ISR as Appendix A, Attachment 2. Activities for the second study year commenced in June 2024 with redeployment of water quality instrumentation in the Whitewater River arm to collect water quality information. Field work is ongoing, and a draft report will be distributed in Q4, which will include a summary of data for both study years.
- **Computational Fluid Dynamics (CFD) Modeling of Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse:** A final study report was provided in the ISR as Appendix A, Attachment 3. While the original scope and objectives of this study task have been met, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be implemented at Bad Creek II

instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled. Therefore, additional CFD modeling has been carried out to incorporate these updated hydraulic capacities. A summary report presenting the effects of updated pumping capacities in Whitewater River cove was developed for Duke Energy and distributed for 30-day stakeholder review on June 12, 2024. The final report is provided with this Study Progress Report as Attachment A and will be included as an addendum to the CFD study report in the Updated Study Report (USR).

- **CHEOPS Modeling of Water Exchange Rates and Lake Jocassee Reservoir Levels:** The final CHEOPS report was distributed to the RCs on April 27, 2024, and was provided as Attachment A of the fifth Quarterly Study Progress Report.
- **Water Quality Management Plan (WQMP) Development:** Development of the WQMP began in second quarter 2024. In early August, Duke Energy met directly with staff from the South Carolina Department of Environmental Services (SCDES, Clean Water Act Section 401 water quality certifying agency) to discuss the proposed Bad Creek II Complex and elements of the WQMP. Duke Energy provided a draft version of the WQMP directly to SCDES for review and comment. Following receipt of comments from SCDES, Duke Energy will revise the draft WQMP as appropriate and distribute it to the Water and Aquatics RCs for input in 2024. Duke Energy presently expects to complete this consultation and finalize the WQMP by the end of Q4.

**Variance from Approved Study Plan**

The study is proceeding in accordance with the approved study plan except the study area has expanded to incorporate the proposed Fisher Knob Access Road. Additional CFD modeling was carried out to incorporate increased hydraulic pumping capacities associated with recently proposed variable-speed units at Bad Creek II, as described above.

## 5.0 AQUATIC RESOURCES STUDY

The components of the Aquatic Resources Study and status of each are provided below:

- **Entrainment Study:** The final report was reviewed by stakeholders and provided in the ISR as Appendix B, Attachment 1. As described above, recent optimization studies for Bad Creek II have indicated that variable speed pump-turbine units will be constructed at Bad Creek II instead of single-speed units, which would result in increased hydraulic capacities compared to what was originally modeled for entrainment. Therefore, additional modeling

is being carried out to incorporate these updated hydraulic capacities and Addendum 1 to the final report will be distributed to the Aquatic Resources RC in November 2024 for a 30-day review and included in the USR. Also, per the Commission's request in their ISR comments, a literature review is currently being carried out for the intrinsic population growth rate of threadfin shad, as well as other species of interest, as appropriate. This review will be included as Addendum 2 to the final report and will be distributed to the Aquatic Resources RC for a 30-day review prior to being included in the USR.

- **Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat:** The final report was distributed to the RC on June 3, 2024, and was included as Attachment B of the fifth Quarterly Study Progress Report.
- **Impacts to Surface Waters and Associated Aquatic Fauna:** The final report was distributed to the RC on February 14, 2024, and was included as Attachment A of the fourth Quarterly Study Progress Report.

**Variance from Approved Study Plan**

The Entrainment Study and Effects of Bad Creek II Complex and Expanded Weir on Aquatic Habitat were completed in accordance with the approved study plan. The Impacts to Surface Waters and Associated Aquatic Fauna study area was expanded to include the proposed Fisher Knob Access Road. Stream habitat surveys for five streams within spoil locations were not completed due to safety concerns related to inclement weather. These variances were reported in the ISR.

## 6.0 VISUAL RESOURCES STUDY

The final study report was distributed to the RC on June 26, 2024, and was included as Attachment B of the fifth Quarterly Study Progress Report.

**Variance from Approved Study Plan**

The study was completed in accordance with the approved study plan with the addition of the proposed Fisher Knob Access Road into the viewshed model.

## 7.0 RECREATIONAL RESOURCES STUDY

The status of the Recreational Resources Study is described below.

- **Foothills Trail Recreation Use and Needs (RUN) Study**: The draft RUN Study Report, including the Foothills Trail carrying Capacity analysis report, was distributed to the

Recreational & Visual Resources RC in May and June, 2024. The final RUN Study Report will be provided in the USR.

- **Foothills Trail Condition Assessment**: Duke Energy received comments on the draft report from the FTC, South Carolina Department of Natural Resources (SCDNR), and Friends of Lake Keowee Society. The RC discussed these comments during the February 2024 meeting. Additional information was collected by Long Cane Trails to address some of the RC comments. A memo summarizing the additional information was prepared and distributed to the RC for review on June 26, 2024. The FTC provided comments on the memo, which will be addressed in the USR. The final Foothills Trail Condition Assessment report, including the additional information memo, will be filed with the USR.
- **Whitewater River Cove Existing Recreational Use Evaluation**: This effort has been completed and the final report was included in the ISR as Appendix D, Attachment 3. No further work in association with this task is planned.
- **Whitewater River Cove Recreation Public Safety Evaluation:** This effort will integrate the CFD modeling surface velocity data developed in the Water Resources Study with the Whitewater River cove recreational use data captured during the 2023 boating season. Development of the draft report is underway and distribution to Recreational & Visual Resources RC members is planned for October.

**Variance from Approved Study Plan**

The study is proceeding in accordance with the study plan as modified by FERC.

## 8.0 CULTURAL RESOURCES STUDY

The final report was attached as Attachment B of the fourth Quarterly Progress Report[2]. In Q3, Duke Energy identified the need to slightly expand the proposed FERC Project Boundary and the Area of Potential Effect (APE) to align with the proposed widened corridor for the transmission line, based on its current design. Duke Energy notified the SC SHPO of this minor modification to the APE by letter dated September 11, 2024. Additional cultural resources field work has been conducted along the proposed approximately 9.3-mile-long 525-kV transmission corridor for Bad Creek II. Results will be incorporated into an updated final report in the USR.

[2] Consistent with FERC policy, the Cultural Resources report was submitted as Controlled Unclassified Information (CUI)/Privileged information.

**Variance from Approved Study Plan**

The study was completed in accordance with the approved study plan; the geographic scope of the study area was expanded to encompass the proposed Fisher Knob Access Road and the transmission corridor.

## 9.0 ENVIRONMENTAL JUSTICE STUDY

The final report was filed as Appendix F of the ISR. No written comments were provided requesting modifications to the final study report. Although disproportionately high or adverse effects to Environmental Justice (EJ) communities surrounding the Project were not identified through desktop analyses, FERC has indicated in verbal comments during the Initial Study Report (ISR) meeting that they would recommend outreach to engage the identified environmental justice communities in the relicensing process. Duke Energy is currently in the process of planning public outreach efforts for late 2024, with a focus on the two geographic areas identified during the desktop analysis. Outreach efforts will be summarized within the USR.

**Variance from Approved Study Plan**

The study was conducted in accordance with the study plan as modified by FERC.

## 10.0 WILDLIFE AND BOTANICAL UPDATE

Duke Energy developed a bat study plan in consultation with the SCDNR and U.S. Fish and Wildlife Service (USFWS) to carry out additional surveys for bats at the Project due to potential clearing associated with the proposed Fisher Knob Access Road, spoil areas, transmission line, and other areas of proposed Bad Creek II Power Complex infrastructure. The final bat study plan was distributed to the Wildlife and Botanical RC on May 31, 2024. Copies of the study plan were also distributed to the U.S. Department of Agriculture (J. Magniez) and FERC staff (S. Salazar), per individual requests.

Surveys were carried out between June 1 and June 20 in proposed impact areas including potential spoil sites and the proposed Fisher Knob Access Road, as well as areas potentially impacted by the proposed transmission line construction and maintenance. The potential impact areas contain 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. Bat surveys followed the 2024 Range-wide

Indiana Bat and Northern Long-eared Bat Survey Guidelines.[3] The final Bat Study Plan was provided with the fifth Study Progress Report. The Bat Survey Report is currently under development and will be included in the USR.

In response to a written request from the SCDNR in comments submitted to the Commission on the ISR, Duke Energy developed a study plan for the federally threatened small whorled pogonia. This study was designed to determine the presence or absence of this protected species prior to land disturbance activities associated with the access road and overall construction of the Bad Creek II Power Complex and to aid in the quality and comprehensiveness of the statewide dataset for rare, threatened, and endangered species. This survey and other fieldwork components were completed in June 2024. Additionally, field biologists recorded incidental observations of priority plant species identified in the SC Wildlife Action Plan (SWAP) during the survey. The small whorled pogonia draft study plan was distributed to the SCDNR and USFWS for review and comment on May 24, 2024; neither agency had comment on the draft study plan, therefore, the final study plan was distributed to the Wildlife and Botanical RC on June 5, 2024. The final Small Whorled Pogonia Study Plan was provided with the fifth Progress Report as Attachment E. The Small Whorled Pogonia Survey Report was distributed to the Wildlife and Botanical RC on August 28, 2024, and the report was revised to incorporate feedback from the SCDNR and Upstate Forever. This final report was distributed to the Wildlife and Botanical RC on September 19, 2024 and is included as Attachment B.

## 11.0 PERMITTING ACTIVITIES

In the fifth Quarterly Study Progress Report, Duke Energy provided information about initial work in support of Clean Water Act Section 404 / 401 permitting, including pre-application meetings with the U.S. Army Corps of Engineers (USACE) (as well as SCDES, USFWS, SCDNR, and Catawba Indian Nation) on March 28, 2024, and a follow-up meeting with additional USACE staff on April 11, 2024. In Q3, Duke Energy's consultant, HDR Engineering, Inc. (HDR), carried out surveys of the Project Area for Waters of the U.S. (WOTUS) under Clean Water Act Section 404/401, including delineation of jurisdictional WOUS and stream classifications, in accordance with current regulations and guidance. Duke Energy and HDR filed a combined Preliminary/Approved Jurisdictional Request with the USACE on September 28,

[3] Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines | FWS.gov

2024, seeking written verification for the delineated waters within the Project Area and are continuing coordination with USACE on this process.

# Attachment A: Bad Creek CFD Model Updated Pumping Rates Addendum

# Attachment B: Small Whorled Pogonia Survey Report

**From:** Gledhill-earley, Renee <renee.gledhill-earley@dncr.nc.gov>
**Sent:** Wednesday, October 2, 2024 3:07 PM
**To:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Subject:** RE: [External] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

Thank you, Alan.
In that case, please do not include the North Carolina SHPO in this matter as we do not have role in the Section 106 consultation process. And, are working hard to deal with Hurricane Helene's damage in NC.
Appreciate your quick reply and understanding.

Renee Gledhill-Earley
Environmental Review Coordinator
NC State Historic Preservation Office
919-814-6579

**Please note my new email address is renee.gledhill-earley@dncr.nc.gov**

**From:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Sent:** Wednesday, October 2, 2024 2:18 PM
**To:** Gledhill-earley, Renee <renee.gledhill-earley@dncr.nc.gov>
**Subject:** Re: [External] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6



Hi Renee,

Confirming, none of the Bad Creek project lies within the State of NC.

We completely understand, relate, and sympathize with you folks regarding the challenges left in Hurricane Helene's path.

Hoping you folks are safe and healthy.
Alan

**From:** Gledhill-earley, Renee <renee.gledhill-earley@dncr.nc.gov>
**Sent:** Wednesday, October 2, 2024 1:55:58 PM
**To:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Subject:** RE: [External] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

Alan:
Given that we are in triage mode with projects due to Hurricane Helene, can you confirm that none of P-2740 Bad Creek Relicensing – is located within the State of North Carolina. Your answer will help us direct the project if there is any of it in NC.
Thank you.

Renee Gledhill-Earley
Environmental Review Coordinator
NC State Historic Preservation Office
919-814-6579

**Please note my new email address is renee.gledhill-earley@dncr.nc.gov**

---

**From:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Sent:** Wednesday, October 2, 2024 12:05 PM
**To:** gcyantis2 <gcyantis2@yahoo.com>; Wood, Chris J. <chris.wood@ncwildlife.org>; suewilliams130@gmail.com; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; Dale Wilde <dwilde@keoweefolks.org>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; Watt, Acee - United Keetoowah Band of Cherokee Indians <awatt@ukb-nsn.gov>; US Bureau of Land Management <BLM_ES_SSDO_Comments@blm.gov>; Townsend, Russell - Eastern Band of Cherokee Indians <syerka@nc-cherokee.com>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Liz Thomas <liz.thomas@klgates.com>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Clemsonla <Clemsonla@gmail.com>; Tarver, Fred <fred.tarver@deq.nc.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Strong, Brian <brian.strong@ncparks.gov>; MacStone <MacStone@naturalandtrust.org>; Chris Starker <cstarker@upstateforever.org>; Sneed, Richard (Chief) Cherokee Nation <ashlstep@nc-cherokee.com>; PShirley <PShirley@oconeeco.com>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Rohde, Fritz <fritz.rohde@noaa.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; Lorianne Riggin <rigginl@dnr.sc.gov>; Ridgeway, Chip - USACE <Irvin.C.Ridgeway@usace.army.mil>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rawlings, Leonard - USBIA <Leonard.Rawlings@bia.gov>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; Peter Raabe <praabe@americanrivers.org>; Peterson, Harold - USBIA <harold.peterson@bia.gov>; Perry, Fletcher - City of Pickens <fperry@pickenscity.com>; growens@gmail.com; Olds, Melanie J <melanie_olds@fws.gov>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; lputnammitchell <lputnammitchell@gmail.com>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Elizabeth Miller <MillerE@dnr.sc.gov>; derrick.miller@usda.gov; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; McKoy, Brice - USACE <Peter.B.McKoy@usace.army.mil>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Laughter, Jaime <jaime.laughter@transylvaniacounty.org>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Keene, Terry - AQD <jtk7140@me.com>; JohnsonHughes, Christy <christy_johnsonhughes@fws.gov>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Erika Hollis <ehollis@upstateforever.org>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; glenn@hilliardgrp.com; Hill, David - Muscogee (Creek) Nation <dhill@mcn-nsn.gov>; hightocw@dhec.sc.gov; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Charles (Rowdy) B Harris <charris@scprt.com>; Hall, Tim - City of Walhalla, SC <thall@cityofwalhalla.com>; Wenonah Haire <wenonah.haire@catawba.com>; jhains@g.clemson.edu; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; Sara Green

<sara@scwf.org>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Gledhill-earley, Renee <renee.gledhill-earley@dncr.nc.gov>; Andrew Gleason <andrewandwilla@hotmail.com>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Adin T Fell <afell@scprt.com>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Duncan, Jeffrey - NPS <jeff_duncan@nps.gov>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Andy Douglas <adoug41@att.net>; Davis, Amin <amin.davis@deq.nc.gov>; Dach, Bob - USBIA NR <robert.dach@bia.gov>; Cotton, Mark <mark@cottonrealestate.com>; Corney, Steve <steve@corney.org>; Corney, Michael <mike_corney@yahoo.com>; Copelof, Maureen - City of Brevard <maureen.copelof@cityofbrevard.com>; Wes Cooler <wes.cooler@mac.com>; Mayor, Clemson - cityofclemson <mayor@cityofclemson.org>; Collins, Neal - SC House of Representatives <nealcollins@schouse.gov>; Colburn, Kevin - American Whitewater <kevin@americanwhitewater.org>; Clampitt, Mike - NC House Representative <Mike.Clampitt@ncleg.gov>; Cato, Van - US Senate <Van_Cato@lgraham.senate.gov>; Case, Mike <mgcase@icloud.com>; Carter, Jerry - SC House of Representatives <jerrycarter@schouse.gov>; Caggiano, Annie - Oconee Economic Alliance <acaggiano@oconeesc.com>; abrock@oconeesc.com; Boss, Jeff - Greenville Water <jboss@greenvillewater.com>; Boos, Laura - USACE <Laura.M.Boos@usace.army.mil>; Bobertz, Shannon - SCDNR <bobertzs@dnr.sc.gov>; Bernhart, David - NOAA <david.bernhart@noaa.gov>; Bedenburgh, Michael - Palmetto Trust for Historic Preservation <oldhouse@palmettotrust.org>; Beason, Erica - SCDNR <BeasonE@dnr.sc.gov>; Barnhart, Jen - USFS Sumter NF <jenniferjbarnhart@fs.fed.us>; Bailey, William - USACE Savannah <william.g.bailey@usace.army.mil>; Amedee, Morgan D. <amedeemd@dhec.sc.gov>; Alexander, Thomas - SC Senate <thomasalexander@scsenate.gov>; Alexander, D - seneca.sc <dalexander@seneca.sc.us>; Adams, Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Jennifer - Oconee County <councilclerkinfo@oconeesc.com>; Salazar, Maggie <Maggie.Salazar@hdrinc.com>
**Subject:** [External] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6



Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of the Relicensing Study Progress Report No. 6 filing, which includes activities that occurred in quarter 3 (Q3) of 2024 and activities expected to be conducted in quarter 4 (Q4) of 2024. The Study Progress Report No. 6 was electronically filed with FERC by Duke Energy on October 2, 2024 and is available on FERC's eLibrary system and the Project's public relicensing website under Documents (https://www.badcreekpumpedstorage.com/documents/).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Please stay safe,
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

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**From:** Massey, John (Gant) <jmassey@blm.gov>
**Sent:** Thursday, October 3, 2024 12:22:23 PM
**To:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Cc:** Kennedy, Brian C <bckennedy@blm.gov>; Harris, William G <wgharris@blm.gov>; Paffrath, Hunter R <hpaffrath@blm.gov>
**Subject:** Re: [EXTERNAL] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6



Alan, thanks for reaching out to the Bureau of Land Management (BLM). Both the Southeastern States District Office Realty and Minerals staff have checked whether there are any BLM surface properties or federal mineral rights that might be affected by the Bad Creek Pumped Storage Project. No conflicts have been identified, so we have no further comments.

Best wishes for the success of this project.

Sincerely,

Gant

John Gant Massey, Ph.D.
Assistant District Manager-Resources
Bureau of Land Management, Eastern States State Office
Southeastern States District Office
273 Market Street, Flowood, Mississippi 39232
Interior Region 1, 2 and 4: N. Atlantic - Appalachian; S. Atlantic - Gulf; MS Basin
phone: 601-715-5572
jmassey@blm.gov
https://www.blm.gov/office/southeastern-states

**Miles forward every day. g**

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**From:** SSDO_Comments, BLM_ES <BLM_ES_SSDO_Comments@blm.gov>
**Sent:** Wednesday, October 2, 2024 1:40 PM
**To:** Kennedy, Brian C <bckennedy@blm.gov>; Massey, John (Gant) <jmassey@blm.gov>
**Subject:** FW: [EXTERNAL] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6

Hunter Paffrath
Bureau of Land Management
Southeastern States Public Affairs
C: (769) 366-4821

**From:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>
**Sent:** Wednesday, October 2, 2024 11:05 AM
**To:** gcyantis2 <gcyantis2@yahoo.com>; Wood, Chris J. <chris.wood@ncwildlife.org>; suewilliams130@gmail.com; Willett, Scott - Anderson Regional Joint Water System <swillett@arjwater.com>; Dale Wilde <dwilde@keoweefolks.org>; Whitmire, Bill - SC House of Representatives <billwhitmire@schouse.gov>; Weese, Elizabeth - NCDOJ <jweese@ncdoj.gov>; awatt.ukb-nsn_contact <awatt@ukb-nsn.gov>; SSDO_Comments, BLM_ES <BLM_ES_SSDO_Comments@blm.gov>; syerka.nc-cherokee_contact <syerka@nc-cherokee.com>; Toombs, Elizabeth - Cherokee Nation <elizabeth-toombs@cherokee.com>; Threatt-Taylor, Dale - Nature Conservancy <d.threatttaylor@tnc.org>; Liz Thomas <liz.thomas@klgates.com>; Thayer, Anne - SC House of Representatives <annethayer@schouse.gov>; Clemsonla <Clemsonla@gmail.com>; Tarver, Fred - NCDEQ <fred.tarver@ncdenr.gov>; Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Strong, Brian - NC State Parks <brian.strong@ncparks.gov>; MacStone <MacStone@naturalandtrust.org>; Chris Starker <cstarker@upstateforever.org>; ashlstep@nc-cherokee.com; PShirley <PShirley@oconeeco.com>; Sandifer, Bill - SC House of Representatives <billsandifer@schouse.gov>; Salter, Findlay - SC Office of Regulatory Staff <fsalter@ors.sc.gov>; Roper, Ken - Pickens County <kenr@co.pickens.sc.us>; Rohde, Fritz <fritz.rohde@noaa.gov>; Rimkunas, Matt - US Senate <matt_rimkunas@lgraham.senate.gov>; rigginl@dnr.sc.gov; Ridgeway, Chip - USACE <Irvin.C.Ridgeway@usace.army.mil>; Rice, Rex - SC Senate <rexrice@scsenate.gov>; Rice, Garry S <Garry.Rice@duke-energy.com>; Rawlings, Leonard D <Leonard.Rawlings@bia.gov>; Bill Ranson-Retired <bill.ranson@retiree.furman.edu>; Ramsden, Simeon - Kipling Ventures <simeon@kiplingventures.com>; praabe@americanrivers.org; Peterson, Harold S <Harold.Peterson@bia.gov>; Perry, Fletcher - City of Pickens <fperry@pickenscity.com>; growens@gmail.com; Olds, Melanie J <melanie_olds@fws.gov>; Ntale, Kajumba - Chief - USEPA <kajumba.ntale@epa.gov>; lputnammitchell <lputnammitchell@gmail.com>; Mindel, Howard - USACE <howard.p.mindel@usace.army.mil>; Elizabeth Miller <MillerE@dnr.sc.gov>; derrick.miller@usda.gov; McNamara, Rachel - FERC <rachel.mcnamara@ferc.gov>; McKoy, Brice - USACE <Peter.B.McKoy@usace.army.mil>; McCormack, Paul - SCDPRT <pmccormack@scprt.com>; Lineberger, Jeff <Jeff.Lineberger@duke-energy.com>; Laughter, Jamie - Transylvanie Cty <jaime.laughter@transylvaniacounty.org>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Keene, Terry - AQD <jtk7140@me.com>; JohnsonHughes, Christy <christy_johnsonhughes@fws.gov>; Johnson, Elizabeth - SCDAH <EMJOHNSON@scdah.sc.gov>; Jewsbury, Steve - Pickens Cty Water Auth <sjewsburyjr@bellsouth.net>; Hunt, Turner - Muscogee (Creek) Nation <thunt@muscogeenation.com>; Hughes, Jennifer - SCDHEC <hughesjr@dhec.sc.gov>; Howell, Kelly - SCDPRT <khowell@scprt.com>; Erika Hollis <ehollis@upstateforever.org>; Hoffstatter, Mike - National Wild Turkey Federation <mhoffstatter@nwtf.net>; Hiott, David - SC House of Representatives <davidhiott@schouse.gov>; glenn@hilliardgrp.com; David Hill <dhill@mcn-nsn.gov>; hightocw@dhec.sc.gov; Hawkins, Ray - Jocassee Outdoor Center <fun@jocasseeoutdooreenter.com>; Charles (Rowdy) B Harris <charris@scprt.com>; Hall, Tim - City of Walhalla, SC <thall@cityofwalhalla.com>; wenonah.haire.catwba_contact <wenonah.haire@catawba.com>; jhains@g.clemson.edu; Griffin, Marvin - USACE Savannah <marvin.l.griffin@usace.army.mil>; Sara Green <sara@scwf.org>; Gordon, Jeffrey - SC Office of Reg Staff <jgordon@ors.sc.gov>; Gledhill-Earley, Renee - NCSHPO <renee.gledhill-earley@ncdcr.gov>; Andrew Gleason <andrewandwilla@hotmail.com>; Gilstrap, David - Pickens Cty Water Auth <gilstrap4@gmail.com>; Gestwicki, Tim - NC Wildlife Federation <tim@ncwf.org>; Adin T Fell <afell@scprt.com>; Farrell, Christine - NC State Parks <christine.farrell@ncparks.gov>; Duncan, Jeffrey R <Jeff_Duncan@nps.gov>; Douglas, Heyward - Foothills Trail Conservancy <heyward69@gmail.com>; Andy Douglas <adoug41@att.net>; Davis, Amin - NCDNCR <amin.davis@ncdenr.gov>; Dach, Bob - USBIA NR <robert.dach@bia.gov>;

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**Subject:** [EXTERNAL] P-2740 Bad Creek Relicensing – Notice of Filing of ILP Progress Report #6



Dear Bad Creek Pumped Storage Project Stakeholders:

Duke Energy Carolinas, LLC (Duke Energy) is the licensee, owner and operator of the Bad Creek Pumped Storage Project (FERC No. 2740) (Project) located in Oconee County, South Carolina. The existing license for the Project was issued on August 1, 1977, under the terms of an Original License issued by the Federal Energy Regulatory Commission (FERC or Commission), and the current license expires on July 31, 2027. Accordingly, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP), as described at 18 Code of Federal Regulations (CFR) Part 5.

We are notifying stakeholders of the availability of the Relicensing Study Progress Report No. 6 filing, which includes activities that occurred in quarter 3 (Q3) of 2024 and activities expected to be conducted in quarter 4 (Q4) of 2024. The Study Progress Report No. 6 was electronically filed with FERC by Duke Energy on October 2, 2024 and is available on FERC's eLibrary system and the Project's public relicensing website under Documents (https://www.badcreekpumpedstorage.com/documents/).

Should you have any questions regarding this filing or the relicensing process, or if you would like to request changes to the email distribution list for future submittals, please contact me at alan.stuart@duke-energy.com. On behalf of Duke Energy, thank you for your interest in the Bad Creek Project and for your participation in this process.

Please stay safe,
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:** | Stuart, Alan Witten |
| **To:** | Adams, Jennifer - Oconee County; Alexander, D - seneca.sc; Alexander, Thomas - SC Senate; Amedee, Morgan D.; Bailey, William - USACE Savannah; Barnhart, Jen - USFS Sumter NF; Ericah Beason; Bedenburgh, Michael - Palmetto Trust for Historic Preservation; Bernhart, David - NOAA; Bobertz, Shannon - SCDNR; Boos, Laura - USACE; Boss, Jeff - Greenville Water; Caggiano, Annie - Oconee Economic Alliance; Case, Mike; Cato, Van - US Senate; Chief of NEPA Program - USEPA; Clampitt, Mike - NC House Representative; Colburn, Kevin - American Whitewater; Collins, Neal - SC House of Representatives; Wes Cooler; Copelof, Maureen - City of Brevard; Corney, Michael; Corney, Steve; Cotton, Mark; Dach, Bob - USBIA NR; Davis, Amin - NCDNCR; Andy Douglas; Douglas, Heyward - Foothills Trail Conservancy; Duncan, Jeffrey - NPS; Farrell, Christine - NC State Parks; Adin T Fell; tim; Gilstrap, David - Pickens Cty Water Auth; Andrew Gleason; Gordon, Jeffrey - SC Office of Reg Staff; Green, Sara - SC Wildlife Federation; Griffin, Marvin - USACE Savannah; jhains@g.clemson.edu; Wenonah Haire; Mayor, Clemson - cityofclemson; Hall, Tim - City of Walhalla, SC; Charles (Rowdy) B Harris; hightocw@dhec.sc.gov; Hill, David - Muscogee (Creek) Nation; glenn@hilliardgrp.com; Hiott, David - SC House of Representatives; Hoffstatter, Mike - National Wild Turkey Federation; Erika Hollis; Howell, Kelly - SCDPRT; Hughes, Jennifer - SCDHEC; Hunt, Turner - Muscogee (Creek) Nation; Jewsbury, Steve - Pickens Cty Water Auth; Jocassee Outdoor Center; Johnson, Elizabeth - SCDAH; JohnsonHughes, Christy; Keene, Terry - AQD; Kirouac, Justin - Oconee Cty Administrator; Kulpa, Sarah; Salazar, Maggie; Laughter, Jamie - Transylvanie Cty; Lineberger, Jeff; McCormack, Paul - SCDPRT; McKoy, Brice - USACE; McNamara, Rachel - FERC; derrick.miller@usda.gov; Elizabeth Miller; Mindel, Howard - USACE; Mitchell, Phil - Fishers Knob Home Owners Group; Olds, Melanie J; growens@gmail.com; Peterson, Harold - USBIA; Raabe, Peter - American Rivers; Ramsden, Simeon - Kipling Ventures; Bill Ranson-Retired; Rawlings, Leonard - USBIA; Rice, Garry S; Rice, Rex - SC Senate; Ridgeway, Chip - USACE; Lorianne Riggin; Rohde, Fritz; Roper, Ken - Pickens County; Salter, Findlay - SC Office of Regulatory Staff; Scipio, Isaiah - Mayor, City of Pickens, SC; PShirley; Sneed, Richard (Chief) Cherokee Nation; Chris Starker; Stone, Mac - Naturaland Trust; Strong, Brian - NC State Parks; Tarver, Fred - NCDEQ; Clemsonla; Thomas Esq, Elizabeth - K&L Gates LLP; Threatt-Taylor, Dale - Nature Conservancy; Toombs, Elizabeth - Cherokee Nation; Townsend, Russell - Eastern Band of Cherokee Indians; Watt, Acee - United Keetoowah Band of Cherokee Indians; Weese, Elizabeth - NCDOJ; Whitmire, Bill - SC House of Representatives; Dale Wilde; Willett, Scott - Anderson Regional Joint Water System; suewilliams130@gmail.com; Santos, Sarah Anna |
| **Cc:** | Sarah Salazar; Kulpa, Sarah; McCarney-Castle, Kerry; Huff, Jen; Salazar, Maggie; Ziegler, Ty; Fletcher, Scott T; Abney, Michael A; Pardue, Ethan; Churchill, Christy |
| **Subject:** | Save the Date - FERC 2740 Bad Creek Relicensing Updated Study Report Meeting on January 16, 2025 |
| **Date:** | Monday, December 2, 2024 2:06:23 PM |



Dear Bad Creek Relicensing Stakeholders:

Duke Energy will convene a meeting of all relicensing stakeholders to review the Updated Study Report (USR) results to be filed with FERC on **January 3, 2025**. The meeting will occur on Thursday, January 16, 2025, 9 am–4 pm, at the Duke Energy Wenwood Facility, 425 Fairforest Way, Greenville, SC 29607 (Conference Room 100). The meeting will cover all aspects of the six resource committee studies required and approved by FERC under the Integrated Licensing Process (ILP) and an overall update on the ILP schedule including a look ahead into 2025 with filing of the Draft License Application (DLA). Lunch will be served at the meeting.

Duke Energy will send a separate meeting invitation so you can schedule on your Outlook calendar. We strongly encourage in-person participation but will offer a virtual Teams meeting link for those who cannot attend in person. If **you do plan to attend in person**, please respond to me so I can ensure there is an accurate headcount for lunch.

A meeting agenda will be provided to participants prior the January 16 meeting date.

Thanks, and we look forward to seeing you at the meeting.

Regards,
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

# Attachment 2

Attachment 2 – USR
Meeting Agenda

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# Meeting Agenda

**Bad Creek Pumped Storage Project Relicensing**
**Updated Study Report Meeting**

**January 16, 2025**
**9:00 am – 5:00 pm**

**Wenwood Operations Center**
**425 Fairforest Way, Greenville, SC 29607**

**Introduction**

- Welcome and Meeting Purpose
- Safety Moment
- Introductions and FERC ILP Schedule Review
- General Project and Relicensing Study Overview

**Water Resources**

- Task 1: Existing Water Quality Data Report*
- Task 2: Water Quality Monitoring in Whitewater River Arm
- Task 3: Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)*
    - Updated Pumping Results
- Task 4: Water Exchange Rates and Lake Jocassee Reservoir Levels (CHEOPS Modeling)
- Task 5: Water Quality Management Plan

**Break – 15 min**

**Recreational Resources**

- Task 1: Foothills Trail Recreation Use & Needs
- Task 2: Foothills Trail Conditions Assessment
- Task 3: Whitewater River Cove Existing Recreational Use*
- Task 4: Whitewater River Cove Recreational Public Safety Evaluation

**Aquatic Resources**

- Task 1: Entrainment*
    - (Addendum 1) Updated Pumping Results
    - (Addendum 2) Literature Review
- Task 2: Desktop Studies on Pelagic & Littoral Habitat
- Task 3: Mussel Surveys & Stream Habitat Quality Surveys*

**Lunch – 30 min**

**Environmental Justice***

- Public Outreach Update

**Cultural Resources***

- 2024 Surveys

| |
|---|
| **Visual Resources**<br>• Tasks 5-9 |
| **Additional Bad Creek II Studies and Updates**<br>• Small-whorled pogonia survey<br>• Bat surveys |
| **Questions and Additional Discussion** |
| **Closing** |

** Indicates topic was covered during the Initial Study Report meeting; however, study task objectives and main results will be summarized.*

# Attachment 3

Attachment 3 – Bat Survey Report

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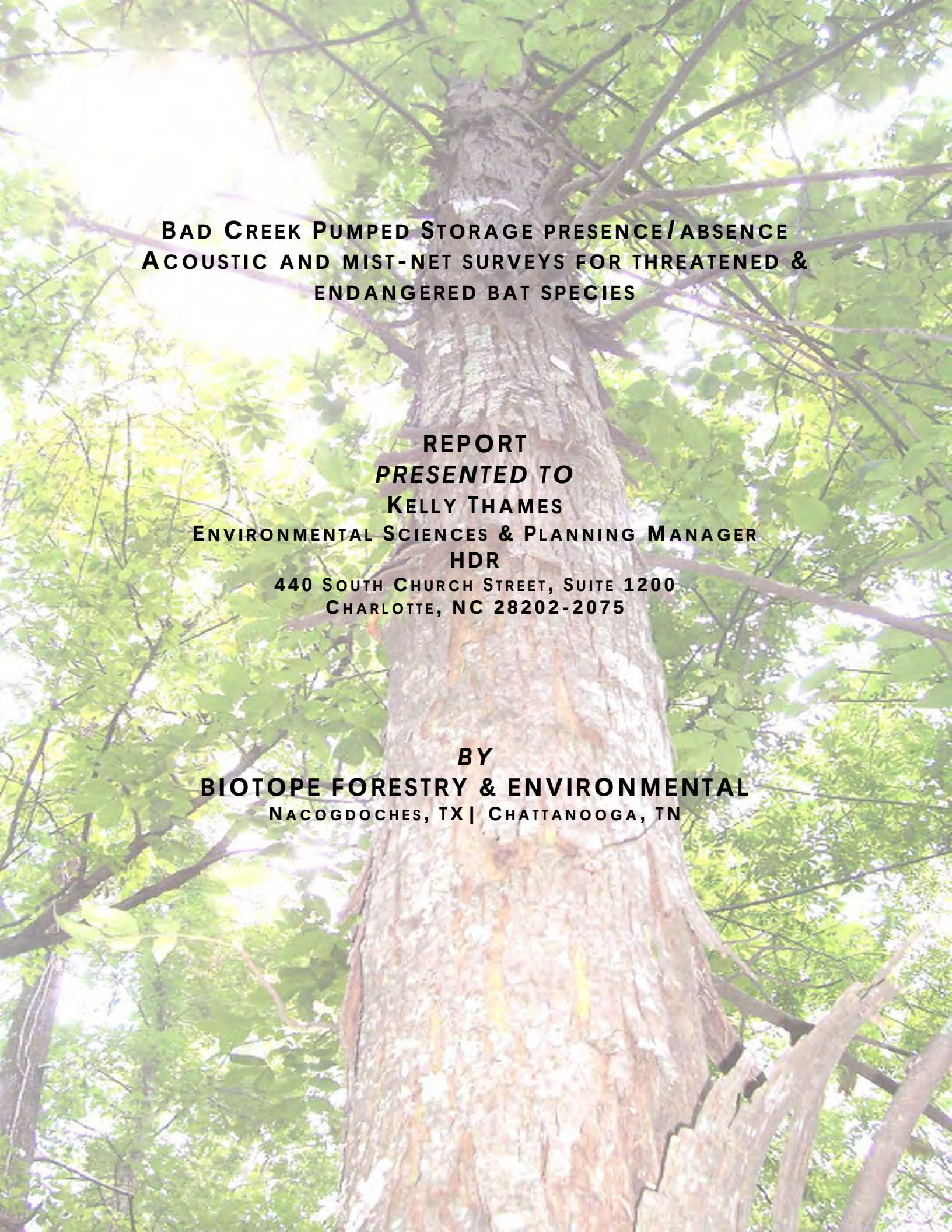

# Bad Creek Pumped Storage presence/absence Acoustic and mist-net surveys for threatened & endangered bat species

**REPORT**

***PRESENTED TO***


**Kelly Thames**

**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 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.

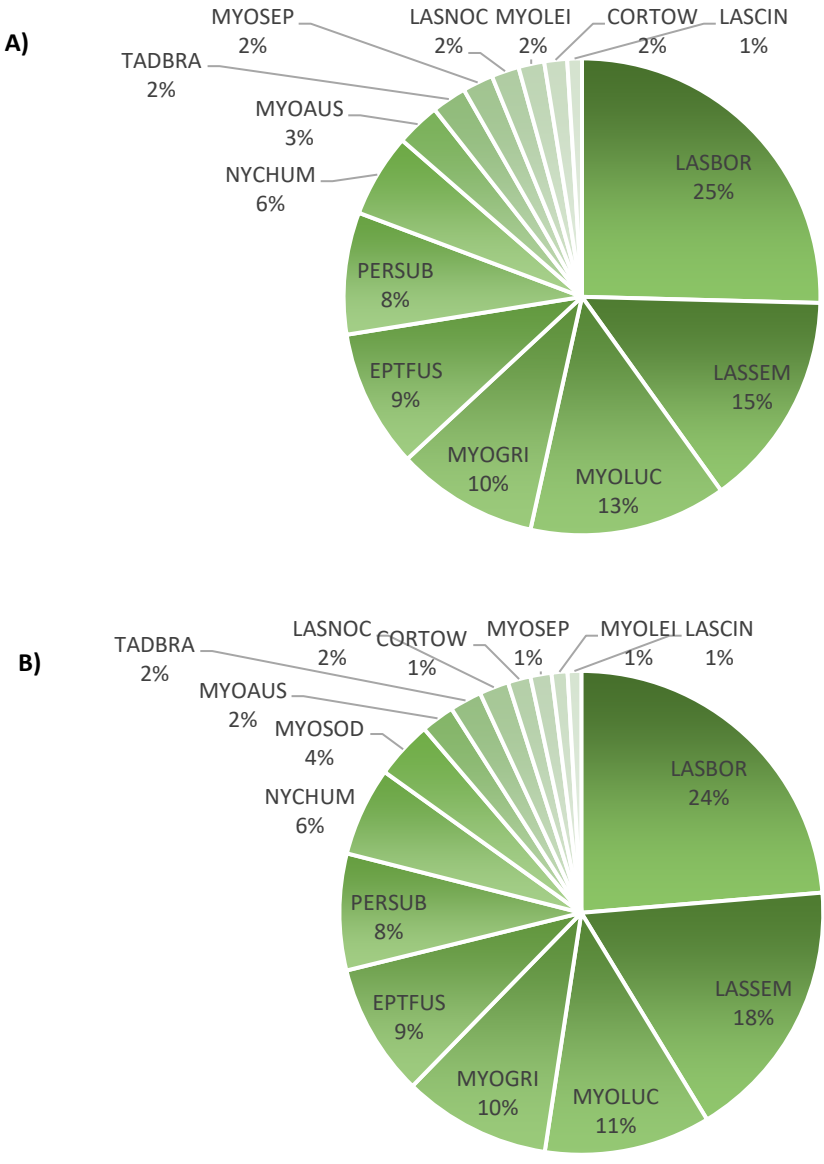


**Figure 1. The proportion of total calls that were assigned to each species using the approved acoustic bat identification program, Kaleidoscope Pro 5.6.3, when run without (A) and with (B) *M. sodalis*.** The approved acoustic bat identification program used the classifier Bats of North America 5.4.0 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

***PRESENTED TO***


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**Environmental Sciences & Planning Manager**
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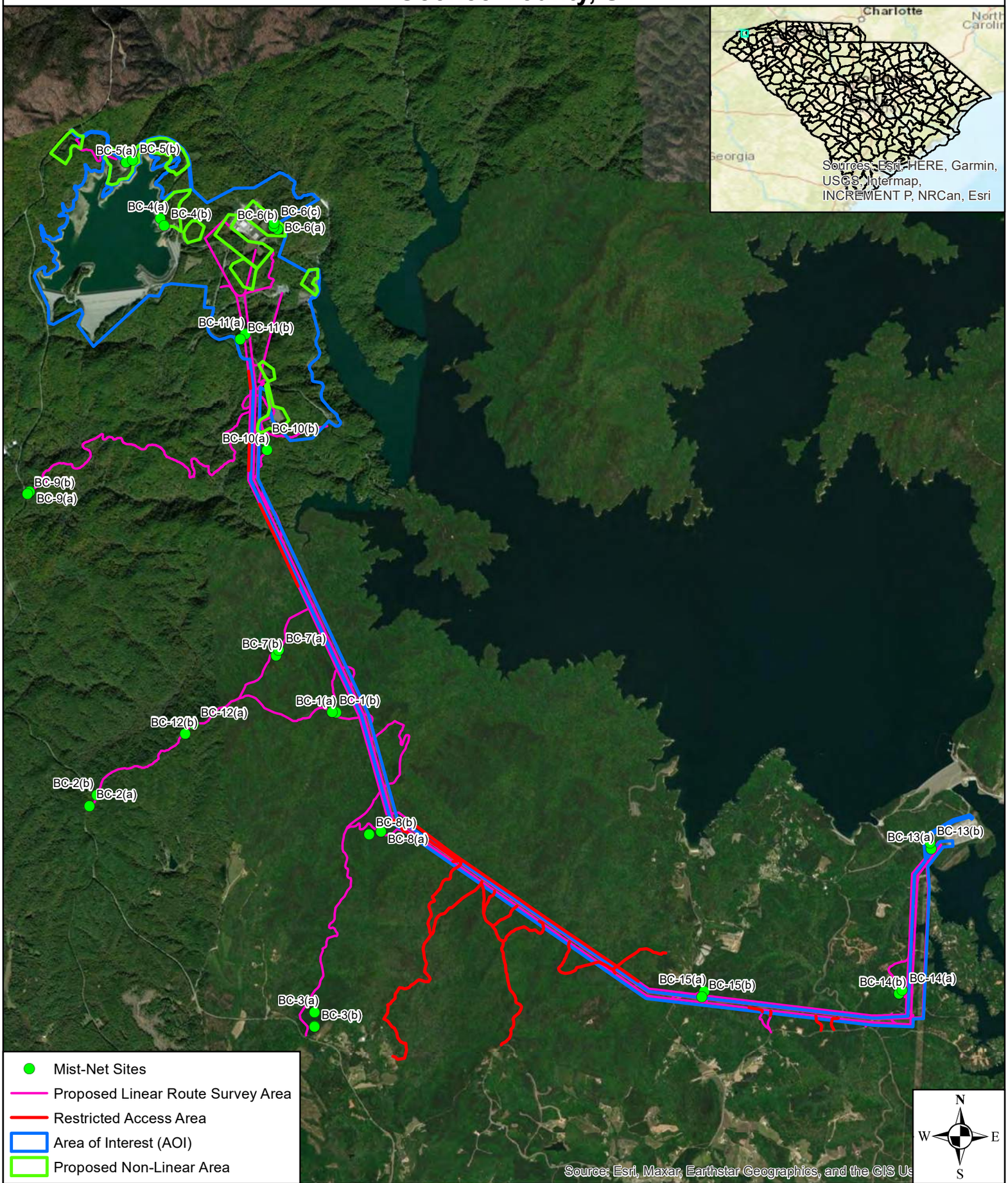
***BY***


**BIOTOPE FORESTRY & ENVIRONMENTAL**
**Nacogdoches, TX | Chattanooga, TN**

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

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Date Created: 07/16/2024


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


0 110 220 440 660 Feet

Scale 1:2,500

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


0 110 220 440 660 Feet

Scale 1:2,500

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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
W E
S

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

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-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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0 110 220 440 660 Feet

Scale 1:2,500

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


0 110 220 440 660 Feet

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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Feet

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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0 110 220 440 660 Feet

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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Feet

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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0 110 220 440 660
Feet

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

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-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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0 110 220 440 660 Feet

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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0 110 220 440 660 Feet

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

N
W E
S

0 110 220 440 660 Feet

Scale 1:2,500

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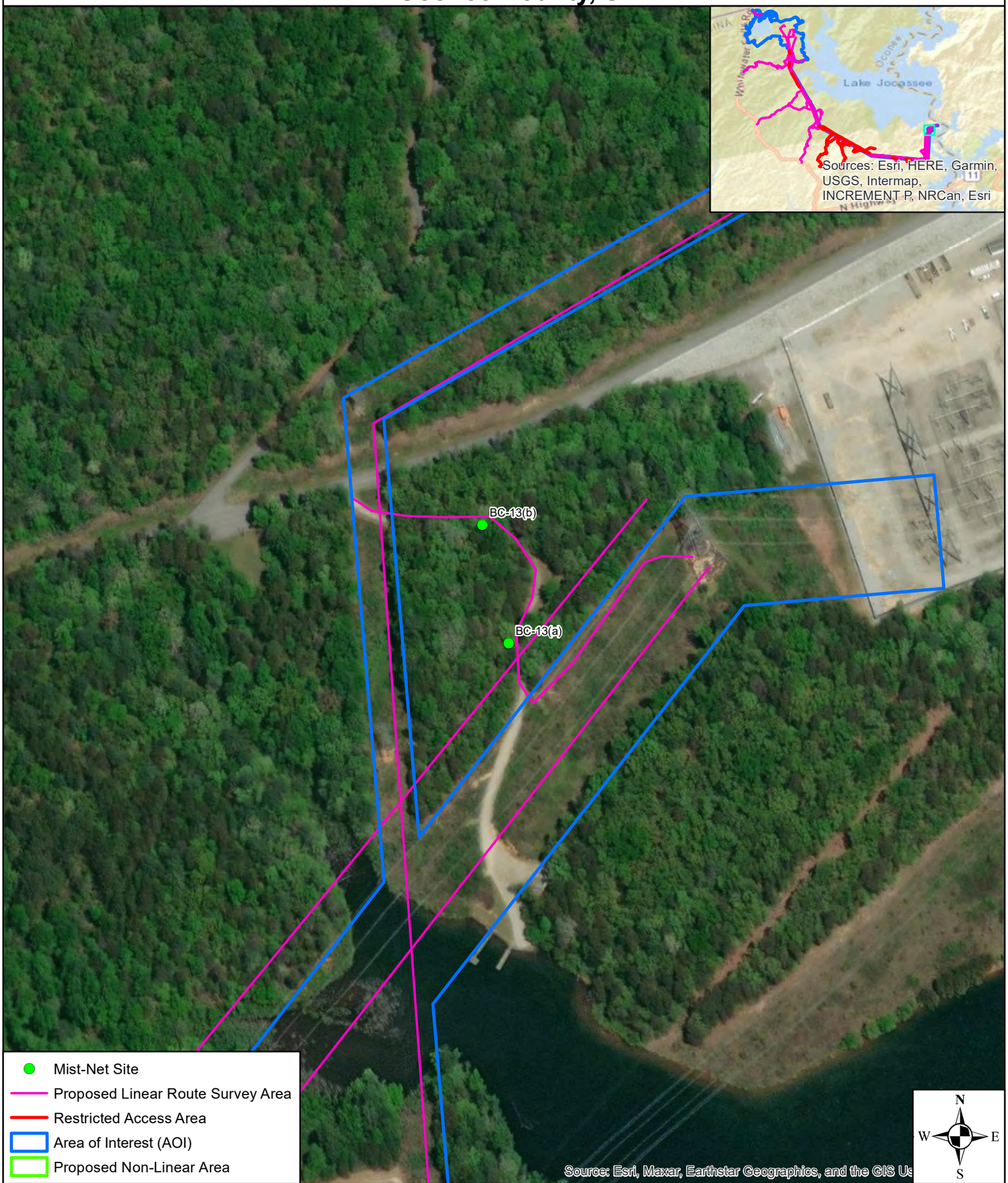
# Bad Creek Pumped Storage
# Mist-Net Site Map (BC-13)
# Oconee County, SC




0 110 220 440 660 Feet

Scale 1:2,500

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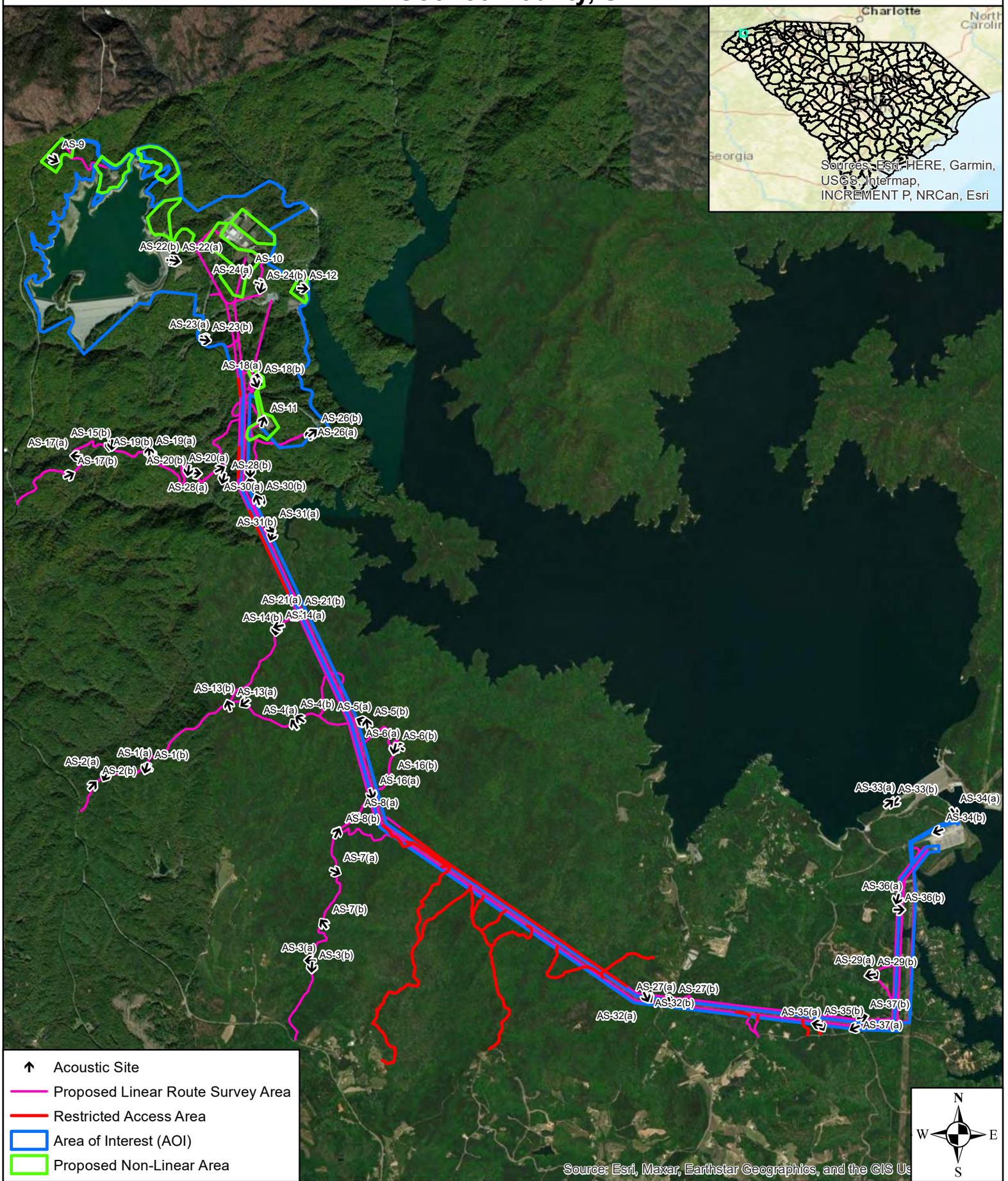
# Bad Creek Pumped Storage
# Acoustic Survey Map
# Oconee County, SC




Scale 1:51,000

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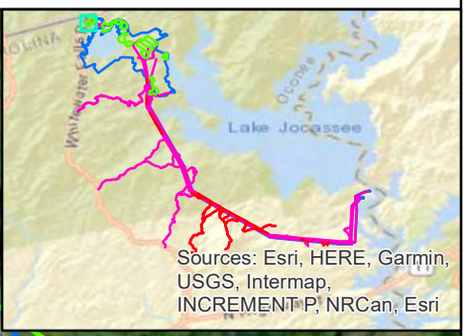
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-9)
# Oconee County, SC




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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0 110 220 440 660 Feet

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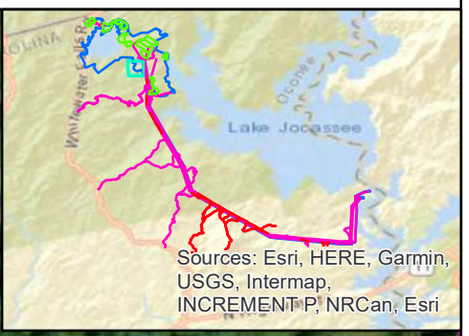
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-23)
# Oconee County, SC




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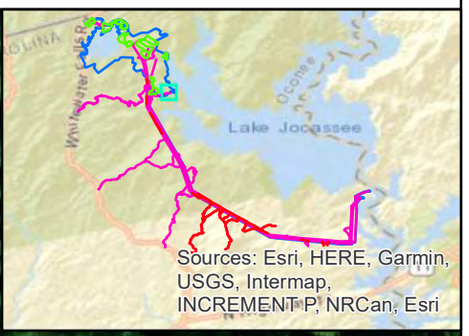
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-26)
# Oconee County, SC




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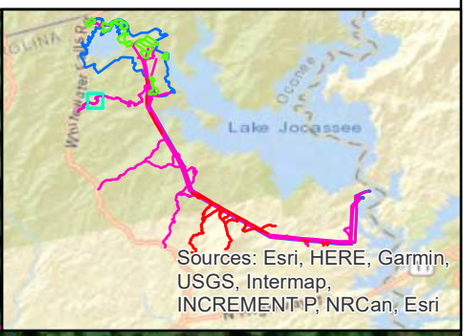
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-17)
# Oconee County, SC




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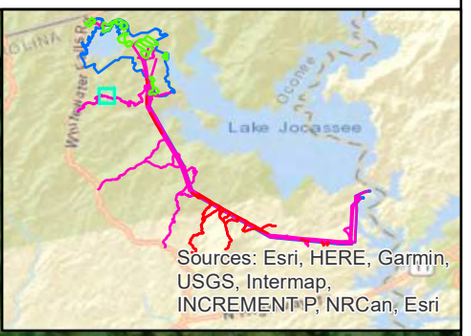
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-15)
# Oconee County, SC




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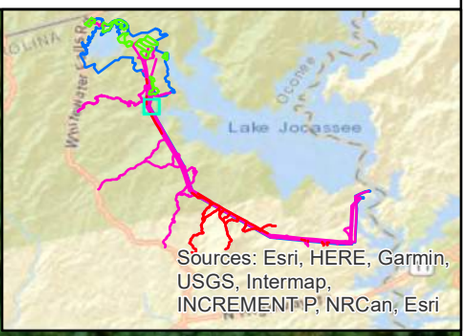
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-25, AS-30)
# Oconee County, SC




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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Scale 1:2,500

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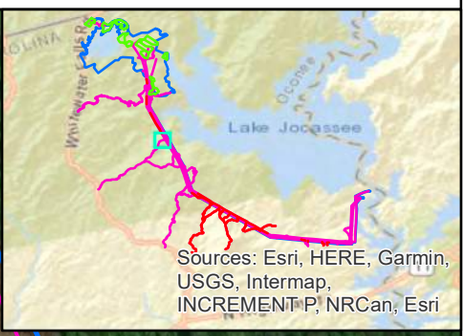
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-14, AS-21)
# Oconee County, SC




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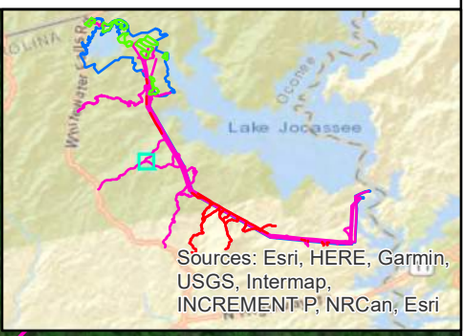
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-13)
# Oconee County, SC




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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Scale 1:2,500

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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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Feet

Scale 1:2,500

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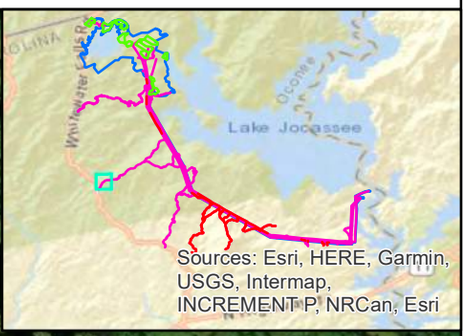
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-2)
# Oconee County, SC




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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Scale 1:2,500

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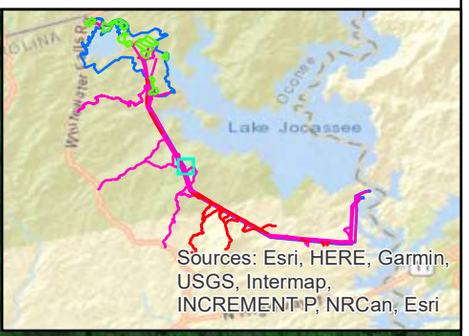
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-5)
# Oconee County, SC




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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Scale 1:2,500

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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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Scale 1:2,500

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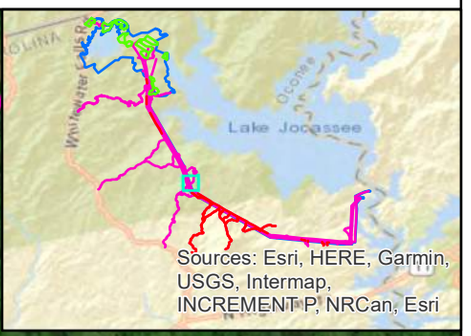
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-16)
# Oconee County, SC




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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Scale 1:2,500

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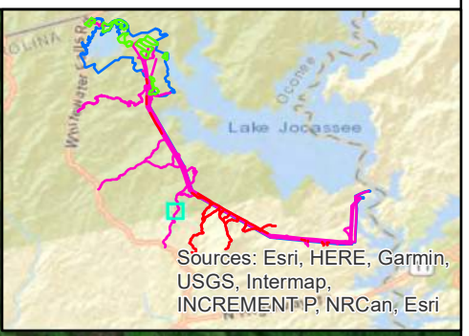
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-7)
# Oconee County, SC




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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Scale 1:2,500

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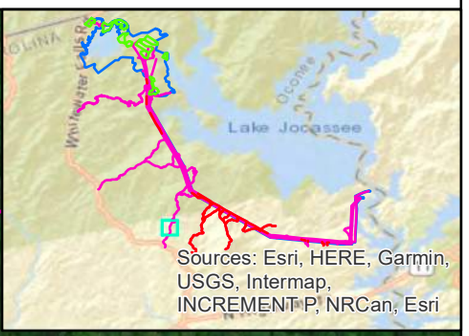
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-3)
# Oconee County, SC




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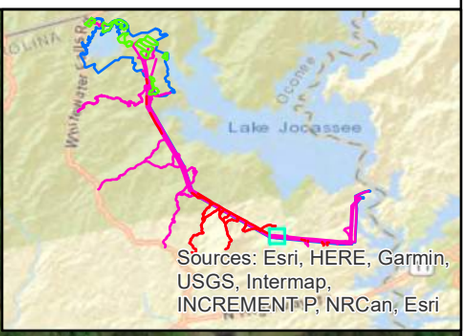
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-27, AS-32)
# Oconee County, SC




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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Scale 1:2,500

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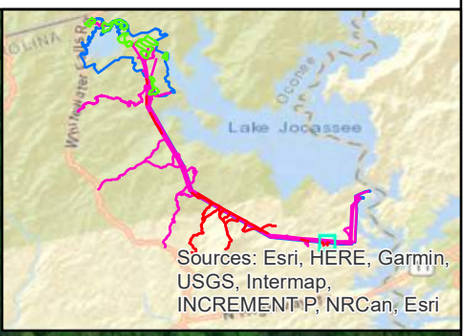
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-35)
# Oconee County, SC




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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Scale 1:2,500

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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

N
W E
S

0 110 220 440 660 Feet

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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# 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

N
W E
S

0 110 220 440 660 Feet

Scale 1:2,500

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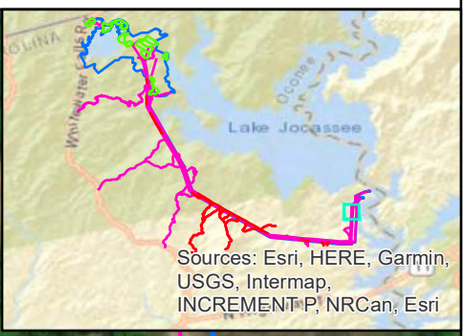
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-36)
# Oconee County, SC




AS-36(a)

AS-36(b)

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

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

N
W E
S

0 110 220 440 660 Feet

Scale 1:2,500

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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

N
W E
S

0 110 220 440 660 Feet

Scale 1:2,500

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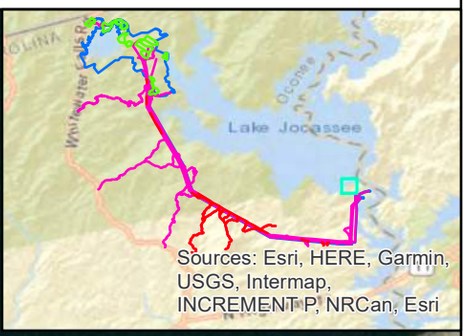
# Bad Creek Pumped Storage
# Acoustic Site Map (AS-33)
# Oconee County, SC




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

N
W E
S

0 110 220 440 660 Feet

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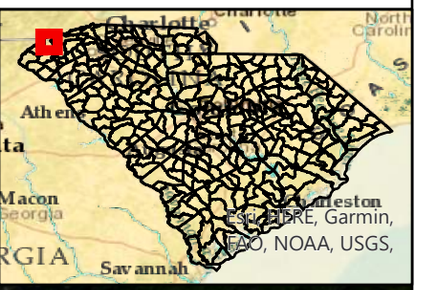
# Bad Creek Pumped Storage
# Bat Species of Concern (SOC) - Conservation Buffer Map
# Oconee County, SC




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

N
W E
S

0 1,250 2,500 5,000 7,500 Meters

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: 09/29/2024

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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*


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*BY*


BIOTOPE FORESTRY & ENVIRONMENTAL
Nacogdoches, TX | Chattanooga, TN

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## 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)

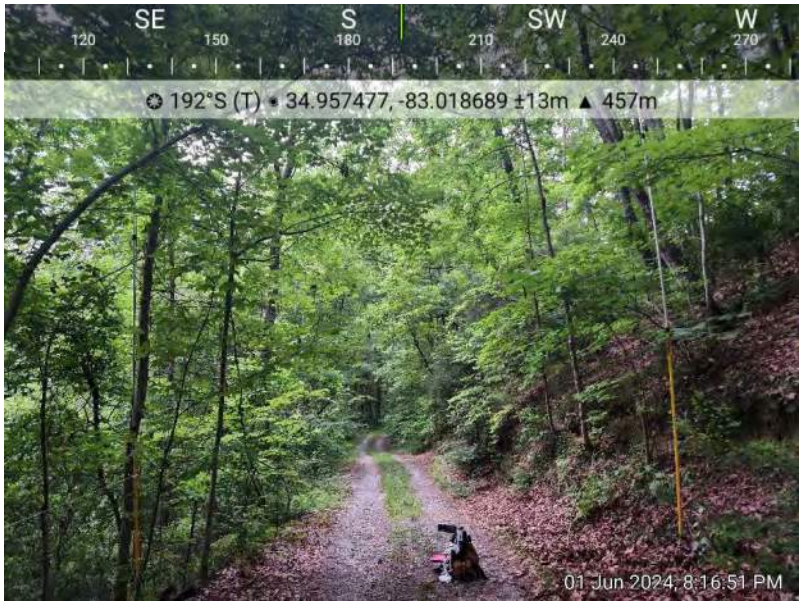



**Figure A4. Photos of BC-2 mist-net set B.** Photos were taken from each side of the net while facing north (A) and south (B).

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)


**Figure A6. Photos of BC-3 mist-net set B.** Photos were taken from each side of the net while facing east (A) and west (B).

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)


**Figure A8. Photos of BC-4 mist-net set B.** Photos were taken from each side of the net while facing northwest (A) and southeast (B).

A)


B)


**Figure A9. Photos of BC-5 mist-net set A.** Photos were taken from each side of the net while facing northwest (A) and southeast (B).

A)


B)


**Figure A10. Photos of BC-5 mist-net set B.** Photos were taken from each side of the net while facing northeast (A) and south (B).

A)


B)


**Figure A11. Photos of BC-6 mist-net set A.** Photos were taken from each side of the net while facing north (A) and south (B).

A)


B)


**Figure A12. Photos of BC-6 mist-net set B.** Photos were taken from each side of the net while facing southwest (A) and east (B).

A)


B)


**Figure A13. Photos of BC-6 mist-net set C.** Photos were taken from each side of the net while facing north (A) and south (B).

A)


B)


**Figure A14. Photos of BC-7 mist-net set A.** Photos were taken from each side of the net while facing northeast (A) and southwest (B).

A)


B)


**Figure A15. Photos of BC-7 mist-net set B.** Photos were taken from each side of the net while facing northeast (A) and northwest (B).

A)


B)


**Figure A16. Photos of BC-8 mist-net set A.** Photos were taken from each side of the net while facing southeast (A) and west (B).

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)


**Figure A18. Photos of BC-9 mist-net set A.** Photos were taken from each side of the net while facing south (A) and north (B).


**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)


**Figure A22. Photos of BC-11 mist-net set A.** Photos were taken from each side of the net while facing northeast (A) and southwest (B).

A)


B)


**Figure A23. Photos of BC-11 mist-net set B.** Photos were taken from each side of the net while facing northwest (A) and southeast (B).

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)

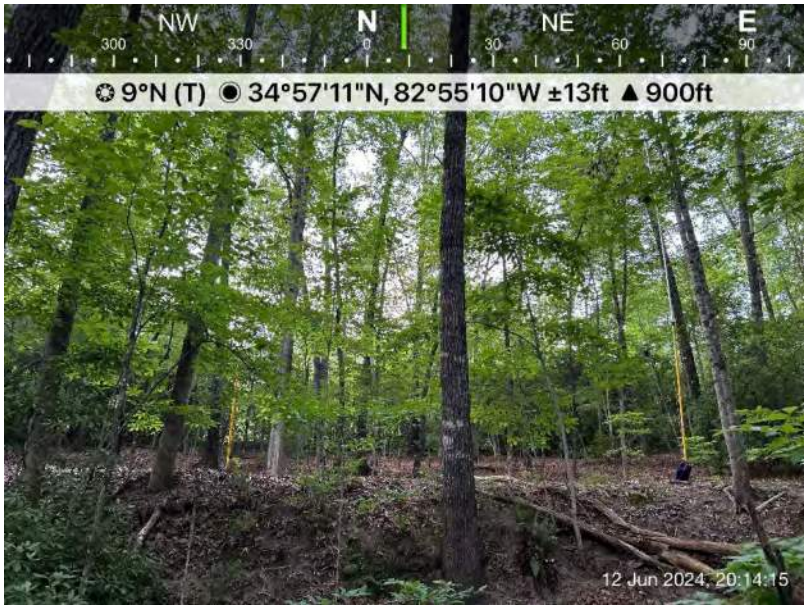

**Figure A25. Photos of BC-12 mist-net set B.** Photos were taken from each side of the net while facing northeast (A) and southwest (B).

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)

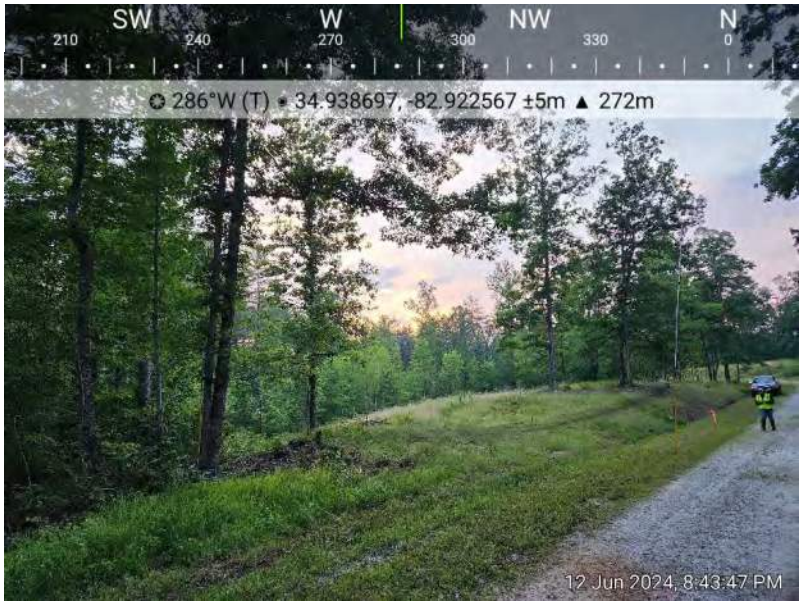



**Figure A28. Photos of BC-14 mist-net set A.** Photos were taken from each side of the net while facing east (A) and west (B).

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).

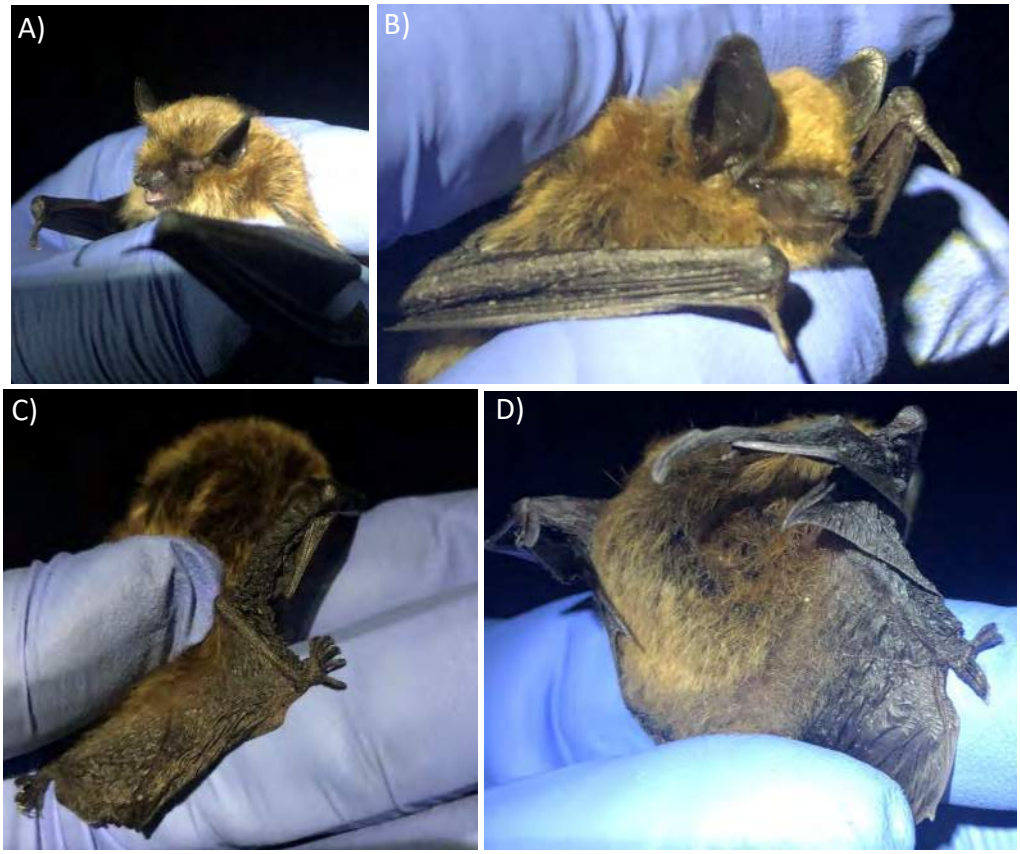



**Figure A35. Photos of the two eastern small-footed bat (*Myotis leibii*) captured at mist-net site BC-11 on the Bad Creek Pumped Storage Project.** The black mask indicative of this species and the keeled calcar respectively can be seen for the first (A, B) and second bat (C, D).

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

## APPENDIX C
## Acoustic Details

***PRESENTED TO***


**Kelly Thames**
**Environmental Sciences & Planning Manager**
**HDR**
**440 South Church Street, Suite 1200**
**Charlotte, NC 28202-2075**


***BY***


**BIOTOPE FORESTRY & ENVIRONMENTAL**
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## 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)

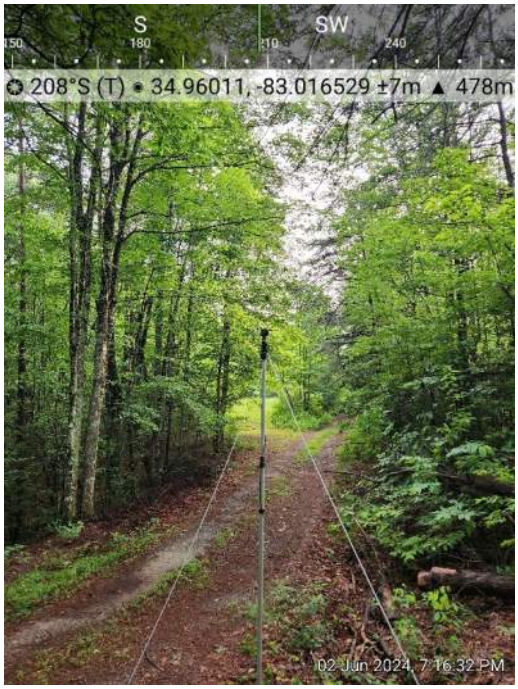



**Figure A2. Photos of AS-2 acoustic site which consisted of two acoustic detectors A) AS-2-A and B) AS-2-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

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)

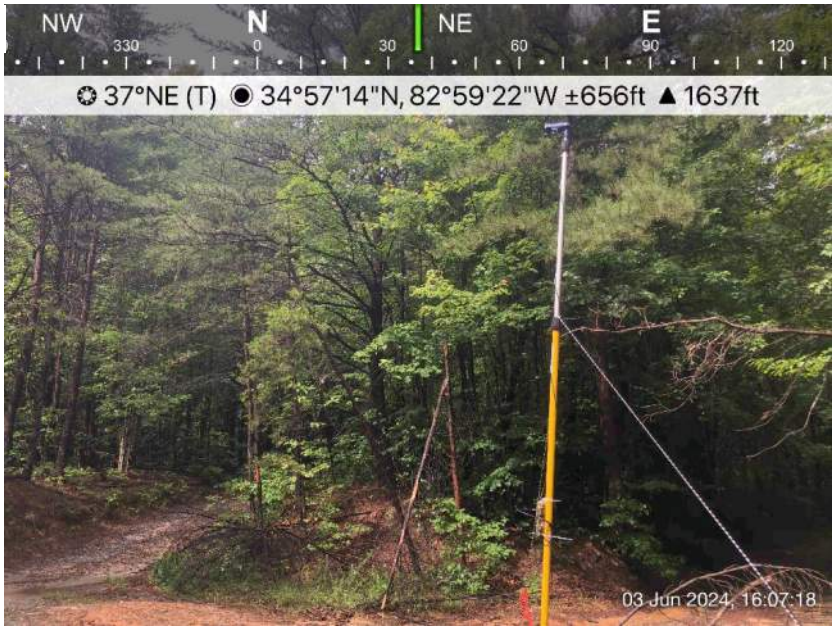

**Figure A6. Photos of AS-6 acoustic site which consisted of two acoustic detectors A) AS-6-A and B) AS-6-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

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)

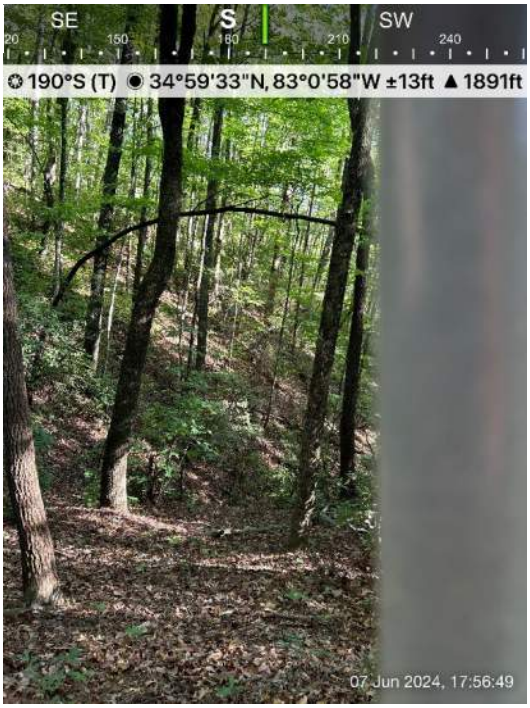

**Figure A13. Photos of AS-13 acoustic site which consisted of two acoustic detectors A) AS-13-A and B) AS-13-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

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)

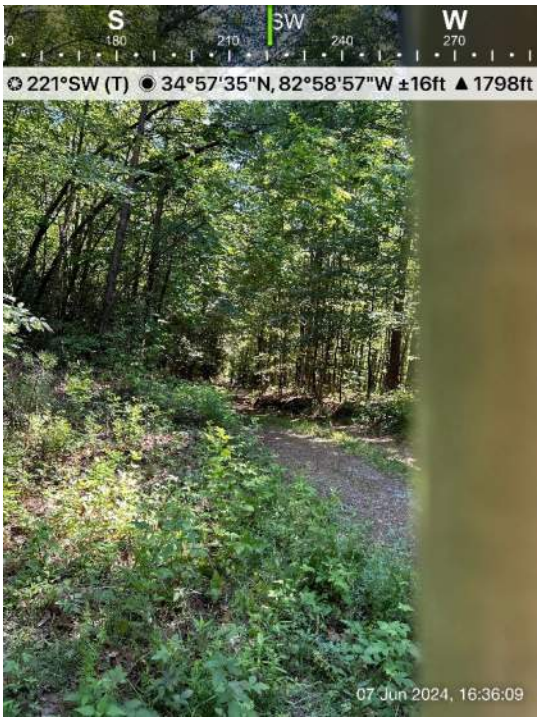
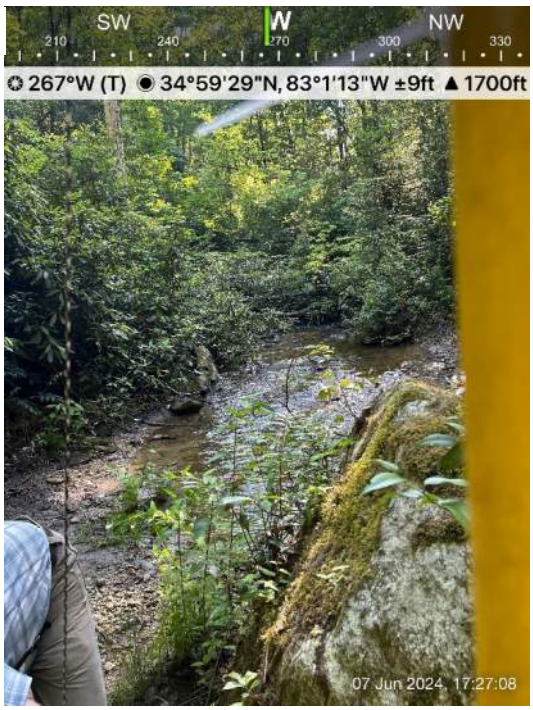



**Figure A16. Photos of AS-16 acoustic site which consisted of two acoustic detectors A) AS-16-A and B) AS-16-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

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)

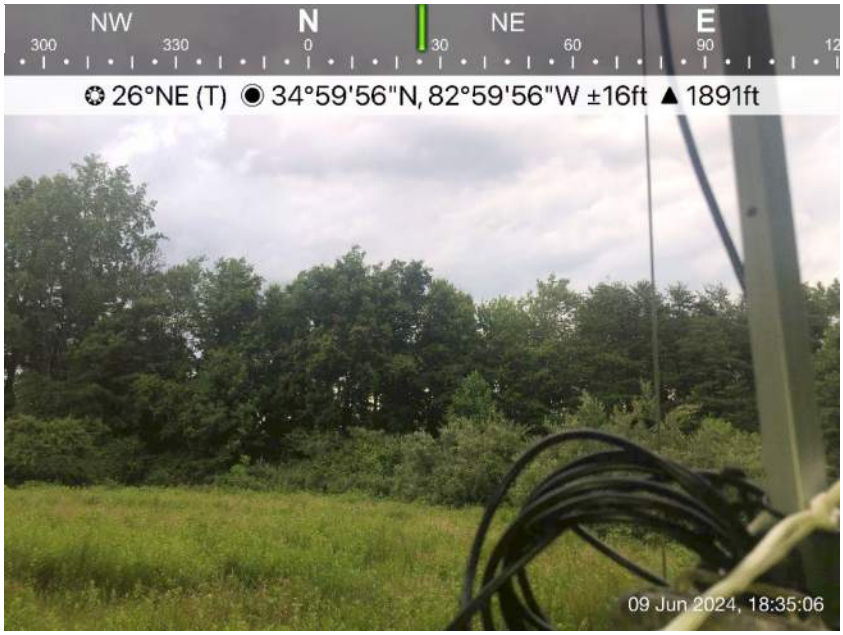



**Figure A18. Photos of AS-18 acoustic site which consisted of two acoustic detectors A) AS-18-A and B) AS-18-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)


B)

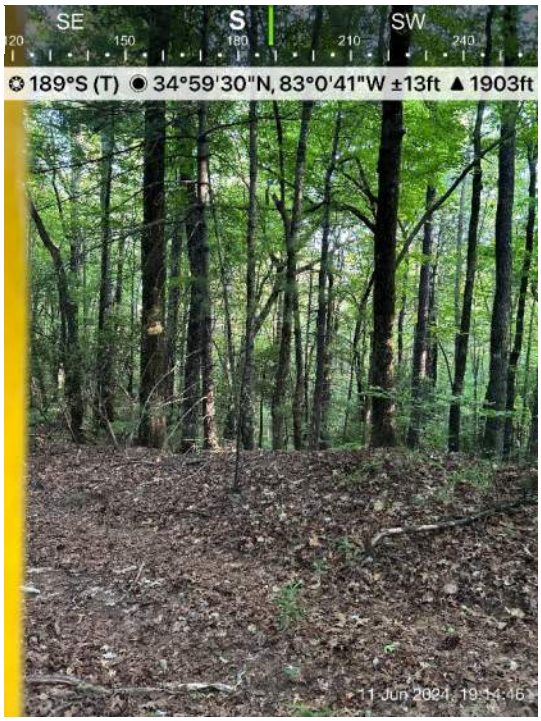
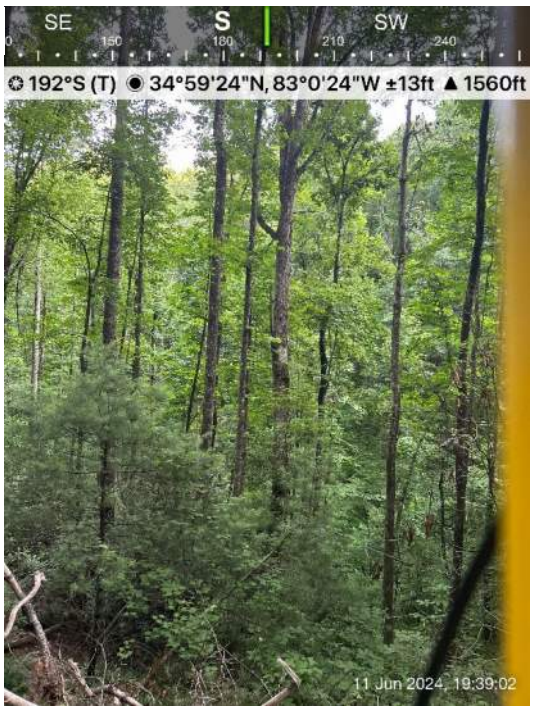



**Figure A19. Photos of AS-19 acoustic site which consisted of two acoustic detectors A) AS-19-A and B) AS-19-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

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)

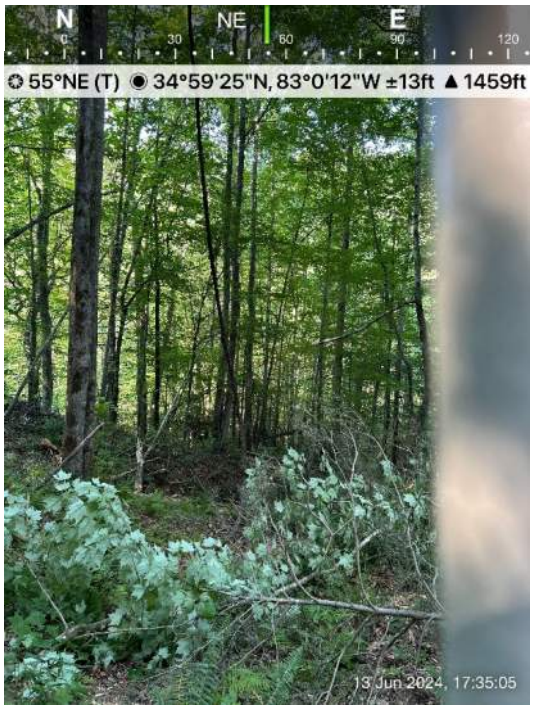

**Figure A26. Photos of AS-26 acoustic site which consisted of two acoustic detectors A) AS-26-A and B) AS-26-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

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)

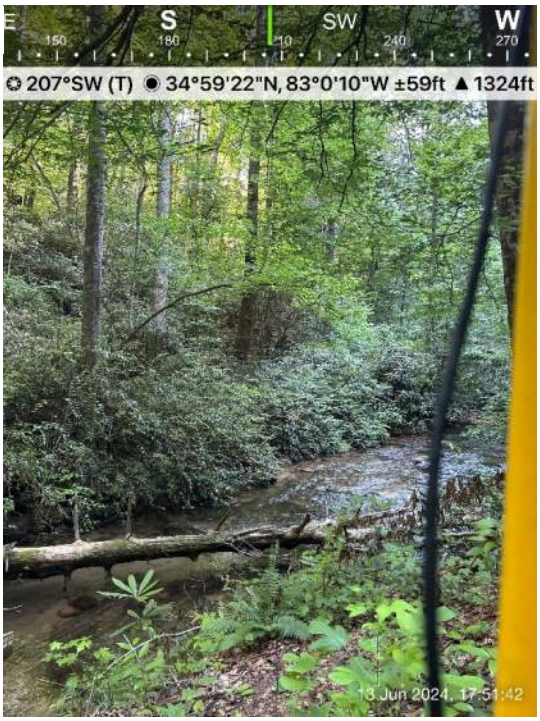



**Figure A28. Photos of AS-28 acoustic site which consisted of two acoustic detectors A) AS-28-A and B) AS-28-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

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)

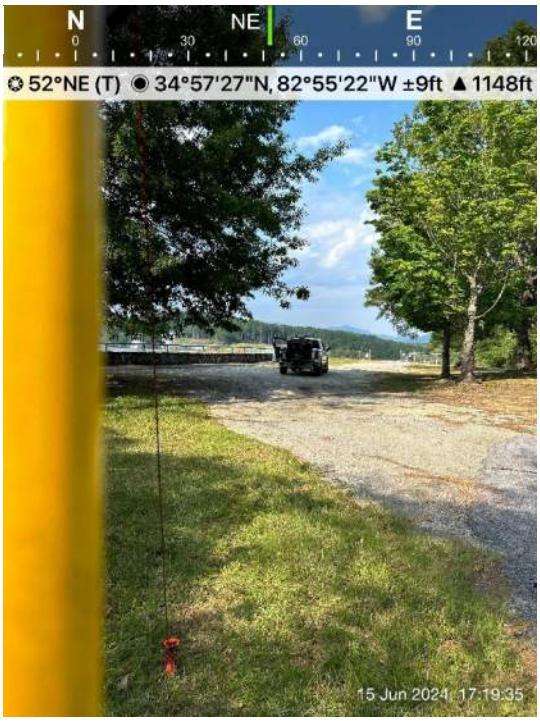
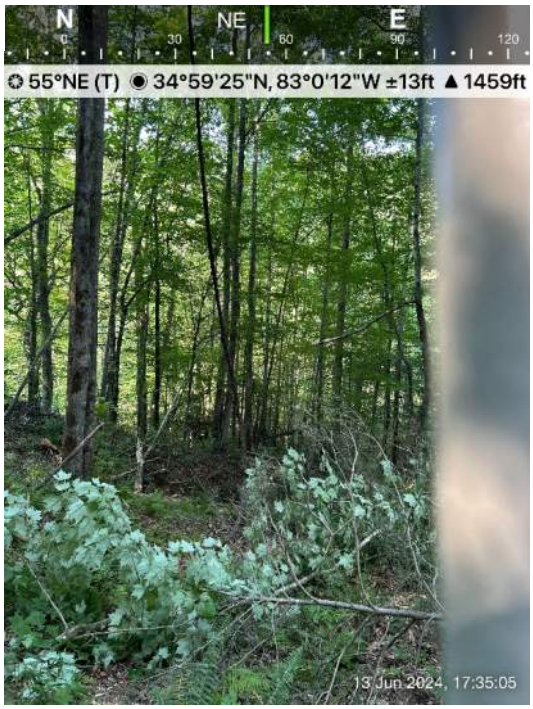



**Figure A33. Photos of AS-33 acoustic site which consisted of two acoustic detectors A) AS-33-A and B) AS-33-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

A)




B)

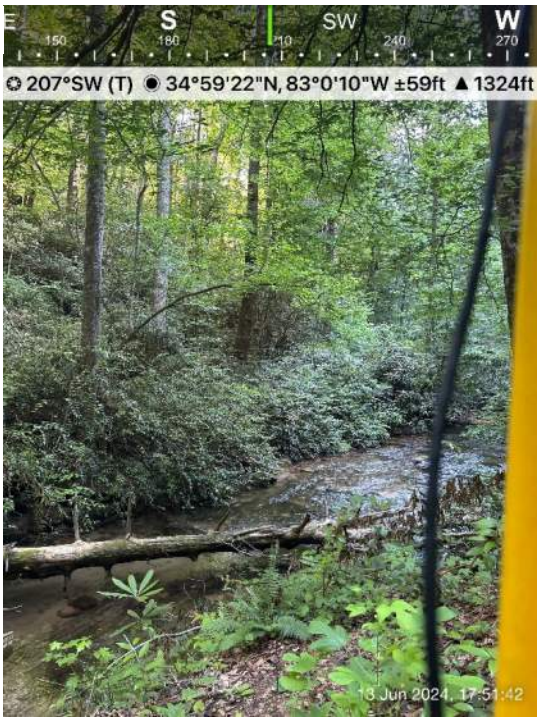



**Figure A34. Photos of AS-34 acoustic site which consisted of two acoustic detectors A) AS-34-A and B) AS-34-B.** Each photo demonstrates the microphone orientation and the zone of detection for one of the detectors deployed at the site.

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
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—**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<br>2024-06-13 | MYOGRI | MYOGR | MYOGRI calls were Lasiurine | 0 |
| AS-30-A | SN637040<br>2024-06-18 | MYOLUC | | MYOLUC calls not definitive enough, appear Lasiurine. | 0 |
| AS-30-B | SN637052<br>2024-06-18 | MYOGRI, MYOLUC | MYOGRI, MYOLUC, MYOSOD | MYOGRI are Lasiurine. MYOLUC and MYOSOD calls are not definitive enough | 0 |
| | SN637052<br>2024-06-19 | MYOGRI, MYOLUC | MYOGRI, MYOSOD | MYOGRI are Lasiurine. MYOLUC and MYOSOD calls are not definitive enough | 0 |
| AS-31-A | SN637042<br>2024-06-16 | MYOGRI | MYOGRI, MYOLUC | MYOGRI and MYOLUC calls are LASBOR | 0 |
| | SN637042<br>2024-06-17 | MYOGRI, PERSUB | MYOGRI, PERSUB | MYOGRI AND PERSUB calls are LASBOR. | 0 |
| AS-31-B | SN637052<br>2024-06-17 | PERSUB | PERSUB | PERSUB are LASBOR | 0 |
| AS-32-A | SN637049<br>2024-06-16 | MYOGRI, PERSUB | MYOGRI, PERSUB | MYOGRI calls are LASBOR**. PERSUB confirmed** | 20 PERSUB |
| | SN637049<br>2024-06-17 | PERSUB | | **PERSUB confirmed.** | 5 PERSUB |
| AS-32-B | SN637044<br>2024-06-17 | PERSUB | PERSUB | **PERSUB confirmed** | 4 PERSUB |
| AS-33-A | SN440578<br>2024-06-16 | PERSUB | PERSUB | **PERSUB confirmed** | 2 PERSUB |
| | SN440578<br>2024-06-17 | PERSUB | PERSUB | **PERSUB confirmed** | 4 PERSUB |
| AS-33-B | SN637020<br>2024-06-16 | PERSUB | PERSUB | **PERSUB confirmed.** | 3 PERSUB |
| AS-34-A | SN637019<br>2024-06-16 | PERSUB | PERSUB | **PERSUB confirmed** | 1 PERSUB |
| | SN637019<br>2024-06-17 | PERSUB | PERSUB | **PERSUB confirmed** | 1 PERSUB |
| AS-34-B | SN620359<br>2024-06-16 | PERSUB | PERSUB | **PERSUB confirmed** | 2 PERSUB |
| AS-35-A | SN637044<br>2024-06-18 | MYOGRI | MYOGRI | MYOGRI calls are Lasiurine | 0 |
| | SN637044<br>2024-06-19 | MYOGRI | MYOGRI | MYOGRI calls are Lasiurine | 0 |
| AS-35-B | SN637049<br>2024-06-18 | MYOGRI | MYOGRI | MYOGRI calls are Lasiurine | 0 |
| | SN637049<br>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<br>2024-06-18 | MYOGRI, MYOLUC, PERSUB | MYOGRI, MYOLUC, PERSUB | **PERSUB confirmed.** MYOGRI appeared Lasiurine, MYOLUC not definitive enough. | 3 PERSUB |
| | SN637019<br>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<br>2024-06-18 | MYOGRI, PERSUB | MYOGRI, PERSUB | **PERSUB confirmed.** MYOGRI calls appear Lasiurine. | 4 PERSUB |
| AS-37-B | SN637020<br>2024-06-19 | MYOGRI | MYOGRI | MYOGRI appears to be Lasiurine | 0 |
| All sites | | | | | 75 PERSUB<br>18 MYLU<br>1 MYGR |

## 5.3 Representative Calls

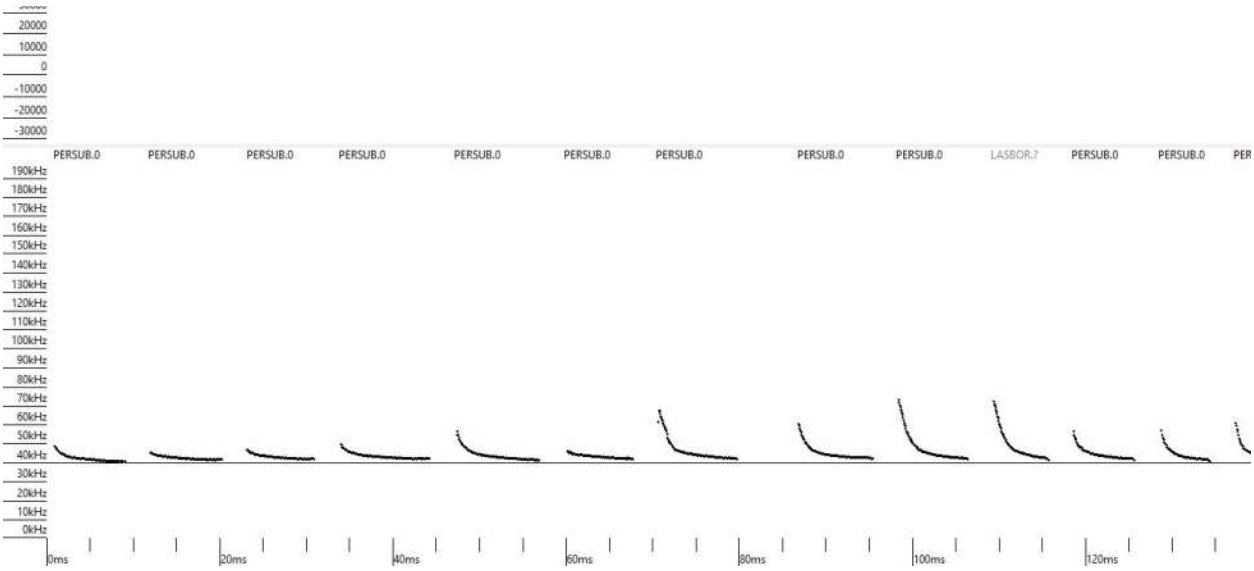



**Figure A38. Representative photo of a PESU call from the detector at acoustic site AS-12.** Calls exhibit low, "flat" slopes consistently at or just above 40 kHz. This screen capture shows the calls in compressed-time view.

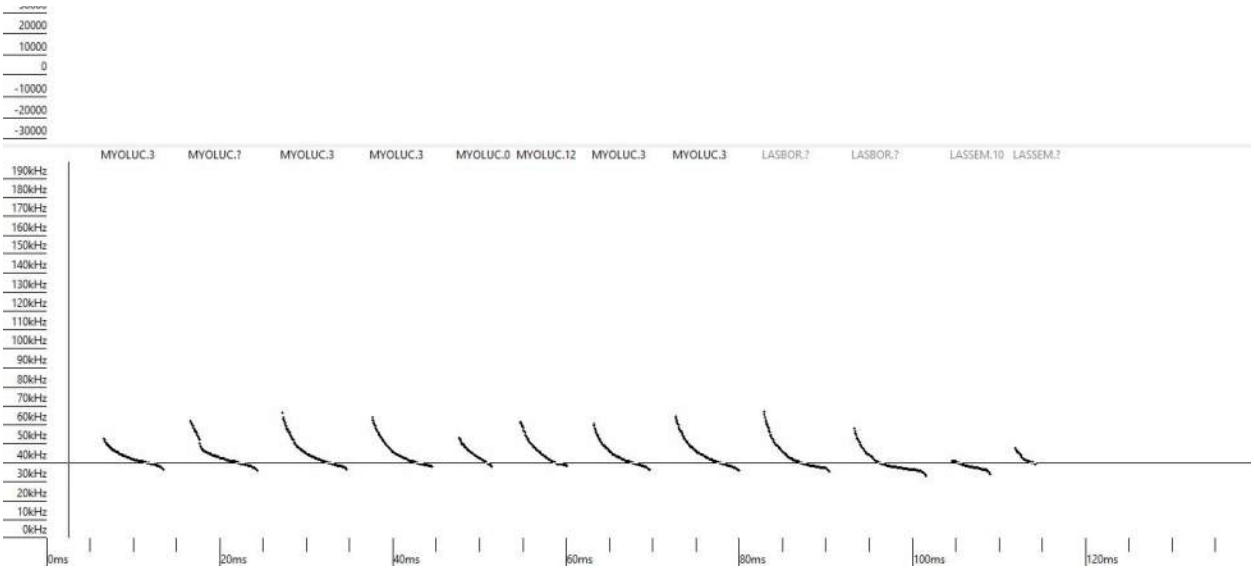



**Figure A39. Representative photo of a MYLU call from acoustic site AS-19, detector A.** Note the search phase call shows characteristic frequencies (Fc) consistently between 38-39 kHz, inflections, and call durations greater than 7 milliseconds. This screen capture shows the calls in compressed-time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

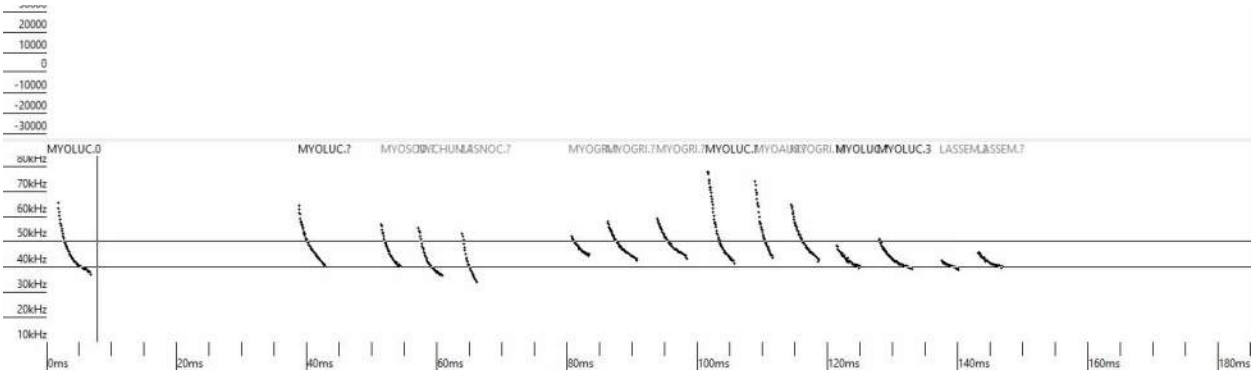



**Figure A40. Representative photo of a call auto identified as a MYLU call but deemed to be a LABO upon qualitative analysis.** Note the clear undulations, the rise and fall of the frequencies which is not consistent with MYLU call characteristics. This screen capture shows the calls in compressed-time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

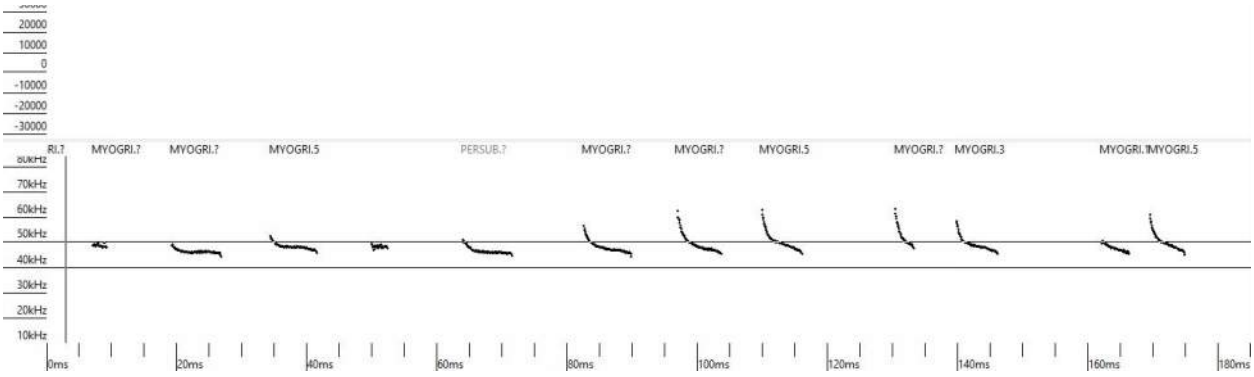



**Figure A41. Representative photo of a MYGR call from acoustic site AS-36, detector B.** Note how the call exhibits consistent Fc>44 KHz with durations near five (5) milliseconds, and a sigmoidal curve with inflections at 50 kHz. This screen capture shows the calls in compressed-time view.

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


***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 |

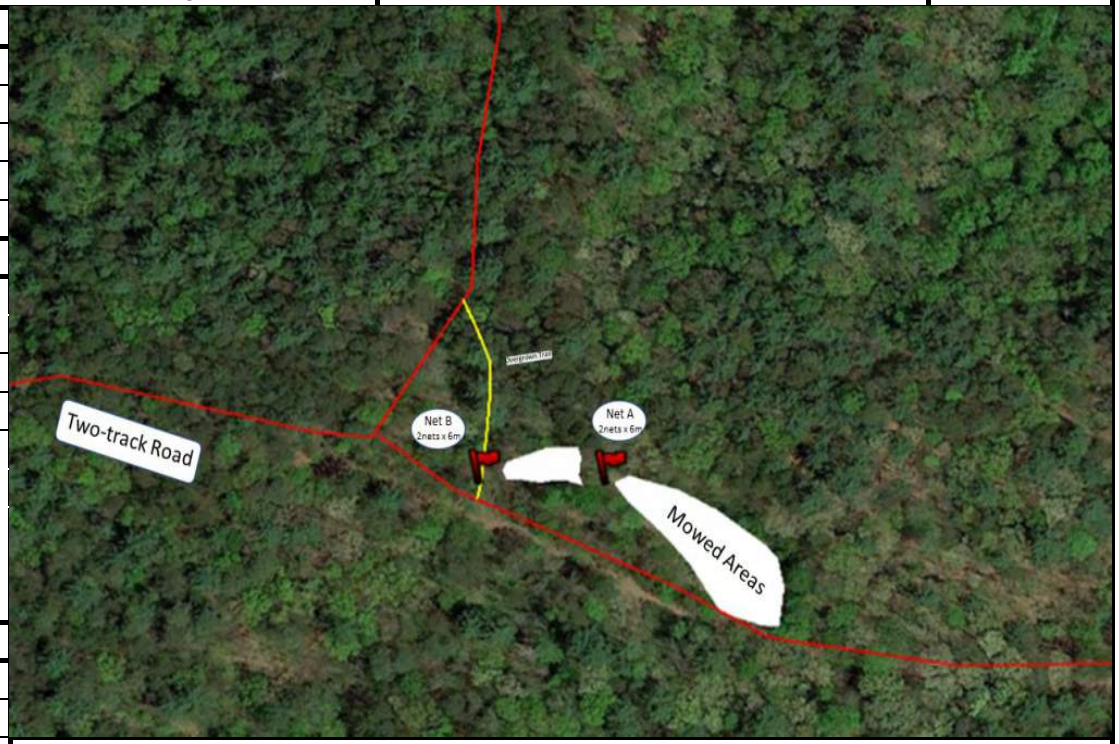
*Acer saccharum*

*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 | |
| | | | | | | | | | | | | | | | |
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# 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 |
| | | | | | | | | | | | | | | | |
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# 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 |

| 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*

**Site Sketch** ↑N


**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 | |
| | | | | | | | | | | | | | | | |
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# 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 |
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# 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 |

**Site Sketch** ↑N


| **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*

**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 |
| | | | | | | | | | | | | | | | |
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# 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 |
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# 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* | | | | | | | | | | | |
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# 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 |
| | | | | | | | | | | | | | | | |
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# 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

| 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 | |
| | | | | |
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| 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 | | |
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| 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 |
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# 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 |
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# 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 | | |
| | | | | | | | | |
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| 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 | |
| | | | | |
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| 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 |
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# 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 |

| **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.*

**Site Sketch** ↑N


**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 |
| | | | | | | | | | | | | | | | |
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# 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) |
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# 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. |

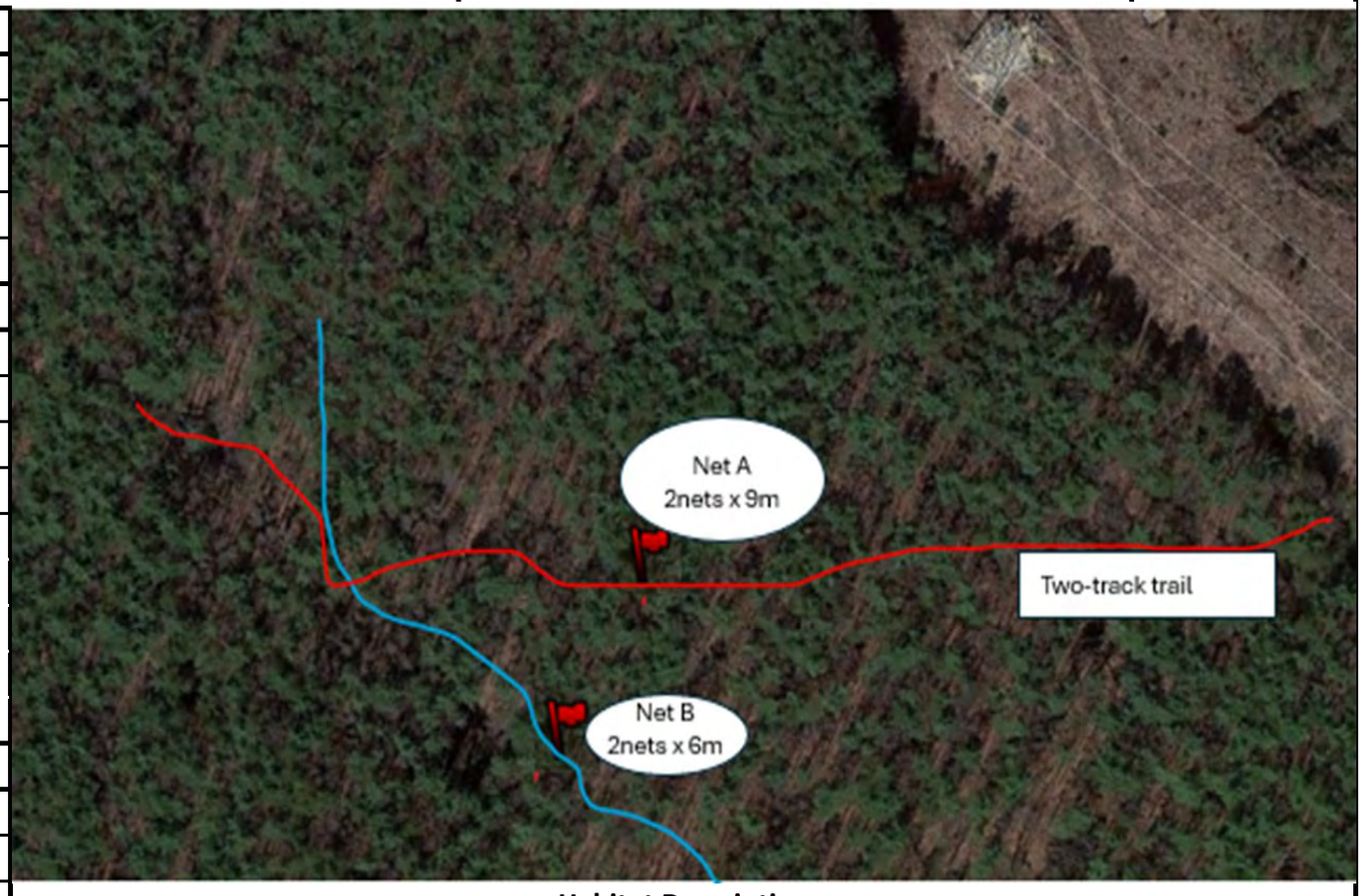
| Water Source | |
|---|---|
| **Type:** | Stream |
| **Distance (m):** | 10 |

| 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 | |
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# 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 | |
| | | | | |
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| 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 |
| | | | | | | | | | | | | | | | |
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# 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 |

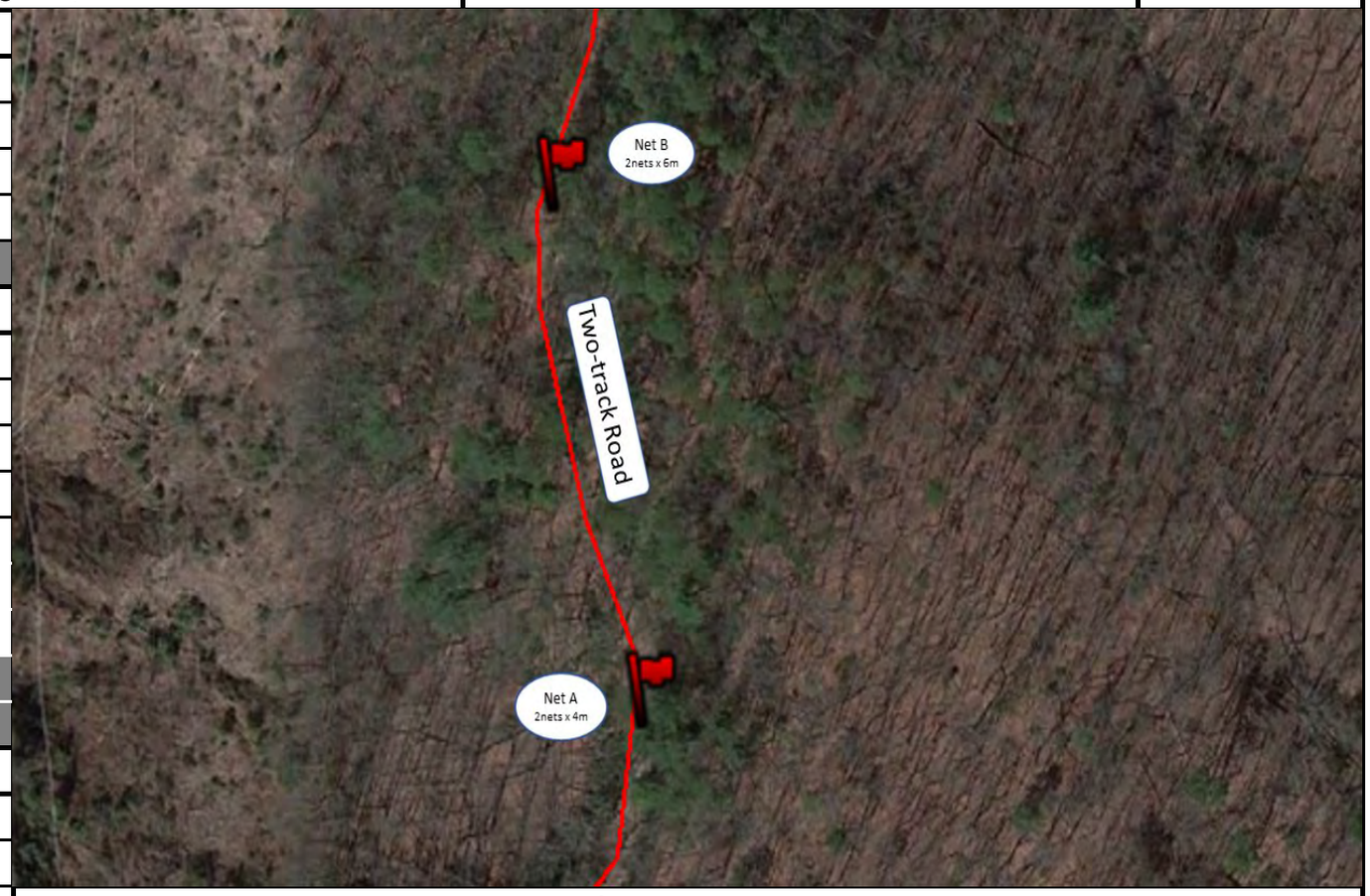
# HABITAT DESCRIPTION

| 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 | |
|---|---|
| **Rank:** | High |
| **Roost Type(s):** | Dead |
| **Description:** | Scattered snags along road, inbetween nets |

| Water Source | | |
|---|---|---|
| | **Type:** | Other |
| | **Distance (m):** | 800 |

**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 | |
| | | | | | | | | | | | | | | | |
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# 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 | | |
| | | | | | | | | |
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| 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 |
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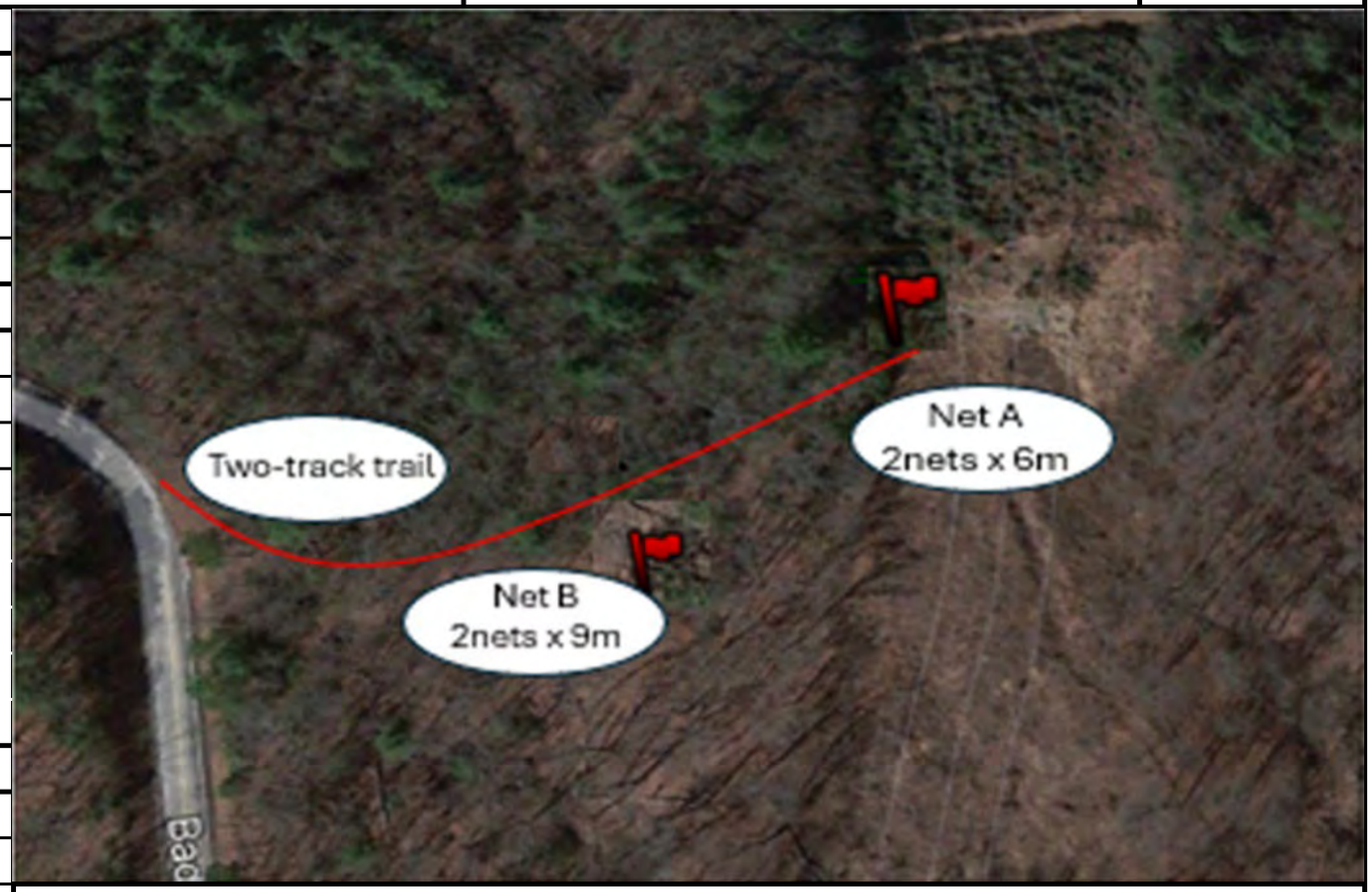
# HABITAT DESCRIPTION

| 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 |

**Site Sketch** ↑N




| 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*

**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 Decimals) | 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 (°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 | 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 | |
| | | | | | | | | | | | | | | | |
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# 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 |
| | | | | | | | | | | | | | | | |
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# 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 | | |
| | | | | | | | | |
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| 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 | |
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# 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 | | |
| | | | | | | | | |
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| 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 | |
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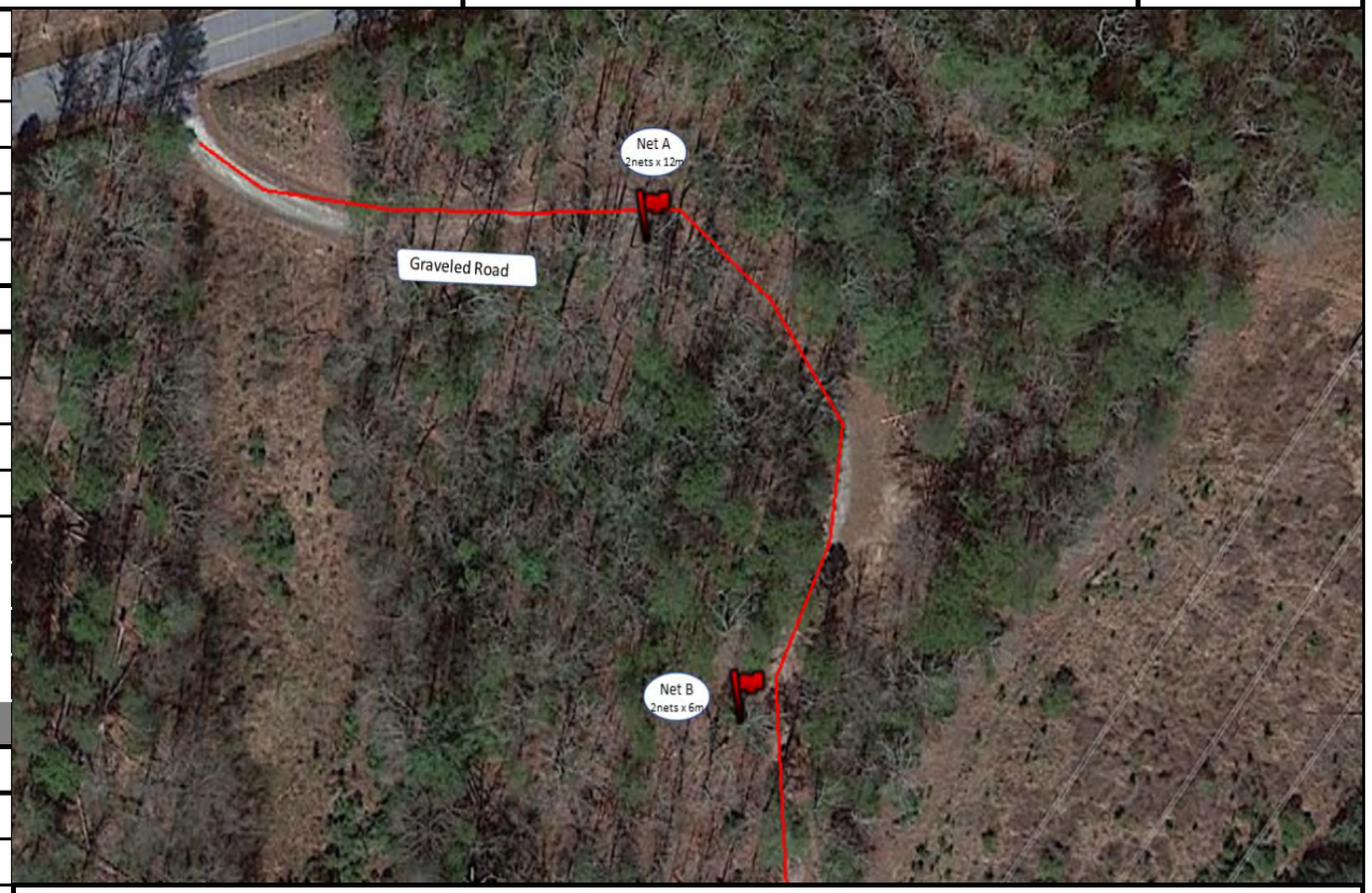
# HABITAT DESCRIPTION

| 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 | | Water Source | Type: | Other |
|---|---|---|---|---|
| **Rank:** | Moderate | | **Distance (m):** | 200 |
| **Roost Type(s):** | Dead | **Site Sketch** | | ↑N |
| **Description:** | A few dead conifers around site | | | |




| 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 |
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# 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 | | |
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| 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 |
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# 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 | | |
| | | | | | | | | |
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| 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 |
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# 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 | |
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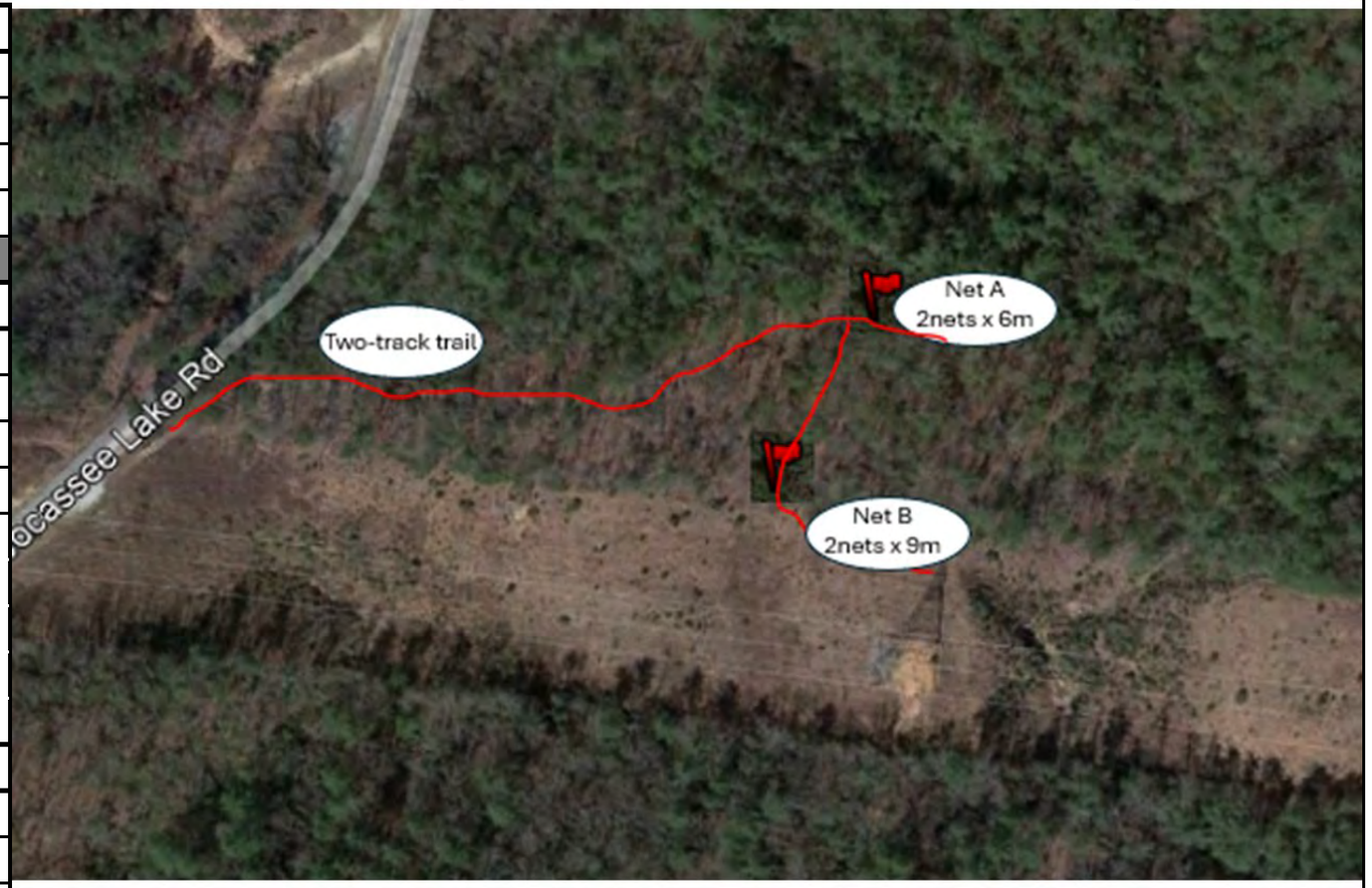
# HABITAT DESCRIPTION

| 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 |
| | | | | | | | | | | | | | | | |
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# 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 |
| | | | | | | | | | | | | | | | |
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# 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* | |
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# 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*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9045 | Endangered |
| Tricolored Bat *Perimyotis subflavus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/10515 | Proposed Endangered |

## INSECTS

| NAME | STATUS |
|---|---|
| Monarch Butterfly *Danaus plexippus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9743 | Candidate |

## FLOWERING PLANTS

| NAME | STATUS |
|---|---|
| Small Whorled Pogonia *Isotria medeoloides*<br>Population:<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/1890 | Threatened |
| Smooth Coneflower *Echinacea laevigata*<br>No critical habitat has been designated for this species.<br>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*<br>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.<br>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.

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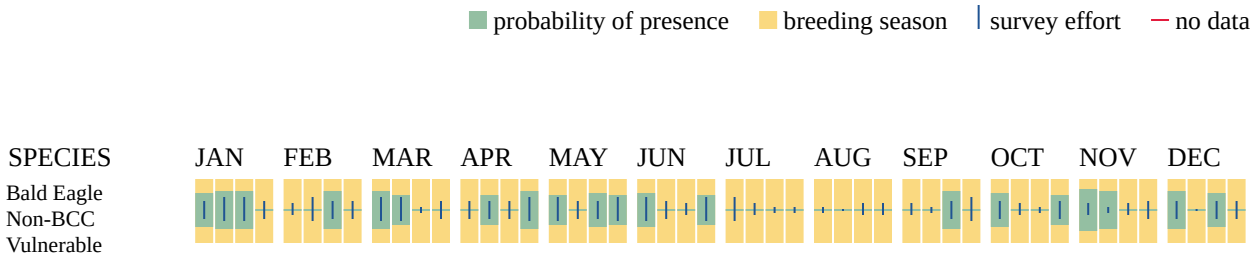



Additional information can be found using the following links:

- 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*<br>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.<br>https://ecos.fws.gov/ecp/species/1626 | Breeds Sep 1 to Aug 31 |
| Bobolink *Dolichonyx oryzivorus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9454 | Breeds May 20 to Jul 31 |
| Canada Warbler *Cardellina canadensis*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9643 | Breeds May 20 to Aug 10 |
| Chimney Swift *Chaetura pelagica*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9406 | Breeds Mar 15 to Aug 25 |
| Chuck-will's-widow *Antrostomus carolinensis*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA<br>https://ecos.fws.gov/ecp/species/9604 | Breeds May 10 to Jul 10 |
| Eastern Whip-poor-will *Antrostomus vociferus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/10678 | Breeds May 1 to Aug 20 |
| Golden-winged Warbler *Vermivora chrysoptera*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/8745 | Breeds May 1 to Jul 20 |
| Prothonotary Warbler *Protonotaria citrea*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9439 | Breeds Apr 1 to Jul 31 |
| Red-headed Woodpecker *Melanerpes erythrocephalus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9398 | Breeds May 10 to Sep 10 |

| NAME | BREEDING SEASON |
|---|---|
| Wood Thrush *Hylocichla mustelina*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>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.

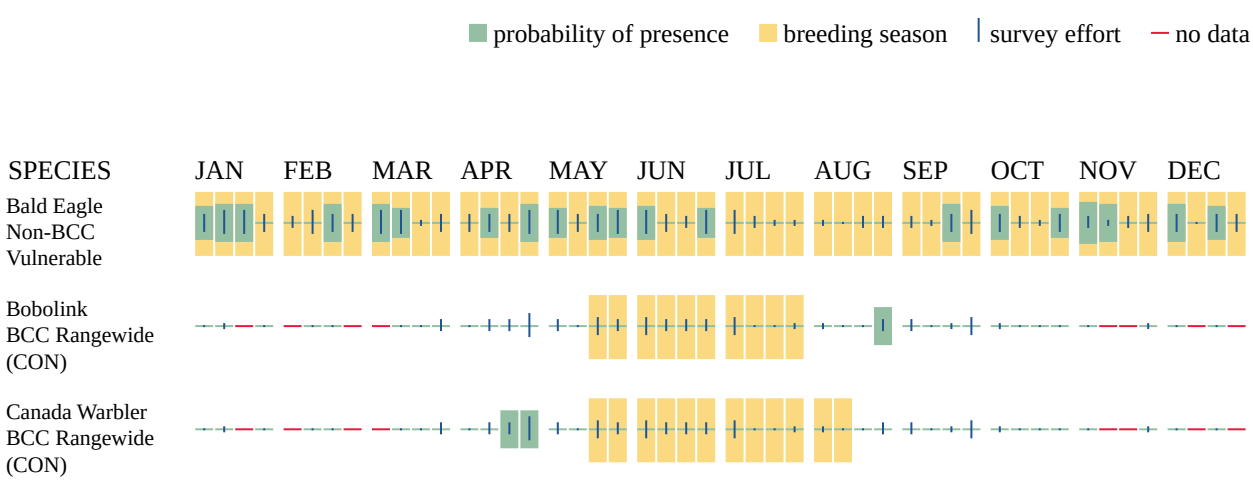
**Probability of Presence** (■)

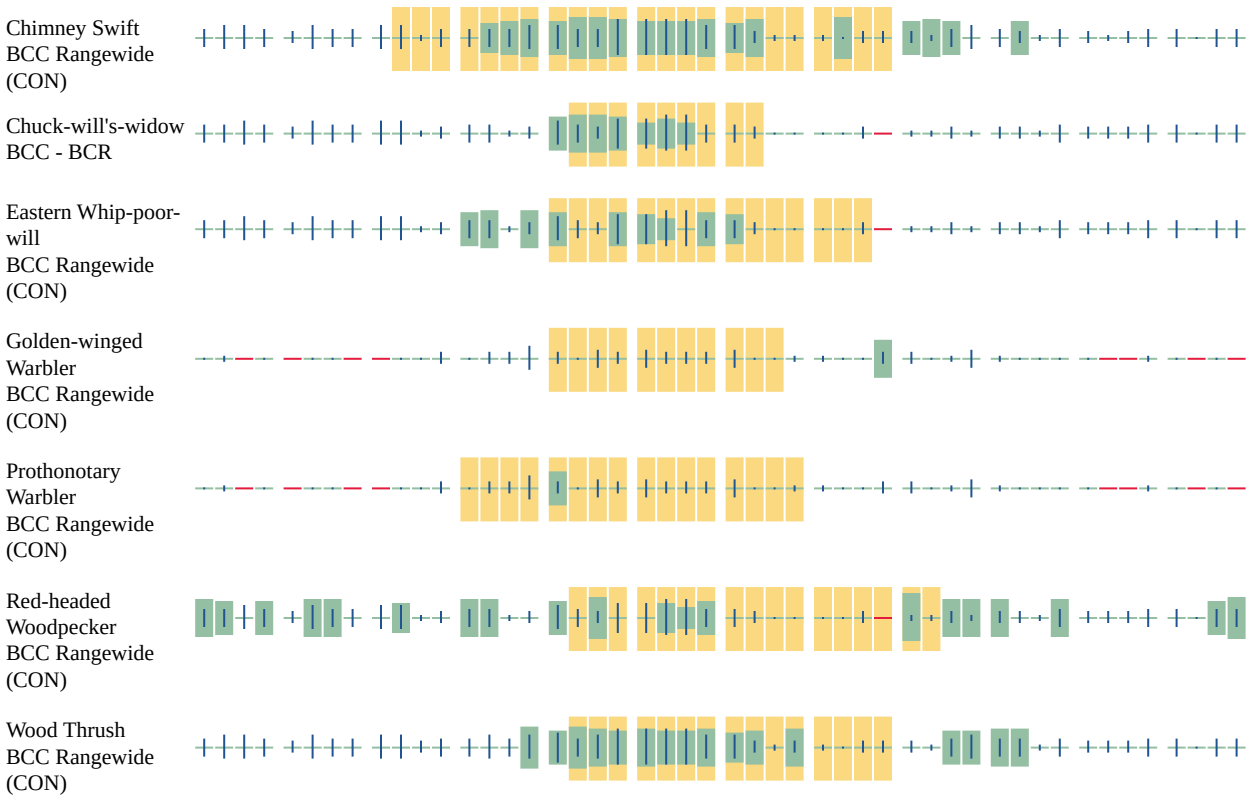
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

**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
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

*206*

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
City: Charlotte
State: NC
Zip: 28202
Email eric.mularski@hdrinc.com
Phone: 7049736878

# 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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**Dylan Brooks**
dylan.biotope@gmail.com
**(828) 507-5523**

# 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

**Dylan Brooks**
dylan.biotope@gmail.com
**(828) 507-5523**

## 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.

**Dylan Brooks**
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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

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# Eli Corwin

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## 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

## 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

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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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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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# 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

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# Attachment 4

Attachment 4 – Small Whorled Pogonia Report

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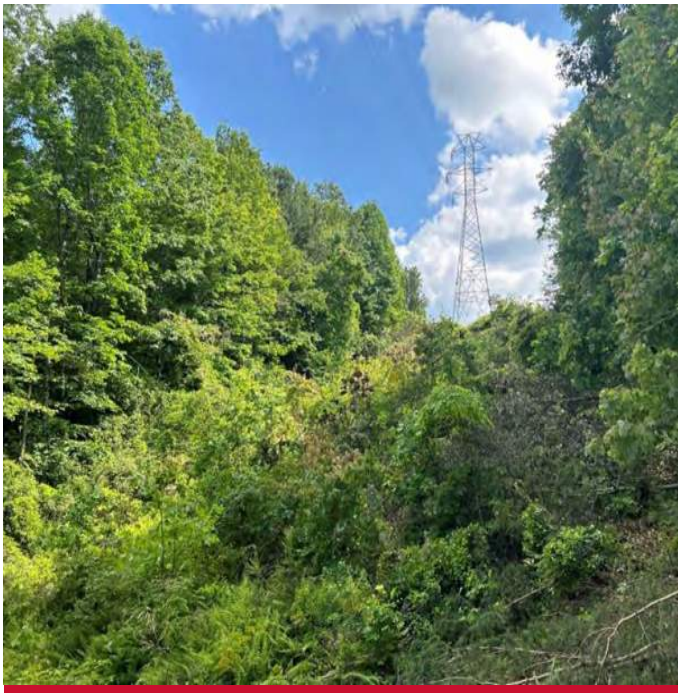

# Small Whorled Pogonia Survey Report

Bad Creek Pumped Storage Project

FERC Project No. 2740

*Oconee County, South Carolina*

September 19, 2024

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# Contents



# Figures



# Appendices

# Acronyms and Abbreviations

| | |
|---|---|
| Bad Creek II | Bad Creek II Power Complex |
| Bad Creek or Project | Bad Creek Pumped Storage Project |
| Duke Energy | Duke Energy Carolinas, LLC |
| ILP | Integrated Licensing Process |
| SCDNR | South Carolina Department of Natural Resources |
| SWAP | South Carolina Wildlife Action Plan |
| USFWS | U.S. Fish and Wildlife Survey |
| USACE | U.S. Army Corps of Engineers |

# 1 Introduction

Duke Energy Carolinas, LLC (Duke Energy) is the owner and operator of the 1,400-megawatt Bad Creek Pumped Storage Project (Project; Federal Energy Regulatory Commission [FERC] Project No. 2740) located in Oconee County, South Carolina. The existing (original) license for the Project was issued by the Commission for a 50-year term, with an effective date of August 1, 1977, and expires July 31, 2027, therefore, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP) (18 Code of Federal Regulations Part 5). An alternative relicensing proposal presently being evaluated by Duke Energy is the construction of a second 1,400-megawatt power complex (Bad Creek II Power Complex; Bad Creek II) adjacent to the existing Project to increase renewable pumping and generating capacity at the Project.

In response to a written request from the South Carolina Department of Natural Resources (SCDNR) in comments submitted to the Commission on the Initial Study Report (Duke Energy 2024) and to support Endangered Species Act Compliance for Clean Water Act Section 404, U.S. Army Corps of Engineers (USACE) permitting, Duke Energy contracted HDR to survey for the federally threatened small whorled pogonia (*Isotria medeoloides*) during the appropriate survey window (mid-May through early July)[1] as detailed in the Small Whorled Pogonia Study Plan, which was developed in collaboration with the SCDNR and filed with the fifth ILP Study Progress Report on June 28, 2024.

The SCDNR Natural Heritage Trust Program, which documents and tracks element of occurrence data for rare, threatened, and endangered species (both federal and state) indicates no record of the small whorled pogonia within a 2-mile of radius of the Project (SCNHP 2023), however, this species is listed by the U.S. Fish and Wildlife Survey (USFWS) (Information for Planning and Consultation [IPaC] species list; **Appendix A**) as having the potential to occur in the project vicinity, therefore surveys were conducted to determine the presence or absence of this protected species prior to land disturbance activities associated with the construction of Bad Creek II. This survey was also carried out to aid in the quality and comprehensiveness of the statewide dataset for rare, threatened, and endangered species and record incidental observations of priority plant species identified in the South Carolina Wildlife Action Plan (SWAP) during the survey.

This document provides an overview of the approach and results of the small whorled pogonia survey.

# 2 Study Area Overview

The Study Area included lands that will be potentially impacted by the construction of Bad Creek II and associated infrastructure including the proposed spoil area locations, Fisher Knob access road, and the Bad Creek 100kV Transmission Line access roads (Figure 1).

[1] A Natural Resources Survey was carried out by Duke Energy in 2021 and indicated that suitable habitat for the small whorled pogonia was present at the site, however, the study was performed outside of the survey window. The Natural Resources Survey was filed with the Pre-Application Document in February, 2023.

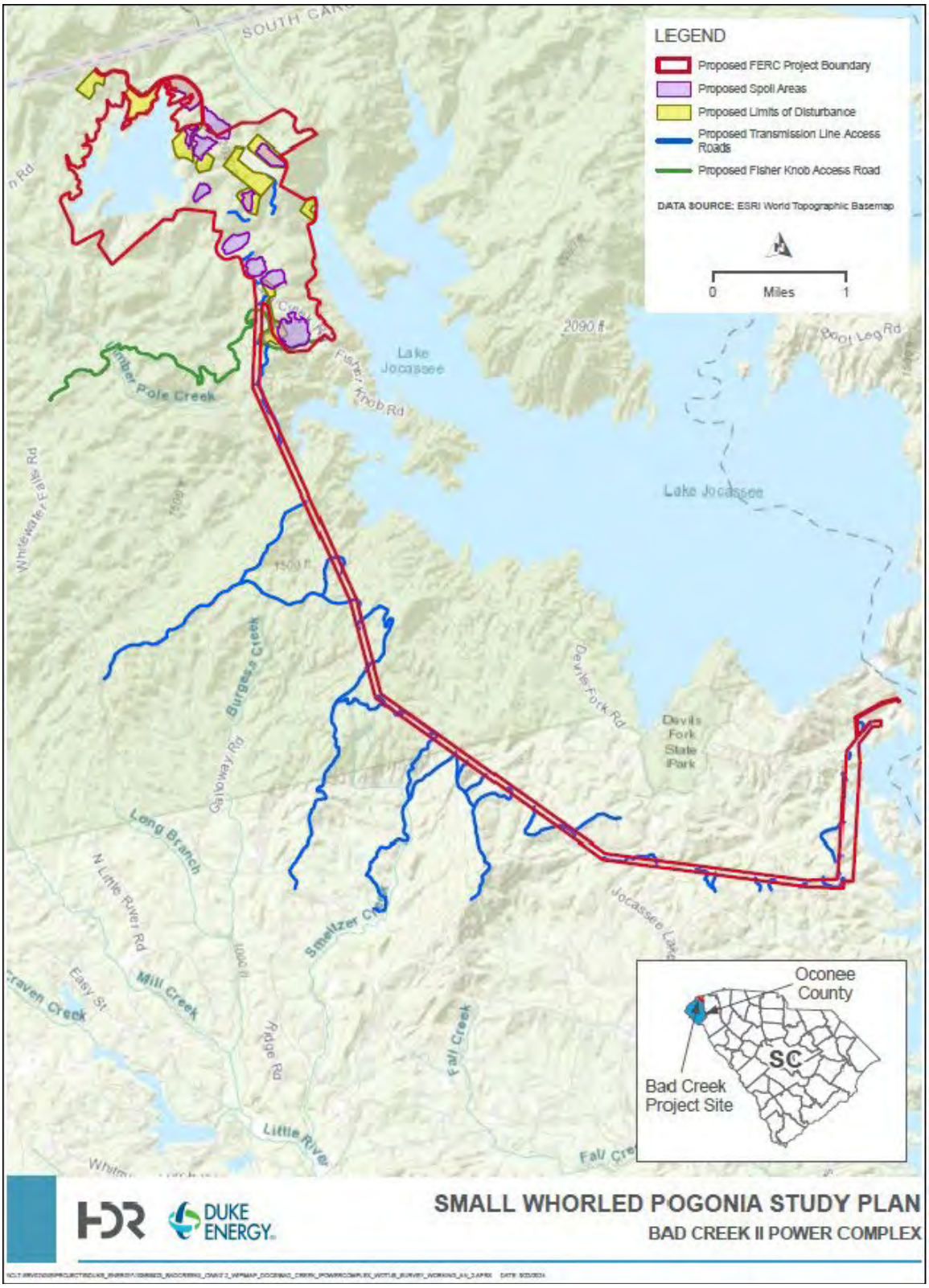


**Figure 1. Bad Creek Site Vicinity with Proposed Locations of Spoil Areas and Transmission Line Access Roads**

The Study Area is situated in the Southern Crystalline Ridges and Mountains ecoregion, which is the larger Level III Blude Ridge ecoregion of South Carolina. The Blue Ridge ecoregion is a narrow strip of mountainous ridges to hilly plateaus which transition to more massive mountainous areas with high peaks. The Southern Crystalline Ridges and Mountains region is a rough, dissected region with elevations between 1,200 – 4,500 feet above sea level (Griffith et al. 2002).

# 3 Small Whorled Pogonia Overview

## 3.1 Species Description

The small whorled pogonia is a perennial orchid that produces a smooth, hollow stem ranging from 2 to 14 inches tall and topped by five to six leaves in circular arrangement (false whorl). One or two flowers stand in the center of the whorl of leaves. The leaves are milky-green or grayish-green, and the flower is yellowish-green with a greenish-white lip (USFWS 2024). Flowers appear soon after the plants emerge in mid-May or June. This species is non-clonal, and plants may emerge each spring or they may remain vegetatively dormant and below the ground for one to several years. Each plant typically produces only one, rarely more than one, overwintering bud per year (USFWS 2022).

## 3.2 Habitat

The small whorled pogonia occurs in both young and mature mixed-deciduous or mixed-deciduous/coniferous forests. Sometimes it grows in stands of softwoods with a thick layer of dead leaves, often on slopes near small streams. The species may also be found on dry, rocky, wooded slopes; moist slopes; ravines lacking stream channels; or slope bases near braided channels of vernal streams. The orchid, often limited by shade, requires small light gaps or canopy breaks, and typically grows under canopies that are relatively open or near features like logging roads or streams that create long-persisting breaks in the forest canopy. It prefers acidic soils with a thick layer of dead leaved and sparse to moderate ground cover (USFWS 2024).

## 3.3 Natural Vegetative Community Types

The Study Area supports a wide diversity of flora and fauna due to highly varied topography and climatic conditions. Resources used to identify and categorize vegetative community types within the Study Area included the Ecological Zones in the Southern Blue Ridge Escarpment 4th Approximation (Simon 2015) and the Natural Communities of South Carolina Initial Classification and Description (Nelson 1986). The NatureServe community classification system (NatureServe 2013) was used to identify and categorize vegetative community types within the Study Area. Terminology in the Ecological Zones in the Southern Blue Ridge Escarpment was also used to describe the terrestrial habitats within the Study Area. Ecological groups and community types that were identified within the Study Area included Shortleaf Pine-Oak Forest and Woodland, Montane Oak-Hickory Forest, Cove Forest, and Floodplain Forest.

**Shortleaf Pine-Oak Forest and Woodland**

This habitat type is characterized by shortleaf pine (*Pinus echinate*) and oak dominated forested areas on exposed ridges and sideslopes (Simon 2015). Dominant tree canopy cover observed included white oak (*Quercus alba*), southern red oak (*Quercus falcata*), northern red oak (*Quercus rubra*), chestnut oak (*Quercus montana*), mockernut hickory (*Carya tomentosa*), tulip poplar

(*Liriodendron tulipifera*), white pine (*Pinus strobus*), sugar maple (*Acer saccharum*), eastern hemlock (*Tsuga canadensis*), loblolly pine (*Pinus taeda*), and sourwood (*Oxydendrum arboreum*). Sapling and shrubs consist of similar canopy species as well as American holly (*Ilex opaca*), buffalo-nut (*Pyrularia pubera*), lowbush blueberry *(Vaccinium angustifolium*), mountain laurel (*Kalmia latifolia*), rhododendron (*Rhododendron maximum*), Fraser magnolia (*Magnolia fraseri*), American witch-hazel (*Hamamelis virginiana*), black oak (*Quercus velutina*), and sassafras (*Sassafras albium)*. Herbaceous and vine species consisted of running cedar (*Lycopodium digitatum*), striped wintergreen (*Chimaphila maculata*), Christmas fern (*Polystichum acrostichoides*) and muscadine grape *(Vitis rotundifolia).*

**Mixed Oak/Rhododendron Forest**

This habitat type is characterized by rhododendron-dominated thickets found on mountains and upper piedmont with sparse herbaceous cover. Dominant species observed for this habitat type included northern red oak, shortleaf pine, mountain laurel, rhododendron, eastern hemlock, white pine, sourwood, red maple (*Acer rubrum*), and black gum (*Nyssa sylvatica*).

**Montane Oak-Hickory Forest (Cove and Slope)**

This habitat type is characterized by a mix of hardwood tree species on lower elevations within mountains and upland slopes between rivers and headwater tributaries. Dominant tree species observed for this habitat type included northern red oak, chestnut oak, pignut hickory (*Carya glabra*), white pine, red maple, tulip poplar, mountain laurel, sourwood, black gum, magnolia, and low bush blueberry.

**Acidic Cove Forest**

This habitat type is characterized by hemlock and mixed hardwood-conifer forests, typically dominated by an evergreen understory occurring in narrow coves (ravines) and extending to adjacent protected, north-facing slopes (Simon 2015). Dominant tree species observed for this habitat type consisted of red maple, sweetgum (*Liquidambar styraciflua*), black gum, eastern hemlock, rhododendron, tulip poplar, sourwood, chestnut oak, sweet birch (*Betula lenta*), and green ash (*Fraxinus pennsylvanica*). Shrubs consist of mountain doghobble (*Leucothoe fontanesiana*), buffalo-nut, witch hazel, elderberry (*Sambucus nigra*), Fraser magnolia, American snowbell (*Styrax americanus*), and pawpaw (*Asimina triloba*). The herbaceous and vine layer is dominated by Galax (*Galax urceolata*), wild hydrangea (*Hydrangea arborescens*), Jack-in-the-pulpit (*Arisaema triphyllum*), jewelweed (*Impatiens capensis*), Indian cucumber (*Medeola virginiana*), violets (*Viola* spp.), Christmas fern, sedges (*Carex* spp.), and Virginia creeper (*Parthenocissus quinquefolia*).

**Floodplain Forest**

This habitat type is found in regularly or seasonally flooded areas adjacent to river systems with a diverse herbaceous cover. Dominant trees consisted of white oak, sweetgum, red maple, eastern hemlock, sourwood, red oak, and American sycamore (*Platanus occidentalis*). The shrub and vine layer consists of pawpaw, alders (*Alnus* spp.), and muscadine. The herbaceous layer consists of New York fern (*Parathelypteris noveboracencis*), Indian cucumber, Hartweg's wild ginger (*Asarum* hartwegii), running cedar) partridge berry (*Mitchella repens*), sedge, Christmas fern, jewelweed (*Impatiens capensis*), and nettled chain fern (*Woodwardia areolata*).

Plants identified in the study area during the field investigation were classified into their appropriate category as tree, shrub, herb or vine and are provided in **Appendix B**.

# 4 Survey Methods

Before fieldwork began, a desktop review of existing site information was conducted to aid in identifying potential small whorled pogonia habitat in the Study Area. Information evaluated during the desktop review included existing vegetation patterns, topography, drainage, and potential or known SWAP priority plants (SCDNR 2015) in the vicinity of the study area.

Surveys were conducted during the USFWS recommended optimal survey window of mid-May – early July. Areas were surveyed along the 50-foot-wide buffer of the proposed temporary Fisher Knob access road and within the proposed limits of disturbance and spoil area alternatives, as well as along proposed transmission line access roads related to the Bad Creek II Power Complex proposed infrastructure (Figure 1).

Survey areas were visually delineated by local topography (ravines, slopes, benches) or by landmarks (boulders, downed or otherwise conspicuous trees, or old roads) (USFWS 2016). The survey methodology consisted of slowly traversing back and forth across transects; surveyors were spaced approximately 25-feet apart focusing the immediate area within a 10-to-15-foot radius depending on habitat type and visibility. Handheld Global Positioning System (GPS) units were used to navigate throughout the site to avoid survey gaps.

Vegetation cover type and specific habitats/substrates were noted by surveyors and photographed. A detailed photo log is included in **Appendix C**. Applicable reference materials were used during the field assessments including regional field guides and plant identification mobile apps to identify plants to genus and species level. Surveyors were aware that no small whorled pogonia voucher specimens were to be collected, and any plant locations were considered to be “Privileged Non-Public Information”. Additionally, field biologists recorded incidental observations of priority plant species identified on the South Carolina SWAP list that may occur in the Blue Ridge Ecoregion; this list is provided in **Appendix D**.

# 5 Survey Results and Conclusions

No small whorled pogonia was identified during the 2024 surveys[2], and no species on the SWAP list were observed. Several individuals of the *Trillium* genus were identified, including potential for the southern nodding trillium (*Trillium rugelii*, a SWAP species), but could not be classified to the species level since the survey was conducted outside of the survey window. Potential habitat for the small whorled pogonia was observed in all study areas.

The species inventory is based on the best professional judgment of HDR’s team of biologists with experience in plant identification in the Blue Ridge ecoregion. Surveyor qualifications are provided in **Appendix E**. Further evaluation of rare, threatened, and endangered plants, and potential jurisdiction may be necessary if additional guidance, status changes, or further rulemaking are provided from the USACE, USFWS, and SCDNR. Documentation of consultation with resource agencies and other relicensing stakeholders is included in **Appendix F**. In association with the Draft License Application (scheduled for completion in February 2025), Duke Energy will consult with USFWS,

[2] Small whorled pogonia surveys were carried out in 2024 as follows: June 3-5 for the proposed Fisher Knob Access Road and transmission line access roads, and intermittently between late May and July 2024 for potential spoil areas and the general proposed limits of disturbance for Bad Creek II construction.

SCDNR, and the Wildlife and Botanical Resources Committee on the need to prepare a Species Protection Plan specific to small whorled pogonia or other special status plant species and communities. If required and as applicable, the Species Protection Plan may include, among other identified protection measures, provisions for future surveys.

# 6 References

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U.S. Fish and Wildlife Service (USFWS). 2016. Small Whorled Pogonia (*Isotria medeoloides*) Survey Protocol for Maine. Small Whorled Pogonia Survey Protocol for Maine | FWS.gov. Accessed May 16, 2024.

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# Appendix A

## Appendix A – Threatened and Endangered Species List

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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: 08/14/2024 14:47:17 UTC
Project Code: 2024-0130237
Project Name: Bad Creek Relicensing

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: 2024-0130237
Project Name: Bad Creek Relicensing
Project Type: Power Gen - Hydropower - FERC
Project Description: hydro relicensing
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@34.979103800000004,-82.99510223504396,14z


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.

---

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*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9045 | Endangered |
| Tricolored Bat *Perimyotis subflavus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/10515 | Proposed Endangered |

## INSECTS

| NAME | STATUS |
|---|---|
| Monarch Butterfly *Danaus plexippus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9743 | Candidate |

## FLOWERING PLANTS

| NAME | STATUS |
|---|---|
| Small Whorled Pogonia *Isotria medeoloides*<br>Population:<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/1890 | Threatened |
| Smooth Coneflower *Echinacea laevigata*<br>No critical habitat has been designated for this species.<br>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*<br>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.<br>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.

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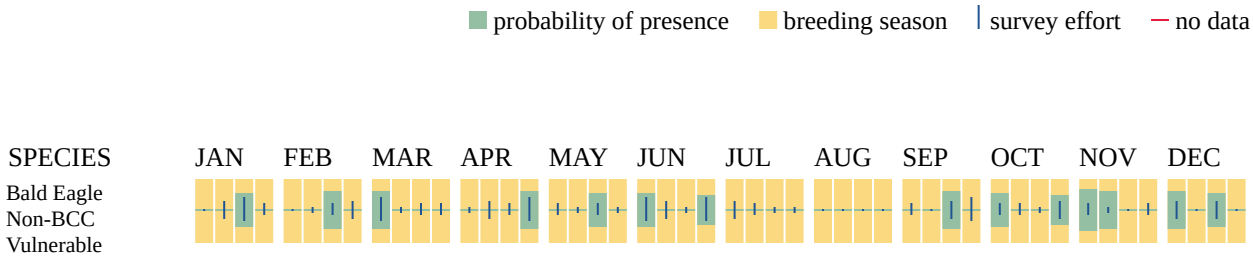


Additional information can be found using the following links:

- 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".

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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*<br>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.<br>https://ecos.fws.gov/ecp/species/1626 | Breeds Sep 1 to Aug 31 |
| Bobolink *Dolichonyx oryzivorus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9454 | Breeds May 20 to Jul 31 |
| Canada Warbler *Cardellina canadensis*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9643 | Breeds May 20 to Aug 10 |
| Cerulean Warbler *Setophaga cerulea*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/2974 | Breeds Apr 27 to Jul 20 |
| Chimney Swift *Chaetura pelagica*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9406 | Breeds Mar 15 to Aug 25 |
| Chuck-will's-widow *Antrostomus carolinensis*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA<br>https://ecos.fws.gov/ecp/species/9604 | Breeds May 10 to Jul 10 |
| Eastern Whip-poor-will *Antrostomus vociferus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/10678 | Breeds May 1 to Aug 20 |
| Golden-winged Warbler *Vermivora chrysoptera*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/8745 | Breeds May 1 to Jul 20 |
| Kentucky Warbler *Geothlypis formosa*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9443 | Breeds Apr 20 to Aug 20 |

| NAME | BREEDING SEASON |
|---|---|
| Prairie Warbler *Setophaga discolor*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9513 | Breeds May 1 to Jul 31 |
| Prothonotary Warbler *Protonotaria citrea*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9439 | Breeds Apr 1 to Jul 31 |
| Red-headed Woodpecker *Melanerpes erythrocephalus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9398 | Breeds May 10 to Sep 10 |
| Wood Thrush *Hylocichla mustelina*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>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.

■ probability of presence ■ breeding season | survey effort – no data


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.

WETLAND INFORMATION WAS NOT AVAILABLE WHEN THIS SPECIES LIST WAS GENERATED. PLEASE VISIT HTTPS://WWW.FWS.GOV/WETLANDS/DATA/MAPPER.HTML OR CONTACT THE FIELD OFFICE FOR FURTHER INFORMATION.

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# Appendix B

## Appendix B – Identified Plants List

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# Identified Plants List

| | Genus Species | Common Name |
|---|---|---|
| ***Trees*** | *Acer rubrum* | Red Maple |
| | *Albizia julibrissin* | Silktree |
| | *Asimina triloba* | Common Paw Paw |
| | *Betula lenta* | Sweet Birch |
| | *Carya glabra* | Pignut Hickory |
| | *Carya tomentosa* | Mockernut Hickory |
| | *Diospyros virginiana* | Persimmon |
| | *Fraxinus pennsylvanica* | Green Ash |
| | *Hamamelis virginiana* | American Witchhazel |
| | *Ilex opaca* | American Holly |
| | *Juniperus virginiana* | Eastern Red-Cedar |
| | *Kalmia latifolia* | Mountain Laurel |
| | *Liquidambar styraciflua* | Sweetgum |
| | *Liriodendron tulipifera* | Tulip Poplar |
| | *Magnolia frasier* | Fraser Magnolia |
| | *Nyssa sylvatica* | Black Tupelo |
| | *Oxydendron arboreum* | Sourwood |
| | *Pinus echinata* | Shortleaf Pine |
| | *Pinus strobus* | White Pine |
| | *Pinus taeda* | Loblolly Pine |
| | *Platanus occidentalis* | American Sycamore |
| | *Prunus serotina* | Black Cherry |
| | *Quercus alba* | White Oak |
| | *Quercus falcata* | Southern Red Oak |
| | *Quercus montana* | Chestnut Oak |
| | *Quercus rubra* | Northern Red Oak |
| | *Quercus velutina* | Black Oak |
| | *Rhododendron maximum* | Great Laurel |
| | *Robinia pseudoacacia* | Black Locust |
| | *Salix nigra* | Black Willow |
| | *Sassafras albidum* | Sassafras |
| | *Tsuga canadensis* | Eastern Hemlock |
| | | |
| ***Shrubs*** | *Alnus serrulata* | Brookside Alder |
| | *Amelanchier arborea* | Common Serviceberry |
| | *Aralia spinosa* | Devil's Walking Stick |
| | *Elaeagnus umbellata* | Autumn olive |
| | *Epigaea repens* | Trailing Arbutus |
| | *Halesia tetraptera* | Mountain Silverbell |
| | *Leucothoe fontanesiana* | Dog Hobble |
| | *Pyrularia pubera* | Buffalo-nut |
| | *Rhododendron maximum* | Great Laurel |
| | *Rosa multiflora* | Rambler Rose |
| | *Rubus spp.* | Blackberry |
| | *Styrax americanus* | American Snowbell |
| | *Vaccinium spp.* | Blueberry |
| | *Viburnum acerifolium* | Mapleleaf Viburnum |
| | *Xanthorhiza simplicissima* | Shrub Yellowroot |
| | | |

| | Genus Species | Common Name |
|---|---|---|
| ***Herbs*** | *Actaea racemosa* | Black Snakeroot |
| | *Andropogon virginicus* | Broom-Sedge |
| | *Arisaema triphyllum* | Jack-in-the-Pulpit |
| | *Arundinaria appalachiana* | Hill Cane |
| | *Bidens aristosa* | Bearded Beggarticks |
| | *Boehmeria cylindrica* | Small-Spike False Nettle |
| | *Bromus arvensis* | Field Brome |
| | *Cardamine diphylla* | Two-leaved Toothwort |
| | *Carex frankii* | Frank's Sedge |
| | *Carex lurida* | Shallow Sedge |
| | *Carex spp.* | Sedge |
| | *Carex stipata* | Stalk-Grain Sedge |
| | *Chimaphila maculata* | Striped Wintergreen |
| | *Circaea spp.* | Nightshade |
| | *Cladonia rangiferina* | Reindeer lichen |
| | *Clematis virginiana* | Devil's-Darning-Needles |
| | *Cyperus strigosus* | Straw-Color Flat Sedge |
| | *Dichanthelium scoparium* | Broom Rosette Grass |
| | *Diodia teres* | Poorjoe |
| | *Elephantopus tomentosus* | Common Elephant's Foot |
| | *Eupatorium cappilifolium* | Dog Fennel |
| | *Eupatorium perfoliatum* | Common Boneset |
| | *Euphorbia spp.* | Spurge |
| | *Eurybia divaricata* | White Wood-aster |
| | *Galax urceolata* | Galax |
| | *Goodyera pubescens* | Downy Rattlesnake Plantain |
| | *Hexastylis spp.* | Wild Ginger |
| | *Houstonia purpurea* | Summer Bluet |
| | *Hydrangea arborescens* | Wild Hydrangea |
| | *Hylodesmum nudiflorum* | Naked-flowered Tick-Trefoil |
| | *Impatiens capensis* | Spotted Touch-Me-Not |
| | *Iris cristata* | Dwarf Crested Iris |
| | *Juncus effusus* | Lamp Rush |
| | *Juncus tenuis* | Lesser Poverty Rush |
| | *Junus spp.* | Rushes |
| | *Laportea canadensis* | Wood Nettle |
| | *Lespedeza cuneata* | Chinese Bush-Clover |
| | *Lycopodium digitatum* | Running Cedar |
| | *Lycopus uniflorus* | Northern Bugleweed |
| | *Lysimachia quadrifolia* | Whorled Loosestrife |
| | *Maianthemum racemosum* | Solomon's Plume |
| | *Medeola virginiana* | Cucumber Root |
| | *Microstegium vinimum* | Japanese Stiltgrass |
| | *Monarda clinopodia* | White Bergamot |
| | *Murdannia keisak* | Marsh Dewflower |
| | *Nabalus altissimus* | Tall Rattlesnake Root |
| | *Nabalus trifoliolatus* | Three-Leaved Rattlesnake Root |
| | *Onoclea sensibilis* | Sensitive Fern |
| | *Osmunda regalis* | Royal Fern |
| | *Osmundastrum cinnamomeum* | Cinnamon Fern |
| | *Oxalis corniculata* | Creeping Yellow Wood-Sorrel |
| | *Packera anonyma* | Small's Ragwort |

| | Genus Species | Common Name |
|---|---|---|
| | *Parathelypteris noveboracencis* | New York Fern |
| | *Passiflora lutea* | Yellow Passionflower |
| | *Perilla frutescens* | Beefsteakplant |
| | *Persicaria sagittata* | Arrow-Leaf Tearthumb |
| | *Phyrma leptostachya* | American Lopseed |
| | *Polygala polygama* | Racemed Milkwort |
| | *Polystichum arostichoides* | Christmas Fern |
| | *Potentilla canadensis* | Dwarf Cinquefoil |
| | *Pteridium aquilinium* | Common Bracken Fern |
| | *Rubus allegheniensis* | Allegheny Blackberry |
| | *Sceptridium biternatum* | Sparse-lobed Grapefern |
| | *Scirpus cyperinus* | Cottongrass Bulrush |
| | *Schizachyrium scoparium* | Little Bluestem |
| | *Smilax spp.* | Greenbriar |
| | *Solidago altissima* | Tall Goldenrod |
| | *Stellar pubera* | Star Chickweed |
| | *Trifolium repens* | White Clover |
| | *Trillium cuneatum* | Little Sweet Betsy |
| | *Trillium catesbaei* | Bashful Wakerobin |
| | *Trillium spp.* | Trillium species |
| | *Verbesina spp.* | Crownbeard |
| | *Vernonia noveboracensis* | New York Ironweed |
| | *Viola primulifolia* | Primrose-leaved Violet |
| | *Viola spp.* | Violet |
| | *Vulpia spp.* | Grass spp. |
| | *Woodwardia areolata* | Netted Chain Fern |
| | | |
| *Vines* | *Bignonia capreolata* | Crossvine |
| | *Dioscorea villosa* | Wild Yam |
| | *Mitchella repens* | Partridge Berry |
| | *Parthenocissus quiquefolia* | Virginia Creeper |
| | *Toxicodendron radicans* | Poison Ivy |
| | *Vitis rotundifolia* | Muscadine |

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# Appendix C

## Appendix C – Representative Site Photographs

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**Photo 1.** Potential SWP habitat; rocky slope with dappled sunlight (Fisher Knob Access Road)

**Photo 2.** Running cedar *Lycopodium digitatum* (Fisher Knob Access Road)

**Photo 3.** Potential SWP habitat; hardwood forest with dappled sunlight (Fisher Knob Access Road)

**Photo 4.** Potential SWP habitat; dry upland hardwood forest with dappled sunlight


**Photo 5.** Whorled loosestrife *Lysimachia quadrifolia* (Fisher Knob Access Road)

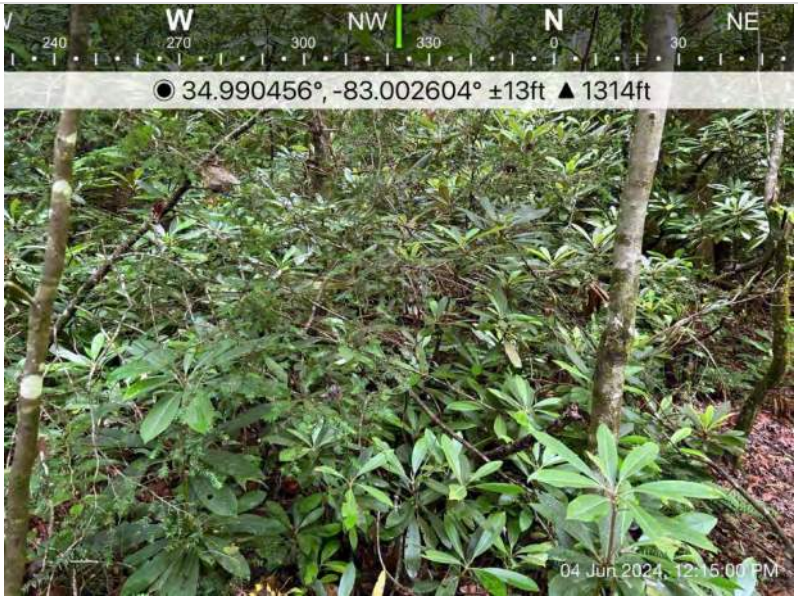


**Photo 6.** Dense rhododendron sp.; not habitat for SWP (Fisher Knob Access Road)


**Photo 7.** *Trillium* sp. (Fisher Knob Access Road)


**Photo 8.** Cove forest adjacent to Howard Creek with dense vegetation; not habitat for SWP (Fisher Knob Access Road)

**Photo 9.** Hemlock, white pine with dense fern/herbaceous layer; not habitat for SWP (Fisher Knob Access Road)

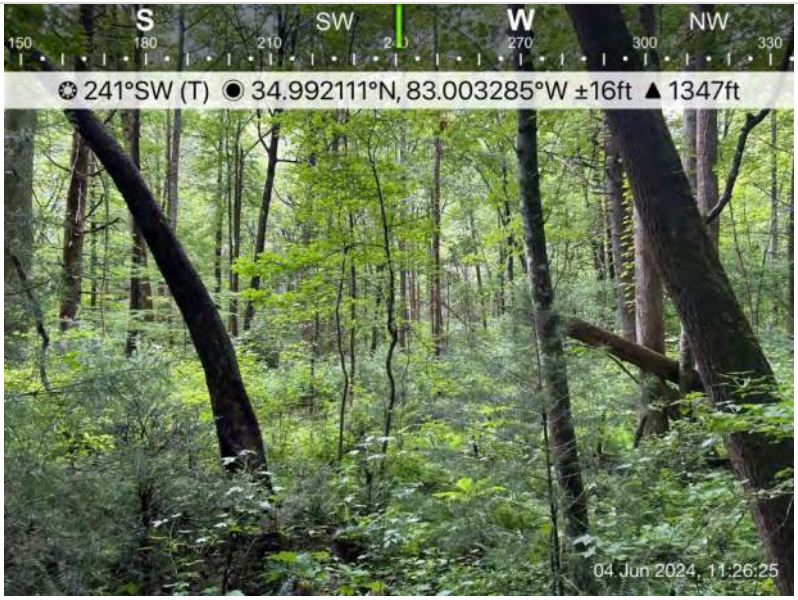


**Photo 10.** Bottomland forest with dense herb and shrub layers; not habitat for SWP (Fisher Knob Access Road)


**Photo 11.** Bashful wakerobin *Trillium catesbaei* (Fisher Knob Access Road)


**Photo 12.** Mixed hardwood forest with herbaceous layer; not habitat for SWP (Fisher Knob Access Road)


**Photo 13.** Forested area with dense understory and herbaceous layers; not habitat for SWP (Fisher Knob Access Road)

**Photo 14.** Potential SWP habitat; upland hardwood forest with dappled sunlight (Fisher Knob Access Road)


**Photo 15.** Potential SWP habitat; hardwood slope (transmission line access roads)


**Photo 16.** Open space along access road; potential habitat for SWP on margins (transmission line access roads)


**Photo 17.** Slope with dense rhododendron sp.; not habitat for SWP (transmission line Access Roads)


**Photo 18.** Potential SWP habitat; mixed hardwood with dappled sunlight (transmission line access roads)


**Photo 19.** Mixed hardwood with dense understory; not habitat for SWP (transmission line access roads)


**Photo 20.** Access Road; potential habitat for SWP on margins (transmission line access roads)


**Photo 21.** Potential SWP habitat; dense mixed hardwood with dappled sunlight (transmission line access roads)

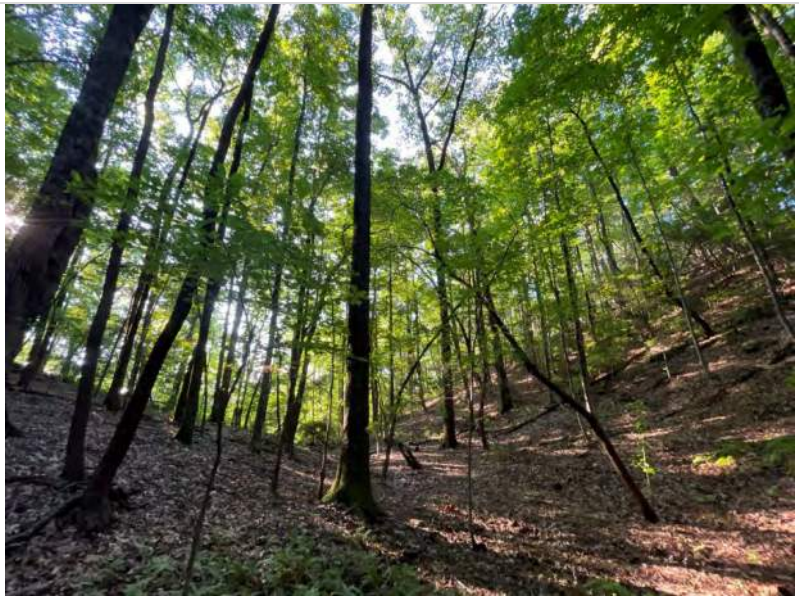

**Photo 22.** Potential SWP habitat; acidic cove forest (spoil location B)

**Photo 23.** Maintained open area; not habitat for SWP (spoil locations B, E, and F)

**Photo 24.** Potential SWP habitat; shortleaf pine and oak woodland (spoil locations B and C)

**Photo 25.** Dense vegetation in ROW; not SWP habitat (spoil locations C and M)

**Photo 26.** Potential SWP habitat; montane oak hickory cove forest (spoil location D)

**Photo 27.** Potential SWP habitat; dry mesic oak hickory forest (spoil locations C, D, G, I, and M)

**Photo 28.** Mixed hardwood with dense shrub layer; not habitat for SWP (spoil location J)

**Photo 29.** Potential SWP habitat; upland mixed wood with dappled sunlight (spoil location K)

**Photo 30.** Potential SWP habitat; open herb layer with dappled sunlight (spoil location D)

**Photo 31.** Disturbed open habitat; not habitat for SWP (spoil location F)

**Photo 32.** Potential SWP habitat; upland mixed wood with dappled sunlight (spoil location K)

# Appendix D

## Appendix D – South Carolina SWAP Priority Plants for the Blue Ridge Ecoregion

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# SWAP Priority Plants for the Blue Ridge Ecoregion

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| *Agrimonia pubescens* | Soft Groovebur | | Moderate | Low Elevation Basic and Acidic Mesic Forests |
| *Arnoglossum muehlenbergii* | Great Indian Plantain | | Moderate | Low Elevation Basic and Acidic Mesic Forests; Bottomlands and Riparian Zones |
| *Asplenium monanthes* | Single-sorus Spleenwort | | Moderate | Wet/Moist Unique Landforms |
| *Asplenium pinnatifidum* | Lobed Spleenwort | | Moderate | Rock Outcrops |
| *Asplenium resiliens* | Black-stem Spleenwort | | Moderate | Wet/Moist Unique Landforms |
| *Betula alleghaniensis* | Yellow Birch | | Moderate | Bottomlands and Riparian Zones |
| *Bryocrumia vivicolor* | Bryocrumia Moss | | High | Bottomlands and Riparian Zones |
| *Cardamine flagellifera* | Blue-Ridge Bittercress | | High | Bottomlands and Riparian Zones |
| *Carex appalachica* | Appalachian Sedge | | Moderate | Appalachian Oak Forest; High Elevation Forest; Rock Outcrops; Wet/Moist Unique Landforms |
| *Carex biltmoreana* | Biltmore Sedge | | High | Rock Outcrops; Wet/Moist Unique Landforms |
| *Carex communis var. amplisquama* | Fort Mountain Sedge | | High | Low Elevation Basic Mesic Forest |
| *Carex decomposita* | Cypress-knee Sedge | | High | Depressions; Wet/Moist Unique Landforms |
| *Carex folliculata* | Long Sedge | | Moderate | High Elevation Forest; Wet/Moist Unique Landforms |
| *Carex manhartii* | Manhart Sedge | | Moderate | Bottomlands and Riparian Zones |
| *Carex pedunculata* | Longstalk Sedge | | Moderate | Low Elevation Basic Mesic Forest |
| *Carex radfordii* | Radford's Sedge | | High | Appalachian Oak Forest; Low Elevation Basic Mesic Forest |
| *Carex woodii* | Pretty Sedge | | Moderate | Bottomlands and Riparian Zones |
| *Cheilolejeunea evansii* | Evan's Cheilolejeunea | | High | Bottomlands and Riparian Zones; Wet/Moist Unique Landforms |
| *Chrysosplenium americanum* | American Golden-saxifrage | | Moderate | Low Elevation Acidic Mesic Forest; Wet/Moist Unique Landforms |
| *Cladrastis kentukea* | Yellowwood | | Moderate | Low Elevation Basic Mesic Forest |
| *Collinsonia verticillata* | Whorled Horse-balm | | Moderate | Low Elevation Basic Mesic Forest; Low Elevation Acidic Mesic Forest |
| *Comptonia peregrina* | Sweet Fern | | Moderate | Grasslands/Early-Successional |
| *Convallaria majuscula* | American Lily-of-the-valley | | Moderate | High Elevation Forest |
| *Coreopsis latifolia* | Broad-leaved Tickseed | | High | Low Elevation Basic Mesic Forest |
| *Cornus racemosa* | Stiff Dogwood | | Moderate | Bottomlands and Riparian Zones |
| *Cystopteris bulbifera* | Bulblet Fern | | Moderate | Rock Outcrops |

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| *Danthonia epilis* | Bog Oat-grass | | Moderate | Rock Outcrops; Wet/Moist Unique Landforms |
| *Deschampsia flexuosa* | Crinkled Hairgrass | | Moderate | Rock Outcrops |
| *Dicentra eximia* | Wild Bleeding-heart | | Moderate | Low Elevation Basic Mesic Forest |
| *Diplazium pycnocarpon* | Glade Fern | | Moderate | Low Elevation Basic Mesic Forest |
| *Dryopteris goldiana* | Goldie's Woodfern | | Moderate | Low Elevation Basic Mesic Forest; Rock Outcrops |
| *Echinacea laevigata* | Smooth Coneflower | LE: Endangered | Highest | Grasslands/Early-Successional |
| *Eurybia avita* | Alexander's Rock Aster | | High | Rock Outcrops |
| *Fothergilla major* | Mountain Witch-alder | | High | Low Elevation Basic Mesic Forest |
| *Gaylussacia baccata* | Black Huckleberry | | Moderate | Appalachian Oak Forest; Low Elevation Acidic Mesic Forest |
| *Gymnoderma lineare* | Rocky Gnome Lichen | LE: Endangered | Highest | Rock Outcrops |
| *Helenium brevifolium* | Shortleaf Sneezeweed | | Moderate | Bottomlands and Riparian Zones |
| *Helianthus glaucophyllus* | White-leaved Sunflower | | Moderate | Low Elevation Basic Mesic Forest |
| *Helonias bullata* | Swamp-pink | LT: Threatened | Highest | Wet/Moist Unique Landforms |
| *Hydrangea cinerea* | Ashy-hydrangea | | Moderate | Low Elevation Basic Mesic Forest |
| *Hydrocotyle americana* | American Water-pennywort | | Moderate | Bottomlands and Riparian Zones; Depressions |
| *Hymenophyllum tayloriae* | Taylor's Fern | | High | Wet/Moist Unique Landforms |
| *Hymenophyllum tunbrigense* | Tunbridge Fern | | Moderate | Wet/Moist Unique Landforms |
| *Hypericum buckleii* | Blue Ridge St. John's-wort | | High | Rock Outcrops |
| *Impatiens pallida* | Pale Jewel-weed | | Moderate | Bottomlands and Riparian Zones; Depressions |
| *Isoetes caroliniana* | Engelmann's Quillwort | | Moderate | Depressions |
| *Isotria medeoloides* | Small Whorled Pogonia | LT: Threatened | Highest | Wet/Moist Unique Landforms |
| *Juncus subcaudatus* | Woods-rush | | Moderate | Depressions |
| *Juniperus communis var. depressa* | Dwarf Juniper | | Moderate | High Elevation Forest |
| *Krigia montana* | False Dandelion | | High | Rock Outcrops |
| *Lejeunea blomquistii* | "A Liverwort" | | High | Rock Outcrops |
| *Leptohymenium sharpii* | Sharp's Leptohymenium Moss | | High | Wet/Moist Unique Landforms |

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| *Liatris microcephala* | Small-head Gayfeather | | Moderate | Rock Outcrops |
| *Liparis liliifolia* | Large Twayblade | | Moderate | Low Elevation Basic Mesic and Acidic Forests |
| *Listera smallii* | Kidney-leaf Twayblade | | Moderate | Low Elevation Acidic Mesic Forest |
| *Lophocolea appalachiana* | Appalachian Lophocolea | | High | Wet/Moist Unique Landforms |
| *Lycopodium clavatum* | Running Pine | | Moderate | Appalachian Oak Forest; High Elevation Forest |
| *Lycopodium porophilum* | Rock Clubmoss | | Moderate | Rock Outcrops |
| *Lycopodium tristachyum* | Deep-root Clubmoss | | Moderate | High Elevation Forest |
| *Lysimachia fraseri* | Fraser Loosestrife | | High | Bottomlands and Riparian Zones |
| *Lysimachia hybrida* | Lance-leaf Loosestrife | | Moderate | Depressions |
| *Magnolia cordata* | Piedmont Cucumber Tree | | Moderate | Low Elevation Basic Mesic Forest |
| *Mitella diphylla* | Two-leaf Bishop's-cap | | Moderate | Low Elevation Basic Mesic Forest |
| *Monotropsis odorata* | Sweet Pinesap | | High | Appalachian Oak Forest; High Elevation Forest |
| *Oenothera perennis* | Small Sundrops | | Moderate | Depressions |
| *Panax quinquefolius* | American Ginseng | | High | Low Elevation Basic Mesic Forest |
| *Parnassia grandifolia* | Large-leaved Grass-of-parnassus | | High | Wet/Moist Unique Landforms |
| *Pellaea atropurpurea* | Purple-stem Cliff-brake | | Moderate | Rock Outcrops |
| *Pellaea wrightiana* | Cliff-brake Fern | | Moderate | Rock Outcrops |
| *Pellia appalachiana* | Appalachian Pellia | | Moderate | Bottomlands and Riparian Zones; Wet/Moist Unique Landforms |
| *Phacelia bipinnatifida* | Fernleaf Phacelia | | Moderate | Low Elevation Basic Mesic Forest; Bottomlands and Riparian Zones |
| *Plagiochila caduciloba* | Gorge Leafy Liverwort | | High | Wet/Moist Unique Landforms |
| *Plagiochila sharpii* | "A Liverwort" | | High | Wet/Moist Unique Landforms |
| *Plagiochila sullivantii* | "A Liverwort" | | High | Wet/Moist Unique Landforms |
| *Plagiomnium carolinianum* | Mountain Wavy-leaf Moss | | High | Wet/Moist Unique Landforms |
| *Platanthera integrilabia* | White Fringeless Orchid | C: Candidate | Highest | Bottomlands and Riparian Zones; Depressions |
| *Platyhypnidium pringlei* | Pringle's Platyhypnidium Moss | | High | Wet/Moist Unique Landforms |
| *Poa alsodes* | Blue-grass | | Moderate | Low Elevation Basic Mesic Forest |
| *Porella japonica ssp. appalachiana* | "A Liverwort" | | Moderate | Bottomlands and Riparian Zones |

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| *Pycnanthemum montanum* | Single-haired Mountain-mint | | Moderate | Appalachian Oak Forest; High Elevation Forest; Low Elevation Basic Mesic Forest |
| *Rhododendron catawbiense* | Catawba Rhododendron | | Moderate | High Elevation Forest |
| *Rudbeckia heliopsidis* | Sun-facing Coneflower | | High | Low Elevation Acidic Mesic Forest |
| *Sarracenia rubra ssp. jonesii* | Mountain Sweet Pitcher-plant | LE: Endangered | Highest | Rock Outcrops; Wet/Moist Unique Landforms |
| *Saxifraga careyana* | Carey Saxifrage | | High | High Elevation Forest; Low Elevation Basic Mesic Forest; Rock Outcrops |
| *Senecio millefolium* | Piedmont Ragwort | | High | Rock Outcrops |
| *Shortia galacifolia* | Oconee bells | | High | High Elevation Forest; Low Elevation Basic Mesic Forest; Rock Outcrops; Wet/Moist Unique Landforms |
| *Silene ovata* | Ovate Catchfly | | High | Appalachian Oak Forest; High Elevation Forest; Low Elevation Basic Mesic Forest |
| *Solidago simulans* | Granite Dome Goldenrod | | High | High Elevation Forest; Low Elevation Basic Mesic Forest; Rock Outcrops |
| *Stachys clingmanii* | Clingman's Hedge-nettle | | High | Appalachian Oak Forest; High Elevation Forest |
| *Thermopsis mollis* | Soft-haired Thermopsis | | Moderate | Low Elevation Acidic Mesic Forest |
| *Tradescantia virginiana* | Virginia Spiderwort | | Moderate | High Elevation Forest; Low Elevation Basic Mesic Forest |
| *Trichomanes boschianum* | Bristle-fern | | Moderate | Low Elevation Basic Mesic Forest; Rock Outcrops; Depressions |
| *Trichophorum cespitosum* | Deer-haired Bulrush | | Moderate | High Elevation Forest |
| *Trillium grandiflorum* | Large-flower Trillium | | Moderate | High Elevation Forest; Depressions |
| *Trillium rugelii* | Southern Nodding Trillium | | High | Low Elevation Basic Mesic Forest; Depressions |
| *Trillium simile* | Sweet White Trillium | | High | Low Elevation Basic Mesic Forest; Depressions |
| *Triphora trianthophora* | Nodding Pogonia | | Moderate | Depressions |
| *Viola conspersa* | American Bog Violet | | Moderate | Low Elevation Basic Mesic Forest |
| *Xyris torta* | Twisted Yellow-eyed-grass | | Moderate | Wet/Moist Unique Landforms |

# Appendix E

## Appendix E – Surveyor Qualifications

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# Surveyor Qualifications

| | |
|---|---|
| **Name** | Eric Mularski, PWS, PMP |
| **Education** | B.S, Biology – Eastern Washington University – 2001 |
| **Experience:** | Environmental Sciences and Planning Manager – HDR Engineering, Inc. (HDR) – October 2015 to present<br>Environmental Scientist – HDR – November 2006 to October 2015<br>Environmental Scientist – Buck Engineering – October 2004 to November 2006<br>Fisheries Technician – Kalispel Tribe of Indians – June 2001 to September 2004 |
| **Qualifications:** | 18 years experience conducting botanical and presence and absence surveys for federally protected plant species in the Southern Blue Ridge Ecoregion of North Carolina, South Carolina, and Virgina. |

| | |
|---|---|
| **Name** | Paul Bright |
| **Education** | B.S. Geography: B.A. Earth Science – University of North Carolina at Charlotte - 2006 |
| **Experience:** | Environmental Scientist II – HDR – January 2022 to present<br>Environmental Scientist – SWCA Consultants – September 2021 to January 2022<br>Natural Resources Assistant – Mecklenburg County Park & Recreation Natural Resources – October 2020 to September 2021<br>Chief Operating Officer – EDIA Maps – November 2021 to September 2021<br>Environmental Scientist – Carolina Wetland Services – June 2006 to November 2009 |
| **Qualifications:** | 5 years experience conducting botanical and presence and absence surveys for federally protected plant species in the Southern Blue Ridge Ecoregion of North Carolina and South Carolina. |

| | |
|---|---|
| **Name** | Jake Irvin, PWS, CE |
| **Education** | M.S. Environmental Sciences – University of North Carolina at Wilmington – 2019<br>B.A. Environmental Sciences – Ferrum College - 2017 |
| **Experience:** | Environmental Scientist II – HDR – July 2019 to present |
| **Qualifications:** | 5 years experience conducting botanical and presence and absence surveys for federally protected plant species in the Southern Blue Ridge Ecoregion of North Carolina, South Carolina, and Virgina. |

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# Appendix F

Appendix F – Consultation

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| | |
|---|---|
| **From:** | Crutchfield Jr., John U |
| **To:** | Olds, Melanie J; Elizabeth Miller |
| **Cc:** | Stuart, Alan Witten; Fletcher, Scott T; Kulpa, Sarah; Mularski, Eric; McCarney-Castle, Kerry |
| **Subject:** | Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED) |
| **Date:** | Friday, May 24, 2024 12:20:08 PM |
| **Attachments:** | image001.png |
| **Importance:** | High |



Dear Melanie and Elizabeth:

Duke Energy is pleased to distribute the draft Small Whorled Pogonia Study Plan for your review and comment. Bad Creek_Small Whorled Pogonia Study Plan_May 2024

We kindly request comments back by June 7th; however, Duke Energy will have field crews at the project site the week of June 3rd, therefore, expedited comments received by the end of next week (May 31) would be greatly appreciated to facilitate the field effort.

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:** | Olds, Melanie J |
| **To:** | Crutchfield Jr., John U; Elizabeth Miller |
| **Cc:** | Stuart, Alan Witten; Fletcher, Scott T; Kulpa, Sarah; Mularski, Eric; McCarney-Castle, Kerry |
| **Subject:** | Re: [EXTERNAL] Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED) |
| **Date:** | Wednesday, May 29, 2024 7:37:51 AM |
| **Attachments:** | image001.png<br>Outlook-aguwz1wf.png<br>Outlook-4amisz42.png |



John,

The Service has reviewed the Small Whorled Pogonia Study Plan and does not have any comments. We look forward to seeing the results of the survey.

*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, May 24, 2024 12:19 PM
**To:** Olds, Melanie J <melanie_olds@fws.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>
**Cc:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; scott.fletcher <scott.fletcher@duke-energy.com>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>
**Subject:** [EXTERNAL] Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED)

**links, opening attachments, or responding.**

Dear Melanie and Elizabeth:

Duke Energy is pleased to distribute the draft Small Whorled Pogonia Study Plan for your review and comment. Bad Creek_Small Whorled Pogonia Study Plan_May 2024

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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:** | Elizabeth Miller |
| **Cc:** | Stuart, Alan Witten; Fletcher, Scott T; Kulpa, Sarah; Mularski, Eric; McCarney-Castle, Kerry |
| **Subject:** | RE: Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED) |
| **Date:** | Friday, May 31, 2024 2:13:55 PM |
| **Attachments:** | image001.png |
| **Importance:** | High |



Elizabeth: Good afternoon!

I wanted to check in to see if SC DNR has any comments on the Small Whorled Pogonia Draft Study Plan. The survey crews are scheduled to be in the field next week and if Sc DNR has any comments on the study plan that might affect field surveys, please let us know.

Regards,
John

---

**From:** Crutchfield Jr., John U
**Sent:** Friday, May 24, 2024 12:20 PM
**To:** Melanie Olds <melanie_olds@fws.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>
**Cc:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>
**Subject:** Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED)
**Importance:** High

Dear Melanie and Elizabeth:

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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:** | Elizabeth Miller |
| **To:** | Crutchfield Jr., John U |
| **Cc:** | Stuart, Alan Witten; Fletcher, Scott T; Kulpa, Sarah; Mularski, Eric; McCarney-Castle, Kerry |
| **Subject:** | RE: [EXTERNAL] RE: Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED) |
| **Date:** | Monday, June 3, 2024 10:20:57 AM |
| **Attachments:** | image001.png |



Hi John,

The SCDNR has reviewed the Small Whorled Pogonia draft Study Plan and has no comments to offer.

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:** Monday, June 3, 2024 9:09 AM
**To:** Elizabeth Miller <MillerE@dnr.sc.gov>
**Cc:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>
**Subject:** RE: [EXTERNAL] RE: Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED)

Thank you, Elizabeth.

---

**From:** Elizabeth Miller <MillerE@dnr.sc.gov>
**Sent:** Monday, June 3, 2024 9:07 AM
**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>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>
**Subject:** [EXTERNAL] RE: Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED)

Hi John,

Our upstate botanist was unable to review the draft plan last week but is planning to do so today. I'll get you our comments as soon as I can.

Thanks,

EM

Elizabeth C. Miller
SCDNR
Office: 843-953-3881
Cell: 843-729-4636

---

**From:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
**Sent:** Friday, May 31, 2024 2:14 PM
**To:** Elizabeth Miller <MillerE@dnr.sc.gov>
**Cc:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>
**Subject:** RE: Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED)
**Importance:** High

Elizabeth: Good afternoon!

I wanted to check in to see if SC DNR has any comments on the Small Whorled Pogonia Draft Study Plan. The survey crews are scheduled to be in the field next week and if Sc DNR has any comments on the study plan that might affect field surveys, please let us know.

Regards,
John

---

**From:** Crutchfield Jr., John U
**Sent:** Friday, May 24, 2024 12:20 PM
**To:** Melanie Olds <melanie_olds@fws.gov>; Elizabeth Miller <MillerE@dnr.sc.gov>
**Cc:** Stuart, Alan Witten <Alan.Stuart@duke-energy.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>
**Subject:** Bad Creek Relicensing - Small Whorled Pogonia Draft Study Plan (REVIEW REQUESTED)
**Importance:** High

Dear Melanie and Elizabeth:

Duke Energy is pleased to distribute the draft Small Whorled Pogonia Study Plan for your review and comment. Bad Creek_Small Whorled Pogonia Study Plan_May 2024

We kindly request comments back by June 7th; however, Duke Energy will have field crews at the project site the week of June 3rd, therefore, expedited comments received by the end of next week (May 31) would be greatly appreciated to facilitate the field effort.

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


EXTERNAL EMAIL: Do not click any links or open any attachments unless you trust the sender and know the content is safe.

| | |
|---|---|
| **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:** | Sarah Salazar; McCarney-Castle, Kerry; Salazar, Maggie |
| **Subject:** | Bad Creek Relicensing - Small Whorled Pogonia Final Study Plan |
| **Date:** | Wednesday, June 5, 2024 10:40:59 AM |
| **Attachments:** | image001.png |
| **Importance:** | High |



Dear Wildlife & Botanical Resources Committee:

Please find attached the final Small Whorled Pogonia Study Plan which was developed in consultation and review by the US Fish & Wildlife Service and the South Carolina Department of Natural Resources. The study plan is being provide to the Resource Committee for information and reference.

The study plan can be accessed at the following link: 20240605_Bad Creek_Small Whorled Pogonia_Study Plan.pdf

The study plan was developed In response to a written request from the South Carolina Department of Natural Resources (SCDNR) in comments submitted to the Federal Energy Regulatory Commission on the Initial Study Report and to support Clean Water Act Section 404 U.S. Army Corps of Engineers permitting activities associated with the Bad Creek II Power Complex.

Duke Energy will survey the area around the proposed Fisher Knob Access Road for the federally threatened small whorled pogonia (*Isotria medeoloides*) during the appropriate survey window (mid-May through early July).

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

# Memo

| | |
|---|---|
| Date: | Wednesday, June 05, 2024 |
| Project: | Bad Creek II Power Complex |
| To: | Alan Stuart, Duke Energy |
| From: | Eric Mularski, HDR |
| Subject: | Small Whorled Pogonia Study Plan |

# Project Understanding

Duke Energy Carolinas, LLC (Duke Energy) is the owner and operator of the 1,400-megawatt Bad Creek Pumped Storage Project (Project; Federal Energy Regulatory Commission [FERC] Project No. 2740) located in Oconee County, South Carolina. The existing (original) license for the Project was issued by the Commission for a 50-year term, with an effective date of August 1, 1977, and expires July 31, 2027, therefore, Duke Energy is pursuing a new license for the Project pursuant to the Commission's Integrated Licensing Process (ILP) (18 Code of Federal Regulations Part 5). An alternative relicensing proposal presently being evaluated by Duke Energy is the construction of a second 1,400-megawatt power complex (Bad Creek II Power Complex) adjacent to the existing Project to increase renewable pumping and generating capacity at the Project.

In response to a written request from the South Carolina Department of Natural Resources (SCDNR) in comments submitted to the Commission on the Initial Study Report (Duke Energy 2024) and to support Clean Water Act Section 404 U.S. Army Corps of Engineers permitting, Duke Energy proposed to survey the area around the proposed Fisher Knob Access Road for the federally threatened small whorled pogonia (*Isotria medeoloides*) during the appropriate survey window (mid-May through early July).[1]

The SCDNR Natural Heritage Trust Program, which documents and tracks element of occurrence data for rare, threatened, and endangered species (both federal and state) indicates no record of the small whorled pogonia within a 2-mile of radius of the Project (SCNHP 2023), however, this species is listed on the U.S. Fish and Wildlife Survey (USFWS) Information for Planning and Consultation (IPaC) database as having the potential to occur in the project vicinity, therefore surveys are proposed to determine the presence or absence of this protected species prior to land disturbance activities associated with the access road and overall construction of the Bad Creek II Power Complex. This will aid in the quality and comprehensiveness of the statewide dataset for rare, threatened, and endangered species. Additionally, field biologists will record incidental observations of priority plant species identified in the SC Wildlife Action Plan (SWAP) during the survey.

[1] A Natural Resources Survey was carried out by Duke Energy in 2021 and indicated that suitable habitat for the small whorled pogonia was present at the site, however, the study was performed outside of the survey window. The Natural Resources Survey was filed with the Pre-Application Document in February, 2023.

This document provides an overview of the approach to the proposed small whorled pogonia surveys.

# Small Whorled Pogonia

## Species Description

The small whorled pogonia is a perennial orchid that produces a smooth, hollow stem from 2 to 14 inches tall and topped by five to six leaves in circular arrangement (false whorl). One or two flowers stand in the center of the whorl of leaves. The leaves are milky-green or grayish-green, and the flower is yellowish-green with a greenish-white lip (USFWS 2024). Flowers appear soon after the plants emerge in mid-May or June. This species is non-clonal, and plants may emerge each spring or they may remain vegetatively dormant and below the ground for one to several years. Each plant produces only one, rarely more than one, overwintering bud per year (USFWS 2022).

## Habitat

The small whorled pogonia occurs in young as well as maturing (second to third successional growth) mixed-deciduous or mixed-deciduous/coniferous forests. Sometimes it grows in stands of softwoods with a thick layer of dead leaves, often on slopes near small streams. The species may also be found on dry, rocky, wooded slopes; moist slopes; ravines lacking stream channels; or slope bases near braided channels of vernal streams. The orchid, often limited by shade, requires small light gaps or canopy breaks, and typically grows under canopies that are relatively open or near features like logging roads or streams that create long-persisting breaks in the forest canopy. It prefers acidic soils with a thick layer of dead leaved and sparse to moderate ground cover (USFWS 2024).

# Proposed Survey Methods

Surveys will be conducted during the USFWS recommended optimal survey window of mid-May – early July. Potential habitat will be surveyed along a 50-foot-wide buffer of the proposed Fisher Knob Access Road and within the proposed limits of disturbance and spoil area alternatives, as well as along proposed transmission line access roads related to the Bad Creek II Power Complex proposed infrastructure (Figure 1).

Survey areas can be visually delineated by local topography (ravines, slopes, benches) or by landmarks (boulders, downed or otherwise conspicuous trees, or old roads) (USFWS 2016). The survey methodology will consist of slowly traversing back and forth across transects; surveyors will be spaced approximately 25-feet apart focusing the immediate area within a 10-to-15-foot radius depending on habitat type and visibility. Handheld Global Positioning System (GPS) units will be used to navigate throughout the site to avoid survey gaps.

Small whorled pogonia plants favor certain micro-habitats such as:

- Vernal or ephemeral runoff courses (leaf piles)
- Terraces or benches and base-of-slope areas
- Small canopy openings, fern patches

If one or more small whorled pogonia plants are identified during the survey, the surveyor will do the following:

- Delineate a polygon of the location and demarcate the boundaries using brightly colored flagging. A GPS unit will be used to collect boundary coordinates.
- Photo-document the plants sufficiently to confirm the identification of the species.
- Describe the size of each population (e.g., in square feet).
- Record a detailed written description and photo-document of specific and surrounding habitat.
- Contact USFWS and SCDNR representatives within 48 hours of species sightings.

Vegetation cover type and specific habitats /substrates will be noted by surveyor. No voucher specimens will be collected, and any plant locations will be considered to be “Privileged Non-Public Information”. Additionally, field biologists will record incidental observations of priority plant species identified in the South Carolina SWAP; a list of priority plants included in the SWAP that may occur in Blue Ridge Ecoregion is provided in Table 1.

# Results and Conclusions

Results and conclusions of the field surveys will be provided in a summary report during the third quarter of 2024.

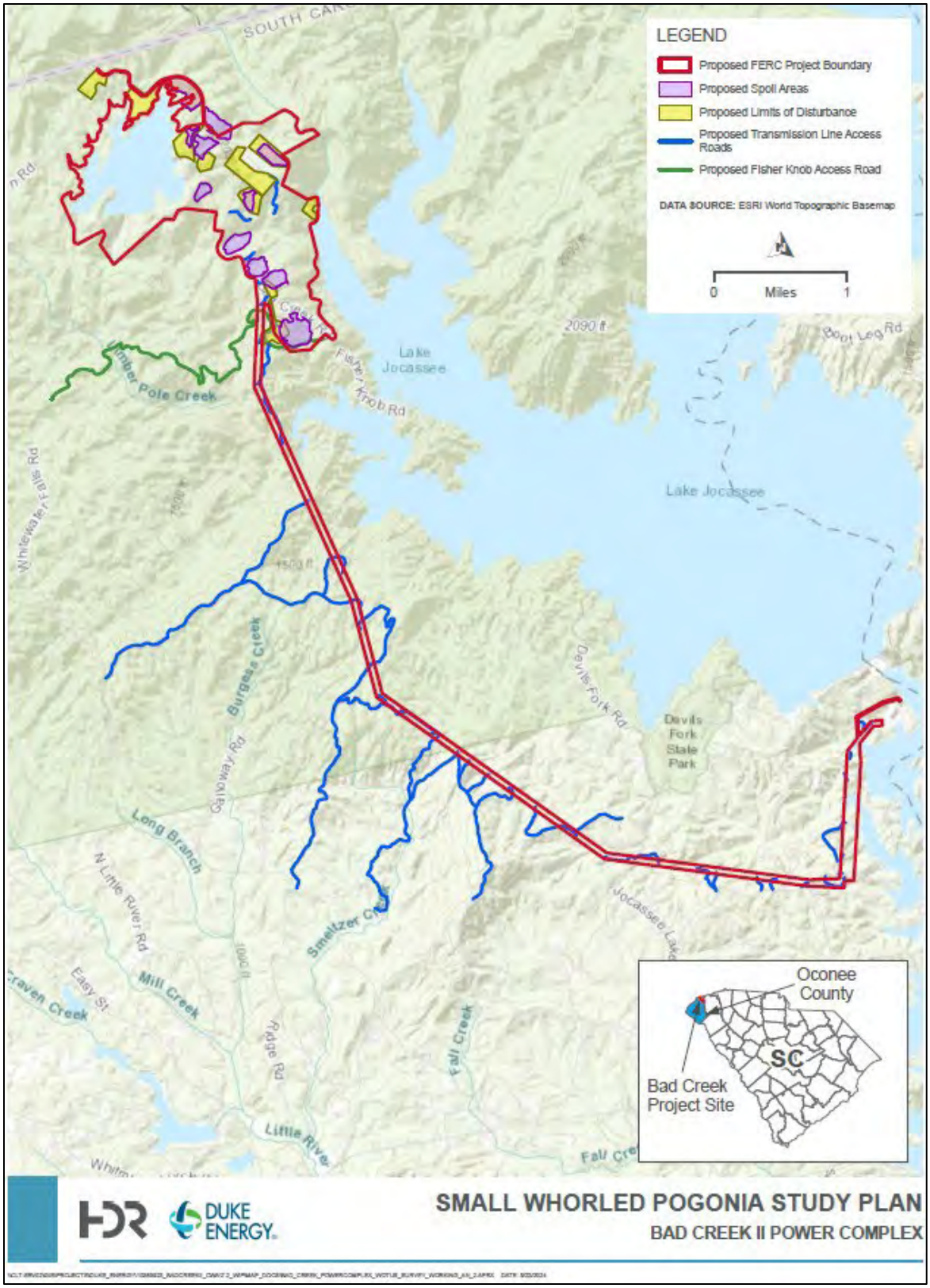


**Figure 1. Bad Creek Site Vicinity and Proposed Area of Small Whorled Pogonia Surveys**

**Table 1. List of South Carolina State Wildlife Action Plan Priority Plant that May Occur in Blue Ridge Ecoregion**

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| *Agrimonia pubescens* | Soft Groovebur | | Moderate | Low Elevation Basic and Acidic Mesic Forests |
| *Arnoglossum muehlenbergii* | Great Indian Plantain | | Moderate | Low Elevation Basic and Acidic Mesic Forests; Bottomlands and Riparian Zones |
| *Asplenium monanthes* | Single-sorus Spleenwort | | Moderate | Wet/Moist Unique Landforms |
| *Asplenium pinnatifidum* | Lobed Spleenwort | | Moderate | Rock Outcrops |
| *Asplenium resiliens* | Black-stem Spleenwort | | Moderate | Wet/Moist Unique Landforms |
| *Betula alleghaniensis* | Yellow Birch | | Moderate | Bottomlands and Riparian Zones |
| *Bryocrumia vivicolor* | Bryocrumia Moss | | High | Bottomlands and Riparian Zones |
| *Cardamine flagellifera* | Blue-Ridge Bittercress | | High | Bottomlands and Riparian Zones |
| *Carex appalachica* | Appalachian Sedge | | Moderate | Appalachian Oak Forest; High Elevation Forest; Rock Outcrops; Wet/Moist Unique Landforms |
| *Carex biltmoreana* | Biltmore Sedge | | High | Rock Outcrops; Wet/Moist Unique Landforms |
| *Carex communis var. amplisquama* | Fort Mountain Sedge | | High | Low Elevation Basic Mesic Forest |
| *Carex decomposita* | Cypress-knee Sedge | | High | Depressions; Wet/Moist Unique Landforms |
| *Carex folliculata* | Long Sedge | | Moderate | High Elevation Forest; Wet/Moist Unique Landforms |
| *Carex manhartii* | Manhart Sedge | | Moderate | Bottomlands and Riparian Zones |
| *Carex pedunculata* | Longstalk Sedge | | Moderate | Low Elevation Basic Mesic Forest |
| *Carex radfordii* | Radford's Sedge | | High | Appalachian Oak Forest; Low Elevation Basic Mesic Forest |
| *Carex woodii* | Pretty Sedge | | Moderate | Bottomlands and Riparian Zones |
| *Cheilolejeunea evansii* | Evan's Cheilolejeunea | | High | Bottomlands and Riparian Zones; Wet/Moist Unique Landforms |
| *Chrysosplenium americanum* | American Golden-saxifrage | | Moderate | Low Elevation Acidic Mesic Forest; Wet/Moist Unique Landforms |
| *Cladrastis kentukea* | Yellowwood | | Moderate | Low Elevation Basic Mesic Forest |
| *Collinsonia verticillata* | Whorled Horse-balm | | Moderate | Low Elevation Basic Mesic Forest; Low Elevation Acidic Mesic Forest |
| *Comptonia peregrina* | Sweet Fern | | Moderate | Grasslands/Early-Successional |

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| *Convallaria majuscula* | American Lily-of-the-valley | | Moderate | High Elevation Forest |
| *Coreopsis latifolia* | Broad-leaved Tickseed | | High | Low Elevation Basic Mesic Forest |
| *Cornus racemosa* | Stiff Dogwood | | Moderate | Bottomlands and Riparian Zones |
| *Cystopteris bulbifera* | Bulblet Fern | | Moderate | Rock Outcrops |
| *Danthonia epilis* | Bog Oat-grass | | Moderate | Rock Outcrops; Wet/Moist Unique Landforms |
| *Deschampsia flexuosa* | Crinkled Hairgrass | | Moderate | Rock Outcrops |
| *Dicentra eximia* | Wild Bleeding-heart | | Moderate | Low Elevation Basic Mesic Forest |
| *Diplazium pycnocarpon* | Glade Fern | | Moderate | Low Elevation Basic Mesic Forest |
| *Dryopteris goldiana* | Goldie's Woodfern | | Moderate | Low Elevation Basic Mesic Forest; Rock Outcrops |
| *Echinacea laevigata* | Smooth Coneflower | LE: Endangered | Highest | Grasslands/Early-Successional |
| *Eurybia avita* | Alexander's Rock Aster | | High | Rock Outcrops |
| *Fothergilla major* | Mountain Witch-alder | | High | Low Elevation Basic Mesic Forest |
| *Gaylussacia baccata* | Black Huckleberry | | Moderate | Appalachian Oak Forest; Low Elevation Acidic Mesic Forest |
| *Gymnoderma lineare* | Rocky Gnome Lichen | LE: Endangered | Highest | Rock Outcrops |
| *Helenium brevifolium* | Shortleaf Sneezeweed | | Moderate | Bottomlands and Riparian Zones |
| *Helianthus glaucophyllus* | White-leaved Sunflower | | Moderate | Low Elevation Basic Mesic Forest |
| *Helonias bullata* | Swamp-pink | LT: Threatened | Highest | Wet/Moist Unique Landforms |
| *Hydrangea cinerea* | Ashy-hydrangea | | Moderate | Low Elevation Basic Mesic Forest |
| *Hydrocotyle americana* | American Water-pennywort | | Moderate | Bottomlands and Riparian Zones; Depressions |
| *Hymenophyllum tayloriae* | Taylor's Fern | | High | Wet/Moist Unique Landforms |
| *Hymenophyllum tunbrigense* | Tunbridge Fern | | Moderate | Wet/Moist Unique Landforms |
| *Hypericum buckleii* | Blue Ridge St. John's-wort | | High | Rock Outcrops |
| *Impatiens pallida* | Pale Jewel-weed | | Moderate | Bottomlands and Riparian Zones; Depressions |
| *Isoetes caroliniana* | Engelmann's Quillwort | | Moderate | Depressions |
| *Isotria medeoloides* | Small Whorled Pogonia | LT: Threatened | Highest | Wet/Moist Unique Landforms |
| *Juncus subcaudatus* | Woods-rush | | Moderate | Depressions |

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| *Juniperus communis var. depressa* | Dwarf Juniper | | Moderate | High Elevation Forest |
| *Krigia montana* | False Dandelion | | High | Rock Outcrops |
| *Lejeunea blomquistii* | "A Liverwort" | | High | Rock Outcrops |
| *Leptohymenium sharpii* | Sharp's Leptohymenium Moss | | High | Wet/Moist Unique Landforms |
| *Liatris microcephala* | Small-head Gayfeather | | Moderate | Rock Outcrops |
| *Liparis liliifolia* | Large Twayblade | | Moderate | Low Elevation Basic Mesic and Acidic Forests |
| *Listera smallii* | Kidney-leaf Twayblade | | Moderate | Low Elevation Acidic Mesic Forest |
| *Lophocolea appalachiana* | Appalachian Lophocolea | | High | Wet/Moist Unique Landforms |
| *Lycopodium clavatum* | Running Pine | | Moderate | Appalachian Oak Forest; High Elevation Forest |
| *Lycopodium porophilum* | Rock Clubmoss | | Moderate | Rock Outcrops |
| *Lycopodium tristachyum* | Deep-root Clubmoss | | Moderate | High Elevation Forest |
| *Lysimachia fraseri* | Fraser Loosestrife | | High | Bottomlands and Riparian Zones |
| *Lysimachia hybrida* | Lance-leaf Loosestrife | | Moderate | Depressions |
| *Magnolia cordata* | Piedmont Cucumber Tree | | Moderate | Low Elevation Basic Mesic Forest |
| *Mitella diphylla* | Two-leaf Bishop's-cap | | Moderate | Low Elevation Basic Mesic Forest |
| *Monotropsis odorata* | Sweet Pinesap | | High | Appalachian Oak Forest; High Elevation Forest |
| *Oenothera perennis* | Small Sundrops | | Moderate | Depressions |
| *Panax quinquefolius* | American Ginseng | | High | Low Elevation Basic Mesic Forest |
| *Parnassia grandifolia* | Large-leaved Grass-of-parnassus | | High | Wet/Moist Unique Landforms |
| *Pellaea atropurpurea* | Purple-stem Cliff-brake | | Moderate | Rock Outcrops |
| *Pellaea wrightiana* | Cliff-brake Fern | | Moderate | Rock Outcrops |
| *Pellia appalachiana* | Appalachian Pellia | | Moderate | Bottomlands and Riparian Zones; Wet/Moist Unique Landforms |
| *Phacelia bipinnatifida* | Fernleaf Phacelia | | Moderate | Low Elevation Basic Mesic Forest; Bottomlands and Riparian Zones |
| *Plagiochila caduciloba* | Gorge Leafy Liverwort | | High | Wet/Moist Unique Landforms |
| *Plagiochila sharpii* | "A Liverwort" | | High | Wet/Moist Unique Landforms |
| *Plagiochila sullivantii* | "A Liverwort" | | High | Wet/Moist Unique Landforms |

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| | | | | |
| *Plagiomnium carolinianum* | Mountain Wavy-leaf Moss | | High | Wet/Moist Unique Landforms |
| *Platanthera integrilabia* | White Fringeless Orchid | C: Candidate | Highest | Bottomlands and Riparian Zones; Depressions |
| *Platyhypnidium pringlei* | Pringle's Platyhypnidium Moss | | High | Wet/Moist Unique Landforms |
| *Poa alsodes* | Blue-grass | | Moderate | Low Elevation Basic Mesic Forest |
| *Porella japonica ssp. appalachiana* | "A Liverwort" | | Moderate | Bottomlands and Riparian Zones |
| *Pycnanthemum montanum* | Single-haired Mountain-mint | | Moderate | Appalachian Oak Forest; High Elevation Forest; Low Elevation Basic Mesic Forest |
| *Rhododendron catawbiense* | Catawba Rhododendron | | Moderate | High Elevation Forest |
| *Rudbeckia heliopsidis* | Sun-facing Coneflower | | High | Low Elevation Acidic Mesic Forest |
| *Sarracenia rubra ssp. jonesii* | Mountain Sweet Pitcher-plant | LE: Endangered | Highest | Rock Outcrops; Wet/Moist Unique Landforms |
| *Saxifraga careyana* | Carey Saxifrage | | High | High Elevation Forest; Low Elevation Basic Mesic Forest; Rock Outcrops |
| *Senecio millefolium* | Piedmont Ragwort | | High | Rock Outcrops |
| *Shortia galacifolia* | Oconee bells | | High | High Elevation Forest; Low Elevation Basic Mesic Forest; Rock Outcrops; Wet/Moist Unique Landforms |
| *Silene ovata* | Ovate Catchfly | | High | Appalachian Oak Forest; High Elevation Forest; Low Elevation Basic Mesic Forest |
| *Solidago simulans* | Granite Dome Goldenrod | | High | High Elevation Forest; Low Elevation Basic Mesic Forest; Rock Outcrops |
| *Stachys clingmanii* | Clingman's Hedge-nettle | | High | Appalachian Oak Forest; High Elevation Forest |
| *Thermopsis mollis* | Soft-haired Thermopsis | | Moderate | Low Elevation Acidic Mesic Forest |
| *Tradescantia virginiana* | Virginia Spiderwort | | Moderate | High Elevation Forest; Low Elevation Basic Mesic Forest |
| *Trichomanes boschianum* | Bristle-fern | | Moderate | Low Elevation Basic Mesic Forest; Rock Outcrops; Depressions |
| *Trichophorum cespitosum* | Deer-haired Bulrush | | Moderate | High Elevation Forest |
| *Trillium grandiflorum* | Large-flower Trillium | | Moderate | High Elevation Forest; Depressions |

| Scientific Name | Common Name | Legal Status | Priority | Habitat |
|---|---|---|---|---|
| *Trillium rugelii* | Southern Nodding Trillium | | High | Low Elevation Basic Mesic Forest; Depressions |
| *Trillium simile* | Sweet White Trillium | | High | Low Elevation Basic Mesic Forest; Depressions |
| *Triphora trianthophora* | Nodding Pogonia | | Moderate | Depressions |
| *Viola conspersa* | American Bog Violet | | Moderate | Low Elevation Basic Mesic Forest |
| *Xyris torta* | Twisted Yellow-eyed-grass | | Moderate | Wet/Moist Unique Landforms |

# References

Duke Energy Carolinas, LLC (Duke Energy). 2024. Bad Creek Pump Storage Project (FERC Project No. 2740) Initial Study Report. Prepared by HDR Engineering, Inc. January, 2024. Accessed May 21, 2024. eLibrary; https://elibrary.ferc.gov/eLibrary/filelist?accession_num=20240104-5044

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U.S. Fish and Wildlife Service (USFWS). 2016. Small Whorled Pogonia (*Isotria medeoloides*) Survey Protocol for Maine. Small Whorled Pogonia Survey Protocol for Maine | FWS.gov. Accessed May 16, 2024.

_____. 2022. Small Whorled Pogonia (*Isotria medeoloides*) 5-Year Review: Summary and Evaluation. August, 2022. Small whorled pogonia 5 year review (ecosphere-documents-production-public.s3.amazonaws.com). Accessed May 15, 2024.

_____. 2024. Small Whorled Pogonia Fact Sheet. Small Whorled Pogonia Fact Sheet (fws.gov). Accessed May 15, 2024.

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|---|---|
| **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:** | Kulpa, Sarah; McCarney-Castle, Kerry; Salazar, Maggie |
| **Subject:** | Bad Creek Relicensing - Small Whorled Pogonia Survey Report |
| **Date:** | Wednesday, August 28, 2024 6:37:10 AM |
| **Attachments:** | image001.png |
| **Importance:** | High |



Dear Wildlife & Botanical Resources Committee:

Duke Energy is pleased to provide the final Small Whorled Pogonia Survey report, which was developed in response to a written request from the South Carolina Department of Natural Resources (SCDNR) in comments submitted to the Federal Energy Regulatory Commission on the Bad Creek relicensing Initial Study Report and to support Clean Water Act Section 404 U.S. Army Corps of Engineers permitting activities associated with the Bad Creek II Power Complex. The report was developed in consultation with the U.S. Fish & Wildlife Service and SCDNR and is being provided to the Resource Committee for information and reference.

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Please let Alan Stuart 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

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| **To:** | Crutchfield Jr., John U; Abney, Michael A; Andrew Grosse; Andy Douglas; Austen Attaway; Bill Ranson-Retired; 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:** | Kulpa, Sarah; McCarney-Castle, Kerry; Salazar, Maggie |
| **Subject:** | Re: Bad Creek Relicensing - Small Whorled Pogonia Survey Report |
| **Date:** | Wednesday, August 28, 2024 3:18:56 PM |
| **Attachments:** | image001.png |



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Regardless of the presence/absence of SWP, I do want to point out that some of the plant community types that may be disturbed are ecologically significant, such as shortleaf pine forest and cove forest specifically.

Sincerely,
Chris

Chris Starker
Land Conservation Manager
864-203-1948

---

**From:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
**Sent:** Wednesday, August 28, 2024 6:36 AM
**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>; dwilde@keoweefolks.org <dwilde@keoweefolks.org>; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; 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>; Melanie Olds <melanie_olds@fws.gov>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <cloningerp@dnr.sc.gov>; Samantha Tessel <Tessels@dnr.sc.gov>; alan.stuart@duke-energy.com <alan.stuart@duke-energy.com>; Sue Williams <suewilliams130@gmail.com>; wes.cooler@mac.com <wes.cooler@mac.com>; Willie Simmons <simmonsw@dnr.sc.gov>
**Cc:** Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>; Maggie Salazar <maggie.salazar@hdrinc.com>
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Regards,

***John Crutchfield***
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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:** | Keith A. Bradley |
| **To:** | Chris Starker; Crutchfield Jr., John U; Abney, Michael A; Andrew Grosse; Andy Douglas; Austen Attaway; Bill Ranson-Retired; Dale Wilde; Elizabeth Miller; Mularski, Eric; Fletcher, Scott T; Huff, Jen; Jennifer Kindel; Ken Forrester; Olds, Melanie J; Amedee, Morgan D.; Pat Cloninger; Samantha Tessel; Stuart, Alan Witten; suewilliams130@gmail.com; Wes Cooler; Willie Simmons |
| **Cc:** | Kulpa, Sarah; McCarney-Castle, Kerry; Salazar, Maggie |
| **Subject:** | RE: Bad Creek Relicensing - Small Whorled Pogonia Survey Report |
| **Date:** | Thursday, August 29, 2024 10:24:37 AM |
| **Attachments:** | image001.png |



All,

The northern starflower photo (Trientalis borealis, = Lysimachia borealis), is actually a picture of the fairly common Lysimachia quadrifolia.

Some other species that are certainly misidentifications include:
Asarum hartwegii
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Juncus articulatus
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Scoparium spp. (perhaps Schizachyrium scoparium was intended)
Urtica dioica (likely Laportea canadensis)
Vaccinium angustifolium
Verbesina helianthoides

Also, Circaea alpina would represent Circaea canadensis. This is a state-tracked rare species and any data on the occurrence is appreciated.

Keith A. Bradley, Botanist
South Carolina Department of Natural Resources
Heritage Trust, Botany & Plant Conservation Program
1000 Assembly St., Columbia, SC 29201
BradleyK@dnr.sc.gov

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**From:** Chris Starker <cstarker@upstateforever.org>
**Sent:** Wednesday, August 28, 2024 3:19 PM
**To:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; 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>; dwilde@keoweefolks.org; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; 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>; alan.stuart@duke-energy.com; Sue Williams <suewilliams130@gmail.com>; wes.cooler@mac.com; Willie Simmons <SimmonsW@dnr.sc.gov>
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| **Cc:** | Kulpa, Sarah; McCarney-Castle, Kerry; Salazar, Maggie |
| **Subject:** | RE: [EXTERNAL] RE: Bad Creek Relicensing - Small Whorled Pogonia Survey Report |
| **Date:** | Wednesday, September 4, 2024 7:57:38 AM |
| **Attachments:** | image001.png |



Chris and Keith: Thank you for your review and comments on the Small Whorled Pogonia Report. We appreciate your input and will address your comments and compile additional information into a revised report to be issued to the Resource Committee.

For other Resource Committee members, if you have any comments on the report, please let Alan and me know by end of next week.

Again, thank you for the input.

Regards,
John

---

**From:** Keith A. Bradley <BradleyK@dnr.sc.gov>
**Sent:** Thursday, August 29, 2024 10:24 AM
**To:** Chris Starker <cstarker@upstateforever.org>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; 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>; dwilde@keoweefolks.org; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Jen Huff <jen.huff@hdrinc.com>; Jennifer Kindel <KindelJ@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@mac.com; Willie Simmons <SimmonsW@dnr.sc.gov>
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---

**From:** Chris Starker <cstarker@upstateforever.org>
**Sent:** Wednesday, August 28, 2024 3:19 PM
**To:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; 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>; dwilde@keoweefolks.org; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; 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>; alan.stuart@duke-energy.com; Sue Williams <suewilliams130@gmail.com>; wes.cooler@mac.com; Willie Simmons

<SimmonsW@dnr.sc.gov>
**Cc:** Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>; Maggie Salazar <maggie.salazar@hdrinc.com>
**Subject:** Re: Bad Creek Relicensing - Small Whorled Pogonia Survey Report

Thank you for sharing the report. Will there be additional surveys conducted? As the study plan and report state, "This species ... may remain vegetatively dormant and below the ground for one to several years." Neither the study plan nor the report includes a schedule/calendar for conducting surveys, but only provides an "optimal survey window of mid-May to early July." Seems like multiple calendar years would be ideal for determining its presence/absence considering orchids don't flower every year and may not even put out vegetative growth. Additionally, the survey results on page 5 state, "No small whorled pogonia was identified during the 2024 survey," which sounds as if there are plans to conduct additional surveys in following years, but this is not clear.

Similarly, the report should clearly state the year when the current observations/surveys were conducted. One assumes the survey results are from 2024 due to the statement in the study results section stated above, but based on the footnote on page 1, there could have been a survey in 2023, although hastily done given the lack of time for preparation. Regardless, redundancy in clarity never hurts and the reader shouldn't have to piece clues together to figure it out.

We also recommend including the qualifications of the biologists associated with the study and report, which is normal for a report of this type.

Lastly, northern starflower (see Photo 5 on page 2 of Appendix C) is not a rare species, although its presence in SC is perhaps unusual. It is in fact globally secure and not ranked in SC. Given the location of the surveys, though, its observation is perhaps on the edge of its typical range. That said, based on the image in the photo, it looks more like Indian cucumber (Medeola virginiana) to me.

Regardless of the presence/absence of SWP, I do want to point out that some of the plant community types that may be disturbed are ecologically significant, such as shortleaf pine forest and cove forest specifically.

Sincerely,
Chris

Chris Starker
Land Conservation Manager
864-203-1948

---

**From:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>

**Sent:** Wednesday, August 28, 2024 6:36 AM
**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>; dwilde@keoweefolks.org <dwilde@keoweefolks.org>; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; 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>; Melanie Olds <melanie_olds@fws.gov>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <cloningerp@dnr.sc.gov>; Samantha Tessel <Tessels@dnr.sc.gov>; alan.stuart@duke-energy.com <alan.stuart@duke-energy.com>; Sue Williams <suewilliams130@gmail.com>; wes.cooler@mac.com <wes.cooler@mac.com>; Willie Simmons <simmonsw@dnr.sc.gov>
**Cc:** 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 - Small Whorled Pogonia Survey Report

Dear Wildlife & Botanical Resources Committee:

Duke Energy is pleased to provide the final Small Whorled Pogonia Survey report, which was developed in response to a written request from the South Carolina Department of Natural Resources (SCDNR) in comments submitted to the Federal Energy Regulatory Commission on the Bad Creek relicensing Initial Study Report and to support Clean Water Act Section 404 U.S. Army Corps of Engineers permitting activities associated with the Bad Creek II Power Complex. The report was developed in consultation with the U.S. Fish & Wildlife Service and SCDNR and is being provided to the Resource Committee for information and reference.

The final report can be accessed at the following link: Small Whorled Pogonia Survey Report.

Please let Alan Stuart 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:** | Olds, Melanie J |
| **To:** | Crutchfield Jr., John U; Keith A. Bradley; Chris Starker; Abney, Michael A; Andrew Grosse; Andy Douglas; Austen Attaway; Bill Ranson-Retired; Dale Wilde; Elizabeth Miller; Mularski, Eric; Fletcher, Scott T; Huff, Jen; Jennifer Kindel; Ken Forrester; Amedee, Morgan D.; Pat Cloninger; Samantha Tessel; Stuart, Alan Witten; suewilliams130@gmail.com; Wes Cooler; Willie Simmons |
| **Cc:** | Kulpa, Sarah; McCarney-Castle, Kerry; Salazar, Maggie |
| **Subject:** | Re: [EXTERNAL] RE: Bad Creek Relicensing - Small Whorled Pogonia Survey Report |
| **Date:** | Thursday, September 5, 2024 4:05:58 PM |
| **Attachments:** | image001.png<br>Outlook-xphlhut5.png<br>Outlook-xlnh23b0.png |



John,

The Service reviewed the report and does not have any comments.

*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



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**From:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>
**Sent:** Wednesday, September 4, 2024 7:57 AM
**To:** Keith A. Bradley <BradleyK@dnr.sc.gov>; Chris Starker <cstarker@upstateforever.org>; 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>; dwilde@keoweefolks.org <dwilde@keoweefolks.org>; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Jen Huff <jen.huff@hdrinc.com>; Jennifer Kindel <KindelJ@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@mac.com <wes.cooler@mac.com>; Willie Simmons <SimmonsW@dnr.sc.gov>
**Cc:** Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>; Maggie Salazar <maggie.salazar@hdrinc.com>
**Subject:** RE: [EXTERNAL] RE: Bad Creek Relicensing - Small Whorled Pogonia Survey Report

Chris and Keith: Thank you for your review and comments on the Small Whorled Pogonia Report. We appreciate your input and will address your comments and compile additional information into a revised report to be issued to the Resource Committee.

For other Resource Committee members, if you have any comments on the report, please let Alan and me know by end of next week.

Again, thank you for the input.

Regards,
John

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**From:** Keith A. Bradley <BradleyK@dnr.sc.gov>
**Sent:** Thursday, August 29, 2024 10:24 AM
**To:** Chris Starker <cstarker@upstateforever.org>; Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; 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>; dwilde@keoweefolks.org; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; Fletcher, Scott T <Scott.Fletcher@duke-energy.com>; Jen Huff <jen.huff@hdrinc.com>; Jennifer Kindel <KindelJ@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@mac.com; Willie Simmons <SimmonsW@dnr.sc.gov>
**Cc:** Kulpa, Sarah -hdrinc <Sarah.Kulpa@hdrinc.com>; Kerry McCarney-Castle <Kerry.McCarney-Castle@hdrinc.com>; Maggie Salazar <maggie.salazar@hdrinc.com>
**Subject:** [EXTERNAL] RE: Bad Creek Relicensing - Small Whorled Pogonia Survey Report

All,

The northern starflower photo (Trientalis borealis, = Lysimachia borealis), is actually a picture of the fairly common Lysimachia quadrifolia.

Some other species that are certainly misidentifications include:
Asarum hartwegii
Carex pallescens
Juncus articulatus
Moehringia macrophylla
Scoparium spp. (perhaps Schizachyrium scoparium was intended)
Urtica dioica (likely Laportea canadensis)
Vaccinium angustifolium
Verbesina helianthoides

Also, Circaea alpina would represent Circaea canadensis. This is a state-tracked rare species and any data on the occurrence is appreciated.

Keith A. Bradley, Botanist
South Carolina Department of Natural Resources
Heritage Trust, Botany & Plant Conservation Program
1000 Assembly St., Columbia, SC 29201
BradleyK@dnr.sc.gov

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**Sent:** Wednesday, August 28, 2024 3:19 PM
**To:** Crutchfield Jr., John U <John.Crutchfield@duke-energy.com>; 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>; dwilde@keoweefolks.org; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; 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>; alan.stuart@duke-energy.com; Sue Williams <suewilliams130@gmail.com>; wes.cooler@mac.com; Willie Simmons <SimmonsW@dnr.sc.gov>
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We also recommend including the qualifications of the biologists associated with the study and report, which is normal for a report of this type.

Lastly, northern starflower (see Photo 5 on page 2 of Appendix C) is not a rare species, although its presence in SC is perhaps unusual. It is in fact globally secure and not ranked in SC. Given the location of the surveys, though, its observation is perhaps on the edge of its typical range. That said, based on the image in the photo, it looks more like Indian cucumber (Medeola virginiana) to me.

Regardless of the presence/absence of SWP, I do want to point out that some of the plant community types that may be disturbed are ecologically significant, such as shortleaf pine forest and cove forest specifically.

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dwilde@keoweefolks.org <dwilde@keoweefolks.org>; Elizabeth Miller <MillerE@dnr.sc.gov>; Mularski, Eric -HDRInc <Eric.Mularski@HDRInc.com>; 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>; Melanie Olds <melanie_olds@fws.gov>; Morgan Amedee <amedeemd@dhec.sc.gov>; Pat Cloninger <cloningerp@dnr.sc.gov>; Samantha Tessel <Tessels@dnr.sc.gov>; alan.stuart@duke-energy.com <alan.stuart@duke-energy.com>; Sue Williams <suewilliams130@gmail.com>; wes.cooler@mac.com <wes.cooler@mac.com>; Willie Simmons <simmonsw@dnr.sc.gov>
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The final report can be accessed at the following link: Small Whorled Pogonia Survey Report.

Please let Alan Stuart 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

# Comment Response Table: Small Whorled Pogonia Survey Report

| Organization | Comment/Question | Response |
|---|---|---|
| Upstate Forever | Are additional / future surveys planned for small whorled pogonia? | In association with the Draft License Application (scheduled for completion in February 2025), Duke Energy will consult with USFWS, SCDNR, and the Wildlife and Botanical Resources Committee on the need to prepare a Species Protection Plan specific to Small Whorled Pogonia or other special status plant species and communities. If required and as applicable, the Species Protection Plan may include, among other identified protection measures, provisions for future surveys. |
| | It is unclear when the surveys were conducted; please clarify. | Small whorled pogonia surveys were carried out in 2024 as follows: June 3-5 for the proposed Fisher Knob Access Road and transmission line access roads, and intermittently between late May and July 2024 for potential spoil areas and the general proposed limits of disturbance for Bad Creek II construction.<br><br>As stated in the Small Whorled Pogonia Survey Report, a (more general) Natural Resources Survey was carried out by HDR in 2021 and indicated that suitable habitat for the small whorled pogonia was present at the site, however, that study was performed outside of the survey window for this species. The current study (2024) was performed during the recommended survey window. |
| | We recommend including the qualifications of the biologists associated with the study and report. | A summary of the surveyors' qualifications has been added to the revised study report (Appendix E). As previously noted in the study report, HDR's biologists who conducted the survey have previous experience in plant identification in the Blue Ridge ecoregion. |
| | Northern starflower (see Photo 5 on page 2 of Appendix C) is not a rare species, although its presence in SC is perhaps unusual. | Based on additional comments from SCDNR (below), the referenced photo caption has been revised from *Lysimachia borealis* to *Lysimachia quadrifolia* in the revised study report. |
| | Some of the plant community types that may be disturbed are ecologically significant, such as shortleaf pine forest and cove forest specifically. | Duke Energy acknowledges that, as documented in the Small Whorled Pogonia Survey Report (2024) and the previous Natural Resources Assessment (2021), there are other ecologically significant natural plant communities throughout the Project and will continue to consult with the Resource Committee regarding future construction impacts, as applicable. |
| SCDNR | The northern starflower photo (*Trientalis borealis*, = *Lysimachia borealis*), is actually a picture of the fairly common *Lysimachia quadrifolia*.<br><br>Some other species that are certainly misidentifications | As noted above, the caption for the photo "northern starflower" has been revised from *Lysimachia borealis* to *Lysimachia quadrifolia* in the revised study report.<br><br>Duke Energy appreciates SCDNR's review of the small whorled pogonia survey report. Duke Energy has further consulted with HDR, and HDR has in turn further reviewed available field survey documentation including |

| Organization | Comment/Question | Response |
|---|---|---|
| | include:<br>• *Asarum hartwegii*<br>• *Carex pallescens*<br>• *Juncus articulatus*<br>• *Moehringia macrophylla*<br>• *Scoparium* spp. (perhaps *Schizachyrium scoparium* was intended)<br>• *Urtica dioica* (likely *Laportea canadensis*)<br>• *Vaccinium angustifolium*<br>• *Verbesina helianthoides* | field notes and site photographs. We have incorporated these comments into the revised study report as follows:<br>• Four species names in Appendix B have been corrected (*Asarum hartwegii, Carex pallescens, Juncus articulates, and Moehringia macrophylla)*.<br>o *Asarum hartwegii* was misidentified and is likely a wild ginger (*Hexastylis* sp.).<br>o *Carex pallas*cen – changed to *Carex* sp.<br>o *Juncus articulas* – changed to *Juncus* sp.<br>o *Moehringia macrophylla* – was likely star chickweed (*Stellar pubera*), which is a common species in South Carolina.<br>• For *Scoparium spp., Schizachyrium scoparium* was in fact intended (Little Bluestem), which is a common species in South Carolina.<br>• Based on available documentation, HDR is unable to confirm the last two species in SCDNR's list (left column), so the taxonomic classifications in Appendix B have been revised from species to genus level. HDR notes that these genera (wood nettle, blueberry, and crownbeards) are fairly common and were widely observed in the field. |
| | *Circaea alpina* would represent *Circaea canadensis.* This is a state-tracked rare species and any data on the occurrence is appreciated. | Duke Energy agrees with this species correction provided by SCDNR based on location. HDR's field team reviewed field notes and photographic inventory for this species. A photograph of a nightshade (*Circaea* spp.) plant species was retrieved, and the photograph metadata was used to acquire the location coordinates. The photograph and location map are illustrated on the following page. |


Nightshade (*Circaea* spp.) near 34.990708°, -82.990566°

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# Attachment 5

Attachment 5 – Potential Spoil Areas

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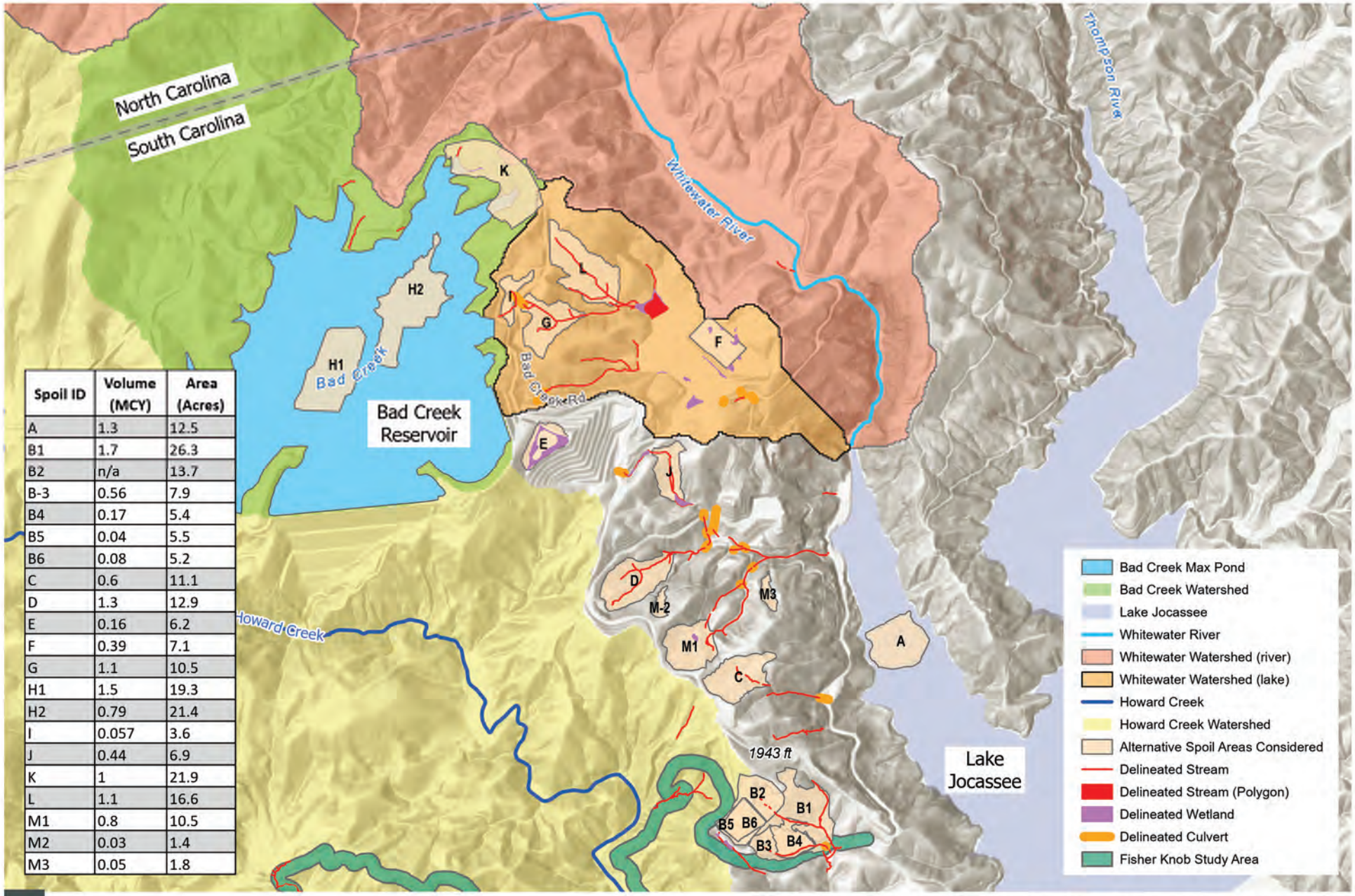


| Spoil ID | Volume (MCY) | Area (Acres) |
|---|---|---|
| A | 1.3 | 12.5 |
| B1 | 1.7 | 26.3 |
| B2 | n/a | 13.7 |
| B-3 | 0.56 | 7.9 |
| B4 | 0.17 | 5.4 |
| B5 | 0.04 | 5.5 |
| B6 | 0.08 | 5.2 |
| C | 0.6 | 11.1 |
| D | 1.3 | 12.9 |
| E | 0.16 | 6.2 |
| F | 0.39 | 7.1 |
| G | 1.1 | 10.5 |
| H1 | 1.5 | 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 |

0 1,000 2,000 Feet

**WATERSHED MAP FOR ALTERNATIVE SPOIL AREA EVALUATION**