WATER STRATEGY, HYDRO LICENSING & LAKE SERVICES

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January 29, 2025

Electronically Filed

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

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

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 (Project) (FERC 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 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. 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. Duke Energy is proposing additional energy storage and generation capacity at the Project, which would be developed by constructing a new 1,400-MW Bad Creek II Power Complex (Bad Creek II) adjacent to the existing powerhouse.

Pursuant to 18 CFR §5.15(f), Duke Energy filed the Updated Study Report (USR) on January 3, 2025. Duke Energy held the USR Meeting with relicensing stakeholders and FERC staff on Thursday, January 16, 2025 from 9am to 4pm at the Duke Energy Wenwood Operations Center in Greenville, SC. The meeting included a virtual (Microsoft Teams) option for remote participants.

Duke Energy hereby files the USR Meeting summary for Commission and relicensing stakeholder review as Attachment 1. The USR Meeting presentation is included as Attachment 2. Duke Energy is filing the USR Meeting summary with the Commission electronically and distributing notification 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 a notification of filing via U.S. mail. Parties interested

in the relicensing process may obtain a copy of the USR Meeting summary electronically through FERC's eLibrary system[1], or from Duke Energy's public relicensing website.[2]

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

Enclosures

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

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

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Attachment 1

Bad Creek Pumped Storage Project - Updated Study Report Meeting Summary

Meeting Summary

Project:	Bad Creek Pumped Storage Project Relicensing (FERC Project No. 2740)
Subject:	Updated Study Report Meeting
Date:	Thursday, January 16, 2025
Location:	Duke Energy Wenwood Operations Center, 425 Fairforest Way, Greenville, South Carolina and Teams Meeting (virtual option)

In-person Attendees

Alan Stuart (Duke Energy)
Christy Churchill (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)
Sarah Santos (Duke Energy)
Mills Dorn (Terracon)
Kelly Kirven (Kleinschmidt Assoc)
Jeremy Wimpey (Applied Trails)
Sarah Kulpa (HDR)
Ty Ziegler (HDR)
Jen Huff (HDR)
Kerry McCarney-Castle (HDR)
Kelly Thames (HDR)
Maggie Salazar (HDR)
Jennifer Gut (Kleinschmidt Assoc)
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David Gandy (FERC)
Prabha Madduri (FERC)
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Wes Cooler (Naturaland Trust)
Glenn Hilliard (Foothills Trail Conservancy)
Rowdy Harris (SCPRT)
Jeffrey Phillips (Greenville Water)
Elizabeth Miller (SCDNR)
Shannon Hammond (USFS)
Derrick Miller (USFS)
Andy Douglas (SC Wildlife Federation/ Jocassee Lake Tours)

Virtual Attendees

Harold Peterson (Bureau of Indian Affairs)
Dale Wilde (FOLKS)
David Todd (City of Brevard)
Andrew Gleason (FTC)
Kelly Shaeffer (KA)
Melanie Olds (USFWS)
Wenonah Haire (Catawba Indian Nation)
Terri Russ (Terracon)
Erin Settevendemio (HDR)
John Hains (FOLKS)
Allan Creamer (FERC)
Angelle Greer (USACE)
Chip Ridgeway (USACE)

Introduction (9:00 am)

The Bad Creek Pumped Storage Project (Bad Creek or the Project) Updated Study Report (USR) was filed with the Federal Energy Regulatory Commission (FERC) on January 3, 2025 – this meeting is being held to discuss the individual studies and findings from the second year of relicensing studies and receive feedback from relicensing participants/stakeholders as well as the Federal Energy Regulatory Commission (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, provided an overview on meeting facility layout and emergency action responsibilities, shared the agenda, facilitated participant introductions, and provided a safety moment (fire safety).

A. Stuart noted Duke Energy is beginning the third year of the relicensing process for Bad Creek and shared the milestone schedule, indicating the Draft License Application (DLA) must be filed by March 3rd (Duke Energy will likely file in late February) and the 90-day stakeholder comment period will be triggered by that filing.

Duke Energy has recently reached settlement with Bad Creek relicensing participants and the signing ceremony for the Bad Creek Relicensing Agreement will be held next week.

Expanded Project Boundary

A. Stuart presented a slide showing the proposed expanded Project Boundary for the proposed Bad Creek II Power Complex (Bad Creek II). The addition of Bad Creek II will double the existing capacity at the Project and use the existing upper (Bad Creek) and lower (Lake Jocassee) reservoirs. The proposed underground powerhouse will be constructed with two tunnels to maintain operability during single unit outages (the current Project only has one tunnel). He also noted the new powerhouse will have variable speed units allowing for greater operational flexibility. The FERC Project Boundary is proposed for expansion by approximately 467 acres to enclose land necessary for construction and operation of the new facilities, lands that could potentially be affected by spoil placement from materials excavated for Bad Creek II, and the wider transmission corridor for the new 525-kv transmission line. (All lands within the expanded Project Boundary are owned by Duke Energy.)

Additional Spoil Areas

A. Stuart showed a figure of potential spoil areas for the approximately 4.4 million cubic yards of earth and rock that will be excavated for Bad Creek II. Duke Energy is currently evaluating which upland spoil areas to use for Bad Creek II based on natural resources studies and minimizing environmental impacts as practicable, noting not all spoil locations will be used. Duke Energy proposes to spoil rock materials from the underground powerhouse and tunnel excavations in Lake Jocassee (by expanding the original weir in the downstream direction), and materials from the upper reservoir inlet/outlet construction in dead storage/deep quarry areas within Bad Creek Reservoir, to reduce the volume of materials to be spoiled in upland locations. Spoil area evaluation is on-going in association with development of the Clean Water Act (CWA) Section 404/401 Application.

A. Stuart showed a slide listing the six FERC-approved ILP studies, noted all relicensing studies are now complete, and handed the presentation over to the resource study presenters. He noted that studies discussed during the ISR meeting will not be covered again during this meeting, however, Duke Energy is happy to take questions and/or discuss these studies further if requested.

Water Resources

Task 1 – Existing Summary of Water Quality Data and Standards

Maverick Raber presented a summary slide of objectives and key results of Task 1. The final Task 1 report was filed with the ISR and discussed during the ISR meeting.

- 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. Results of the first year (Study Year 1; 2023) were discussed during the ISR meeting and documented in the ISR. The final report including results of Study Years 1 and 2 (2023 and 2024) was filed with the USR. M. Raber provided an updated overview of field methods, monitoring locations, and monitoring dates, and compared water quality data (temperature and dissolved oxygen [DO]) between the two study years. [The project operated with three units in 2023 and four units in 2024.] Vertical profile data (temp and DO) shows mixing in the water column at the upstream monitoring location near the lower inlet/outlet (I/O) structure due to Project operations and tributary inflow while the monitoring location downstream of the weir shows well-defined stratification, demonstrating the weir is performing as designed and dissipating energy as water flows over the weir (i.e., vertical mixing is limited to area upstream of the weir). There were no significant differences between Study Year 1 and Study Year 2 data; data from monitoring locations downstream of the weir show stratification under all pumping and generation scenarios, consistent with historical water quality monitoring and recent computational fluid dynamics (CFD) modelling (further discussed in Task 3).

- Andy Douglas noted data (shown on Slides 26-28) indicate water level in Lake Jocassee was drawn down immediately prior to Hurricane Helene and that overall, significant lowering of the reservoir followed by a large amount of precipitation didn't seem to have much of a prolonged effect on Lake Jocassee or mixing. M. Raber agreed the Bad Creek / Lake Jocassee system is very unique and even with such a large storm, there wasn't the degree of mixing / effects one might expect in other southeastern reservoirs (i.e., in a larger watershed).

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

Ty Ziegler presented a summary of updated modeling results for Task 3. The study was completed and filed in the ISR; however, due to the addition of variable speed units at Bad Creek II proposed after the ISR filing, additional CFD runs were made to evaluate the increase in pumping flow. Flows under generation were not significantly changed, therefore, generating operations were not modeled again.

T. Ziegler shared a rendering of the location of the proposed lower reservoir I/O structure in Lake Jocassee adjacent to the existing I/O structure and figures comparing existing vs. proposed cross-section velocities in the Whitewater River cove under pumping during full pond

and minimum pond. Lake Jocassee has never fallen to minimum pond, therefore, modeling minimum pond conditions is a hypothetical (conservative) scenario, particularly since the Keowee-Toxaway Low Inflow Protocol (which went into effect in 2014) reduces the chance of Lake Jocassee reaching minimum pond.

With Bad Creek II operation at Lake Jocassee minimum pond, surface velocities under maximum pumping could reach 10 feet per second (fps) in the recessed area of shoreline immediate downstream of the Bad Creek II lower I/O structure. However, under minimum pond conditions, Whitewater River cove just upstream of the I/O would be largely dewatered because the lakebed elevations in that area are higher than 1,080 feet above mean sea level.

The original conclusions of Task 1 are still valid and even with increased pumping capacity with variable speed units (increased flows), flow patterns are similar compared to original findings. Because surface velocities could reach 10 fps near the proposed I/O structures (only under maximum drawdown), Duke Energy would implement a safety plan to restrict boating, however, under minimum pond (which has never been reached), there likely would not be sufficient water depth for boating in upper Whitewater River cove and Duke Energy likely would not operate at full operational capacity. Lake Jocassee's lowest elevation recorded is 1,081 feet above mean sea level, which was during the severe drought conditions in 2007.

- Elizabeth Miller asked about the modeled increased velocities at the proposed I/O structure and if this information will serve to inform/modify Project operations, i.e., if higher velocities at lower lake elevations change the dispatch order of Bad Creek vs. Bad Creek II units.
    - A. Stuart said it is anticipated Bad Creek II powerhouse will be the primary powerhouse (i.e., higher in the dispatch order) due to the flexibility of the variable speed units, under all elevations, unless there are efficiency losses or other operational issues that would disproportionally affect Bad Creek II as compared to the existing powerhouse.

- E. Miller asked if Duke Energy would consider using Bad Creek instead of Bad Creek II to decrease the potential for fish entrainment at the Bad Creek II I/O structure.
    - A. Stuart responded that isn't likely due to the proposed dispatch order, however, and as contemplated in the relicensing agreement, Duke Energy is willing to further coordinate with SCDNR when Lake Jocassee pond levels drop to critical levels as specified in the relicensing agreement.

- Jeremy Wimpey and Derrick Miller asked about impacts of increased velocities on paddling and where paddlers might relocate to during lower levels at Lake Jocassee.
    - Kelly Kirven noted that potential effects of increased surface velocities to recreational boating and paddling will be discussed later during the Recreational Resources Study presentation.

- Wes Cooler stated there is likely sediment accumulation near the proposed Bad Creek II Lake Jocassee I/O structure. He asked if Duke Energy plans to expand, deepen, or

widen this area by dredging. Additionally, over the next 50 years, there will be more development in the Whitewater River watershed, which will contribute more sediment to the Whitewater River cove. Are there plans to address this?

- T. Ziegler noted that since minimum pond has never been reached, this isn't anticipated to be a problem, therefore, Duke Energy currently has no plans to widen or deepen the upstream extent of Whitewater River cove but would obviously revisit the situation if it becomes an operational problem in the future. He also noted that with implementation of the Low Inflow Protocol, Lake Jocassee is required to release less water than under historic conditions to help maintain Lake Keowee elevations and required downstream flow releases to the U.S. Army Corps (USACE) reservoirs. In addition, Lake Keowee also has more usable storage due to modifications at Oconee Nuclear Station further reducing reliance on water stored in Lake Jocassee to support Lake Keowee elevations during periods of low Project inflows.

- A. Douglas noted dead trees / branches coming down the Whitewater River waterfall could be more of an issue than sediment, as the watershed is developed.
  - M. Raber stated most of the cove is rock outcrop and the watershed is very small. It is unknown how much development will occur in the future; however, exposed soil horizons/ soil erosion is largely limited.

- A. Douglas asked if Jocassee can pull water from Keowee. T. Ziegler responded yes.

- Sarah Salazar asked about the potential for erosion along the opposite bank of the Whitewater River cove (from the Bad Creek lower I/O) in association with generation flows.
  - T. Ziegler explained full CFD model results for generation (and pumping) are documented in the ISR. The potential for erosion is one of the main reasons for development of the original CFD model. A main conclusion of the original CFD model is that due to the prevalence of bedrock in the cove, erosion was found to not be a concern, even with increased discharge with both powerhouses generating. [Note: Findings from the relicensing CFD study are included in the ISR and the initial feasibility CFD modeling study (which includes more detail about erosion and flows immediately downstream from the I/O structure) were filed in Appendix I of the Proposed Study Plan.] M. Raber also added the submerged weir helps to dissipate energy as it discharges from the facility and flows over the weir. K. McCarney-Castle added generation scenarios are covered in the ISR however, K. Kirven of Kleinschmidt will be sharing slides during the Recreation Study presentation showing proposed generation conditions for surface flows.

- John Hains (via chat): What is the maximum possible drawdown for Jocassee?

    - Mike Abney replied the maximum licensed drawdown limit is 30 ft. Under unprecedented drought, it could conceivably go lower under a variance from FERC.
- J. Hains (via chat): What is the elevation of Lake Jocassee at its lowest point? Is that the bottom of the intake structure opening or the emergency gates?
    - M. Abney responded that the Bad Creek intake is around 38 feet deep; however, there is a point where the units can't operate efficiently and would have to shut down. M. Abney added that he did not recall the elevations for Jocassee intakes offhand, but that Duke Energy would not operate the Jocassee spillway gates in a drought. (*As additional information not discussed during the USR Meeting, the openings of the Jocassee intake towers extend from El. 1,067 ft to El. 1,043 ft*).

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

T. Ziegler presented an overview of objectives, results, and methods for Task 4. Task 4 was carried out to identify and evaluate effects to Lake Jocassee reservoir elevations as well as effects to Lake Keowee and downstream projects resulting from operation of Bad Creek II. T. Ziegler explained the scenarios used (baseline vs. alternative), operational effects of the scenarios (including rate of change, Low Inflow Protocol stages, and releases between reservoirs), and the hydrology dataset/climate change sensitivities.

Generally, there would be minimal effects to Lake Jocassee reservoir elevation ranges resulting from Bad Creek II operations with smaller fluctuations over a 24-hour period of Lake Jocassee surface elevations. Only minimal effects were identified at Lake Keowee, the downstream USACE reservoirs, and Savanah River flows.

- J. Hains (via chat message) – At present Richard B. Russell is not allowed to pump back during the day. If that changed, how would it affect the model outcome?
    - T. Ziegler noted the CHEOPS model accounts for operating logic at Richard B. Russell so if that logic changed, there is a tool to evaluate that effect.
    - However, changes in Richard B. Russell operations likely would not affect Duke Energy facilities since Lake Hartwell is between Richard B. Russell and Keowee Hydro[1] and would buffer operational effects from Richard B. Russell.

Task 5 – Future Water Quality Monitoring Plan

T. Ziegler presented objectives for the Bad Creek II Water Quality Monitoring Plan (WQMP) and indicated that this plan will only be implemented if Bad Creek II is constructed. The plan includes two sections addressing measures for (1) Lake Jocassee and (2) upland areas (streams).

[1] The 2014 Operating Agreement between the Army Corps, SEPA, and Duke Energy considers remaining usable storage in the entire USACE system; moving water from Richard B. Russell to Hartwell would not result in a change at Richard B. Russell.

For Lake Jocassee, the main impact during construction will be sediment loading due to construction activities (i.e., submerged weir expansion and lower I/O construction) as well as overland runoff from disturbed uplands. Therefore, turbidity monitoring in Whitewater River cove during and after construction is proposed to support compliance with South Carolina Department of Environmental Services (SCDES) surface water quality standards. Other water quality parameters will also be measured (temp, DO, pH) to monitor overall conditions. Monitoring will include daily surface measurements during construction and for one year following commencement of Bad Creek II operations. The compliance point location for turbidity monitoring will be a new water quality station at the mouth of the Whitewater River cove. A boat barrier is also proposed at that location to exclude boaters from Whitewater River cove during construction due to safety concerns. The turbidity compliance threshold will be based on SCDES guidance for water quality excursions, and consultation with SCDES will be required if more than 10% of turbidity readings over a 30-day rolling period exceed the compliance threshold and the source of elevated turbidity cannot be traced to a rain event (i.e., turbidity exceedances must be tied to construction activity to initiate consultation). Historic monitoring data have shown that large rain events have caused temporary natural spikes in turbidity in the Whitewater River cove; when exceedances are attributed to rain events, the exceedance and precipitation data (from nearest weather station) will be documented and included in an annual report.

- E. Miller asked if there has ever been elevated turbidity that lasted for 30 days.
    - T. Ziegler responded no and clarified the exceedance is not for 30 consecutive days but instead would be triggered when more than 10% of the data points collected over a rolling 30-day period (i.e., three days) exceed the compliance level. Based on historic data, turbidity was elevated many times in the record due to natural events (rainfall runoff) prior to Project construction.

T. Ziegler noted Duke Energy is requesting a temporary variance for turbidity in Whitewater River cove (at the proposed compliance point) since the proposed impact is temporary in nature and will affect a very small area relative to the size of Lake Jocassee. That is, a large turbidity refugia exists that sensitive species could move into if needed, as 98% of the lake (with similar habitat to Whitewater River cove) is available as turbidity refugia. Because Lake Jocassee is considered trout waters, the current state standard for turbidity is 10 NTU; however, Duke Energy is requesting a temporary variance of 25 NTU, which is in alignment with SCDES freshwater lake standards and is considered the upper limit for some sensitive species based on literature review. The variance would only be in effect during Bad Creek II construction and would allow Duke Energy to construct the new facility while maintaining compliance with state regulations, a key goal of Duke Energy.

- A. Douglas asked if the compliance triggers / turbidity events would impact the stocking of trout and if there would be consultation with the agencies? E. Miller noted historically SCDNR doesn't stock in the Whitewater River cove. A. Douglas asked if fish are typically stocked in the winter. Rowdy Harris added that stocking at Jocassee at the Devils Fork State Park ramps is typically done in December.

- Erika Hollis asked if Duke Energy will modify construction if impacts to fish are observed. A. Stuart stated that mitigation for any impacts would be determined in consultation with the agencies under the WQMP and that Duke Energy would work to meet the regulatory limits set forth in permits. T. Ziegler noted consultation would take place if there is an exceedance of 10% of the data over a rolling 30 days and determination of the cause would be communicated to SCDES.

T. Ziegler introduced the second part of the WQMP which addresses upland streams that could be impacted by spoil areas and construction activities. Stream surveys at these locations would capture stream conditions downstream of construction BMPs and surveys will be carried out prior to and following construction.

- E. Miller asked what areas associated with spoil areas are subject to BMPs (noting the wording on the slide could indicate otherwise)
    - Ty confirmed spoil areas will have BMPs required under the construction NPDES permitting. Specific BMP measures and locations are yet to be determined.

- J. Hains (via chat) requested an explanation of H1 and H2 spoil areas in Bad Creek Reservoir.
    - S. Kulpa noted the 2018 Google Earth image shows Bad Creek reservoir drawn down which is helpful to see the bathymetry of the area; H1 and H2 are the deepest portions of the reservoir and were previously used as quarries. Adding excavated material to these areas does not decrease available usable storage for Bad Creek Project operations.

- J. Hains (via chat) asked if there would be a chemical analysis of the turbid material.
    - M. Abney noted that is not part of the WQMP.
    - J. Hains followed up by asking if there would be an effort to evaluate the cause of the turbidity and the nature of the material.
    - M. Raber indicated water is exchanged directly between Bad Creek Reservoir and the Whitewater River cove, therefore conditions in Whitewater River cove are reflective of Bad Creek Reservoir.
    - E. Miller restated her understanding that (turbidity) impacts related to fill of H1 and H2 would be reflected downstream in the Whitewater River cove through turbidity monitoring. T. Ziegler confirmed.

- E. Miller asked if spoil would be placed in H1 and H2 in the wet or during a drawdown.
    - A. Stuart and S. Kulpa responded that fill work in Bad Creek Reservoir would be done during an outage drawdown, noting it would be done primarily via truck hauling or earth moving.

- E. Miller asked if a construction sequence or schedule could be provided. J. Huff noted that this is forthcoming in the DLA but that this information is preliminary.

- Dale Wilde (via chat) asked if there are existing haul routes to the proposed spoil areas.
    - Jen Huff responded there are some existing routes and some spoil areas are more easily accessible than others. K. Thames noted final access roads to be developed will be contingent on spoil pile selection.

Break (11:15-11:30am)

Recreational Resources (11:33am)

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. The goals of the RUN Study were 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.

Results indicated highest uses were Table Rock State Park, Sassafras Mountain, Bad Creek Hydro, and Toxaway River. Parking areas are well-used and Laurel Valley parking can be over capacity at times. Hiking and backpacking are the most popular activities and respondents in the user survey reported very good/good quality of facilities and hiking/ trail experience. The increase in future population demand (16.8% by 2035) is not expected to affect Duke Energy's ability to accommodate demand. During Bad Creek II construction, Duke Energy will close Bad Creek Hydro Access Area and Musterground Road entrance (for up to an estimated 7 years).

J. Wimpey reviewed the results of the Carrying Capacity Analysis, which indicated users' camping experiences were favorable, as they expected, and there is plenty of capacity along the trail.

Future needs for consideration include:

- Parking at Laurel Valley Access
- Increased trail maintenance
- Gradual replacement of existing infrastructure with sustainable materials
- Improved and additional trail markers and signage
- Improved and/or repaired bridges (smaller, non-engineered bridges)
- Increased removal of downed trees
- Additional and improved restroom facilities and bear cables

Task 2 – Foothills Trail Conditions Assessment

K. Kirven described 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 (LCT). LCT identified 89 areas needing maintenance or improvement within the study area. During consultation, the FTC identified an additional 30 areas for maintenance or

improvement. After reviewing data in the ISR, Recreation Resources Committee members requested additional information about four areas which was provided in a subsequent technical memo. Maintenance items identified during the conditions assessment and requested by the relicensing resource committee will be addressed prior to new license issuance.

- D. Wilde (via chat) asked if it should be noted the trail was heavily damaged by Hurricane Helene and is still closed to hikers.
    - K. Kirven noted there was damage from Hurricane Helene. LCT conducted a site visit to some areas in October after Hurricane Helene. K. Kirven shared a slide describing damage and noted that Duke Energy and FTC were working to repair and reopen the trail as soon as possible.

Task 3 – Whitewater River Cove Existing Recreational Use

K. Kirven described the objectives, methods, and results of Task 3 of the Recreational Resources Study. This study task was covered during the ISR meeting and therefore was not covered in depth.

Task 4 – Whitewater River Cove Recreational Public Safety Evaluation

K. Kirven described the objectives and methods of Task 4 of the Recreational Resources Study. This study incorporates the findings from Task 3 of the Water Resources Study and Task 3 of the Recreational Resources study.

- E. Miller asked if there will be any signage discouraging swimming. K. Kirven noted this could be considered.

- A. Douglas asked about the signs and the location for the potential boat barrier to exclude boaters from the I/O structure during drawdown. A. Stuart responded that while exact locations have not been decided, the proposed barrier excluding access to the I/O structure will be parallel to the shoreline as opposed to the barrier that would block entry to the Whitewater River cove during construction. A. Douglas noted that information is helpful and that people will still be able to navigate a boat up the right side (looking upstream) of the cove to see the waterfalls.

- S. Salazar asked if the cove is dewatered, would that affect the weir if the crest of the weir is raised during expansion. A. Stuart responded the crest elevation will remain the same elevation; Duke Energy would expand the weir in the downstream direction only.

- E. Miller asked if there is a figure showing what it would look like if the Whitewater River cove is dewatered (i.e., minimum pond). Kelly reiterated the entire cove wouldn't be dewatered at minimum pond, and revisited the bathymetry slide in the CFD section showing the area just upstream of the I/O structure.

- J. Hains (via chat): When it mentions exclusion adjacent to the I/O, what kind of distances are we talking about? Duke Energy responded (via chat) that would leave a navigation corridor of approximately 400 feet.

Lunch Break

Aquatic Resources

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

Task 1 - Entrainment

M. Abney summarized the two addenda developed following submittal of the final Entrainment Study in the ISR. The two addenda are included in the USR. Both were developed in response to FERC comments on the ISR. The first report addresses additional pumping flows resulting from updated hydraulic pumping capacities and the second incorporates a literature review for threadfin shad and blueback herring.

- No comments/questions or discussion.

Task 2 – Desktop Studies on Pelagic and Littoral Habitat

M. Abney presented an overview of the objectives, methods, and results of Task 2 of the Aquatic Resources Study. The objectives were to 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 relicensing.

Bad Creek II operations will **not** result in impacts to spawning success or littoral zone habitat as compared to the Baseline scenario and some conditions (e.g., spawning success) may improve with the addition of Bad Creek II operations. Lake Jocassee water surface is between 1,104 feet msl and 1,109 feet msl 90% of the time under both the Baseline and Bad Creek II scenarios. This range encompasses the “high” littoral zone habitat scenario in the CHEOPS model and maintains 98.4 to 98.5% of littoral habitat, therefore, no impacts to littoral habitat resulting from proposed Project operations are expected**.**

- No comments/questions or discussion.

Task 3 – Mussel Surveys and Stream Habitat Quality Surveys

M. Abney presented an overview of the objectives of Task 3. The results were covered in the ISR, therefore, only additional consultation with the SCDNR since the time of ISR filing was summarized.

- No comments/questions or discussion.

Environmental Justice

Jenn Gut revisited objectives and results of the Environmental Justice (EJ) study, which was completed for the ISR, and the final report was filed with the ISR. In their comments on the ISR, FERC staff asked for Duke Energy to conduct public outreach to EJ communities identified during the study. A community outreach plan was developed, and two town-hall style public meetings were held in two different counties of the identified EJ communities (one in the morning, one in the evening). Organizations playing a role in supporting members of EJ communities were contacted no less than least three times prior to the meeting to disseminate information to the communities about the meetings. A pamphlet was developed and distributed to organizations and also placed on Duke Energy's public website (in English and Spanish). The distance between the two meeting locations was approximately 20 miles, therefore, both meetings were open to either EJ communities. There were no attendees from EJ communities at either meeting. There were two host-facility representatives for one meeting, who indicated to Duke Energy that little to no participation from communities is not unusual.

- No comments/questions or discussion.

Cultural Resources

Christy Churchill provided an overview of the objectives and results of the Cultural Resources Study. The Cultural Resources study methods and study results were discussed during the ISR meeting; however, more recent (2024) surveys were conducted to accommodate the expanded Area of Potential Effect (APE) (expanded to encompass construction activities and transmission corridor widening). An addendum was developed to document results of the additional Phase I survey for these new areas. No new archaeological sites were located and the addendum was filed with the USR. Concurrence for the expanded APE has been received from the South Carolina State Historic Preservation Office (SHPO) and Catawba Indian Nation, and the addendum report was distributed to the consulting parties as well.

- No comments/questions or discussion.

Visual Resources

J. Huff described the objectives, methods, and preliminary results of the Visual Resources Study; she gave a brief introduction of the nine tasks under the study. Tasks 1, 2, and 3 were covered under the ISR. Results under tasks 4-9 include results of the key views selection, existing visual quality assessment, visual analysis, visual management consistency review, mitigation assessment and conceptual design of Bad Creek II.

- S. Salazar asked about the relocation of the wastewater treatment plant and if the existing settling ponds that need to be relocated (based on tour of Bad Creek facility previous day) were considered in the Visual Resources analysis.
    - A. Stuart stated the settling ponds were not included in the analysis as the design was not performed early enough; however, the settling pond relocation areas are

determined to be in impacted areas; the new “package plant” being evaluated by Duke Energy would likely be located between the lower reservoir I/O structures.

- E. Miller asked what kind of assessment scale was used for visual quality (e.g., to make the distinction between low and moderate).
    - J. Huff responded the sub-consultant who performed this task (Land Planning Development Associates, now Kimley-Horn) used the U.S. Forest Service (USFS) visual management system. E. Miller asked about Key View 7 (Oscar Wiggington) and its classification. J. Huff responded it is ranked as very high. E. Miller noted the transmission line seems to dominate the view / draw the eye. W. Cooler added views of the transmission line corridor would depend on what time of year and if it’s been herbicide treated or cleared recently creating a contrast with the existing vegetation. J. Huff noted it also depends on time of day, noting the Oscar Wiggington overlook is not heavily visited during leaf-off seasons. J. Huff added that the dominant view is of the lake and surrounding vegetated landscape. While the transmission line is visible, it does not dominate the view.

- S. Salazar asked if the existing access to the Foothills Trail is open 24 hours and if visitors would go there at night. J. Huff noted night visits will not be allowed during construction. The Foothills Trail potential key observation view was eliminated during field work because you cannot see anything except the vegetation surrounding the trail. However, someone could possibly use the trail at night - a hiker coming off the trail late or hunters going in before dawn. S. Salazar asked if after the new switchyard is constructed, there will need to be a new place for the trail access. J. Huff responded the parking lot will be reconfigured because the road that goes to the current operations area will be reconfigured and the existing kiosk at Musterground Road would be moved. S. Salazar asked if the parking and lighting would be the same. A. Stuart responded yes, there would be no net loss of parking capacity; it would be moved but no amenities changed.

- D. Miller noted Duke Energy owns the transmission line corridor in fee simple title.

Small Whorled Pogonia

Scott Fletcher presented an overview of the objectives, methods, and findings of the small whorled pogonia (SWP) survey. There will be a SWP species protection plan in the license application and evaluated in the Biological Assessment. SWP habitat exists throughout the Project Area, however, no species occurrences were identified during the extensive survey or previous general natural resource assessments.

- S. Salazar asked if evidence of feral hog activity was observed during the survey. S. Fletcher responded there is a large population of feral hogs in the area. S. Salazar asked if the species protection plan would include excluding feral hogs. K. Kirven mentioned there is hog hunting within the Wildlife Management Area (WMA). D. Miller added the USFS is trying to reduce sounders (family groups of wild hogs) in the area;

however, the population is very difficult to manage. S. Fletcher noted that if a sensitive species were detected exclusion measures could potentially be considered for select areas, but that any type of broader measures would not be practical.

Bat Survey

S. Fletcher presented the objectives, methods, and findings of the bat survey. Of note in the discussion and not emphasized on the slides, Biotope was retained by Duke Energy to conduct the study. Biotope determined the Indiana Bat is likely not present based on acoustic calls. USFWS reviewed the acoustic data, and their findings aligned with Biotope's with the exception of Indiana bat, which the USFWS concluded should tentatively be presumed present in the Project area. Duke Energy will note USFWS' findings and will further discuss species in the Applicant-Prepared Biological Assessment and License Application, as well as the species protection plan.

- S. Salazar asked USFWS (Melanie Olds) for confirmation regarding the final bat guidance, noting that FERC received notification on October 23, 2024, that USFWS released final guidance tools for projects that may impact northern long-eared bat (NLEB)[2]; however, is unsure how this guidance differs from the April 2024 guidelines and if the October guidance is the appropriate guidance to use. M. Olds stated the seasonal data from the October report for hibernation range are appropriate for the Project. S. Salazar asked what the main changes are between the April 2024 guidance and the final October 2024 guidance. M. Olds noted there were no major changes in content; the October final guidance was revised slightly to clarify certain topics (based on review comments) but no substantive changes were introduced (e.g., acreages between NLEB and tricolored bat were put into one table to make clear; summer occupancy window was also clarified as well as year-round active range). Year-round active range doesn't apply to Bad Creek because the facility is in the hibernating range, which was confirmed with USFWS.

- M. Olds confirmed Bad Creek is not within range of any known hibernaculum. S. Fletcher added Duke Energy also checked the tunnel access portal and rock shelter documented during the bat survey period and found no evidence of bat use. Powerhouse access portal conditions are not compatible with bat habitat preferences.

- A. Stuart asked if there was any evidence of white nose syndrome in Biotope's findings. S. Fletcher stated none of the specimens captured via mist net surveys exhibited any signs of white nose syndrome.

[2] https://www.fws.gov/sites/default/files/documents/2024-10/nleb_tcb_consultation_guidance_version-1.0_final_0.pdf

- S. Salazar added that tricolored bats roost in leaf clusters as opposed to tree trunks. S. Fletcher agreed, noting that Duke Energy is currently evaluating how tree maintenance is performed on Duke Energy property.

Additional Discussion

S. Salazar stated the USFWS listed the monarch butterfly as proposed as endangered in December 2024, therefore, Duke Energy will need to consider this change in the draft and final license applications. S. Fletcher responded that Duke Energy is the largest participant of the monarch Candidate Conservation Agreement with Assurances for Monarch Butterfly (CCAA) in the country and the Bad Creek Relicensing Agreement includes monitoring (2 sites) along the existing transmission line between Bad Creek and Jocassee to be incorporated into the monarch CCAA. This will be addressed in the DLA/FLA.

S. Salazar mentioned Comprehensive Plans and asked public agencies in attendance who have Comprehensive Plans on file with FERC to visit the FERC website and ensure their Comprehensive Plans are current. The SCDNR's State Wildlife Action Plan (SWAP) was used as an example (date on plan is 2015), and E. Miller noted the SWAP on file is the most current but will be updated in 2025. S. Salazar reiterated it is the responsibility of individual agencies to file any updates to plans.

A. Stuart presented next steps in the ILP schedule and settlement agreement. Duke Energy and involved participants/stakeholders have worked collaboratively during relicensing. Duke Energy plans to provide a complete license application package to FERC in hopes that FERC will be able to issue a timely license, especially in consideration of the timeframe in which Bad Creek II is needed. S. Salazar encouraged Duke Energy to review SD2 during DLA preparation to ensure resource interests as identified by FERC are addressed in the DLA.

S. Salazar stated FERC staff are available and happy to answer any questions from the stakeholders and invited receiving participants to contact FERC staff directly with any questions or concerns about the relicensing process.

A. Stuart adjourned the meeting and thanked participants in attendance and online for their participation.

Attachment 2

Bad Creek Pumped Storage Project - Updated Study Report Meeting Presentation

Bad Creek Pumped Storage Project No. 2740

Updated Study Report Meeting

DUKE ENERGY®

BUILDING A SMARTER ENERGY FUTURE®

JANUARY 16, 2025

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Meeting Agenda

- Welcome and Meeting Purpose
- Safety Moment & Introductions
- FERC ILP Schedule Review
- General Project Overview and Updates
- Water Resources Study
  - Break
- Recreational Resources Study
- Aquatic Resources Study
  - Lunch
- Environmental Justice Study
- Cultural Resources Study
- Visual Resources Study
- Additional Studies
  - Small Whorled Pogonia Survey
  - Bat Survey
- Closing

2

Safety Moment – Fire Prevention at Home

- Get as many smoke detectors as you need. You should have a smoke detector in each bedroom and on each story of your home.
- Test your smoke detector **monthly** and change the battery in each of your smoke detectors biannually.
- Replace all smoke detectors according to the manufacturer's recommendations.
- **Practice fire drills with children** and plan escape routes.
- If the smoke detector goes off, **immediately evacuate** and call the fire department from a cell phone or a neighbor's phone.

https://www.oceaneering.com/sustainability/health-safety-and-quality-hse/safety-moments/

3

Resource Committees

Lead Technical Manager
- Mike Abney

Project Manager
- Alan Stuart

Aquatic Resources
- Mike Abney
- Nick Wahl

Water Resources
- Maverick Raber

Wildlife & Botanical Resources
- Scott Fletcher

Cultural Resources
- Christy Churchill

Recreation & Aesthetics
- Alan Stuart
- Ethan Pardue

Operations
- Lynne Dunn
- Alan Stuart

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FERC ILP Schedule

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File Notice of Intent (NOI) Initiand Pre-application Document (PAD) (18 CFR §5.5(d))	Licensee	Within 5 years to 5.5 years prior to license expiration	Feb 23, 2022
Initial Tribal Consultation Meeting (18 CFR §5.7)	FERC	No later than 30 days following filing of NOI/PAD	Mar 25, 2022
Issue Notice of NOI/PAD and Scoping Document 1 (SD1) (18 CFR §5.8(a))	FERC	Within 60 days following filing of NOI/PAD	Apr 22, 2022
Conduct Scoping Meetings and site visit (18 CFR §5.8(b)(viii))	FERC	Within 30 days following Notice of NOI/PAD and SD1	May 16-17, 2022
Comments on PAD, SD1, and Study Requests (18 CFR §5.9(a))	Licensee Stakeholders	Within 60 days following Notice of NOI/PAD and SD1	June 23, 2022
Issue Scoping Document 2 (SD2) (18 CFR §5.10)	FERC	Within 45 days following deadline for filing comments on PAD/SD1	Aug 5, 2022
File Proposed Study Plan (PSP) (18 CFR §5.11)	Licensee	Within 45 days following deadline for filing comments on PAD/SD1	Aug 5, 2022
PSP Meeting (18 CFR §5.11(e))	Licensee	Within 30 days following filing of PSP	Sept 7, 2022
Comments on PSP (18 CFR §5.12)	Stakeholders	Within 90 days following filing of PSP	Nov 5, 2022
File Revised Study Plan (RSP) (18 CFR §5.13(a))	Licensee	Within 30 days following deadline for comments on PSP	Dec 5, 2022
Comments on RSP (18 CFR §5.13(b))	Stakeholders	Within 15 days following filing of RSP	Dec 20, 2022
Issue Study Plan Determination (18 CFR §5.13(c))	FERC	Within 30 days following filing of RSP	Jan 4, 2023
Conduct First Season of Studies (18 CFR §5.15)	Licensee	-	Spring-Fall 2023
File Study Progress Reports (18 CFR §5.15(b))	Licensee	Quarterly	Spring 2023 -Fall 2024
File Initial Study Report (ISR) (18 CFR §5.15(c))	Licensee	Pursuant to the Commission-approved study plan or no later than 1 year after Commission approval of the study plan, whichever comes first	Jan 4, 2024
ISR Meeting (18 CFR §5.15(c)(2))	Licensee Stakeholders	Within 15 days following filing of ISR	Jan 17, 2024

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FERC ILP Schedule (cont.)

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File ISR Meeting Summary (18 CFR §5.15(c)(3))	Licensee	Within 15 days following ISR Meeting	Feb 1, 2024
Comments on ISR Meeting and Additional or Modified Study Requests (18 CFR §5.15(c)(4))	Stakeholders	Within 30 days following filing of ISR Meeting Summary	Mar 1, 2024
File Response to Comments on ISR and Meeting Summary (18 CFR §5.15(c)(5))	Licensee	Within 30 days following filing of ISR Meeting Comments	Apr 1, 2024
Resolution of Meeting Summary Disagreements and Issue Amended Study Plan Determination (if required) (18 CFR §5.15(c)(6))	FERC	Within 30 days following filing of response to ISR Meeting Comments	May 1, 2024
Conduct Second Season of Studies (if necessary)	Licensee	-	Spring-Fall 2024
File Updated Study Report (USR) (18 CFR §5.15(f))	Licensee	Pursuant to the approved study plan or no later than 2 years after Commission approval, whichever comes first	Jan 3, 2025
USR Meeting (18 CFR §5.15(f))	Licensee Stakeholders	Within 15 days following filing of USR	Jan 16, 2025
File USR Meeting Summary (18 CFR §5.15(f))	Duke Energy	Within 15 days of USR Meeting	Jan 31, 2025
Deadline to file comments on the USR Meeting Summary	Stakeholders	Within 30 days of filing Meeting Summary	March 3, 2025
Deadline to File 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
Response to USR Meeting Summary Comments	Duke Energy	Within 30 days of USR Meeting Summary Comments filing	April 2, 2025
Comments on DLA (18 CFR §5.16(e))	Stakeholders	Within 90 days following filing 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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Bad Creek II Complex –

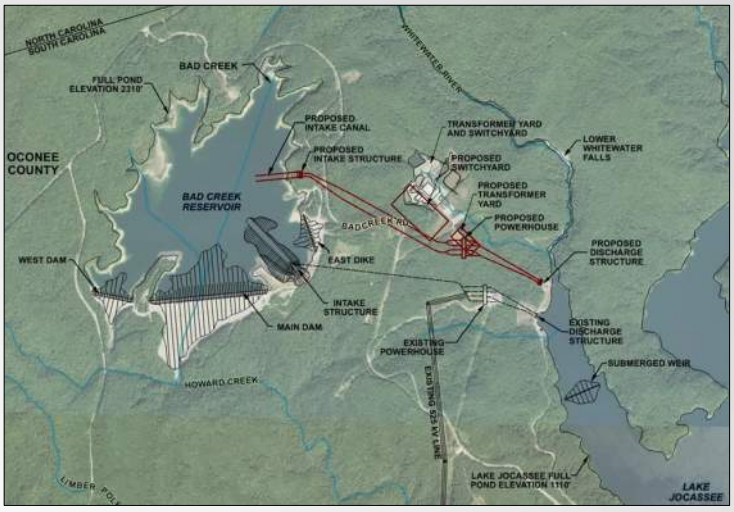
General Overview and Project Updates

7

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 3,460 MW (max generation) with 11 hours of storage

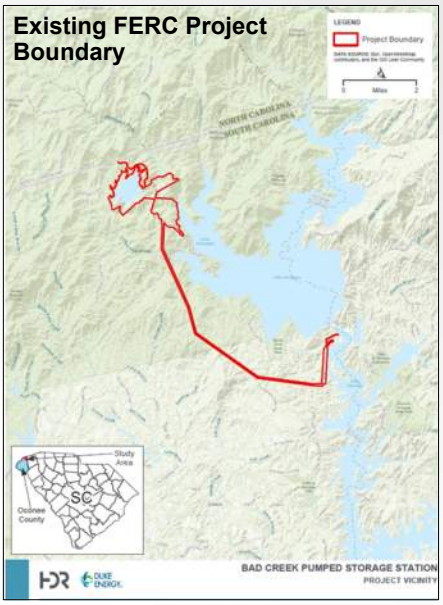


Privileged & Confidential/Attorney-Client Communication; Attorney Work Product

8

Proposed Expanded Project Boundary for Bad Creek II

Existing FERC Project Boundary



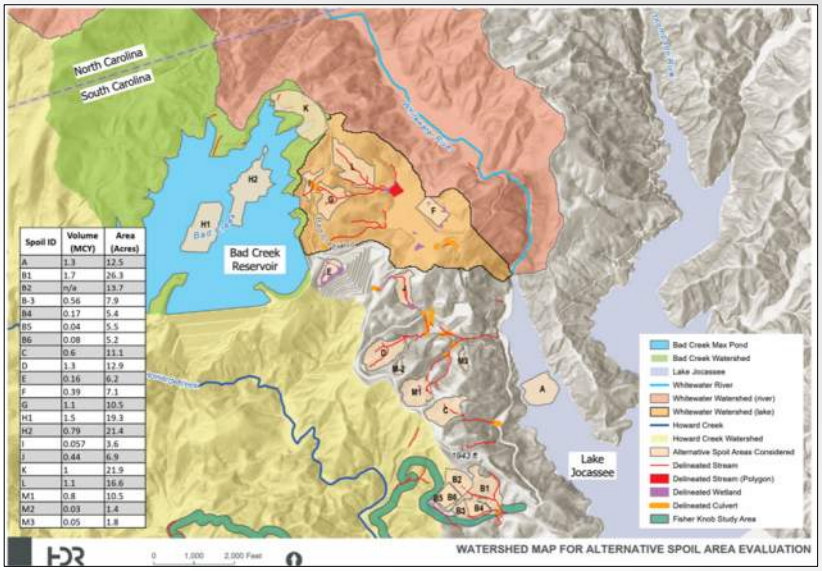
Project boundary expanded to include areas potentially impacted from spoil placement and other project works as well as transmission line widening.

Original: 1,280 acres
Expanded: 1,747 acres

Proposed Expanded Project Boundary

9

Proposed Expanded Project Boundary for Bad Creek II



Spoil ID	Volume (MCY)	Area (Acres)
A	1.3	32.5
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

- According to preliminary studies, approximately **4.4 million cubic yards of excavated material** for Bad Creek II construction will need to be deposited at upland spoil locations and/or along the submerged weir in Lake Jocassee.
  - Preferred potential areas for spoil placement are currently under evaluation.
- **Fisher Knob Access Road** is no longer being pursued as part of the relicensing strategy.

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FERC-Approved Relicensing Studies

Study	Status
1. Water Resources	Complete
2. Recreational Resources	Complete
3. Aquatic Resources	Complete
4. Environmental Justice	Complete
5. Cultural Resources	Complete
6. Visual Resources	Complete

Note: Studies that were presented during the ISR meeting will not be covered again; however, main study objectives and results are provided.

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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	**Complete**
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)	**Complete**
Task 5 – Water Quality Monitoring Plan Development	**Complete**

** Task methods and findings were presented during ISR meeting*

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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 - Summary of Existing Water Quality Data & Standards

Task 1 Results:

1. Upstream of the submerged weir, the water column undergoes vertical mixing and there is no indication of stratification.

2. Downstream of the submerged weir, stratification is observed during all seasons and is consistent between pre and post operation conditions. 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.

4. Results from previous studies in Howard Creek indicate water quality under operational conditions is well within the range of natural/seasonal variation observed under pre-operational conditions. Water quality conditions assessed are fully supportive of designated uses. ***Bad Creek II will not affect Howard Creek.***

Conclusion: It is not expected that adding 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 water quality data from 3 historical locations in the Whitewater River Cove to gather current day water quality information. Intended to provide sufficient information to support an analysis of potential Project effects on water resources in Lake Jocasee.
- **Status:** **Complete**

Bad Creek Pumped Storage Project ISR Meeting | 16

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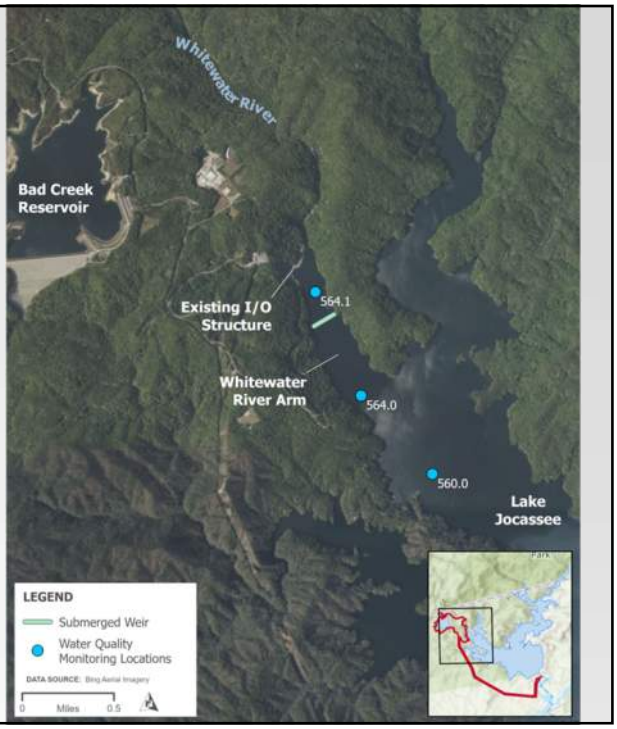
Task 2 – Methods

- Duke Energy collected continuous water temperature data and periodic temperature and DO profiles (bi-weekly) from locations near 3 historic monitoring stations to determine current-day water quality information during summer of 2023 and 2024.
- Data collected in 2023 represented conditions under 3-unit operations; data in 2024 was collected under 4-unit operations.
  - Unit upgrades were completed in March 2024 and increased total maximum hydraulic capacity at the Project by approximately 2,500 cfs.



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Task 2 – Methods

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Task 2 – Methods

Field Dates for Water Quality Measurement and Data Collection

Study Period	Date	Details
2023	May 22	Deploy instrumentation
	May 31	Data download and vertical profile
	June 14	Data download and vertical profile
	June 27	Data download and vertical profile
	July 13, 14*	Data download and vertical profile
	July 24	Data download and vertical profile
	August 11*	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	Data download; Remove instrumentation
2024	May 21	Deploy instrumentation
	June 11	Data download and vertical profile
	June 17	Data download and vertical profile
	July 1	Data download and vertical profile
	July 16	Data download and vertical profile
	July 30	Data download and vertical profile
	August 14	Data download and vertical profile
	August 26	Data download and vertical profile
	September 9	Data download and vertical profile
	September 25	Data download and vertical profile
	October 7	Data download and vertical profile; Remove instrumentation

Depth of VuLink Dataloggers

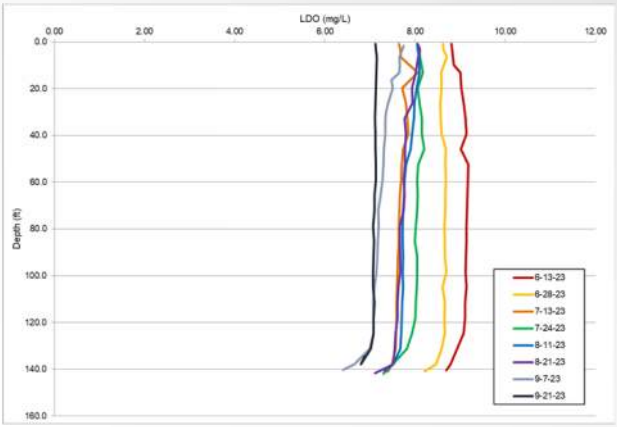
Approximate Water Depth (ft)	Approximate Elevation (ft msl)	Notes
3	1,107	Near surface
30	1,080	Normal maximum Lake Jocassee drawdown elevation
50	1,060	Approximate crest of the submerged weir
70	1,040	Approximately 20 ft below the crest of the submerged weir
100	1,010	Approximate location of thermocline

*Depths and elevations are dependent on Lake Jocassee elevations.

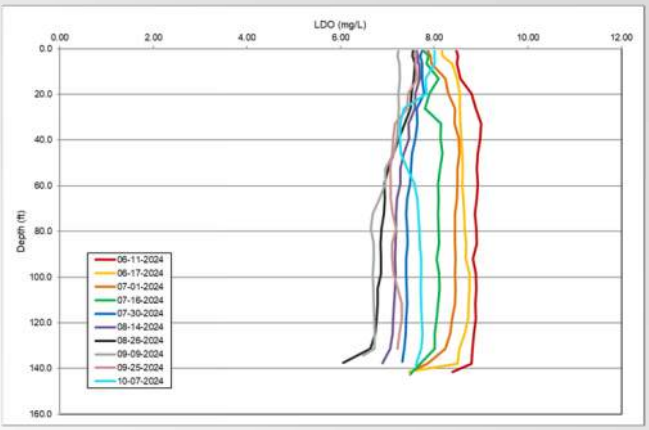
19

DO Profile Data, Station 564.1 (Upstream of Weir)

2023 (3 Units)



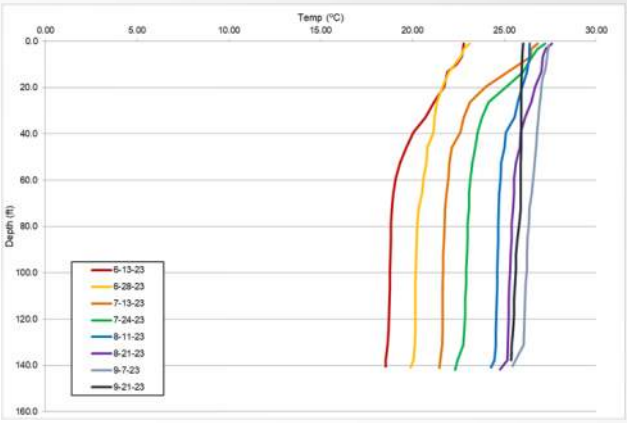
2024 (4 Units)



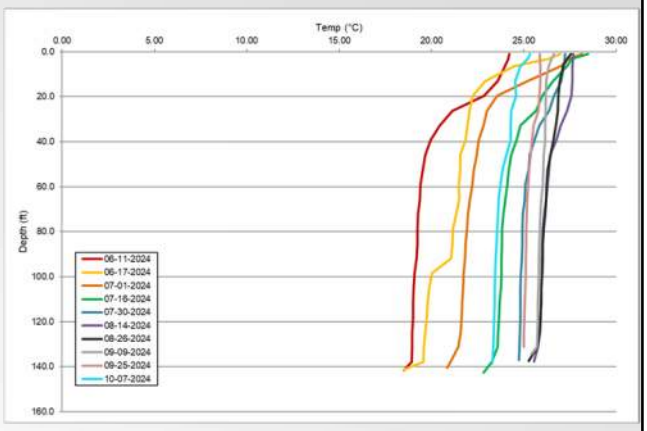
20

Temp Profile Data, Station 564.1 (Upstream of Weir)

2023 (3 Units)



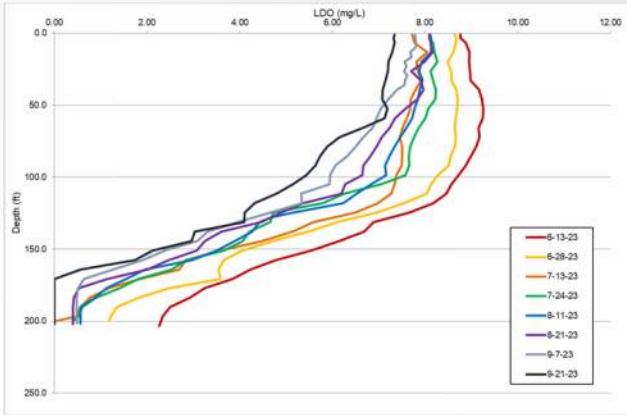
2024 (4 Units)



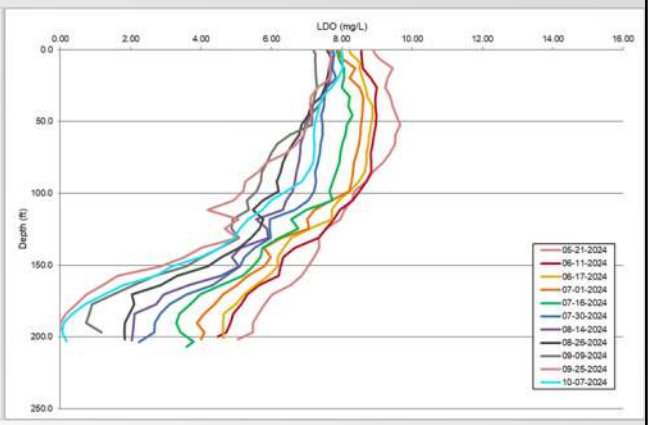
21

DO Profile Data, Station 564.0 (Immediately downstream of weir)

2023 (3 Units)



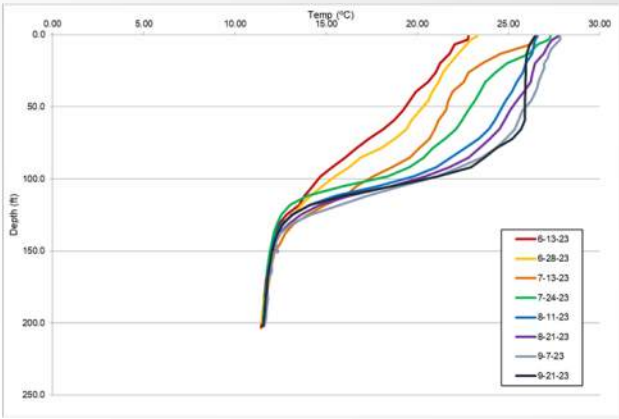
2024 (4 Units)



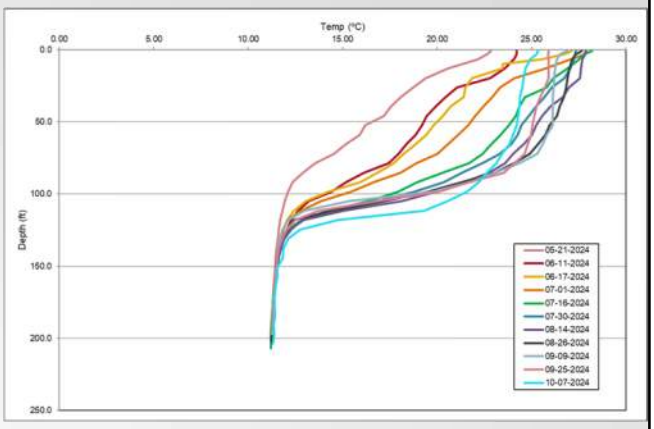
22

Temp Profile Data, Station 564.0 (Immediately downstream of weir)

2023 (3 Units)



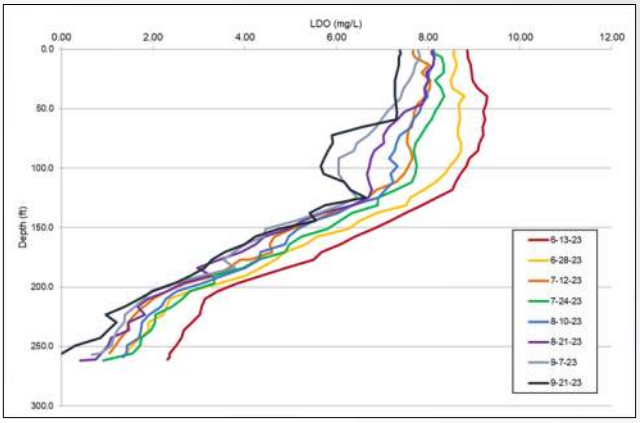
2024 (4 Units)



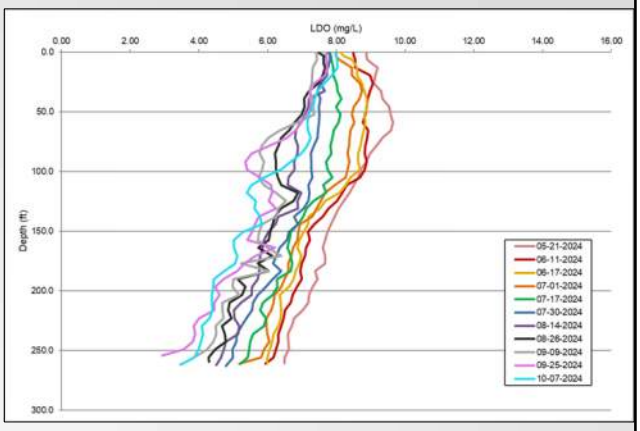
23

DO Profile Data, Station 560.0 (Downstream)

2023 (3 Units)



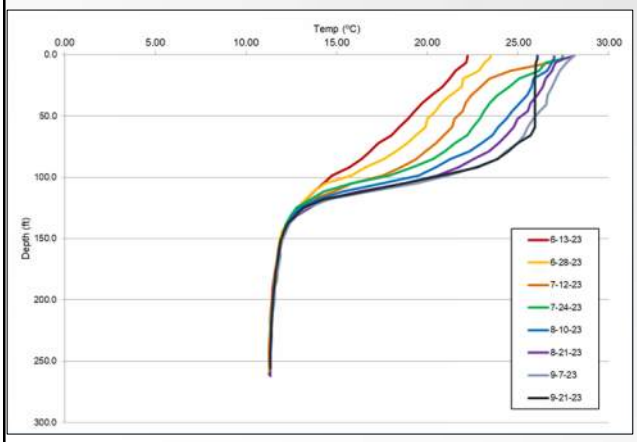
2024 (4 Units)



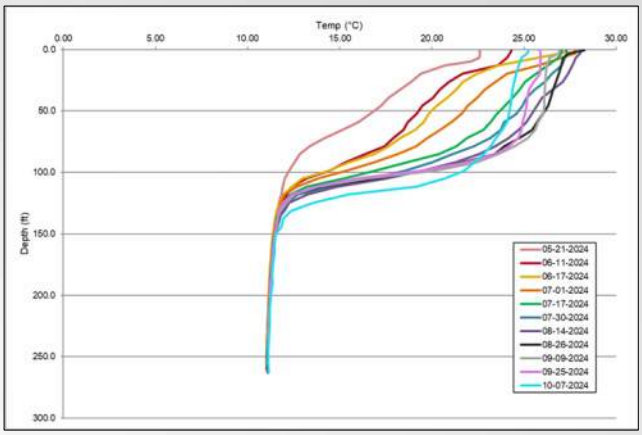
24

Temp Profile Data, Station 560.0 (Downstream)

2023 (3 Units)



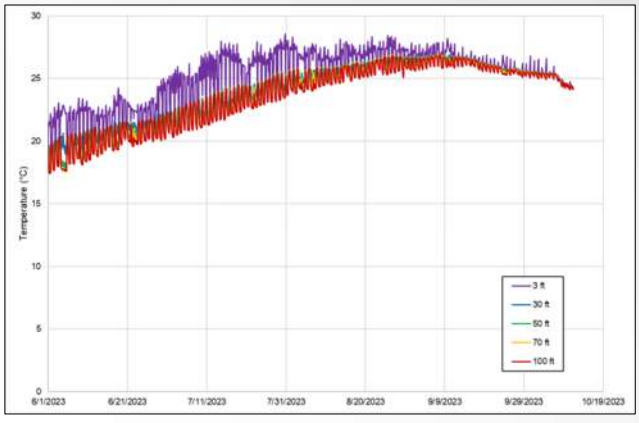
2024 (4 Units)



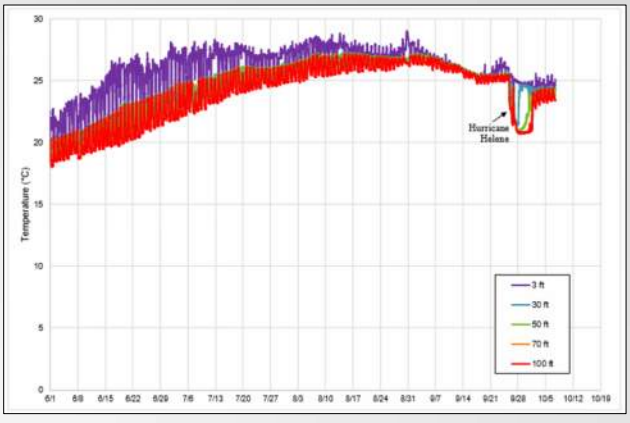
25

Continuous Temperature Data – Station 564.1
(Upstream of Weir)

2023 (3 Units)



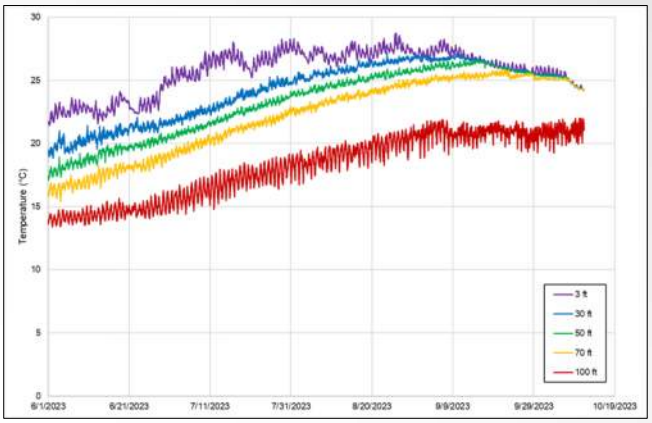
2024 (4 Units)



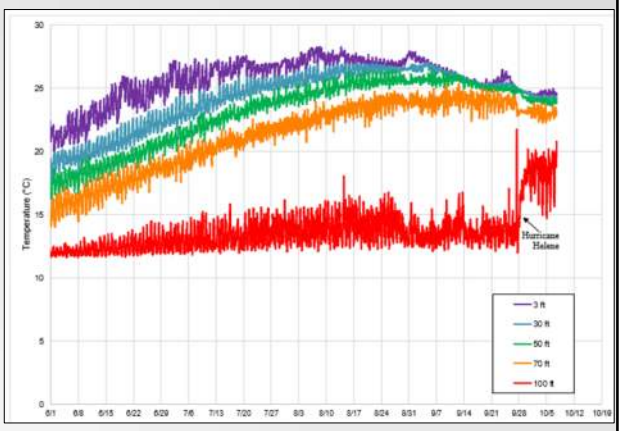
26

Continuous Temperature Data – Station 564.0
(Immediately downstream of weir)

2023 (3 Units)



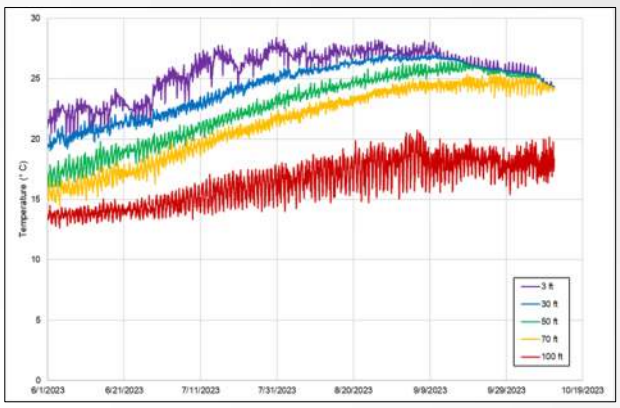
2024 (4 Units)



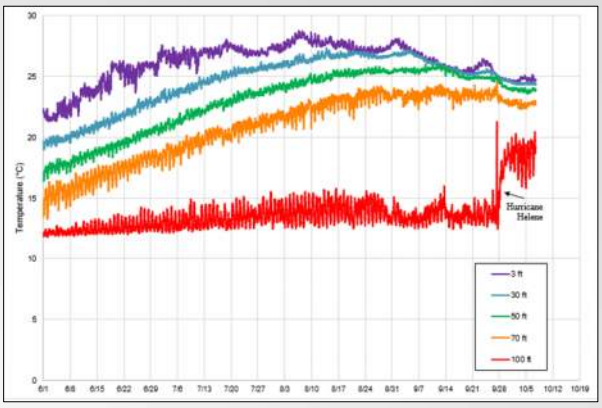
27

Continuous Temperature Data – Station 560.0
(Downstream)

2023 (3 Units)



2024 (4 Units)



28

Task 2 – Conclusions

- Results from water quality monitoring in the Whitewater River cove indicate water upstream of the submerged weir is well-mixed due to Project operations under all operations.
- Data from monitoring locations downstream of the weir show stratification under all pumping and generation scenarios.
- Preservation of stratification downstream of the weir is also supported by historical water quality monitoring and by CFD model results under current project conditions as well as Bad Creek II conditions.

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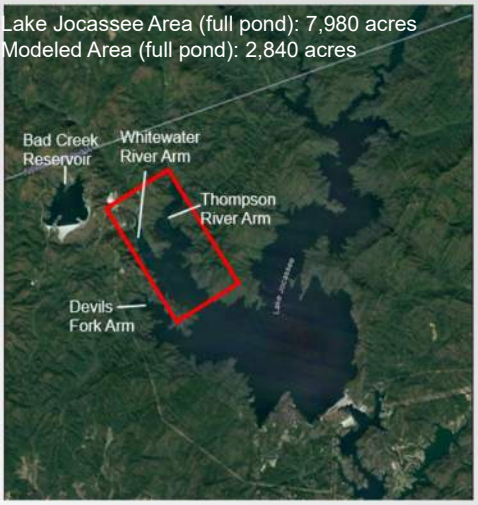
Task 3 - Velocity Effects and Vertical Mixing in Lake Jocassee Due to a Second Powerhouse (CFD Modeling)

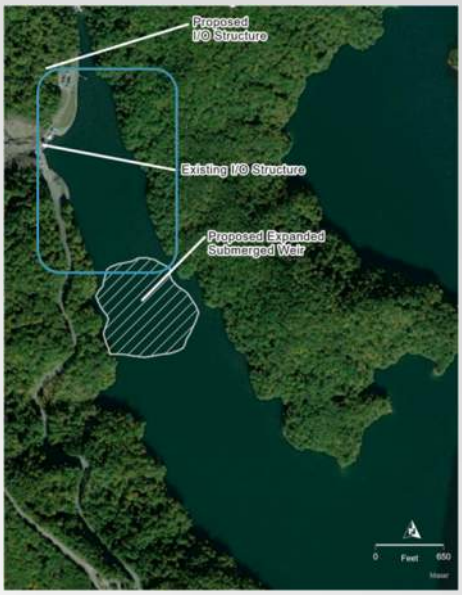
- **Objective:** Increased hydraulic capacities associated with Bad Creek II could affect flow patterns and velocities in the Whitewater River cove. Develop CFD model to evaluate flows and extent of vertical mixing in the Whitewater River arm and downstream of the submerged weir due to the addition of Bad Creek II.
  - **Status:** Complete
- Additional CFD modeling was carried out in 2024 to incorporate **updated hydraulic capacities** associated with Bad Creek II that were not available during original CFD modeling (design change from single speed to variable speed units).
  - An addendum to the Task 3 report was developed and updated results are presented in the following slides.



30

CFD Modeling – Updated Hydraulic Capacity

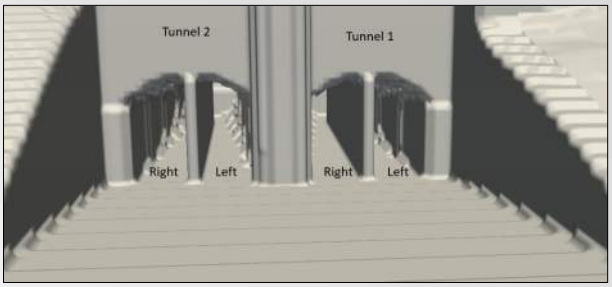
- Updated hydraulic capacity for generation resulted in similar flows as originally estimated during CFD modeling; however, updated ***pumping*** capacities resulted in a **~9 percent increase,** therefore additional CFD modeling was carried out in the Whitewater River cove for updated **pumping only.**
- The study area for this update includes the area of the Whitewater River cove from the proposed inlet/outlet (I/O) structure to the upstream end of the submerged weir (**blue rectangle**).
- A higher-resolution CFD model (previously developed for the Bad Creek II Feasibility Study) was used for this effort to assess near-field hydraulics and changes in velocity in the vicinity of the I/O structures.



31

Existing and Proposed I/O and Tunnel Configuration

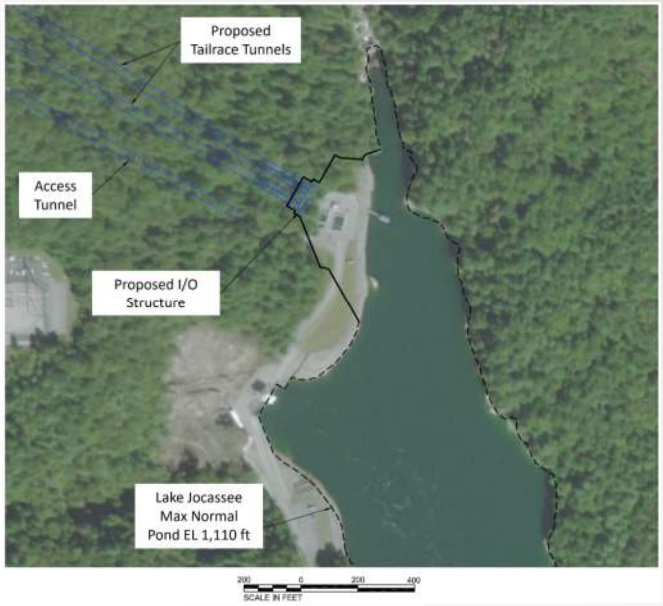
- The proposed I/O structure will be approximately 600-700 ft upstream of the existing I/O structure.



- Proposed structure will be similar to existing structure; 150 ft wide and 95 ft tall.
- Two tailrace tunnels extending from the underground powerhouse will penetrate the I/O structure at invert elevation 1,012 ft msl.
- Each tailrace tunnel has a diameter of 31 ft and the right/left chambers at the outlet are approximately 38 ft tall by 17.5 ft wide.

32

Existing and Proposed I/O and Tunnel Configuration



Width of Whitewater River cove:
- At existing I/O structure: 1,110 ft
- At proposed I/O structure: 675 ft

- The new I/O structure will be set back into the shoreline, creating a small alcove / intake canal in the Whitewater River Cove.

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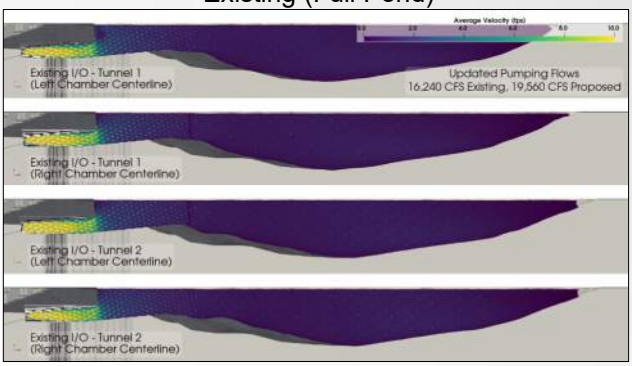
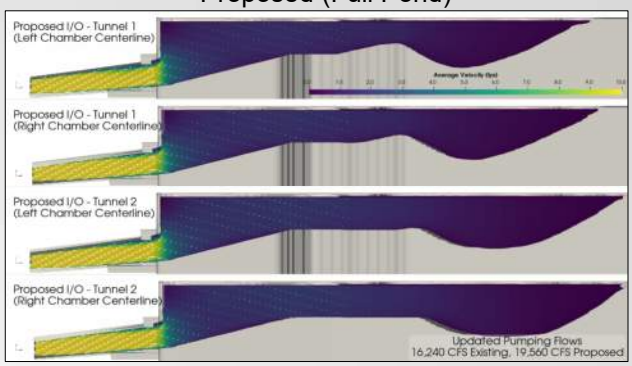
Cross-section Velocities (Pumping) – Full Pond

Existing (Full Pond)



- Depth-averaged approach velocities are 1.8 fps with a **maximum velocity of 2.0 fps**.

Proposed (Full Pond)



- Depth-averaged approach velocities are 1.7 fps with a **maximum velocity of 2.0 fps**.

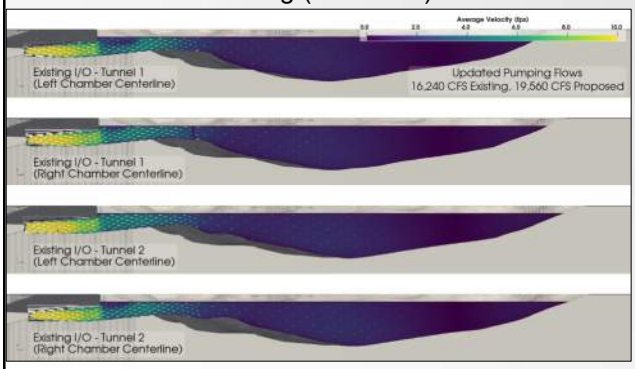
- Increased velocity impacts are limited to inside tunnels at full pond.

Noteworthy: Scale goes up to 10 fps (Yellow)

34

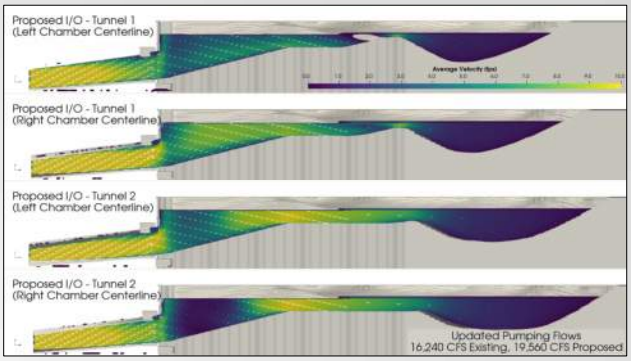
Cross-section Velocities (Pumping) – Min Pond

Existing (Min Pond)



- Depth-averaged approach velocities are 4.6 fps with a **maximum velocity of 5.2 fps**.

Proposed (Min Pond)



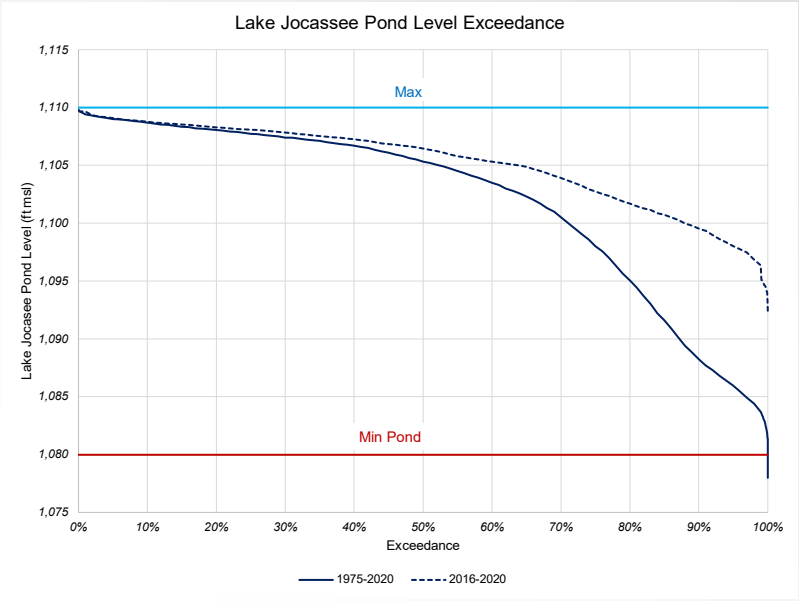
- Depth-averaged approach velocities are 4.5 fps with a **maximum velocity of 8.3 fps**.

- Increased velocity impacts extend into Whitewater River cove (at min pond).

Noteworthy: Scale goes up to 10 fps (Yellow)

35

Jocassee Water Surface Elevations (1975 – 2020)

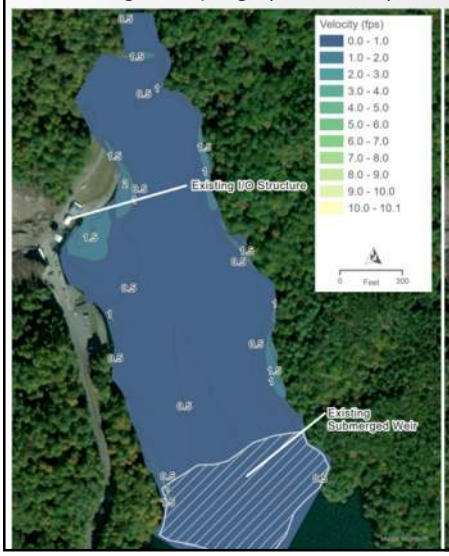


- Maximum allowable drawdown in Lake Jocassee is 30 ft (1,080 ft msl)
- Maximum historic drawdown occurred in 2007 (28.8 ft; 1,081.2 ft msl)
- Lake Jocassee pond elevations are within top 15 ft of operating pool 80% of the time
- 2014 Operating Agreement includes Low-Inflow-Protocol conditions which limit releases downstream of Lake Keowee during drought conditions.

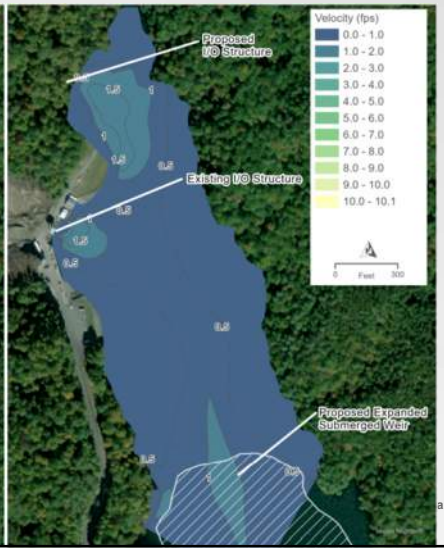
36

Surface Velocities – Full Pond

Existing Pumping (Full Pond)



Proposed Pumping (Full Pond)



- **Left**: Under **existing pumping** at full pond, surface velocities **do not exceed 2.0 fps** and are on average below 1.0 fps.
- **Right**: Under **proposed pumping** at full pond, velocities are very similar to existing conditions with **maximum velocities of 1.5 fps** near the existing and proposed I/O structures.
- Velocities over the expanded weir are consistent with existing velocities.

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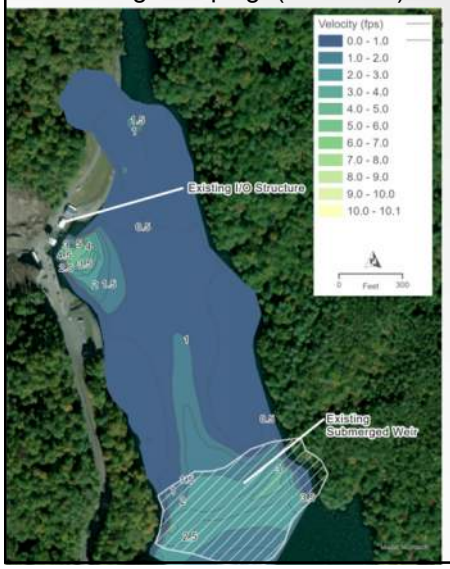
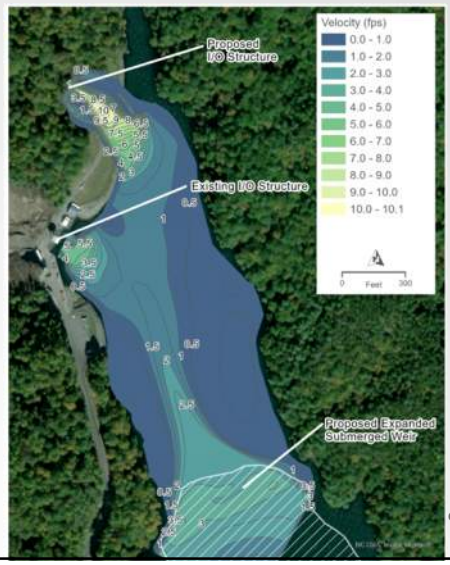
Surface Velocities – Minimum Pond

Existing Pumping (Min Pond)



Proposed Pumping (Min Pond)



- **Left**: Under **existing pumping** at min pond, surface velocities across the weir reach 3 fps and up to 5 fps directly in front of the existing I/O structure.
- **Right**: Under **proposed pumping** at min pond, velocities reach up to 10 fps directly in front of the proposed I/O structure.
- Maximum velocity over the proposed expanded weir is ~3.5 fps, consistent with maximum velocities over the existing submerged weir.

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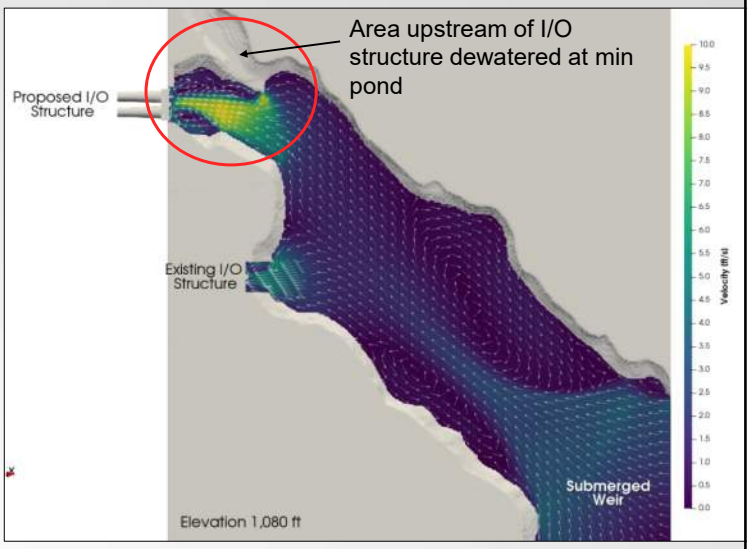
Plan View – Proposed Maximum Pumping (Min Pond)

- At min pond, the area just upstream of the proposed I/O structure would be dewatered as bathymetry is >1,080 ft (note this elevation has never been reached).
- As a result, this area would not support boating activities regardless of Bad Creek II operations; which would likely not operate at maximum hydraulic capacities under these conditions.
- Duke Energy would implement a safety plan to prevent boating near the I/O structure under drawdown conditions.



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Task 3 – CFD Modeling Conclusions

- While velocities in the Whitewater River cove increased from original results due to increased unit pumping capacities, findings from original modeling still hold true:

Original Findings

- The energy of the water discharged from Bad Creek is dissipated as it flows over the existing submerged weir.
- Bad Creek II powerhouse operations (pumping or generation) will not alter existing stratification patterns observed downstream of weir.
- Lake Jocassee at minimum pond elevation (1,080 ft msl) had the greatest effect on Whitewater River cove hydraulics (as expected).

Additional Conclusions from Updated Modeling (Proposed pumping, min pond)

- Pumping at maximum capacity under min pond conditions may result in surface velocities of **up to 10 fps** which could affect non-motorized boats (i.e., paddling would be more difficult due to increased currents).
- Areas of higher velocities (adjacent to I/O structure) will be restricted to boating.
- Boaters could travel along the eastern shoreline instead of near the Project if concerned about flows.
- The area immediately upstream of the Project would be dewatered and would preclude boating regardless of operations.
- Bad Creek would not likely operate at maximum pumping capacity under maximum drawdown scenario.

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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 (and downstream) as a result of operating an additional powerhouse at the Project.
- **Status:** Complete

CHEOPS™ Operations and Planning Model

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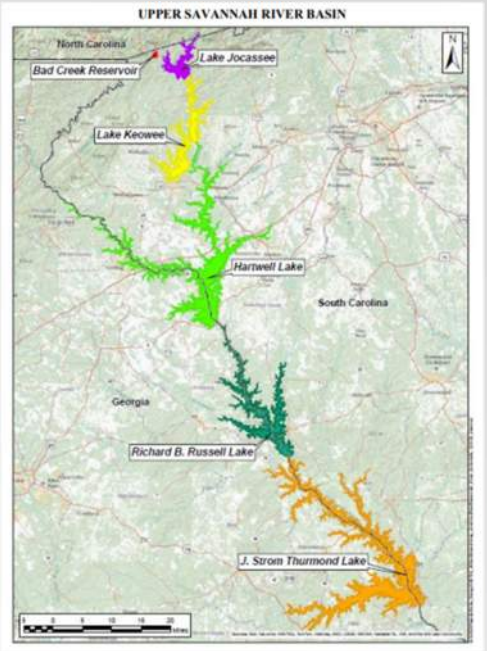
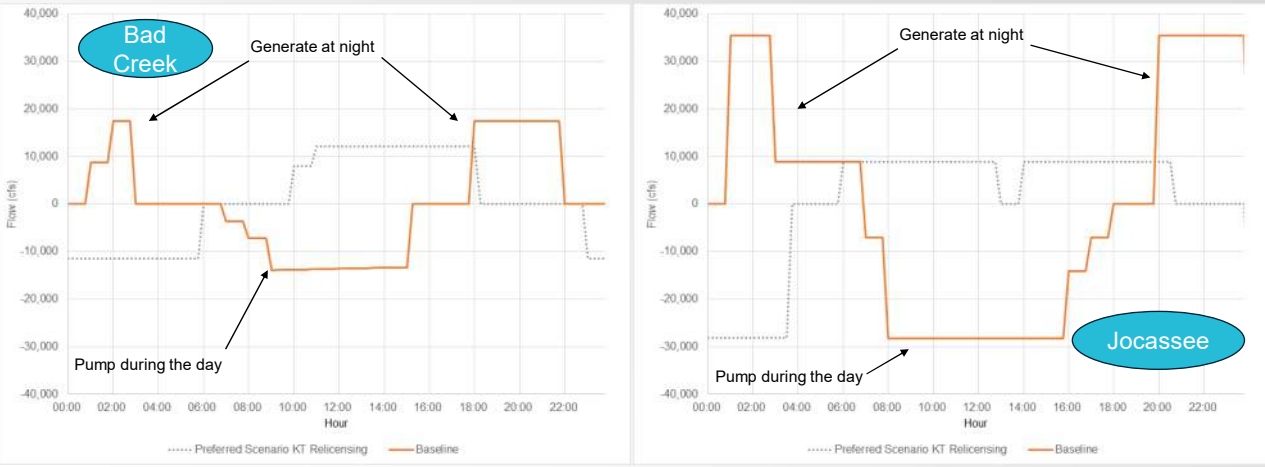
Savannah River CHEOPS™ Model

- Upper Savannah River reservoirs
  - Bad Creek
  - Jocassee
  - Keowee
  - Hartwell
  - Russell
  - Thurmond
- Model Data
  - Reservoir area & volume
  - Discharge rating curves
  - Turbine & generator data
  - Pump data
  - Load shape (pumping & generation)
  - Hydrology
  - Operating rules
    - Bad Creek License
    - Keowee-Toxaway License
      - Low Inflow Protocol
    - 2014 Operating Agreement



42

Pump/Generation Cycle Updates – Example Day



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CHEOPS™ & Bad Creek Relicensing

- Scenarios
  - Baseline (existing facilities and FERC license requirements)
  - Alternative: Baseline + Bad Creek II
- Operational effects of scenarios
  - Lake level fluctuations at Bad Creek, Jocassee & Keowee
  - Rate of change in lake levels
  - Low Inflow Protocol (LIP) Stages
  - Keowee Releases to Lake Hartwell
- Hydrology Dataset
  - Normal: Daily unimpaired inflow (UIF) hydrology dataset (1939-2011)
  - Climate Change – Low (ccLow)
    - 3°F temperature increase (10% increase in evaporation)
  - Climate Change – High (ccHigh)
    - 6°F temperature increase (20% increase in evaporation)
    - 10% decrease in incremental reservoir inflow

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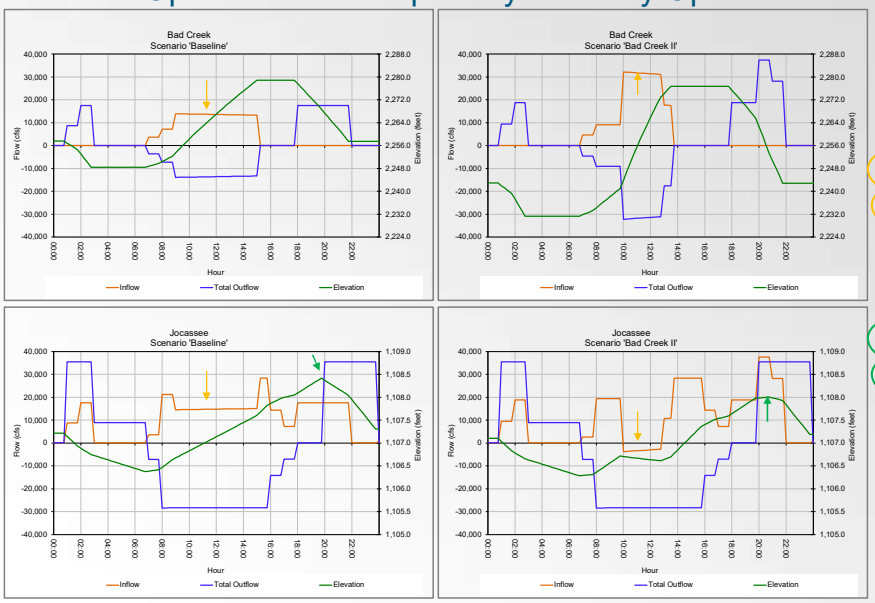
Reservoir Operations - Example Day of Hourly Operations



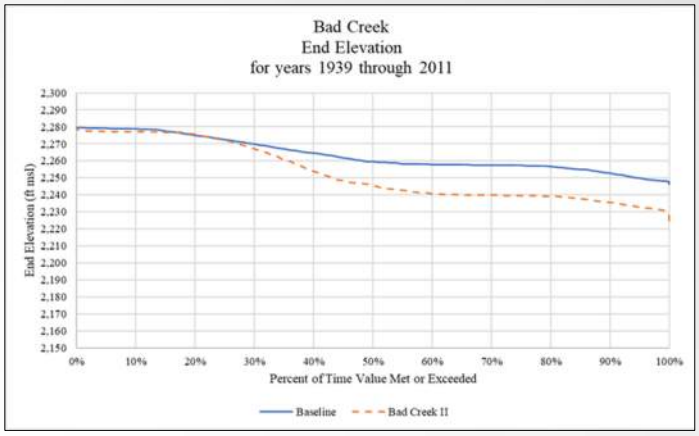
Jocassee discharge is the same for Baseline and Bad Creek II

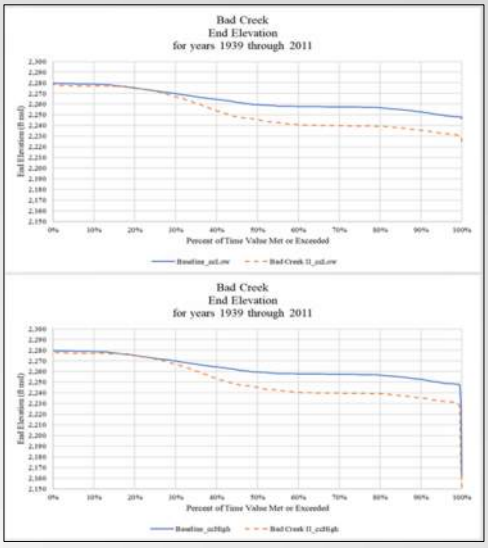
Jocassee inflow varies between scenarios with the varied Bad Creek capacity

About 0.5 feet of additional fluctuation in Jocassee under Baseline example versus Bad Creek II

45

Reservoir Elevations – Bad Creek Reservoir





Hydrology	Baseline Elevations (ft msl)				Bad Creek II Elevations (ft msl)			
	Min	Median	Max	Band (ft)	Min	Median	Max	Band (ft)
Normal	2,246.1	2,259.5	2,280.0	33.9	2,224.7	2,245.6	2,280.0	55.3
ccLow	2,246.1	2,259.5	2,280.0	33.9	2,224.7	2,245.6	2,280.0	55.3
ccHigh	2,160.0	2,259.5	2,280.0	120.0	2,151.6	2,245.3	2,280.0	128.4

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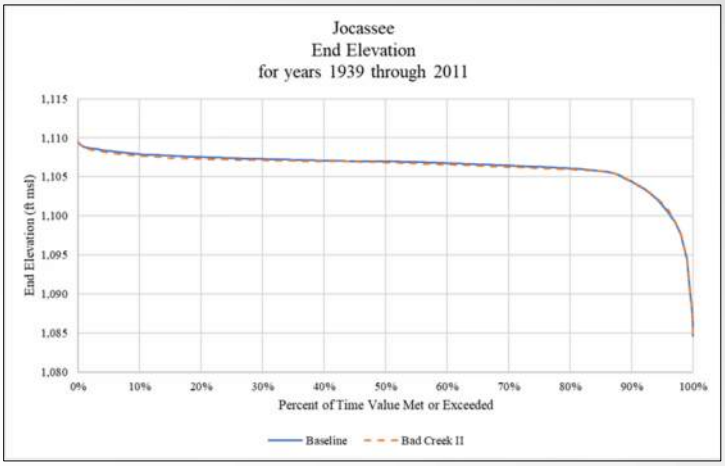
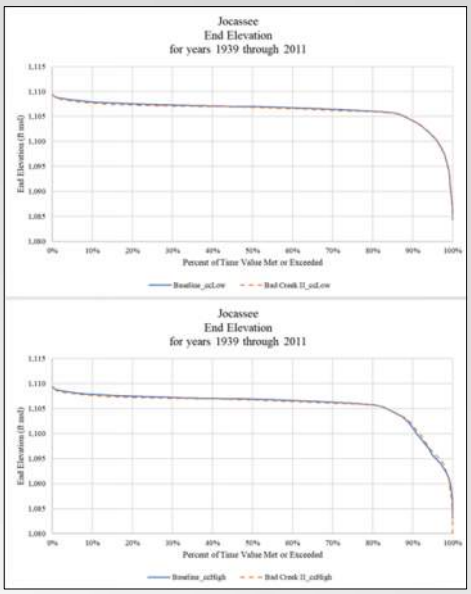
Reservoir Elevations – Lake Jocassee





	Baseline Elevations (ft msl)				Bad Creek II Elevations (ft msl)			
	Min	Median	Max	Band (ft)	Min	Median	Max	Band (ft)
Normal	1,084.1	1,107.0	1,110.0	25.9	1,084.5	1,106.8	1,110.0	25.5
ccLow	1,083.8	1,107.0	1,110.0	26.2	1,084.2	1,106.8	1,110.0	25.8
ccHigh	1,083.0	1,106.9	1,109.5	26.5	1,080.0	1,106.7	1,109.9	29.9

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Lake Jocassee Reservoir Levels – Spawning Performance Measures (Normal Hydrology)

Measure Number	Performance Measures	Criterion (Note 1)	Start Date	End Date	MISC (Note 2)	Baseline	Bad Creek II
	Lake Jocassee					(1939-2011)	(1939-2011)
	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%	71%	100%
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%	34%	99%
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%	19%	89%
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%	0%	59%
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%	0%	0%
13	Maximize spawning success for black bass and blueback herring (3.5-ft fluctuation band)	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 10 consecutive days at least once (Note 5)	1-Apr	31-May	5%	100%	100%
14		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 15 consecutive days at least once (Note 5)	1-Apr	31-May	5%	100%	100%
15		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 20 consecutive days at least once (Note 5)	1-Apr	31-May	5%	100%	99%
16		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 30 consecutive days at least once (Note 5)	1-Apr	31-May	5%	95%	97%
17		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 45 consecutive days at least once (Note 5)	1-Apr	31-May	5%	56%	82%
18	Maximize spawning success for sunfish and threadfin shad (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)	15-May	15-Jul	5%	45%	100%
19		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once (Note 5)	15-May	15-Jul	5%	14%	92%
20		Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once (Note 5)	15-May	15-Jul	5%	0%	3%
21	Maximize spawning success for sunfish and threadfin shad (3.5-ft fluctuation band)	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 10 consecutive days at least once (Note 5)	15-May	15-Jul	5%	100%	100%
22		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 15 consecutive days at least once (Note 5)	15-May	15-Jul	5%	100%	100%
23		Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 20 consecutive days at least once (Note 5)	15-May	15-Jul	5%	79%	99%

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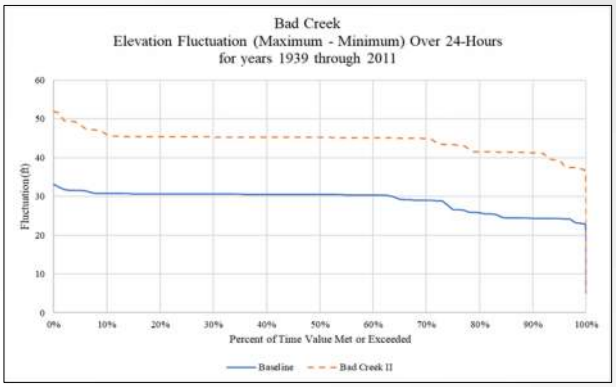
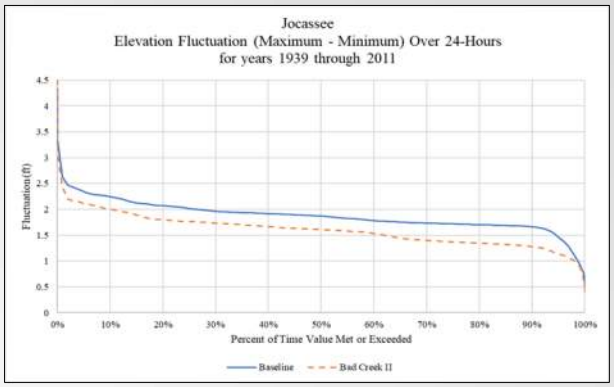
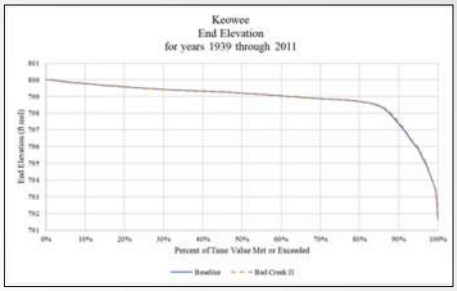
Bad Creek and Jocassee Elevation Fluctuations – Rate of Change

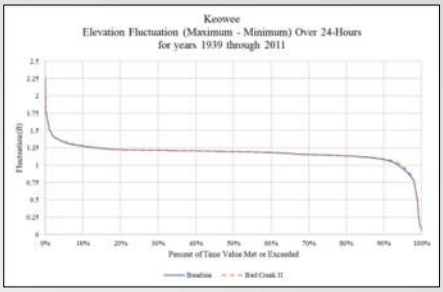
Measure Number	Performance Measures	Criterion (Note 1)	Start Date	End Date	MISC (Note 2)	Baseline	Bad Creek II
	Lake Jocassee					(1939-2011)	(1939-2011)
7	Minimize effects on recreational boating	Number of days where reservoir level changes more than 1.0 ft in one hour	1-Jan	31-Dec	10	0	0

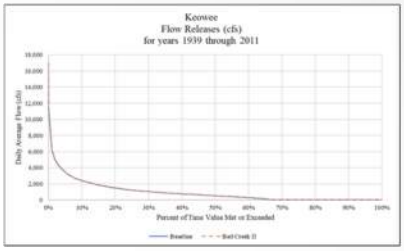


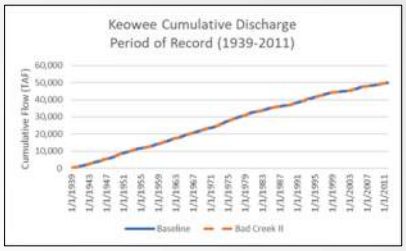


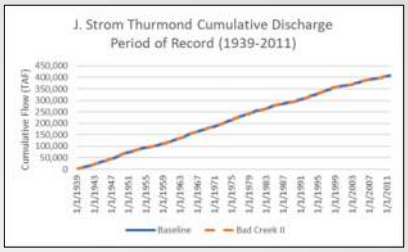
Keowee & Downstream



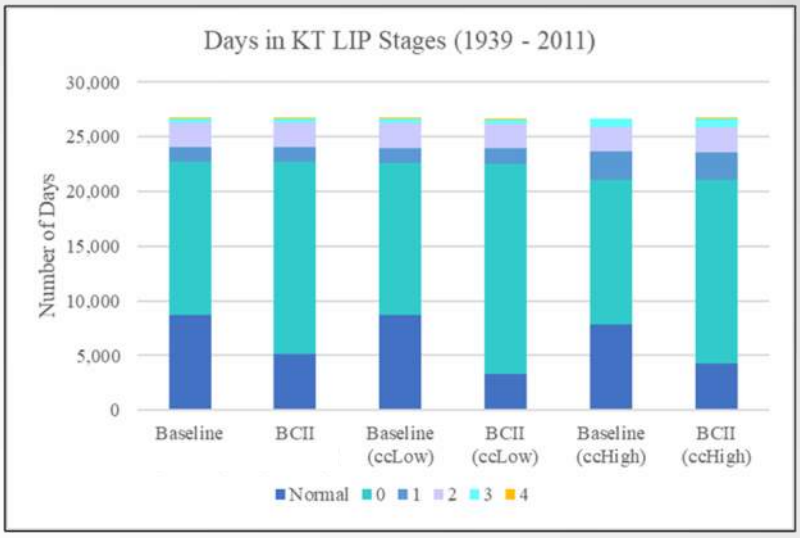








Low Inflow Protocol Stages



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Summary Conclusions – Bad Creek II Effects

- Bad Creek Reservoir elevation: Wider operating band
- Lake Keowee and Lake Jocassee elevations: Comparable to Baseline
- Lake Jocassee reservoir level fluctuations rate of change (24-hour period): Smaller than Baseline
- Lake Keowee water intakes: No effect
- Keowee-Toxaway Low Inflow Protocol (LIP)
  - Stage 0 frequency increases
  - Differences diminish in the more advanced stages of the KT LIP
- USACE reservoirs, Savannah River flows: Minimal effect

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Task 5 – Water Quality Monitoring Plan

Objective(s): The Water Quality Monitoring Plan (WQMP), developed in consultation with agencies and stakeholders, is focused on the proposed Bad Creek II Complex with the main goal of identifying applicable water quality parameters and/or surface water conditions to monitor associated with construction as well as appropriate monitoring methods for compliance with the South Carolina Department of Environmental Services (SCDES) regulations and protection of existing uses.

- **Status:** **Complete***

** Study report was filed with the USR as DRAFT and will be filed as final with the FLA.*

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Task 5 – Water Quality Monitoring Plan Overview

- The Water Quality Monitoring Plan (WQMP) considers water quality in the Whitewater River cove and stream conditions in upland areas that will potentially be affected by Bad Creek II construction activities.
- The WQMP describes two different monitoring strategies to assess Project waters depending on location (i.e., Lake Jocassee vs. upland areas).
  - **Part I - Lake Jocassee**: Select water quality parameters in the Whitewater River cove will be measured via a multi-parameter sonde.
  - **Part II - Upland Areas**: Upland surface waters will be monitored downstream of impacted areas via stream habitat surveys.

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Part I: Lake Jocassee – **Potential Impacts**

- The primary (*temporary*) impact to surface water quality in Lake Jocassee is increased turbidity caused by potential sediment loading from (1) **construction activities** and (2) **overland runoff** from temporarily disturbed land.
  - Construction actives that may (temporarily) impact turbidity in Lake Jocassee include activities associated with the lower reservoir I/O structure and cofferdam and expansion of the submerged weir).
- **No long-term degradation of water quality is expected** to result from construction and operation of the Bad Creek II Complex, however elevated turbidity from sediment loading could temporarily reduce quality of aquatic habitat.

Whitewater River Cove, Lake Jocasee

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Part I: Lake Jocassee – **Monitoring Rationale**

- While water quality impacts would be temporary (during construction phase only) and occur in a very localized area likely limited to Whitewater River cove, monitoring water quality at a consistent location in Lake Jocassee during and after construction is proposed to maintain and document **compliance with SCDES water quality standards for turbidity**.

Whitewater River cove looking upstream from Fisher Knob

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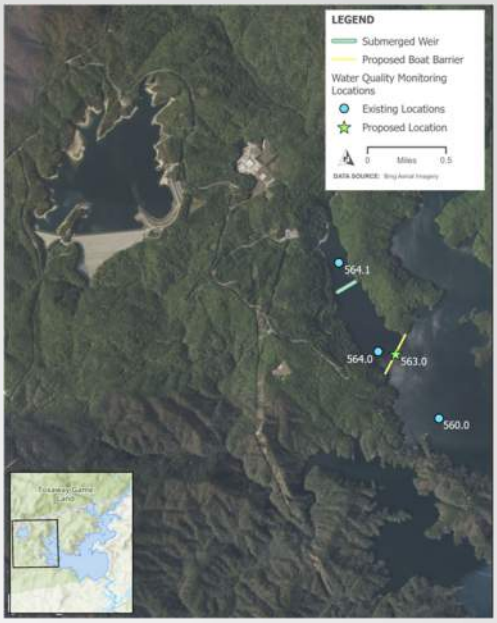
Part I: Lake Jocassee – **New Monitoring Location**

- Duke Energy proposes to monitor the following water quality parameters during the construction and post-construction phases at a new location (**Station 563.0**).
  - Turbidity
  - DO
  - Temperature
  - pH
- New station location is approximately 0.8 miles downstream of the proposed I/O structure and 0.45-miles downstream of the weir.

- Duke Energy will install a temporary boat barrier across the mouth of Whitewater River cove to prevent boating in the cove during construction. New WQ location will be situated near boat barrier.



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Part I: Lake Jocassee – **Monitoring Methods**

- Duke Energy will measure **surface water conditions** approximately 0.3 meters below the surface at proposed Station 563.0.
  - Proposed site will be instrumented with a multi-parameter water quality sonde and high-visibility buoy at the downstream end of Whitewater River cove near the proposed temporary boat barrier.
- The **data sonde will record water quality parameters once daily** (i.e., turbidity, DO, temperature, and pH) and store readings on an internal memory drive.
- Data will be **transmitted and received electronically** (by Duke Energy personnel) via telemetry or by manual download in the field if telemetry is not available.

Data Collection Frequency

- **Pre-construction:** Pre-construction monitoring will not be performed (*the objective is to remain in compliance with state water quality standards, not to ensure recovery to an existing condition*).
- **Construction:** Water quality parameters will be **recorded once daily for the duration of Bad Creek II construction** via a multi-parameter sonde deployed at the proposed point of compliance. Data will be reviewed weekly.
- **Post-construction:** Water quality parameters will be **recorded once daily for one year (365 days) following commencement of Bad Creek II commercial operation** via a multi-parameter sonde deployed at the proposed point of compliance. Data will be reviewed bi-weekly to monthly.

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Part I: Lake Jocassee – **Turbidity Monitoring and Compliance Criteria**

- Increased suspended loading is the proposed impact, therefore, only turbidity data will be used to inform construction activities.

An excursion is defined as any surface reading above the State water quality standard for turbidity (i.e., compliance threshold). **Criteria** for **identifying an excursion** (adapted from SCDES) and **actions to be taken** if turbidity readings exceed the compliance threshold are:

- **If** daily readings exceed the turbidity compliance threshold in more than 10% (but less than 25%) of readings over a rolling 30-day period, Duke Energy will investigate to determine if excursions are result of construction activities or rain event.
  - **If** elevated turbidity is determined to be the result of a rainfall event (i.e., runoff), data characterizing the rain event (timing and amount of precipitation) will be documented using the nearest weather station, along with corresponding recorded turbidity data.
    - **If** turbidity excursions are not clearly linked to a rainfall event, Duke Energy will consult with SCDES if daily readings exceed the turbidity compliance threshold of more than 10% (but less than 25%) of readings over a rolling 30-day period. Similarly, Duke Energy will consult with SCDES if daily readings exceed 25% of readings over a 30-day period.

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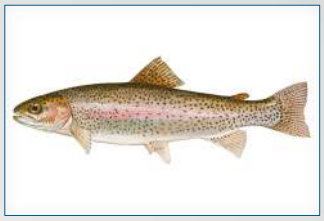
Part I: Lake Jocassee – **Turbidity Variance**

- The turbidity water quality standard for trout waters under S.C. Reg.61-69, is not to exceed 10 NTU or 10% above natural conditions, provided existing uses are maintained. However, **Duke Energy seeks 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).
  - According to S.C. Reg.61-69, a **temporary variance** is "a short-term exemption from meeting certain otherwise applicable water quality standards".



Turbidity Variance Rationale: Turbidity Refugia

- Elevated suspended sediment / turbidity can have behavioral, physical, and habitat effects on fish
  - Non-salmonid species (e.g. bluegill) are considered tolerant of turbidity levels of up to approximately 50 NTU (Gardner 1981). Lloyd (1987) indicates that for salmonids, which are more sensitive to water quality conditions, a "moderate" level of protection roughly translates to turbidity values up to **23 NTU**.
  - **Avoidance** is the primary fish behavioral response to locally turbid water
  - Regardless of the type or magnitude of the impact, it is **important that areas of refugia are available** and accessible for sensitive populations.

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Part I: Lake Jocassee – **Turbidity Variance**

- Whitewater River cove accounts for just **1.5% of the total area of Lake Jocassee**, therefore a large turbidity refugia of similar habitat would be available to species attempting to avoid temporary impacts (98.5% of the lake).
- Because sensitive populations will be able to avoid areas of higher turbidity and increased turbidity levels will be temporary, fish that do move out of the Whitewater River cove to avoid higher turbidities are expected to return following the impact.
- Therefore, a more conservative **turbidity threshold of 25 NTU for compliance reporting**, which would still be protective of natural resources, would allow Duke Energy to construct the new facility while maintaining compliance with state regulations, which is a critical focus of Duke Energy.

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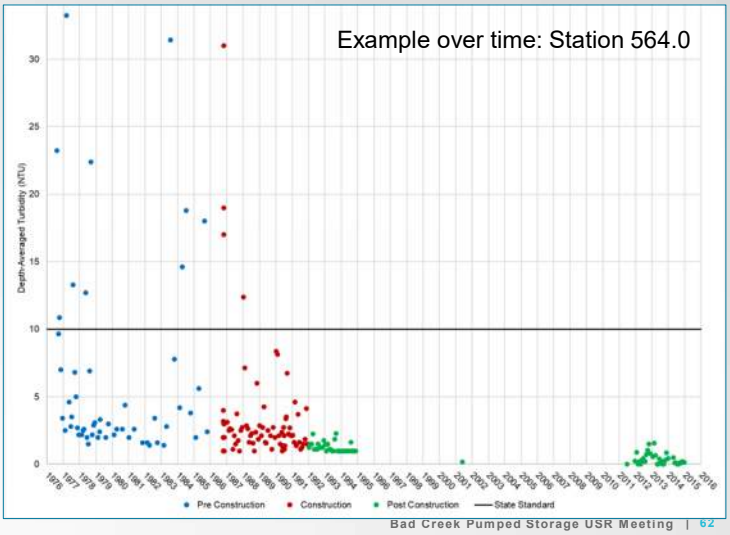
Part I: Whitewater River Cove – **Conclusions**

- 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, downstream of weir).
- Turbidity events would likely be short-lived and, based on previous data, recovery in the water column is expected to be rapid.
- Impacts are expected to be **temporary and limited** to the Whitewater River cove.
- A large turbidity refugia is available to sensitive species (98.5% of the lake).



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Lake Jocassee WQ Reporting

- Lake Jocassee water quality data during construction will be reported per requirements of the SCDES 401 Water Quality Permit and appropriate agencies would be consulted.

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Part II: Upland Areas – **Potential Impacts**

- Construction of the Bad Creek II Complex could temporarily impact upland surface waters due to increased sediment loading.
- Spoil material (i.e., soil and rock) (estimated 4.4 million cubic yards) are proposed to be deposited in several locations throughout the site; locations are currently under evaluation.
- Sediment runoff due to construction traffic is not included in the WQMP; these activities will be monitored as part of the NPDES Construction Permit.

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Part II: Upland Areas – **Monitoring Rationale**

- Water quality monitoring is not required or proposed as part of the SCDES Construction General NPDES permit; however, Duke Energy proposes to conduct stream habitat quality assessment surveys in perennial streams associated with drainage from spoil areas.
- Duke Energy will install and maintain BMPs in accordance with SCDES permit requirements to **mitigate risks to streams impacted by spoil placement** associated with Bad Creek II construction activities.

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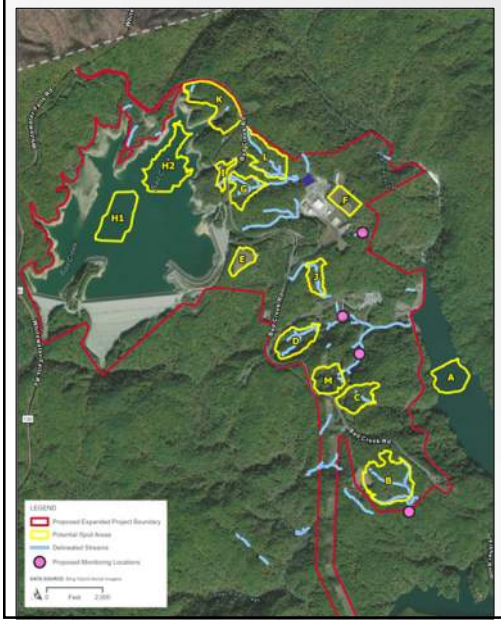
Part II: Upland Areas – **Survey Locations and Frequency**



- Stream assessments will be conducted at accessible downstream reaches where the **cumulative effect of construction activities** can be observed. These locations will be used to document stream conditions and function where water has flowed from the construction area, through a BMP, and into waters of the U.S. (WOTUS).

Frequency

- **Pre-construction**: Pre-construction surveys of areas that will be impacted by spoil placement and construction activities will be carried out prior to installation of BMPs.
- **Construction**: Surveys will not be carried out in areas that are protected by BMPs required by SCDES environmental permits. Duke Energy will regularly inspect and maintain BMPs to help minimize downstream potential impacts to surface waters.
- **Post-construction**: Surveys will be performed to document post-construction conditions and function. Duke Energy proposes surveys at 1-year, 3-years, and 5-years following commencement of Bad Creek II operations.
  - If necessary, an additional survey will be carried out at 7 years post-construction to ensure streams provide fully functioning and supportive habitat and replicate original (existing) stream conditions.

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Part II: Upland Areas – Stream Assessments

- Stream assessments will consider stream conditions, aquatic resources, and habitat function and will be supported by routine monitoring of storm events and BMPs, which will be developed and implemented though the Erosion and Sediment Control (ESC) permitting process.
- Methods are in alignment with methods carried out for previous relicensing studies (Aquatic Resources, Task 3) including:
    - **USEPA Rapid Bioassessment Protocol**
    - **NCSAM**
    - **SQT**
    - **Macroinvertebrate sampling**
- Pre-construction monitoring in these areas will be compared with similar post-construction monitoring to document construction-related impacts and also determine when these areas have recovered to pre-construction conditions and to help plan for site restoration / stabilization.

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WQMP – Standard Operating Procedures

- After the 401 permit is issued, a Standard Operating Procedures (SOP) document will be developed; this is a separate technical document presenting detailed aspects of field monitoring including sampling locations and maps, sampling methods, instrumentation specifications, and field data collection forms.
- The SOP will provide procedures for consistent and scientifically valid quantitative and qualitative monitoring in support of water and aquatic resources for Bad Creek II construction.

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Break

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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	**Complete**
Task 2 – Foothills Trail Corridor Conditions Assessment	**Complete**
Task 3 – Whitewater River Cove Existing Recreational Use Evaluation	**Complete***
Task 4 – Whitewater River Cove Recreational Public Safety Evaluation	**Complete**

** Task methods and findings were presented during ISR meeting*

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Task 1 – Foothills Trail Corridor Recreation Use and Needs Study

- **Objective(s):** The goals of the RUN Study were 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:** **Complete**

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Task 1 – RUN Study Area

Study Area:

- the 43-mile-long segment of the Foothills Trail, 5 spur trails, 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:

- Recreation site inventory
- Traffic & Trail Counters:
  - Foothills Trail
    - March 1-Nov 30, 2023
    - Long Ridge Trail – April 20-Nov 30, 2023
  - Musterground Road Traffic Counter
    - Sept 15, 2023-Jan 15, 2024
    - March 20-May 10, 2024
- Spot counts
  - Laurel Valley Trail Access to supplement the traffic counter data
- In-person surveys
  - Laurel Valley, Toxaway River, Horsepasture River, and Bad Creek Hydro
  - Collected on 30 days (mix of weekdays, weekends, holidays) between March and November 2023
- Online surveys
  - Signs with QR codes/URL were posted at all trail access areas

Table 1 Summary of Data Collection Methods by Location

Locations	Data Collection Methods				
	Recreation Site Inventory	Traffic Counts	Trail Counts	In-Person User Survey	Online User Survey
Table Rock State Park			*		
Long Ridge Trail [a]			*		
Sassafras Mountain Access	*	*	*		*
Chimneytop Gap Access	*		*		*
Laurel Valley Access [b]	*	*	*	*	*
Laurel Fork Falls Access	*		*		*
Toxaway River Access	*		*	*	*
Canebrake Access	*		*		*
Horsepasture River Access	*		*	*	*
Lower Whitewater Falls Overlook	*		*		*
Bad Creek Hydro Access	*	*	*	*	*
Coon Branch Spur Trail			*		*
Musterground Road Access		*			
Upper Whitewater Falls Access		*			

[a] The trail counter at Long Ridge Trail was added after FERC issued the SPD following discussions with stakeholders and was therefore not included in the RSP.
[b] Spot counts were collected at Laurel Valley Access to support traffic counts.

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Task 1 – RUN Study Methods Summary

Data Analysis Methods:

- Current Use Estimates
  - Trail counter data (Foothills Trail)
  - Traffic counter data (Musterground Road)
- User Survey Summaries
  - In-person survey data (4 access areas)
  - Online survey data (all access areas)
- Parking Demand Analysis
  - Traffic counter data (4 access areas)
  - Parking capacity estimates
  - Turnover estimates
  - Parking occupancy rate
- Trail Carrying Capacity Analysis (Applied Trails Research)
  - Current use estimates, parking capacity estimates/campsite information and user survey information
- Future Recreation Use and Needs Analysis
  - Current use estimates
  - Population projections*

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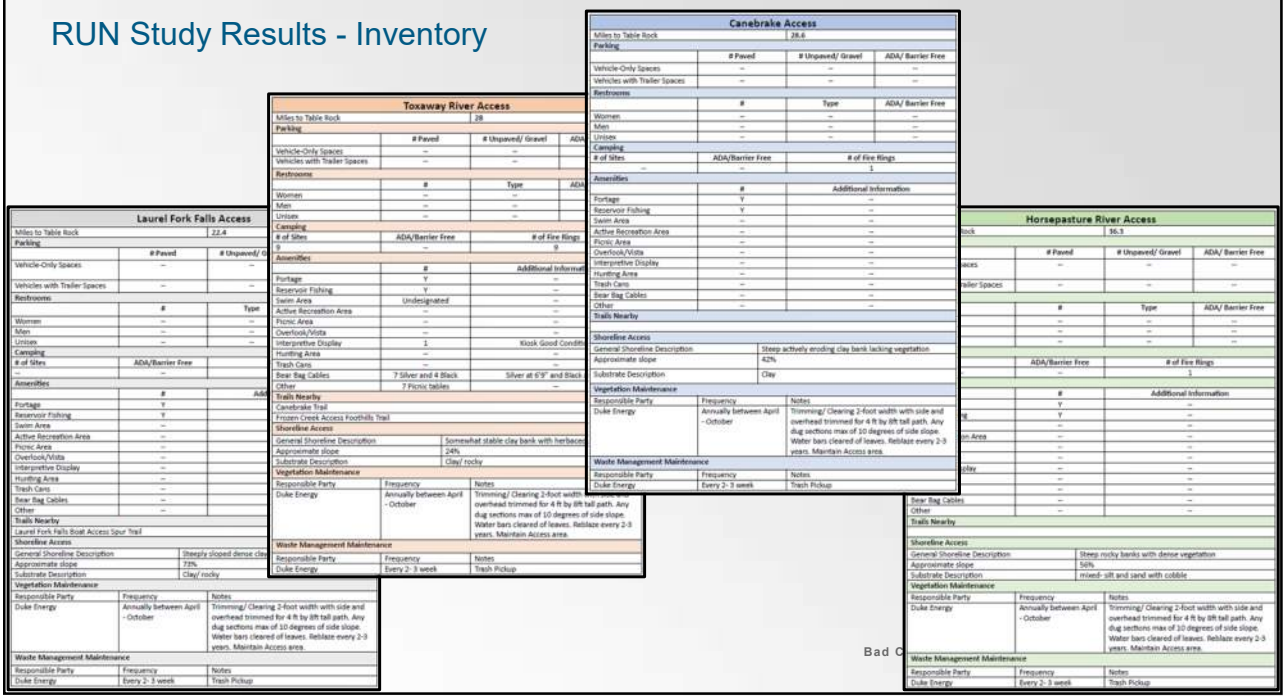
RUN Study Results - Inventory



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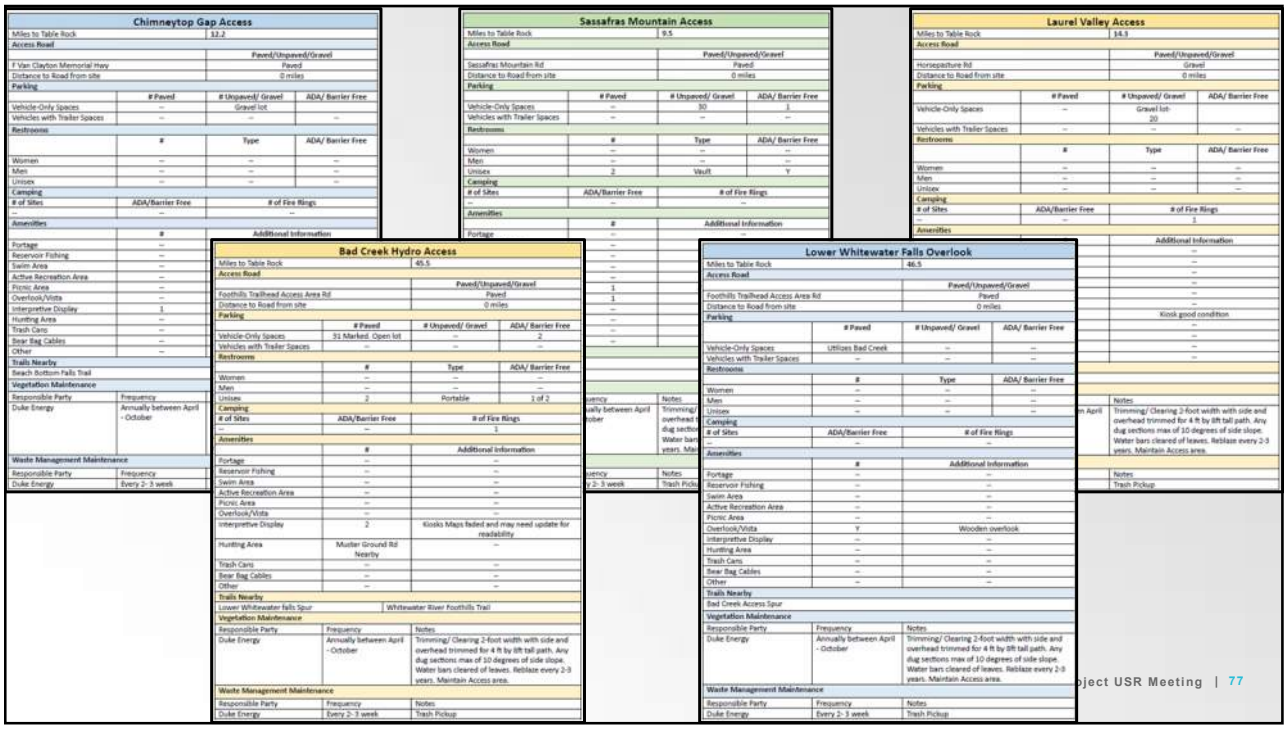

Chimneytop Gap Access

Miles to Table Rock	12.2		
Access Road			
		Paved/Unpaved/Gravel	
F Van Clayton Memorial Hwy		Paved	
Distance to Road from site		0 miles	
Parking			
	# Paved	# Unpaved/ Gravel	ADA/ Barrier Free
Vehicle-Only Spaces	--	Gravel lot	--
Vehicles with Trailer Spaces	--	--	--
Restrooms			
	#	Type	ADA/ Barrier Free
Women	--	--	--
Men	--	--	--
Unisex	--	--	--
Camping			
# of Sites	ADA/Barrier Free	# of Fire Rings	
--	--	--	
Amenities			
	#	Additional Information	
Portage	--	--	
Reservoir Fishing	--	--	
Swim Area	--	--	
Active Recreation Area	--	--	
Picnic Area	--	--	
Overlook/Vista	--	--	
Interpretive Display	1	--	
Hunting Area	--	--	
Trash Cans	--	--	
Bear Bag Cables	--	--	
Other	--	--	
Trails Nearby			
Beach Bottom Falls Trail			
Vegetation Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Annually between April - October	Trimming/ Clearing 2-foot width with side and overhead trimmed for 4 ft by 8ft tall path. Any dug sections max of 10 degrees of side slope. Water bars cleared of leaves. Reblaze every 2-3 years. Maintain Access area.	
Waste Management Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Every 2- 3 week	Trash Pickup	

Sassafras Mountain Access

Miles to Table Rock	9.5		
Access Road			
		Paved/Unpaved/Gravel	
Sassafras Mountain Rd		Paved	
Distance to Road from site		0 miles	
Parking			
	# Paved	# Unpaved/ Gravel	ADA/ Barrier Free
Vehicle-Only Spaces	--	30	1
Vehicles with Trailer Spaces	--	--	--
Restrooms			
	#	Type	ADA/ Barrier Free
Women	--	--	--
Men	--	--	--
Unisex	2	Vault	Y
Camping			
# of Sites	ADA/Barrier Free	# of Fire Rings	
--	--	--	
Amenities			
	#	Additional Information	
Portage	--	--	
Reservoir Fishing	--	--	
Swim Area	--	--	
Active Recreation Area	--	--	
Picnic Area	--	--	
Overlook/Vista	1	--	
Interpretive Display	1	--	
Hunting Area	--	--	
Trash Cans	--	--	
Bear Bag Cables	--	--	
Other	--	--	
Trails Nearby			
Vegetation Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Annually between April - October	Trimming/ Clearing 2-foot width with side and overhead trimmed for 4 ft by 8ft tall path. Any dug sections max of 10 degrees of side slope. Water bars cleared of leaves. Reblaze every 2-3 years. Maintain Access area.	
Waste Management Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Every 2- 3 week	Trash Pickup	

Laurel Valley Access

Miles to Table Rock	14.3		
Access Road			
		Paved/Unpaved/Gravel	
Horsepasture Rd		Gravel	
Distance to Road from site		0 miles	
Parking			
	# Paved	# Unpaved/ Gravel	ADA/ Barrier Free
Vehicle-Only Spaces	--	Gravel lot- 20	
Vehicles with Trailer Spaces	--	--	--
Restrooms			
	#	Type	ADA/ Barrier Free
Women	--	--	--
Men	--	--	--
Unisex	--	--	--
Camping			
# of Sites	ADA/Barrier Free	# of Fire Rings	
--	--	1	
Amenities			
	#	Additional Information	
Portage	--	--	
Reservoir Fishing	--	--	
Swim Area	--	--	
Active Recreation Area	--	--	
Picnic Area	--	--	
Overlook/Vista	--	Kiosk good condition	
Interpretive Display	--	--	
Hunting Area	--	--	
Trash Cans	--	--	
Bear Bag Cables	--	--	
Other	--	--	
Trails Nearby			
Vegetation Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Annually between April - October	Trimming/ Clearing 2-foot width with side and overhead trimmed for 4 ft by 8ft tall path. Any dug sections max of 10 degrees of side slope. Water bars cleared of leaves. Reblaze every 2-3 years. Maintain Access area.	
Waste Management Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Every 2- 3 week	Trash Pickup	

Bad Creek Hydro Access

Miles to Table Rock	45.5		
Access Road			
		Paved/Unpaved/Gravel	
Foothills Trailhead Access Area Rd		Paved	
Distance to Road from site		0 miles	
Parking			
	# Paved	# Unpaved/ Gravel	ADA/ Barrier Free
Vehicle-Only Spaces	31 Marked. Open lot	--	2
Vehicles with Trailer Spaces	--	--	--
Restrooms			
	#	Type	ADA/ Barrier Free
Women	--	--	--
Men	--	--	--
Unisex	2	Portable	1 of 2
Camping			
# of Sites	ADA/Barrier Free	# of Fire Rings	
--	--	1	
Amenities			
	#	Additional Information	
Portage	--	--	
Reservoir Fishing	--	--	
Swim Area	--	--	
Active Recreation Area	--	--	
Picnic Area	--	--	
Overlook/Vista	--	--	
Interpretive Display	2	Kiosks Maps faded and may need update for readability	
Hunting Area	Muster Ground Rd Nearby	--	
Trash Cans	--	--	
Bear Bag Cables	--	--	
Other	--	--	
Trails Nearby			
Lower Whitewater falls Spur	Whitewater River Foothills Trail		
Vegetation Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Annually between April - October	Trimming/ Clearing 2-foot width with side and overhead trimmed for 4 ft by 8ft tall path. Any dug sections max of 10 degrees of side slope. Water bars cleared of leaves. Reblaze every 2-3 years. Maintain Access area.	
Waste Management Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Every 2- 3 week	Trash Pickup	

Lower Whitewater Falls Overlook

Miles to Table Rock	46.5		
Access Road			
		Paved/Unpaved/Gravel	
Foothills Trailhead Access Area Rd		Paved	
Distance to Road from site		0 miles	
Parking			
	# Paved	# Unpaved/ Gravel	ADA/ Barrier Free
Vehicle-Only Spaces	Utilizes Bad Creek	--	--
Vehicles with Trailer Spaces	--	--	--
Restrooms			
	#	Type	ADA/ Barrier Free
Women	--	--	--
Men	--	--	--
Unisex	--	--	--
Camping			
# of Sites	ADA/Barrier Free	# of Fire Rings	
--	--	--	
Amenities			
	#	Additional Information	
Portage	--	--	
Reservoir Fishing	--	--	
Swim Area	--	--	
Active Recreation Area	--	--	
Picnic Area	--	--	
Overlook/Vista	Y	Wooden overlook	
Interpretive Display	--	--	
Hunting Area	--	--	
Trash Cans	--	--	
Bear Bag Cables	--	--	
Other	--	--	
Trails Nearby			
Bad Creek Access Spur			
Vegetation Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Annually between April - October	Trimming/ Clearing 2-foot width with side and overhead trimmed for 4 ft by 8ft tall path. Any dug sections max of 10 degrees of side slope. Water bars cleared of leaves. Reblaze every 2-3 years. Maintain Access area.	
Waste Management Maintenance			
Responsible Party	Frequency	Notes	
Duke Energy	Every 2- 3 week	Trash Pickup	

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RUN Study Results - Current Use Estimates

Highest Overall Use

Lowest Overall Use

Highest Monthly Use

Month	Total Visitors at Trail Counter Locations by Month												
	Bad Creek Hydro	Coon Branch Spur	Lower Whitewater Falls	Horsepasture River	Canebrake	Toxaway River	Laurel Fork Falls	Laurel Valley	Chimneytop Gap	Sassafras Mountain 1[a]	Sassafras Mountain 2[a]	Long Ridge Trail[b]	Table Rock State Park
March	1,605	358	384	192	259	297	279	531	776	1,815	708	-	6,711
April	2,155	988	341	397	508	939	288	872	592	1,966	771	218	6,876
May	1,896	891	369	520	338	781	273	590	425	1,357	525	430	6,637
June	2,372	845	291	369	213	907	201	418	329	4,023	503	344	8,063
July	2,018	692	253	590	374	1,074	340	286	246	1,112	356	186	9,359
Aug	1,842	579	178	395	115	744	254	221	215	1,297	187	171	6,031
Sept	1,965	677	311	310	217	705	333	401	222	1,080	418	424	7,017
Oct	2,385	945	481	77	411	772	329	667	741	6,134	1,024	836	8,812
Nov	1,606	943	430	90	267	254	227	521	518	7,356	815	445	6,284
Total	**17,844**	**6,916**	**3,035**	**2,939**	**2,702**	**6,473**	**2,522**	**4,507**	**4,064**	**26,140**	**5,307**	**3,054**	**65,788**

[a] The trail counter identified as "Sassafras Mountain 1" was located on the Foothills Trail approximately 200 ft. west of the observation tower; the trail counter identified as "Sassafras Mountain 2" was located southeast of the observation tower where the parking area meets the Foothills Trail.
[b] The trail counter at Long Ridge Trail was not installed until April 20, 2023.

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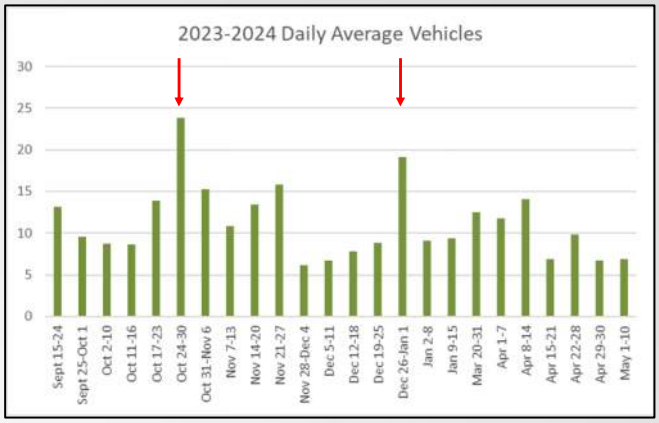
RUN Study Results - Current Use Estimates, Musterground Road

- Musterground Property managed by SCDNR as a WMA within Game Zone 1
- Various hunting seasons coincide with public access
- Use peaks last week bear (October 24-30) and deer (December 26-January 1) seasons
- Other high use times include:
  - first 10 days the road is opened (September 15-24)
  - first week of bear season (October 17-23)
  - Thanksgiving week
  - end of March through mid-April



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RUN Study Results - User Survey Summary

- Number of surveys completed by site

Site	# of Surveys
Bad Creek Hydro	96
Horsepasture River	32
Laurel Valley	72
Toxaway River	54
Online	61
Total	**315**

- Demographics:
  - 60.6 % from South Carolina (2% or more from Greenville, Pickens, Oconee, Anderson, Spartanburg, Charleston counties)
  - 16.5 % from North Carolina (2% or more from Jackson, Mecklenburg, Buncombe, Wake counties)
  - Most common group sizes were 1-2 people
  - Most visitors were adults (18-55) followed by senior adults (55+); less than 10% of visitors were children or youth

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RUN Study Results - User Survey Summary

Primary Reason	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	Total
Hiking	92%	50%	72%	57%	64%	72%
Backpacking	9.4%	69%	39%	67%	23%	35%
Camping	5.2%	19%	13%	50%	11%	17%
Wildlife Viewing	7.3%	6.3%	9.7%	9.3%	15%	9.5%
Picnicking	7.3%	0.0%	0.0%	30%	4.9%	8.3%
Swimming	7.3%	6.3%	4.2%	19%	4.9%	7.9%
Shoreline Relaxation	3.1%	6.3%	5.6%	17%	8.2%	7.3%
Other	6.3%	0.0%	4.2%	9.3%	9.8%	6.3%
Fishing	8.3%	3.1%	1.4%	13%	3.3%	6.0%
Wildflower Viewing	6.3%	3.1%	2.8%	3.7%	11%	5.7%
Birdwatching	4.2%	3.1%	8.3%	3.7%	1.6%	4.4%
Canoeing	1.0%	0.0%	0.0%	5.6%	0.0%	1.3%
Biking	0.0%	0.0%	2.8%	0.0%	0.0%	0.6%
Hunting	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

[1]Note that rows do not sum to 100% because respondents were allowed to list multiple activities.

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RUN Study Results - User Survey Summary

Parking						
Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	All (n=270)
1 Very Poor	1.1%	0.0%	0.0%	0.0%	0.0%	0.4%
2 Poor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3 Fair	1.1%	4.8%	0.0%	0.0%	7.7%	2.2%
4 Good	12.9%	33.3%	28.8%	26.3%	30.8%	23.7%
5 Very Good	84.9%	61.9%	71.2%	73.7%	61.5%	73.7%

Crowding						
Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	All (n=309)
1 Very High	0.0%	0.0%	0.0%	1.9%	0.0%	0.3%
2 High	2.1%	0.0%	0.0%	0.0%	3.4%	1.3%
3 Moderate	7.3%	9.4%	2.9%	11.1%	13.8%	8.4%
4 Low	16.7%	21.9%	23.2%	24.1%	44.8%	25.2%
5 Very Low	74.0%	68.8%	73.9%	63.0%	37.9%	64.7%

Campsites						
Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	All (n=142)
1 Very Poor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2 Poor	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
3 Fair	0.0%	0.0%	2.9%	2.4%	10.0%	3.5%
4 Good	30.0%	22.2%	32.4%	9.8%	20.0%	21.1%
5 Very Good	70.0%	77.8%	64.7%	87.8%	70.0%	75.4%

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RUN Study Results - User Survey Summary

Overall User Experience on Foothills Trail

Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	All
1 Very Poor	0.0%	0.0%	0.0%	0.0%	1.6%	0.3%
2 Poor	2.1%	0.0%	0.0%	0.0%	1.6%	1.0%
3 Fair	1.1%	0.0%	0.0%	0.0%	1.6%	0.6%
4 Good	12.8%	12.9%	15.7%	15.7%	16.4%	12.6%
5 Very Good	84.0%	87.1%	84.3%	84.3%	78.7%	85.4%

Hiking Experience on Foothills Trail

Rating	Bad Creek Hydro	Horsepasture River	Laurel Valley	Toxaway River	Online Survey	Total
1 - Very Poor	0.0%	0.0%	0.0%	2.1%	0.0%	0.3%
2 - Poor	2.1%	0.0%	0.0%	0.0%	1.6%	1.0%
3 - Fair	2.1%	0.0%	0.0%	2.1%	1.6%	1.3%
4 - Good	21.1%	18.8%	22.2%	21.3%	19.7%	20.9%
5- Very Good	74.7%	81.3%	77.8%	74.5%	77.0%	76.5%

Recommended Improvements on Foothills Trail

Recommended Improvements/Comments	Frequency
Better markers/ signs at Bad creek	27
Downed trees	25
Bridge improvements/ repairs	19
Better trail maintenance	15
Restroom improvements/ Install	13
Improved/ added bear hangs/ cables	11

RUN Study Results - Parking Demand Analysis

Month	Parking Occupancy Rate (%)			
	Bad Creek Hydro	Laurel Valley	Sassafras Mountain	Upper Whitewater Falls
March	5%	65%	36%	16%
April	7%	72%	38%	22%
May	5%	63%	34%	24%
June	5%	64%	38%	19%
July	3%	67%	46%	29%
August	3%	52%	33%	26%
September	5%	79%	46%	27%
October	7%	106%	93%	44%
November	6%	79%	45%	21%

Month	Parking Occupancy Rate (%)			
	Bad Creek Hydro	Laurel Valley	Sassafras Mountain	Upper Whitewater Falls
Weekday	3%	46%	31%	20%
Weekend	10%	133%	80%	38%
Holiday	8%	139%	73%	43%

RUN Study Results - Parking Demand Analysis

- **Bad Creek Hydro Access**
  - Parking occupancy **low** over all seasons and day types
  - Parking and crowding not identified issues
- **Laurel Valley Access**
  - Parking occupancy **moderate to high** depending on month and day type
  - Available parking does not always accommodate existing use levels
- **Sassafras Mountain Access**
  - Parking occupancy **high in October**, moderate otherwise
  - Available parking may not accommodate existing use levels in October
- **Upper Whitewater Falls Access**
  - Parking occupancy **low to moderate**; slightly higher October and holidays
  - Available parking accommodates existing use levels

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Carrying Capacity – IVUMC Definition

Visitor capacity is a component of visitor use management and is the maximum amounts and types of visitor use that an area can accommodate while achieving and maintaining desired resource conditions and visitor experiences that are consistent with the purposes for which the area was established.

Desired conditions are defined as statements of aspiration that describe resource conditions, visitor experiences and opportunities, and facilities and services that an agency strives to achieve and maintain in a particular area. Desired conditions describe what conditions, outcomes, and opportunities are to be achieved and maintained in the future, not necessarily what exists today. Descriptions of desired conditions paint a picture of what the particular area will look like, feel like, sound like, and function like in the future. Additional guidance on desired conditions is forthcoming.

- Areas are typically managed towards desired conditions through monitoring. Quotas and rationing of use (numbers) are one of many tools that may be leveraged in the process.

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RUN Study Results - Trail Carrying Capacity Assessment

- Parking Infrastructure
  - Vehicles by Type
- Day-use
  - Experiential (crowding/conflict)
- Overnight Use
  - Experiential (crowding/conflict)
  - Infrastructure based (campsite distribution and size)
- Trail Tread
  - Amount of use
  - Managerial resource based (stewardship and maintenance)

- Resource & Experience Based – Desired Conditions
  - Limited impacts to Vegetation, Soils, Water
    - Some litter and human waste present
  - Adequate number and distribution of sites (28 areas, 118 sites along 40+ mile trail)
    - Estimated to be at 5% capacity on average throughout the 2023 use season with a peak at 20%
  - "Well-Ammenitied" which helps to anchor and concentrate use
  - Crowding/Conflict
    - Distribution and size of sites are accommodating use without much conflict

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RUN Study Results - Trail Carrying Capacity Assessment

Figure 17: Stone campsite furniture at Cantrell Campsite (~FT mile 8.6)

Figure 12: Bear Gap Campsite (~FT mile 33.7)

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RUN Study Results - Trail Carrying Capacity Assessment

- 2023 trail conditions across the Duke Energy managed portion of the Foothills trail are aligned with low-use backcountry trail experiences and conditions.
- Much of the trail utilizes old "woods" road corridors
- Other portions are overly steep and have three significant challenges for long-term sustainability
  - Excessive Grades
  - Wooden Features
  - ½ Bench construction

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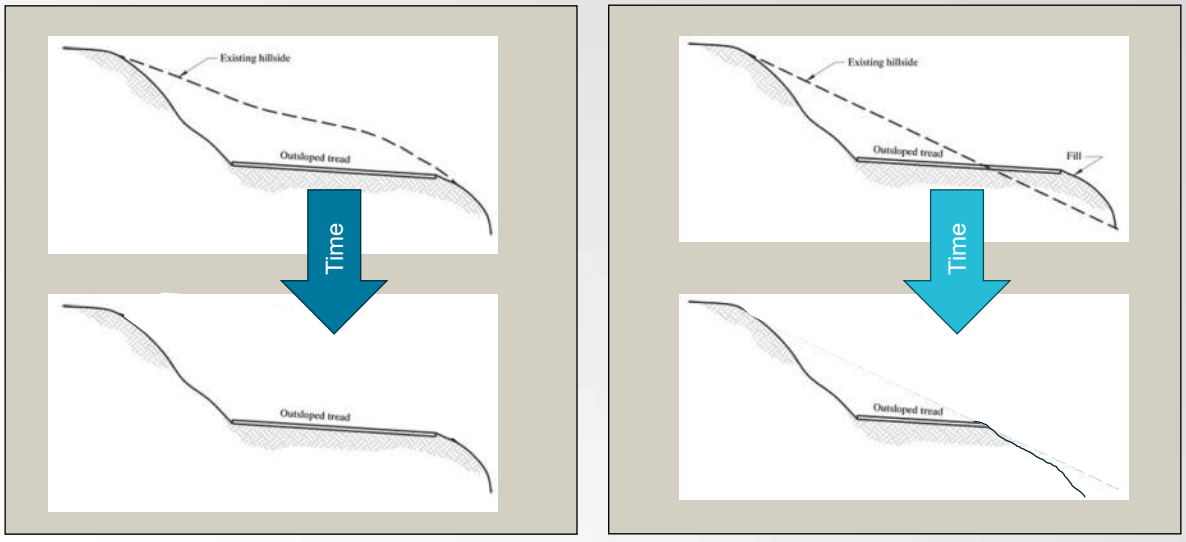
Full Bench v. Half-Bench



90

RUN Study Results - Future Use and Needs Assessment

- **Future Use Estimates**
  - Based on population data from the 11 counties where most survey visitors resided and counties in which the Foothills Trails is located
  - 6 counties in **South Carolina: 13.1 percent increase** in population between 2023 and 2035
  - 5 counties in **North Carolina: 20.6 percent increase** in population between 2023 and 2035
  - Assuming recreation use follows population, future trail use may be **approximately 16.8 percent higher by 2035**

- **Future Needs for Consideration**
  - Parking at Laurel Valley Access
  - Increased trail maintenance
    - Gradual replacement of existing infrastructure with sustainable materials
  - Improved and additional trail markers and signage
  - Improved and/or repaired bridges
  - Increased removal of downed trees
  - Additional and improved restroom facilities and bear cables


Sassafras Mountain Trail Restrooms


Toxaway River Campsite

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RUN Study Summary

- **Characterization of Current Use**
  - Highest use at Table Rock State Park, Sassafras Mountain, Bad Creek Hydro, Toxaway River
  - Parking areas well used particularly on weekends and holidays
    - Laurel Valley parking area can be over capacity
- **User Survey**
  - Hiking and backpacking most popular activities
  - Respondents reported very good/good hiking experience and overall trail experience
  - Respondents reported very good/good quality of facilities, high trail cleanliness, low crowdedness
- **Future Use Estimates**
  - May be approximately 16.8 percent higher by 2035
  - The increased demand is not expected to affect the ability of most access areas to accommodate use
- **Bad Creek II Complex**
  - Temporary impact to Musterground Road Access and Bad Creek Hydro Access during 5-7 year construction period
    - Duke Energy is planning to relocate Bad Creek Hydro Access and Musterground Road entrance during Bad Creek II Complex construction


Laurel Fork Falls


Horsepasture River Access Bridge

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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:** Complete
- **Work completed by:** Long Cane Trails, LLC

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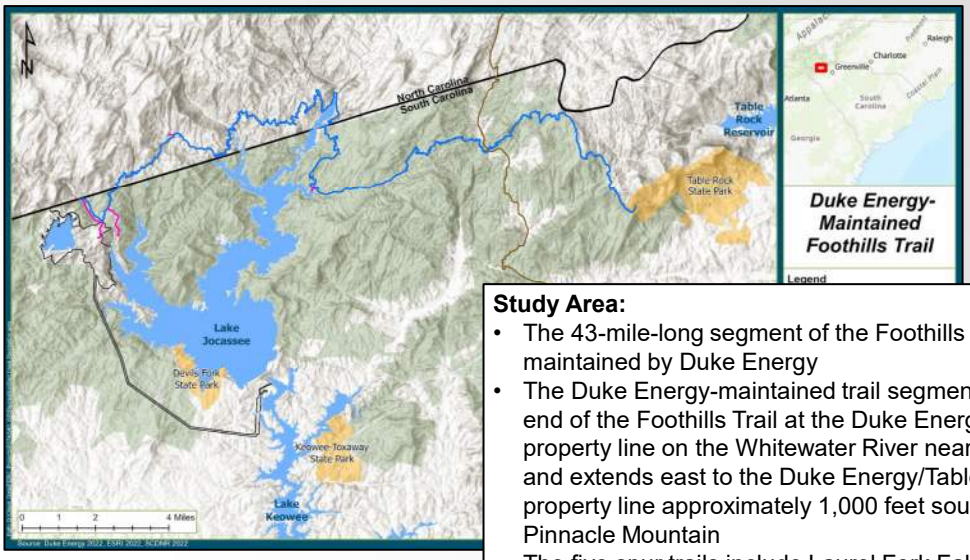
Trail Conditions Assessment - Study Area



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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Trail Conditions Assessment - Methods

- The 43-mile segment of the Foothills Trail was divided into 6 sections using the Foothills Trail Guidebook
- Completed Trail Assessment Form
- 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 slope) in conjunction with erosion, utilize clinometer to measure percent slope
- Provide additional description/comments about issues/structures identified

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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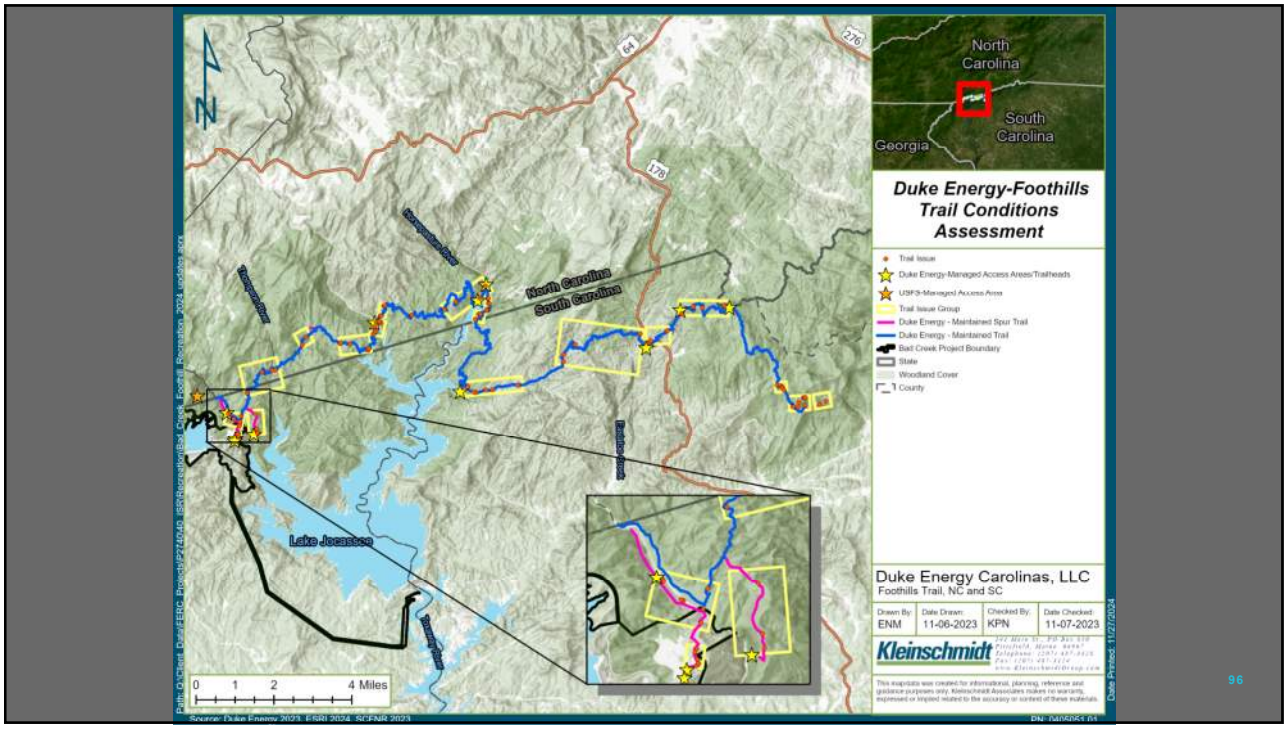

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Trail Conditions Assessment – Results and Consultation

- LCT identified **89 areas** for maintenance or improvement within the study area
- The draft report was issued to the RC for review on November 21, 2023, and submitted in ISR on January 4, 2024
- During consultation, the FTC identified an additional **30 areas** for desired maintenance or improvement
- Duke Energy met with the RC to discuss study results on February 29, 2024
  - RC agreed that additional information was needed for Trail Issues 1,11, 58 and one item submitted by FTC (FTC 21)
  - Additional field work in March and October 2024
  - Memo submitted to RC on November 21, 2024

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. • 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. • Erosion Control: Removal of barricades placed on the side of the trail to address water retention issues. • Steps Replacement: Several steps need replacement due to rot. • 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. • 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. • 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. • Steps Replacement: Various steps along the trail need replacement or repair due to damage. • Fallen Trees: Several fallen trees across the trail need removal. • Bog Bridges: Installation of new bog bridges. • Signage: Adding new trail blazes and interpretive signage. • Brush Removal: Clearing overgrown sections of the trail. • Washout Repair: Addressing trail washouts and water diversion. • 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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Trail Conditions Assessment – Results Summary

- During Hurricane Helene in September 2024, the trail sustained significant damage and portions of trail remain closed
  - Duke Energy is currently working to clear trees, repair damage, and re-open the full extent of trail as soon as possible
- Duke Energy has committed to addressing all 89 maintenance and improvement areas identified by LCT and all 30 maintenance and improvement/enhancement areas identified by FTC during consultation.
  - Maintenance items will be addressed before new license issuance
  - Improvements or enhancements will be implemented following new license issuance/RMP approval

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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 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 per year at Lake Jocassee would be affected; however, this impact (i.e., displacement) is for Whitewater River cove only.

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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.
- **Status:** **Complete**

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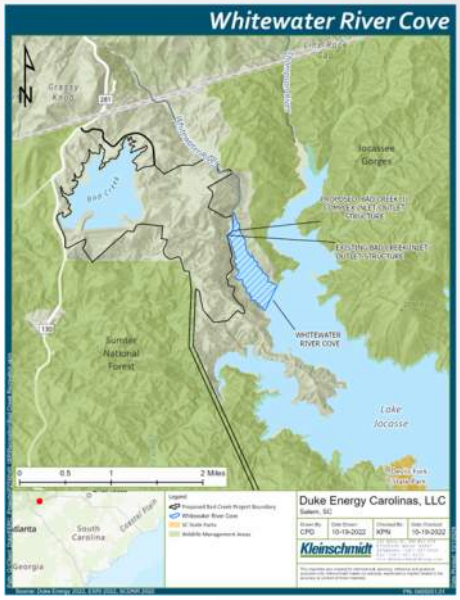
Whitewater River Cove Public Recreational Safety Evaluation



- This study task is based on results from:
  1. **Recreational Resources Task 3 Study** *(Whitewater River Cove Existing Recreational Use Evaluation)*
  2. **Water Resources Task 3 Study** *(CFD Study)*
- The study area includes the Whitewater River cove of Lake Jocassee. Bad Creek II operations could affect surface velocities in the Whitewater River cove downstream of the I/O structure(s) **potentially affecting recreational use (i.e., boating) and safety.**
- Safety risks during construction of the proposed Bad Creek II Complex are not considered in this evaluation as the cove will be closed to public access during construction activities (estimated up to 7 years). Therefore, there are not potential boater safety concerns during the construction phase.

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Whitewater River Cove Public Recreational Safety Evaluation

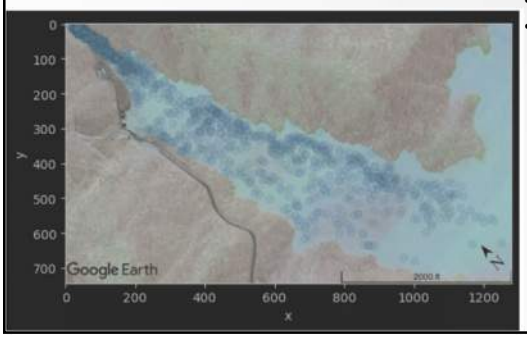
- **Recreational Task 3 Results:**
  - Boats in summer 2023 in Whitewater River cove were:
    - Motorboats (83 percent)
    - Personal watercraft (10 percent)
    - Kayaks (7 percent)
    - Canoes (less than 1 percent)
    - No paddleboards observed

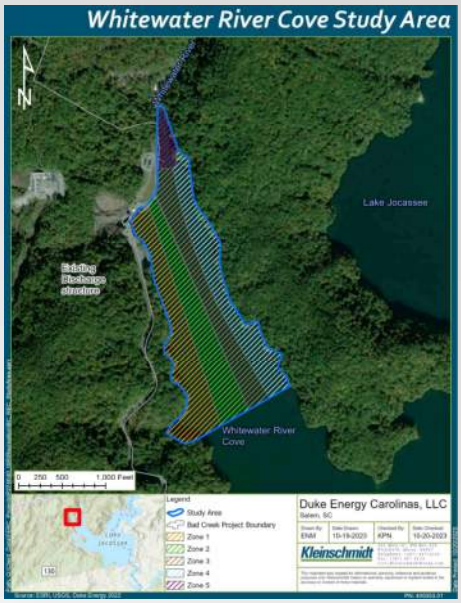
Table 4-2 Total Number of Boats and Boat Types per Flight

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**

Whitewater River Cove Public Recreational Safety Evaluation

- **Recreational Task 3 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)
  - Majority of use was on weekends/holidays (day type) and July (month)
  - Duration of time in cove:
    - 90% of boaters: <1 hour
    - 9% of boaters: 1-2 hours
    - 1% of boaters: >2 hours

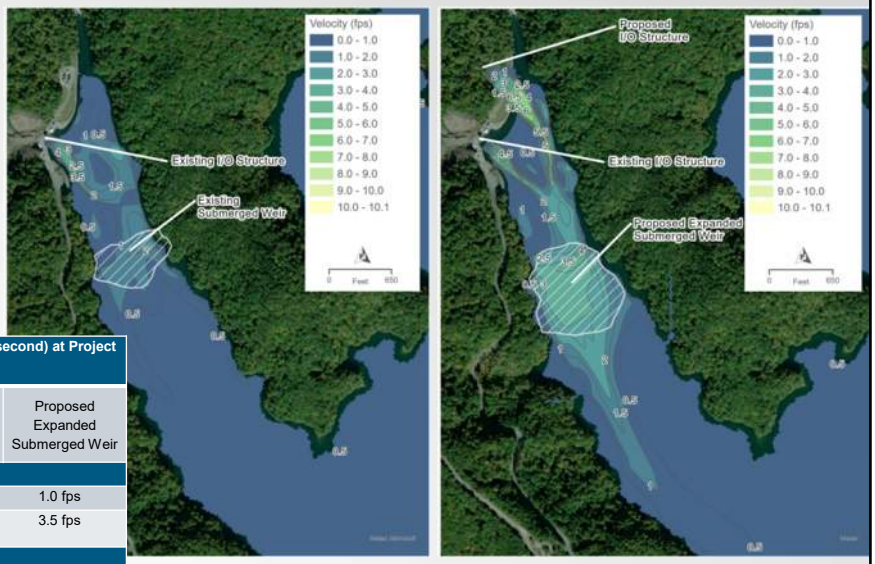




Existing vs. Proposed: Max Generation, Min Pond

Water Resources Task 3 Results:

- Operations from Bad Creek II will not measurably change surface velocities or flow patterns in the Whitewater River cove except if Lake Jocassee is at **min pond**.
- Surface velocities immediately downstream of the proposed I/O structure under max generation with both facilities operating is 6.5 fps.



	Maximum Water Surface Velocities (feet per second) at Project Structures			
Pond Elevations	Existing I/O Configuration	Proposed I/O Configuration	Existing Submerged Weir	Proposed Expanded Submerged Weir
Pumping Operations				
Full Pond	2.0 fps	2.0 fps	1.0 fps	1.0 fps
Minimum Pond	5.0 fps	10.0 fps	3.5 fps	3.5 fps
Generating Conditions				
Full Pond	2.5 fps	2.5 fps	2.0 fps	2.0 fps
Minimum Pond	4.0 fps	6.5 fps	2.0 fps	4.0 fps

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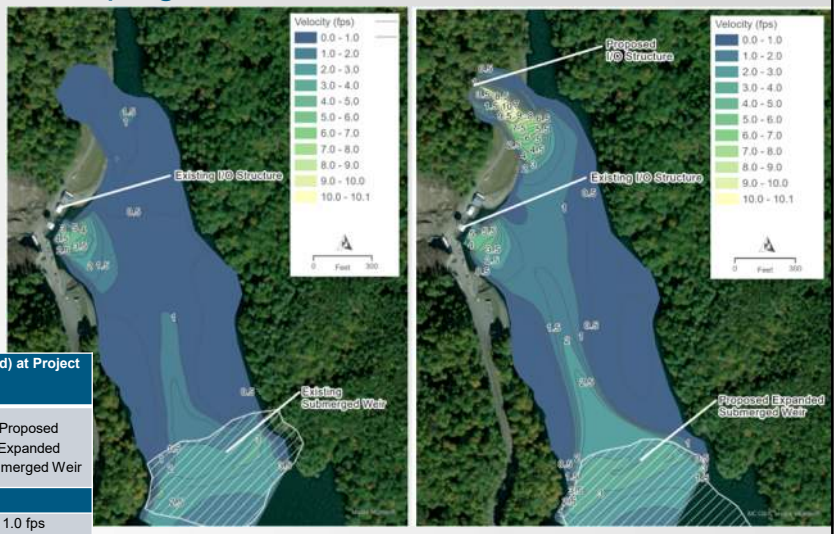
Existing vs. Proposed: Max Pumping, Min Pond

- As noted earlier, surface velocities immediately downstream of the proposed I/O structure under max pumping with both facilities operating is 10.0 fps.
- Duke Energy will implement safety plan to eliminate recreational boating near the structure during drawdown conditions.



	Maximum Water Surface Velocities (feet per second) at Project Structures			
Pond Elevations	Existing I/O Configuration	Proposed I/O Configuration	Existing Submerged Weir	Proposed Expanded Submerged Weir
Pumping Operations				
Full Pond	2.0 fps	2.0 fps	1.0 fps	1.0 fps
Minimum Pond	5.0 fps	10.0 fps	3.5 fps	3.5 fps
Generating Conditions				
Full Pond	2.5 fps	2.5 fps	2.0 fps	2.0 fps
Minimum Pond	4.0 fps	6.5 fps	2.0 fps	4.0 fps

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Task 4 – Whitewater River Cove Public Recreational Safety Evaluation

- **Boater Safety Conclusions**
  - Most changes (i.e., increases) in maximum surface velocities due to operational and pond level scenarios would likely go unnoticed for operators of motorboats with the exception of increased (up to 10.0 fps) velocities adjacent to the proposed I/O structure during pumping operations at minimum pond.
  - Higher velocities during these conditions could affect kayaks and canoes near the proposed I/O structure (difficult paddling).

Previously stated conclusions (Water Resources Task 3):

- Areas immediately adjacent to I/O structure will likely be restricted.
- Boaters could travel along the eastern shoreline instead of near the Project if concerned about higher flows near the station.
- The area immediately upstream of the Project would be dewatered and would preclude boating regardless of operations.
- Bad Creek would not likely operate at maximum pumping capacity under maximum drawdown scenario.
- Since its creation, Lake Jocassee has never been at maximum drawdown.

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Proposed Public Safety Measures

- While **no public safety concerns** related to typical operations exist, Duke Energy proposes to **implement the following public safety measures**:
  - Educate the public about potential hazards.
  - Restrict public access in the immediate vicinity of the I/O structure by installing floating boat barrier.
  - Post signage near structures: "*Warning: Restricted Area, No Trespassing*."
  - Post signage on each bank of the of the Whitewater River cove
  - Post signage at Devils Fork State Park kiosks with information on the Bad Creek Project and associated website and that encourages boaters to check Project operation schedules prior to boating in the Whitewater River cove.
  - Implemented public safety measures at the Project will be incorporated into the Bad Creek Public Safety Plan which will be updated and submitted to FERC for approval.

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Lunch

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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	**Complete**
Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna	**Complete***

** Task methods and findings presented during ISR meeting*

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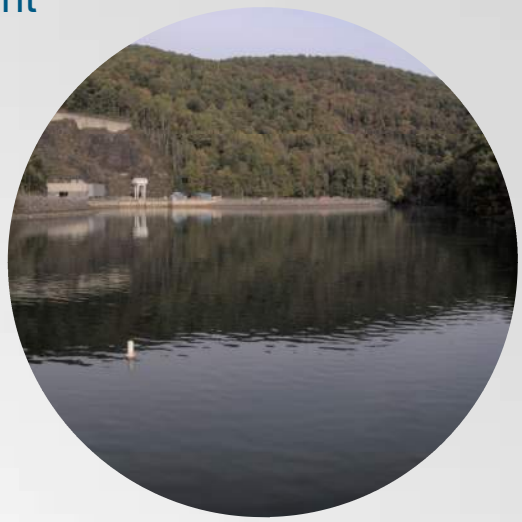
Task 1 – Consultation on Entrainment

- **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.**
- **Update:** Following comments from the FERC on the ISR as well as updated operations for Bad Creek II, two additional supplemental reports were developed and filed with the USR. These results are provided in the following slides.



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Task 1 – Consultation on Entrainment – Addendum 1

- Additional modeling was carried out in 2024 to incorporate **updated hydraulic capacities** associated with Bad Creek II that were not available during original modeling (design change to variable speed units).
  - An addendum to the Entrainment report was developed (Addendum 1) and filed with the USR
- To simulate future operations while ensuring equal volumes pumped, Kleinschmidt derived a coefficient based on pumping the same volume of water as existing conditions:
  - Addition of Bad Creek II reduces operational times by 58.8% (0.412)
  - Example: If the existing (recently upgraded) Project and Bad Creek II were run at full capacity for ***6 hours***, they would pump 773,280,000 ft^3; existing Project would need to run for ***14.55*** hours to pump the **same volume of water.**
- Annual entrainment estimate remains 90,825 - 119,208 fish per year dependent on water elevation.

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Task 1 – Consultation on Entrainment – Addendum 2

- Per the Commission's ISR comment/request, a **literature review** was carried out for the intrinsic population growth rate of Threadfin Shad and Blueback Herring.
  - An addendum to the Entrainment report was developed (Addendum 2) and filed with the USR
- Utilized lifestage specific survival rates to determine population growth rates based on Clean Water Act Section 316(b) entrainment and impingement estimates[1]
- Scenarios: low vs high fecundity, dry vs normal water
- Annual population estimates highly variable, self-sustaining over a 20-year cycle
- Lake Jocassee populations of both species have been self-sustaining for the entire term of Project license; facility is likely at or below maximum sustainable entrainment
- Bad Creek II would not substantially increase the number of entrained organisms **because the overall volume of water pumped would remain the same**

[1] *Electric Power Research Institute (EPRI). (2012). Fish Life History Parameter Values for Equivalent Adult and Production Foregone Models: Comprehensive Update. EPRI, Palo Alto, CA: 2012. Technical Report 1023103*

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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:** **Complete.**

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Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
  - CFD model results review → CFD model developed as part of the Water Resources Task 3 study
- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

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Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
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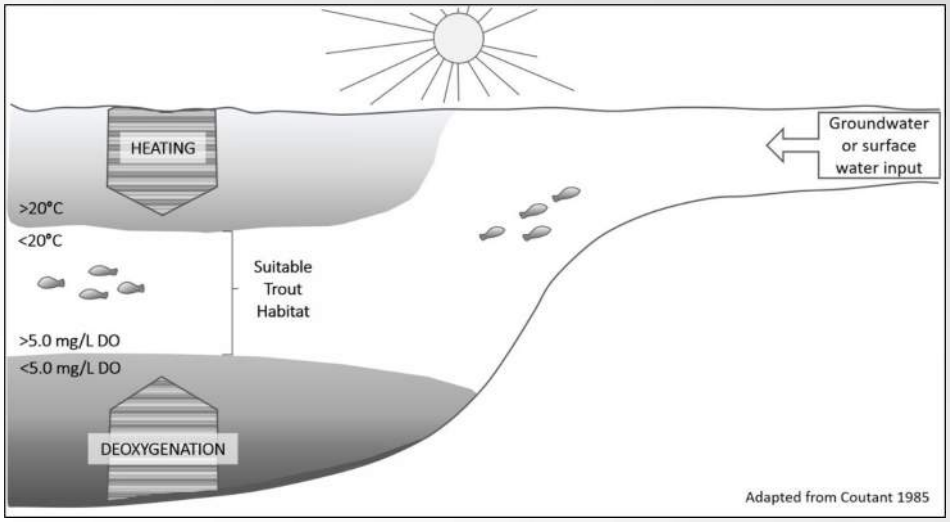
Task 2 Results

Pelagic Trout Habitat Monitoring



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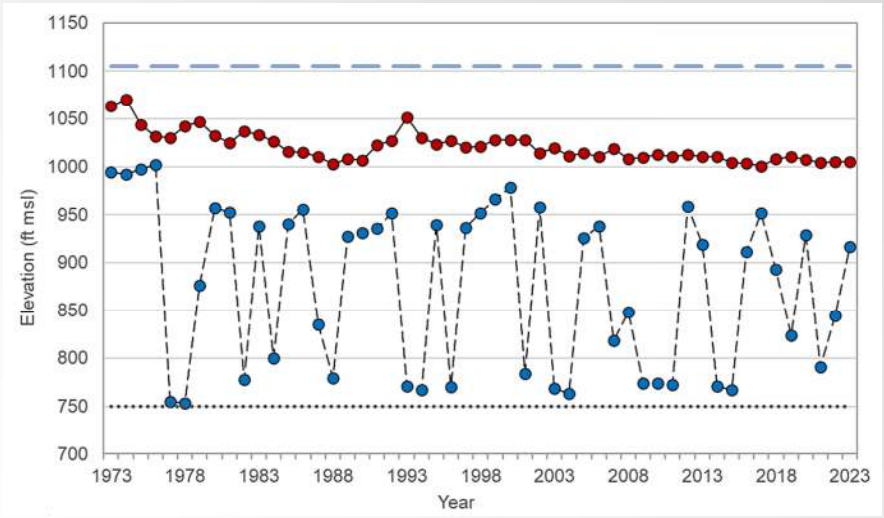
Task 2 Results

Pelagic Trout Habitat Monitoring



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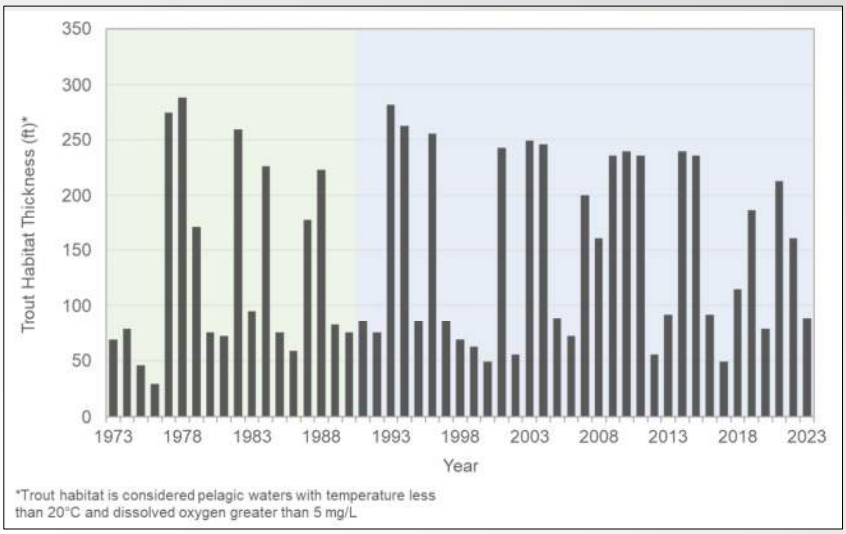
Task 2 Results

Pelagic Trout Habitat Monitoring



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Task 2 Methods

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- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

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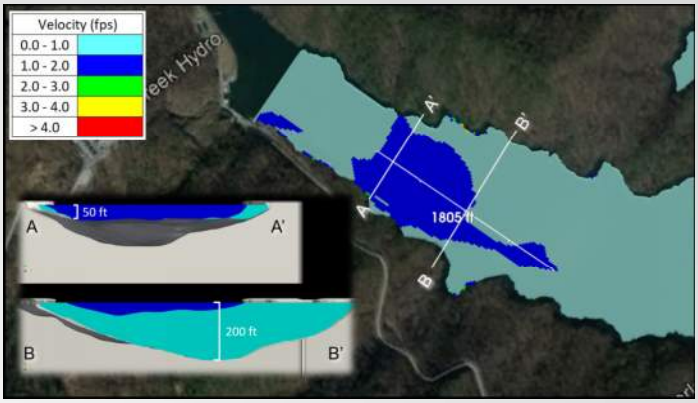
Task 2 Results

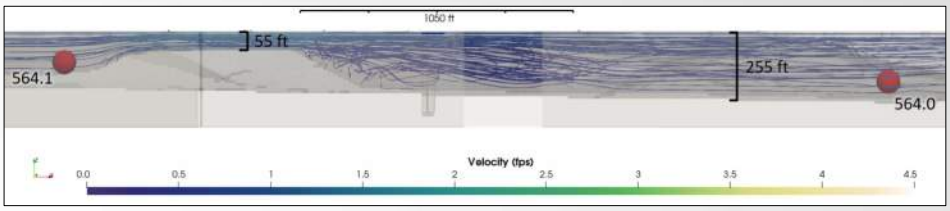
CFD Model Results Review

Generation under full pond elevation (full pond; 1,110 ft msl)

- Slight flow acceleration over the top of the expanded weir and downstream
- Effect does not extend further than Whitewater River cove



- Water column mixing immediately downstream of the weir, but does not extend more than 1,050 ft



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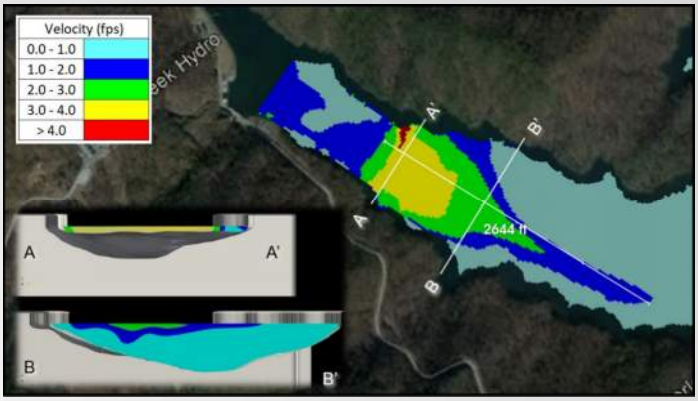
Task 2 Results

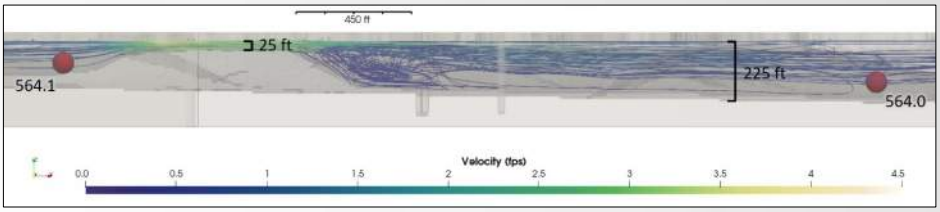
CFD Model Results Review

Generation under minimum pond elevation

(maximum drawdown; 1,080 ft msl)

- Velocity increase over the weir
- Effect does not extend further than Whitewater River cove
- Water column mixing immediately downstream of the weir, but does not extend more than 450 ft





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Task 2 Findings

Pelagic Trout Habitat Assessment

- Pelagic trout habitat in Lake Jocassee is variable and driven by natural environmental fluctuations and to some extent, Jocassee project operations
- Similar trout habitat thickness before vs. after Bad Creek operations began in 1991
- Submerged weir currently, and predicted to provide energy dissipation effects downstream of the weir and into Lake Jocassee
- **No impacts to pelagic trout habitat resulting from proposed Project operations are expected**

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Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
  - CFD model results review → CFD model developed as part of the Water Resources Task 3 study
- Littoral Habitat Assessment
  - CHEOPS model results review → CHEOPS model updated as part of the Water Resources Task 4 study
  - Littoral zone quantification
    - Secchi depth data and analysis → Secchi disk depth data, collected 2003-2015
    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

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Task 2 Methods

CHEOPS Model Update

- HDR's proprietary CHEOPS* model was originally developed in support of the Keowee-Toxaway Project relicensing
- Evaluates the effects of operational changes and physical modifications at multi-development hydroelectric projects
- Performance measures (PMs) – a statistical summary of model output – were developed in consultation with relicensing stakeholders (particularly SCDNR)
- PMs related to frequency of water surface fluctuations and water surface elevations in the littoral zone were evaluated for this study

- Data: hydrologic data set 1939-2011
- Scenarios
  1. Baseline (operations based on Bad Creek and KT Project license requirements)
  2. Bad Creek II (Baseline + four additional units)

*__CHEOPS__: __C__omputer __H__ydro-__E__lectric __O__perations and __P__lanning __S__oftware™

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Task 2 Methods

CHEOPS Model Update

- 21 of 69 PMs evaluated in the Water Resources Task 4 study were selected for review
- Those selected were related to fish spawning, littoral zone habitat, and water surface elevations

Performance Measures	Measure Number	Criterion	Start Date	End Date	MISC[1]
Maximize spawning success for black bass and Blueback Herring (2.5-ft fluctuation band)	8	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once[2]	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[2]	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[2]	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[2]	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[2]	1-Apr	31-May	5%
Maximize spawning success for black bass and Blueback Herring (3.5-ft fluctuation band)	13	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 10 consecutive days at least once[2]	1-Apr	31-May	5%
	14	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 15 consecutive days at least once[2]	1-Apr	31-May	5%
	15	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 20 consecutive days at least once[2]	1-Apr	31-May	5%
	16	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 30 consecutive days at least once[2]	1-Apr	31-May	5%
	17	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 45 consecutive days at least once[2]	1-Apr	31-May	5%
Maximize spawning success for sunfish and Threadfin Shad (2.5-ft fluctuation band)	18	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 10 consecutive days at least once[2]	15-May	15-Jul	5%
	19	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 15 consecutive days at least once[2]	15-May	15-Jul	5%
	20	Percent of years (hourly) reservoir level remains within (-0.5 to 2.0)-ft band for 20 consecutive days at least once[2]	15-May	15-Jul	5%
Maximize spawning success for sunfish and Threadfin Shad (3.5-ft fluctuation band)	21	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 10 consecutive days at least once[2]	15-May	15-Jul	5%
	22	Percent of years (hourly) reservoir level remains within (-0.5 to 3.0)-ft band for 15 consecutive days at least once[2]	15-May	15-Jul	5%

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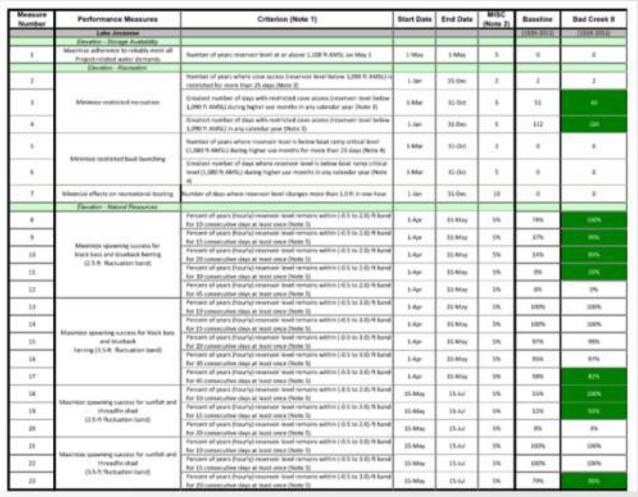
Task 2 Results

CHEOPS Model Update

- Bad Creek II operations and lake levels would be constrained by the existing KT Project FERC license
- Most PMs evaluated showed **no significant change, or showed significant improvement** from the Baseline scenario
- Based on 24-hour elevation fluctuations, Bad Creek II operations would be offset by JPSS operations, resulting in **more stable surface elevations**
- Reservoir levels to support littoral habitat during the growing or spawning season were **not significantly different** under the Bad Creek II scenario vs. Baseline
- The model showed **zero days** where Lake Jocassee would be below 1,081 ft msl (minimum elevation)



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Task 2 Methods

- Pelagic Trout Habitat Assessment
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    - Estimation of the littoral zone → Littoral zone depth calculated as a function of Secchi depth + bathymetric data

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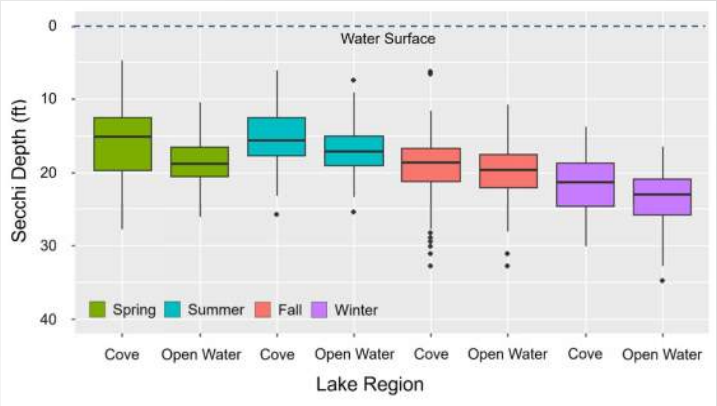
Task 2 Results

Secchi Depth Data and Analysis

- Lake Jocassee is an oligotrophic reservoir
  - Secchi depth generally ≥15 ft
- Differences observed depending on proximity to tributaries, and seasonally
- Secchi depth higher in the water column (i.e., lower water clarity) in cove regions compared to open water



Region	Mean Secchi Depth
Open water	19.6 ft (SD = 4.1)
Cove	17.9 ft (SD = 5.1)

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Task 2 Methods

- Pelagic Trout Habitat Assessment
  - Review of pelagic trout monitoring data → Vertical profile water quality (temp and DO) data, collected 1973-2023
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Task 2 Methods

Estimation of the Littoral Zone

- Known relationships between **Secchi depth and light extinction to calculate the depth of the euphotic zone** (the water column that receives between 1 and 100% of incident radiation from the water surface to the lake bottom)
- Subtracted the euphotic zone depth from water surface elevation (WSE) (upper bound) to find the lake bottom elevation (lower bound) for each of five scenarios

Region	Euphotic Zone Depth (ft)
Cove	48.4
Open Water	53.0

Littoral Zone Scenario	WSE (Upper Bound)	Lake Bottom Elevation (Lower Bound)	
		Cove Region	Open Water Region
1. Maximum Elevation	1,110	1,062	1,057
2. Littoral Zone Habitat During Growing/Spawning Season (High)	1,107	1,059	1,054
3. Littoral Zone Habitat During Growing/Spawning Season (Low)	1,105	1,057	1,052
4. Normal Minimum Elevation	1,096	1,048	1,043
5. Minimum Elevation	1,080	1,032	1,027

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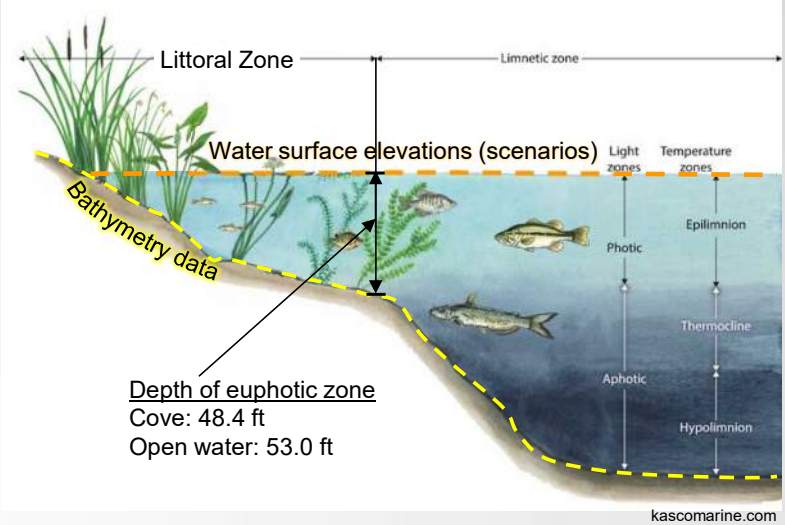
Task 2 Results

Estimation of the Littoral Zone

The spatial area of the littoral zone was estimated by

1. Calculating littoral zone depth for cove and open water regions
2. Using pre-defined water surface elevations for each scenario
3. Extracting the area of the lake between the water surface elevation and bottom of the littoral zone



kascomarine.com

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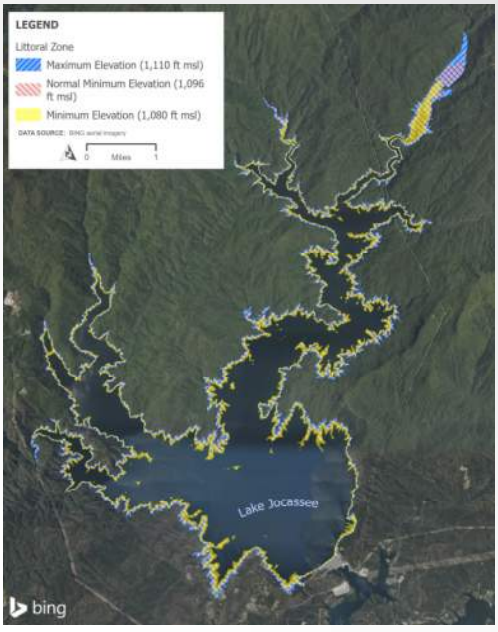
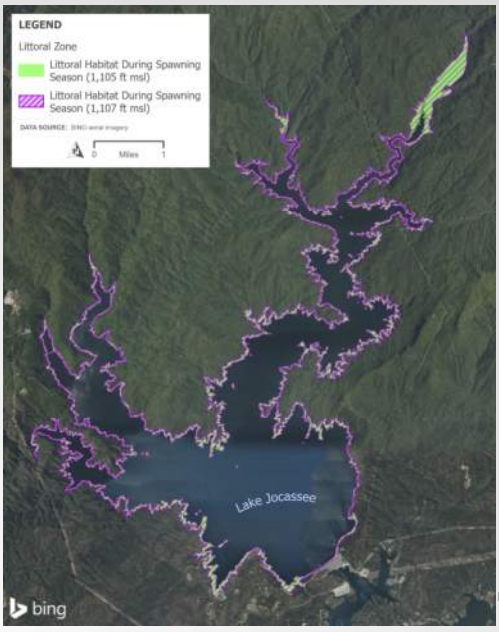
Task 2 Results Estimation of the Littoral Zone





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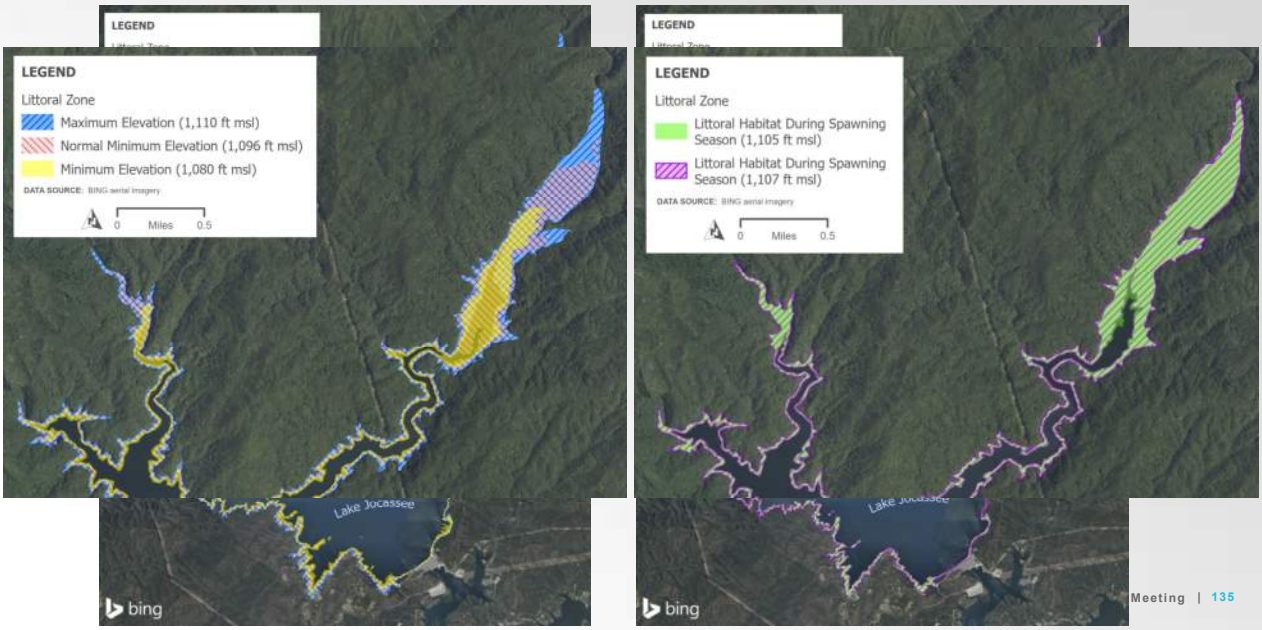
Task 2 Results **Estimation of the Littoral Zone**



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Task 2 Results
Estimation of the Littoral Zone

Littoral Zone Scenario	Littoral Zone Area (acres)			Percent difference from Maximum Elevation
	Cove	Open Water	Total	
1. Maximum Elevation (1,110 ft msl)	718.5	738.8	1,457.3	--
2. Littoral Zone Habitat During Growing/Spawning Season (High) (1,107 ft msl)	703.9	731.3	1,435.2	**-1.5**
3. Littoral Zone Habitat During Growing/Spawning Season (Low) (1,105 ft msl)	701.4	733.2	1,434.6	**-1.6**
4. Normal Minimum Elevation (1,096 ft msl)	671.7	749.7	1,421.4	**-2.5**
5. Minimum Elevation (1,080 ft msl)	541.5	746.5	1,288.0	**-11.6**

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Task 2 Findings

Littoral Habitat Assessment

- The CHEOPS model suggests the addition of the Bad Creek II will **not** result in impacts to spawning success or littoral zone habitat as compared to the Baseline scenario
- Some conditions (e.g., spawning success) may improve with the addition of Bad Creek II Complex operations as indicated by the PMs
- The CHEOPS model, based on the hydrologic data set (1939-2011), showed **zero** days where Lake Jocassee WSE would be below 1,081 ft msl (PM 32) (the scenario representing minimal amount of littoral habitat).
- Lake Jocassee WSE is between 1,104 ft msl and 1,109 ft msl 90% of the time under both the Baseline and Bad Creek II scenarios. This range encompasses the "high" littoral zone habitat scenario in the CHEOPS model and *maintains 98.4-98.5% of littoral habitat*
- **No impacts to littoral habitat resulting from proposed Project operations are expected**

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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:** Complete

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Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

- Task 3 was covered in the ISR and included:
  - SCDNR site visit, meetings, consultation
  - Methods for stream habitat assessments
  - USEPA Rapid Bioassessment Protocol (RBP) scores and stream conditions
  - NCSAM stream types and functional ratings
  - Riparian vegetation assessment methods and results
  - Mussel survey methods and results
  - Fish community sampling results (Howard and Limber Pole creeks)
  - Macroinvertebrate sampling results
  - Stream Quantification Tool (SQT) results
- **Post-ISR Updates**:
  - Following **additional collaboration with the SCDNR,** RBP scores changed slightly; however, the overall stream condition categories remained the same (all results = Optimal and Suboptimal ratings)
  - Scores for the SQT used for the **Fisher Knob Access Road** were also updated, however, Fisher Knob Access Road is no longer being pursued for Bad Creek II

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Task 3 – Impacts to Surface Waters and Associated Aquatic Fauna

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):

- Identify presence of environmental justice communities that may be affected by the relicensing and proposed project expansion.
- Identify the presence of non-English speaking populations that may be affected by the project.
- Identify the presence of sensitive receptor locations in the geographic scope.
- Discuss the effects of the relicensing on any identified environmental justice communities and effects that are disproportionately high and adverse and potential effects on non-English speaking communities and sensitive receptor locations.
- 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**
  - **Update**: In comments provided on the ISR, FERC staff requested that Duke Energy perform public outreach within EJ communities identified during the EJ Study. This presentation describes these public outreach activities.

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Environmental Justice Study - 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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Summary of EJ Study Results

- 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.

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Public Outreach

- In comments provided on the ISR, FERC staff requested that Duke Energy perform public outreach within EJ communities identified during the EJ Study.

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Environmental Justice Study – Public Outreach Plan and Implementation

The following activities were completed to encourage feedback from EJ communities surrounding the Project:

- Development of Community Outreach Plan describing an engagement plan and strategies for outreach through newspapers and community leaders to disseminate information on the public meetings.
- Development of informational materials in plain language (English and Spanish) to ensure accessibility and understandability of proposed project expansion and relicensing.
- Duke Energy held two (2) public town hall meetings: one (1) meeting in Sapphire, North Carolina; one (1) meeting in Salem, South Carolina.

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Environmental Justice Study - Community Outreach Plan

- Organizations that play a role in supporting and securing resources for members of EJ communities were distributed outreach materials and information regarding the upcoming meetings.
- Notice of the meetings was published in newspapers of local circulation, and on Duke Energy's relicensing website.

ORGANIZATIONS CONTACTED
Oconee County Department of Social Services
St. Luke's Methodist Church Food Pantry
United Way of Oconee County
Christ Central Ministries (Oconee County)
Transylvania Social Services
Transylvania Public Health

NEWSPAPERS PUBLISHED IN
Upstate Today
Transylvania Times

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Public Outreach Materials

Bad Creek Pumped Storage Relicensing & Expansion

DUKE ENERGY

The Federal Power Act requires non-federal hydroelectric projects to be relicensed as existing license terms expire.

Duke Energy started the formal relicensing process by filing a pre-application document with the Federal Energy Regulatory Commission (FERC) on February 23, 2022. The final License Application must be filed no later than July 31, 2025.

Applying for a new license from the FERC is a multi-year process that includes Duke Energy working collaboratively with:

- Local, State, and Federal Agencies
- Nearby Environmental Justice Communities
- Members of the Public and Environmental Organizations
- Tribes

The goal is to create outcomes that consider power generation with other benefits, such as the protection and enhancement of recreation and natural resources.

Overview

Additional energy storage and renewable energy capacity are needed to help Duke Energy meet their goal of net zero carbon emissions by 2050. To help achieve this goal, Duke Energy has proposed a potential expansion of the Bad Creek Project: The Bad Creek II Power Complex. This expansion would take advantage of typically unused storage capacity in the upper reservoir to roughly double the energy generation and storage pumping capacity of the current project.

Duke Energy's Commitment
Net Zero Carbon Emissions by 2050

Public participation is an important part of the relicensing process. Interested individuals and organizations are encouraged to participate by attending public meetings and submitting comments with concerns and/or support for the project. Comments can be submitted to the FERC docket at www.ferc.gov using Docket No. P-2740, or to Duke Energy at www.baldcreekpumpedstorage.com/#contact.

Upcoming Public Meetings

Eagles Nest Art Center
4 Eagle Lake
Salem, SC 29676

Date: December 10, 2024
Time: 6:00 - 8:00 PM

Hampton Inn & Suites Carolina Sapphire Valley
3245 US Highway 64 East
Sapphire, NC 28774

Date: December 11, 2024
Time: 10:00 - 12:00 PM

Scan the QR code for more information about the project.

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Environmental Justice Study Public Outreach Meetings

- Duke Energy held two town hall style public meetings: one meeting in Sapphire, NC (daytime), and one in Salem, SC (evening).
- Each meeting was held at a different time of day to achieve the highest level of participation possible.
- Notice of the meetings were circulated.
- A Spanish-speaking interpreter was in attendance at both meetings.

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Environmental Justice Study - Results of EJ Outreach Efforts

- No attendance of meetings by members of the EJ community
- A summary of outreach efforts will be compiled in the DLA

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Cultural Resources Study

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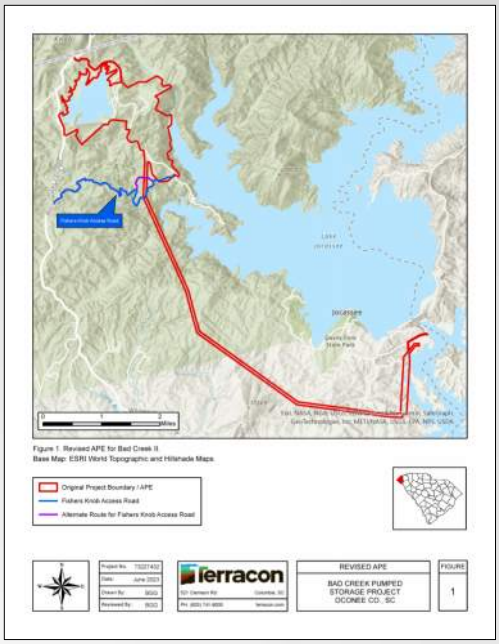
Task 1 – APE Determination

- **Objective:** In consultation with the State Historic Preservation Officer (SHPO), Indian Tribes, and other stakeholders, Duke Energy determined the Area of Potential Effects (APE; defined as all lands within the project boundary) and performed surveys to identify historic properties within the APE.
- **Status:** **Complete**
- **Update:** 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 surveys (in 2024) are presented in a supplemental document attached to the Cultural Resources Study.



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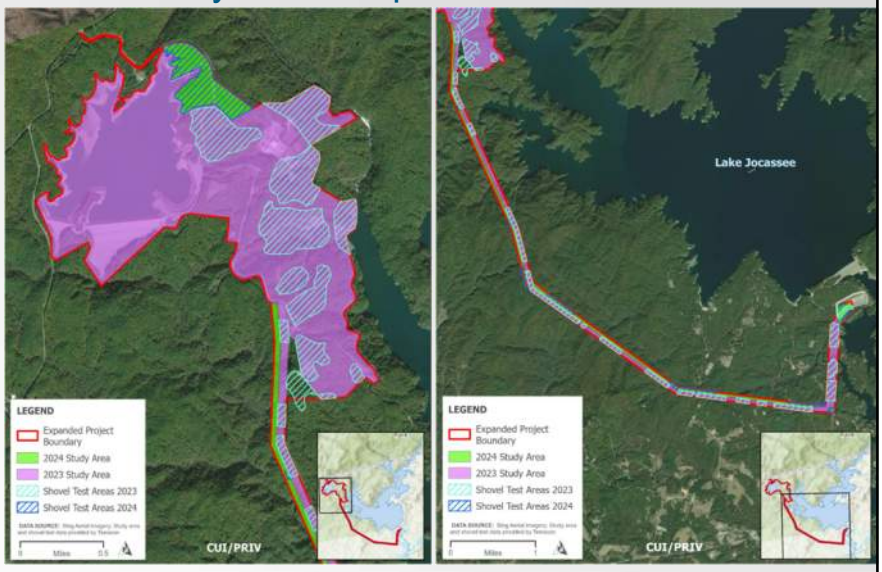
Task 2 – Cultural Resources Survey – 2024 Update

- 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 due to corridor widening and spoil areas (see green shaded areas).
- Duke Energy notified the SC SHPO and Indian tribes of this expansion by letters transmitted September 11, 2024, and September 25, 2024, respectively.
- Concurrence from SCHPO and Catawba Indian Nation has been received.



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Task 2 – Cultural Resources Survey – 2024 Update

- **Results of 2023 Survey:** Identified one isolated find – a Middle Archaic projectile point, tested site 38OC249, and identified five historic-age architectural resources in the APE. Site 38OC249 – Paleoindian(?) through Mississippian Period is a series of rockshelters.
  - 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.
- **Results of 2024 Survey**: The supplemental (2024) investigation in areas affected by the proposed expanded APE identified no new archaeological sites or above ground historic-age resources.

- **Conclusions**: Based on results of both studies, no historic properties will be affected by the Project.

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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	Complete
Task 5 – Existing Visual Quality Assessment	Complete
Task 6 – Visual Analysis	Complete
Task 7 – Visual Management Consistency Review	Complete
Task 8 – Mitigation Assessment	Complete
Task 9 – Conceptual Design of the Bad Creek II Complex	Complete

** Reviewed during ISR meeting*

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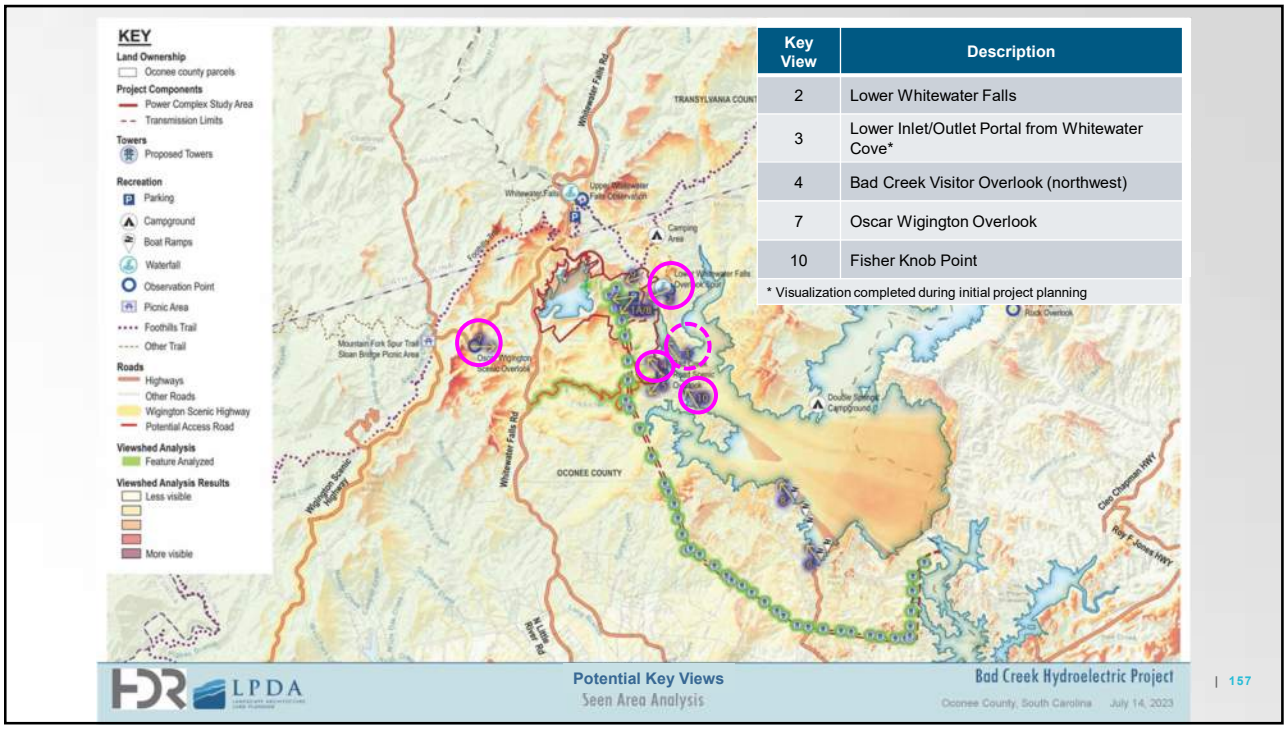

Key View	Description
2	Lower Whitewater Falls
3	Lower Inlet/Outlet Portal from Whitewater Cove*
4	Bad Creek Visitor Overlook (northwest)
7	Oscar Wigington Overlook
10	Fisher Knob Point

* Visualization completed during initial project planning

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Key View 2: Lower Whitewater Falls Observation Platform

Existing

Proposed

1. Transmission lines
2. Lower inlet/outlet bank

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Key View 3: Lower Inlet/Outlet Portal from Whitewater Cove

Existing

Proposed

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Key View 4: Bad Creek Visitor Overlook

Existing

Proposed

1. Inlet/outlet portal
2. Inlet/outlet cove

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Key View 7: Oscar Wigington Scenic Overlook

Existing

Proposed

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Key View 10b: Fisher Knob Point

Existing

Proposed

1. Transmission lines
2. Lower inlet/outlet portal

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Task 7: Visual Management Consistency Review

- United States Forest Service (USFS) Management Plans
  - Applicable to USFS lands only
  - Transmission line widening is consistent with USFS section management (timber production)
- Jim Timmerman Natural Resources Plan
  - Applicable to SCDNR land only
- Oconee County Comprehensive Plan
  - Utility projects excluded from visual resource protection requirements
  - Consistent with existing and future land use classifications
- Keowee-Toxaway Shoreline Management Plan
  - Applicable only to lands within the Keowee-Toxaway Project (FERC No. 2503)
  - Bad Creek II lower inlet/outlet structure shoreline classification: Project Operations

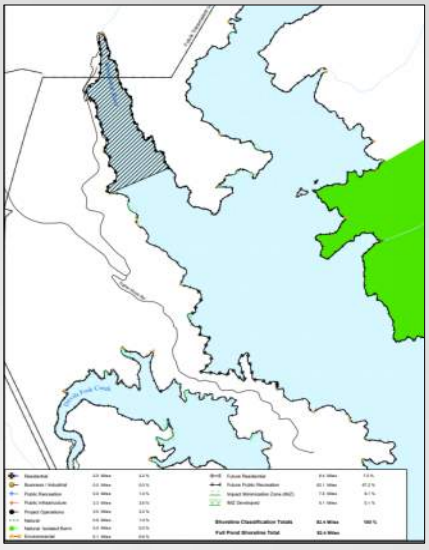

Image source: Duke Energy 2014. Jocassee Development Sheet 2 of 3.

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Task 8 - Mitigation Assessment

Potential PME Measure	Feasibility	Estimated Cost Range	Effectiveness
Building paint colors	High	Low	Moderate
Building and roofing materials	High	Varies	Moderate
Retaining / concrete wall treatments	Moderate	High	Moderate
Revegetation of disturbed areas	High	Low	High
Fencing	Moderate	Low	Low
Landscape screening and plantings	High	Low	Moderate
Landscape berms	High-Low	High-Low	Moderate
Transmission tower material selection	Moderate	Moderate	Moderate
Transmission tower locations	Low	High	Moderate
Lighting: motion-activated lighting	High	Moderate	High
Lighting: fully shielded light fixtures	High	Low	High
Lighting: elimination of existing unnecessary lights	Moderate	Low	High
Lighting: LED lights	High	Low	Moderate
Lighting: warm color spectrum	High	Low	High

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Task 9 - Proposed Site Layout

1. **Spoil areas**
2. **Upper inlet/outlet structure**
3. **Transformer yard, switchyard, access road**
4. **Interconnect line**
5. **Lower inlet/outlet**
6. **Primary transmission line**
7. **Temporary access road**

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Task 9 – Lighting Evaluation

- Limited external lighting
  - Operations area
    - Foothills Trail parking lot
    - Warehouse, garage, administration building, parking lots
  - Lower inlet/outlet area
  - Fisher Knob residences
- Existing external lighting
  - 1980 – 1991 vintage fixtures
  - Cool spectrum
  - Unshielded (generally)

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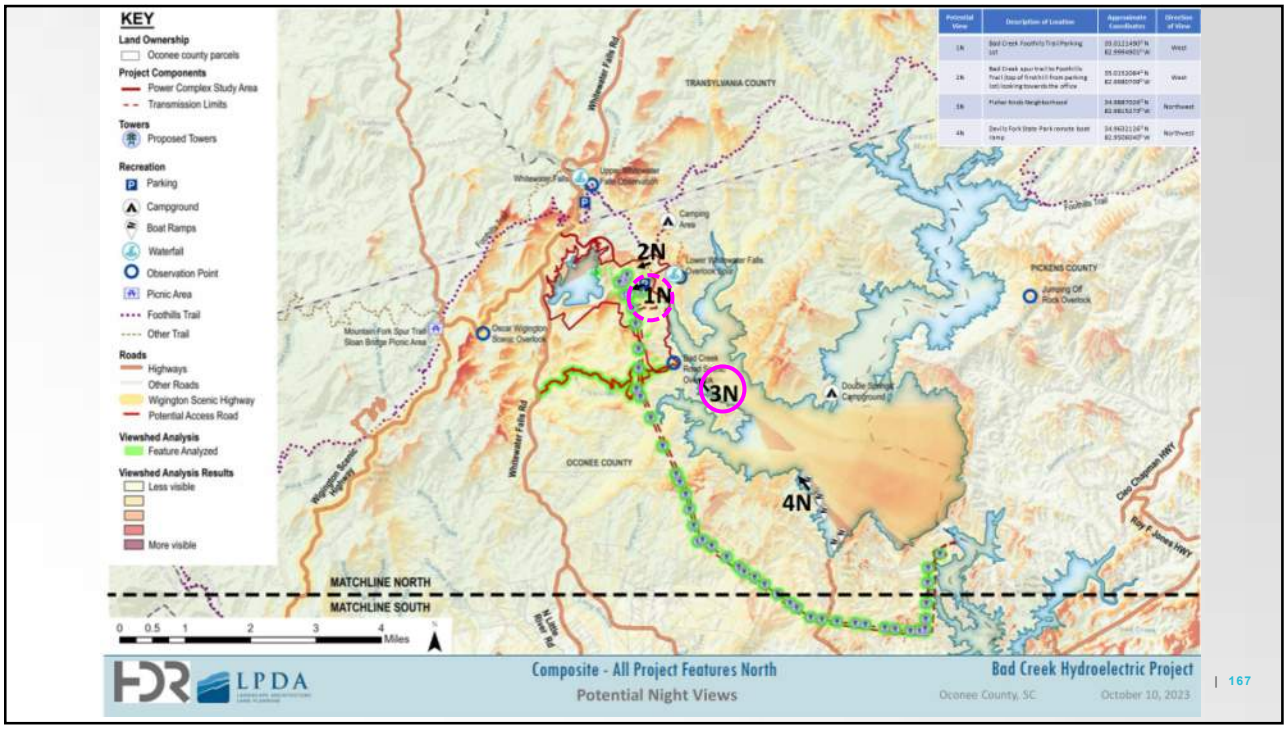

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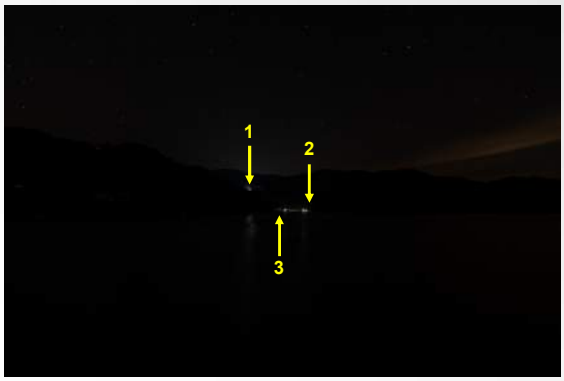
Night View 3N: Fisher Knob Point



Existing

1. Transformer yard
2. Wastewater treatment, parking
3. Lower inlet/outlet

Proposed

1. Lower inlet/outlet portal

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Conclusions

- Project area: High scenic attractiveness
- **Existing Project**
  - Views of existing Project limited by:
    - Vegetation
    - Topography
    - Access restrictions
  - Potential mitigation
    - Lighting
    - Building colors
- **Bad Creek II** effects (construction and operation)
  - Permanent alterations to visual characteristics
  - Mitigation measures could further reduce these effects
- Visual Resources Management Plan under development

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Break

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Additional Surveys

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Small Whorled Pogonia Surveys

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Small Whorled Pogonia Surveys

- **Objective**: In response to a written request from SCDNR and to support ESA compliance for Clean Water Act Section 404 U.S. Army Corps of Engineers permitting, Duke Energy surveyed several areas with potential to be impacted by Bad Creek II activities for the federally threatened small whorled pogonia (*Isotria medeoloides*) during the appropriate survey window (mid-May through early July).
- **Status:** **Complete**

Potential small whorled pogonia habitat – dry upland hardwood forest with dappled sunlight

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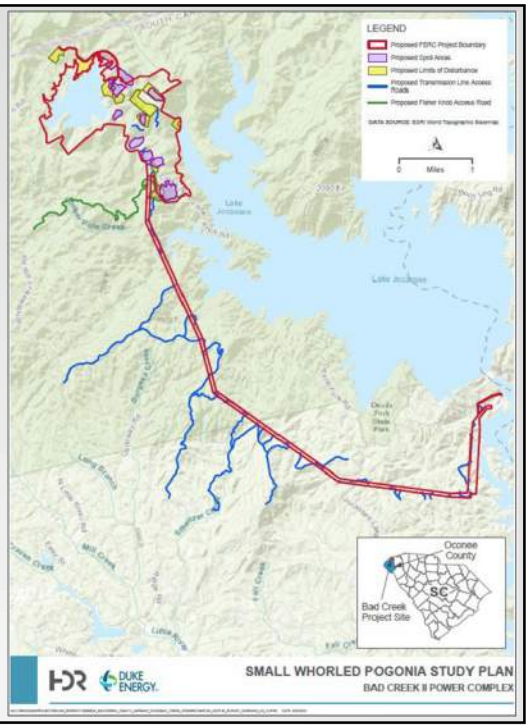
Small Whorled Pogonia Surveys

- The federally threatened Small Whorled Pogonia is listed in the USFWS Information for Planning and Consultation (IPaC) database as having the p**o**tential to occur in the project vicinity.
- A study plan was developed in consultation with the USFWS and SCDNR and distributed to the Wildlife and Botanical Resource Committee in June 2024.
- Surveys included lands that will be potentially impacted by the construction of Bad Creek II including the (1) proposed spoil area locations, (2) Fisher Knob access road (*no longer being pursued*), and (3) Bad Creek Transmission Line access roads.

A Natural Resources Survey was carried out by Duke Energy in 2021 (filed with the PAD) 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.



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Small Whorled Pogonia Surveys - Methods

- Areas were surveyed along the 50-foot-wide buffer of the proposed temporary Fisher Knob access road and proposed transmission line access roads, and within the proposed limits of disturbance and spoil area alternatives.
- Surveys were conducted during the USFWS-recommended optimal survey window of mid-May – early July.
  - June 3-5 for the proposed Fisher Knob Access Road and transmission line access roads
  - May and July 2024 for potential spoil areas and the general proposed limits of disturbance for Bad Creek II construction

Photo 20. Access Road; potential habitat for SWP on margins (transmission line access roads)

- 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.
- Field biologists also recorded incidental observations of priority plant species identified in the SC Wildlife Action Plan (SWAP) during the survey.

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Small Whorled Pogonia Surveys - Findings

- Small whorled pogonia was **not identified** during the 2024 surveys, 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 survey for *Trillium rugelii* was conducted outside of recommended survey window.
- Photos of potential small whorled pogonia habitat and a list of identified plant species are included in the final study report.
- **Potential habitat for the small whorled pogonia was observed in all study areas.**
- A Botanical Species Protection Plan for the small whorled pogonia will be prepared for the license application.
- Small whorled pogonia will also be evaluated in the Biological Assessment for ESA compliance to support both the FERC and CWA Section 404 permitting process.


Photo 29. Potential SWP habitat; upland mixed wood with dappled sunlight (spoil location K)


Photo 27. Potential SWP habitat; dry mesic oak hickory forest (spoil locations C, D, G, I, and M)

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Small Whorled Pogonia Surveys – Potential Habitat Photos

Photo 4. Potential SWP habitat; dry upland hardwood forest with dappled sunlight

Photo 18. Potential SWP habitat; mixed hardwood with dappled sunlight (transmission line access roads)

Photo 20. Access Road; potential habitat for SWP on margins (transmission line access roads)

Photo 1. Potential SWP habitat; rocky slope with dappled sunlight (Fisher Knob Access Road)

Photo 16. Open space along access road; potential habitat for SWP on margins (transmission line access roads)

Photo 24. Potential SWP habitat; shortleaf pine and oak woodland (spoil locations B and C)

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Bat Surveys

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Bat Surveys

- Construction of Bad Creek II will require the removal of trees, potentially impacting suitable habitat for state and federally protected bats.
- A bat study plan was developed in consultation with USFWS and SCDNR and approved by the USFWS on May 28, 2024.
- Mist-net surveys and acoustic surveys were used to assess the presence/probable absence 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*), state endangered Rafinesque's big-eared bat (*Corynorhinus rafinesquii),* state threatened Eastern small-footed myotis (*Myotis leibii),* hoary bat (*Lasiurus cinereus*), and gray bat (*Myotis grisescens).*
- The Project area is in the hibernating range for the NLEB and tricolored bat.

Big brown bat (Eptesicus fuscus)

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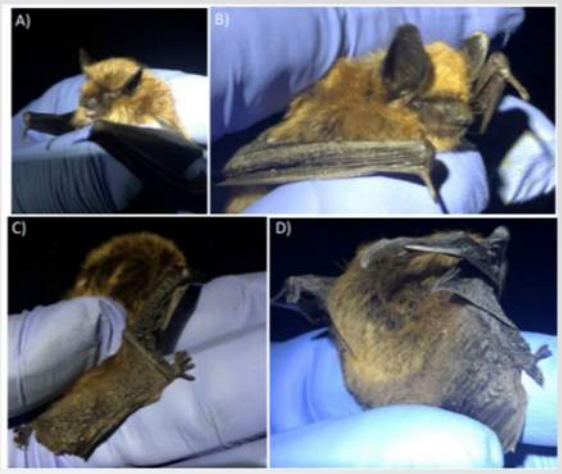
Bat Surveys

- 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 3 inches dbh) 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**.
- Forested acreage onsite was primarily comprised of upland, mature pine-hardwood forests interspersed with early successional habitat throughout.
- Suitable summer habitat for target species including potential roost trees and snags as well as foraging and commuting habitats are located throughout the Project Area.
- Bat surveys were conducted within the AOI on the **nights of June 1st through 19th, 2024**.



Eastern small-footed bat (Myotis leibii)

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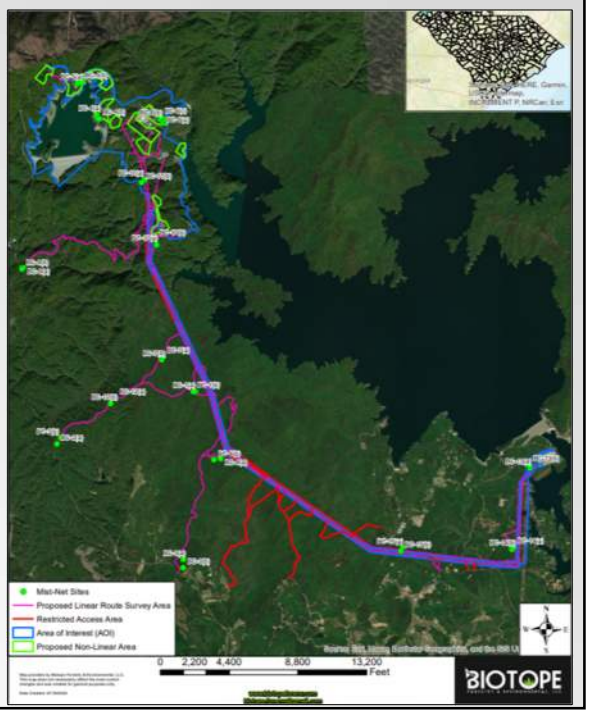
Bat Surveys – Mist Net Surveys

- Fifteen mist-net sites were surveyed for two calendar nights, totaling 62 net 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.
- Net locations were selected in areas that provided preferred habitat for target species where available.
- Nets were opened approximately 10 minutes before sunset and checked every 10 minutes for at least five hours.
- The capture time, species, age, sex, reproductive condition, right forearm length, mass, Reichard's wing damage index score, 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.



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Bat Surveys – Mist Net Surveys

- 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.

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Bat Surveys – Acoustic Surveys

- Thirty-seven acoustic sites were surveyed totaling 144 detector nights for the entire project.
- Detectors were deployed along similar features as mist-net sites where lack of side and top cover made mist-nets less desirable.
- 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

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Bat Surveys – Acoustic Surveys

- Anabat Express acoustic detectors were deployed at all sites with either directional or omnidirectional microphones, dictated by the specific landscape feature being surveyed.
- 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.
- 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
- 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.

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Bat Surveys – Mist Net Results

- A **total of 41 bats** were captured at the Bad Creek project across three species. Approximately 51% and 41% of the captures were big brown bats (*Eptesicus fuscus*) and eastern red bats (*Lasiurus borealis*) respectively, with the remaining 7% eastern small-footed bats (*Myotis leibii*).

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

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Bat Surveys – Acoustic Results

- 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.

Determination of Likely Presence for All Bat Species

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 quality of the summer roosting and foraging habitat within the AOI appears to be generally favorable for the gray bat, tricolored bat, and little brown bat, given the diversity of suitable habitat features identified during the survey.
- The likely presence of 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.
- Raw acoustic data files, that were autoclassified for the Northern Long-eared bat and Indiana bat, have been requested by USFWS for further evaluation.

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Bat Surveys – Summary Results

- A total of 41 individual bats consisting of three species (eastern red bat, big brown bat, and eastern small-footed bat) 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, little brown bat, and the tricolored bat.
- A probable absence determination was made with regards to the federally listed northern long-eared, gray, 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.
- The state endangered Rafinesque's big-eared bat and state threatened Eastern small-footed bat are likely present in the AOI.

Eastern Red Bat (Lasiurus borealis)

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Next Steps

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FERC ILP Schedule Next Steps

Activity	Responsible Parties	Timeframe	Estimated Filing Date or Deadline
File USR Meeting Summary (18 CFR §5.15(f))	Duke Energy	Within 15 days of USR Meeting	Jan 31, 2025
Deadline to file comments on USR Meeting Summary	Stakeholders	Within 30 days of filing Meeting Summary	March 3, 2025
Deadline to File DLA (18 CFR §5.16(a))	Licensee	No later than 150 days prior to the deadline for filing the FLA	March 3, 2025
Deadline to file comments on the USR Meeting Summary	Stakeholders	Within 30 days of filing Meeting Summary	March 3, 2025
Comments on 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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Thank you for Participation!!!

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