

**Stakeholder Team Meeting Summary  
Keowee-Toxaway Hydro Project Relicensing  
FERC No. 2503**

Dates: September 13 - 14, 2011

Location: Wenwood Operations Center

Note: (1) indicates participants attended on Day 1, and (2) indicates they attended on Day 2.

**Participants**

Dyke Spencer, Anderson Chamber (2)  
Anna Mitchell, Anderson Independent (2)  
Kevin Minton, AQDI (2)  
Jim Schoonover, AQDI (1)  
Chuck Smith, AQDI (1)  
Doug Young, AQDI (2)  
Walker Smith, Office of Congressman  
Jeff Duncan (1, 2)  
Hugh Barwick, Duke Energy (1, 2)  
Ed Bruce, Duke Energy (2)  
Dave Coughlan, Duke Energy (2)  
Erin Culbert, Duke Energy (1)  
Joe Carriker, Duke Energy (1)  
Scott Fletcher, Duke Energy (2)  
Phil Fragapane, Duke Energy (2)  
George Galleher, Duke Energy (2)  
Brett Garrison, Duke Energy (1)  
Joe Hall, Duke Energy (1)  
Jen Huff, Duke Energy (1, 2)  
Camille Jessen, Duke Energy (1, 2)  
Steve Johnson, Duke Energy (1, 2)  
Scott Jolley, Duke Energy (1)  
Jeff Lineberger, Duke Energy (1, 2)  
Sandra Magee, Duke Energy (2)  
Mark Oakley, Duke Energy (1)  
Kelvin Reagan, Duke Energy (1)  
Steadman Sugg, Duke Energy (1)  
Tami Styer, Duke Energy (2)  
Jamie Higgins, EPA (1, 2)  
Elizabeth Blaug, FERC (1, 2)  
Stephen Bowler, FERC (1, 2)  
Allan Creamer, FERC (1, 2)  
Monte Terhaar, FERC (1, 2)  
Bob Swank, FOLKS (1, 2)  
Ben Turetzky, FOLKS (1, 2)  
Frank Eskridge, Greenville Water (2)  
K.C. Price, Greenville Water (2)

Mike Benchich, HDR (2)  
Mike Manwaring, HDR (1, 2)  
Tina Woodward, HDR (1, 2)  
Bill Ambrose, Heron Cove Partners (1)  
Ken Kearns, Kearns & West (1, 2)  
Elana Kimbrell, Kearns & West (1, 2)  
Tom Berenz, Keowee Vineyards (1, 2)  
Jim Burgner, Keowee Vineyards (1, 2)  
Bill Elmore, Lake Hartwell Association (2)  
Art Holbrooks, Oconee County (1)  
Karl Dieter, Pickens County resident (1)  
Carla Whitlock, Pickens County (1, 2)  
Steve Jewsbury, Pickens Co. Water  
Authority (2)  
Bill Teat, Pickens Co. Water Authority (2)  
Harry Wilson, Pickens Co. Water Authority  
(2)  
Tony Niemeyer, The Reserve (1)  
Jodi Barnes, SCDAAH (1)  
Rebecca Dobrasko, SCDAAH (1)  
Erin Owen, SCDHEC (2)  
Bill Marshall, SCDNR (1, 2)  
Greg Mixon, SCDNR (1, 2)  
Tom Swaynham, SCDNR (2)  
Vivianne Vejdani, SCDNR (2)  
Rob Achenberg, SCDPRT (1)  
Mark Dudley, SCDPRT (1)  
Bob Faires, Seneca Light & Water (2)  
Douglas Spencer, SEPA (2)  
Wes Cooler, SC Wildlife Federation (2)  
Dave Hargett, SC Wildlife Federation (1)  
Chris Starker, Upstate Forever (1, 2)  
Sandy Campbell, US Army Corps of  
Engineers (1, 2)  
Mark Cantrell, USFWS (1, 2)  
Kevin Young, Young Energy Services (1, 2)

*By Phone and LiveMeeting*

Sarah Florentino, FERC (1, 2)

Patti Leppert, FERC (1, 2)  
Rachel McNamara, FERC (1, 2)

The presentations from the meeting are included at the end of this summary and identify for each individual study (1) goals & objectives; (2) study area; (3) methodology; and (4) schedule. For brevity, this information is not repeated and the summary below addresses only questions and comments discussed at the meeting.

*[Day One]*

## **I. Introductions & Overview**

Ken Kearns, facilitator, reviewed the agenda and ground rules, and provided background and context for the meeting. The Proposed Study Plan (PSP) meeting is a requirement of the Federal Energy Regulatory Commission's (FERC) Integrated Licensing Process (ILP).

Duke Energy is also conducting a parallel stakeholder process which began in late-2009 well in advance of the official FERC process.

The purpose of the Study Plan Meetings was to review Duke's Proposed Study Plan and obtain additional input from stakeholders, including FERC, regarding additional changes or new studies stakeholders believe are needed. The FERC will then make a determination regarding the requirements of the final study plans in January 2012.

Jen Huff, Duke Energy, provided an overview of the process Duke used to develop the Proposed Study Plan. The individual study plans were developed in consultation with the Resource Committees (RC) during more than a year and a half of consultation. Duke originally proposed twelve studies in December 2009. As a result of consultation with the RCs, two additional studies were added.

Huff noted the requests for additional studies not incorporated in the Proposed Study Plan did not meet the FERC's seven study criteria (listed on the agenda) and/or comport with FERC precedents. Many recommendations are possible Protection, Mitigation, & Enhancement (PM&E) measures, which will be discussed later in the licensing process after Project effects have been evaluated in the studies. However, all comments submitted are part of the public record.

## **II. Study Plan Presentations**

### **A. Hydro Structures National Register of Historic Places (NRHP) Eligibility Assessment (Brett Garrison)**

The group discussed possible implications for a hydro site if it is eligible for the NRHP. It was noted all Project structures are in South Carolina, so the North Carolina State Historic Preservation Office elected not to participate on the Study Team or comment on the completed study. The North Carolina State Historic Preservation Office will be given the opportunity to comment on the Historic Properties Management Plan once it is drafted.

An archaeological survey of the shoreline of the reservoirs, islands, and access areas has been previously completed.

Archaeological and historic sites inundated by the creation of the reservoirs are not part of this assessment. On-going management of these sites will be addressed in the Historic Properties

Management Plan Duke will develop in consultation with the Cultural Resources RC.

#### B. Shoreline Management Plan (SMP) Mapping Update (Brett Garrison)

The updated maps will be used in the implementation of the SMP which includes the maps as well as Shoreline Management Guidelines. The RC has also completed an effort cataloging how other hydro project licensees implement various aspects of the Shoreline Management Guidelines. An Ad Hoc Committee of the Stakeholder Team is also currently discussing potential updates to the Shoreline Management Guidelines.

#### C. Lake Jocassee Erosion Study (Hugh Barwick)

FOLKS would like the erosion study expanded to include Lake Keowee. They believe erosion on Lake Keowee is caused by reservoir fluctuations, falling trees along the shoreline, and increasing levels of boating traffic. An assessment of shoreline erosion on Lake Keowee's islands was recently completed. This information used historical aerial photography to compare island area in 1976 and in 2005; the full report is available in Duke's relicensing library and in the technical library on the Stakeholder Team's website. FOLKS discussed the adequacy of the 1976 aerial photography data used for Lake Keowee's islands and their belief erosion rates have increased. Duke's contractor, Orbis, Inc., and Duke contend use of the 1976 photography and the timespan evaluated is appropriate for the comparisons presented in the report. Furthermore, Duke contends the minimal reduction in the area of the islands over the 29-year study period indicates erosion on Lake Keowee has been minimal and not sufficient to warrant a more in-depth study. FOLKS did not agree. Barwick offered to have the consultant who did the historical aerial photography comparison meet with meeting attendees who do not agree with the results of the evaluation to demonstrate the technique used.

The proposed Jocassee study will not evaluate the potential causes of the erosion because of the uncertainties inherent in such determinations. The factors contributing to erosion at Lake Jocassee are described in the Pre-Application Document. Deposition of sediment will be assessed in the Wetlands Study. Duke's responses to the erosion study findings will be determined on a case-by-case basis. The geographic scope of this study is the immediate shoreline.

#### D. Recreation Use and Needs (RUN) Study (Scott Jolley)

The current Recreation Management Plan (RMP) approved by FERC in 2008 is now being implemented. Facility enhancements and additions, such as improved public access to the lake including enhanced access for non-motorized boating, will be addressed in the RMP. The RUN study will help determine what additional changes and new facilities should be included in the new RMP to be filed with the License Application.

Concerns with boating safety and increasing congestion on the lakes will be documented through the RUN study. The RUN study methodology includes incentives to encourage a good response rate for those participating in the web-based surveys. Several attendees suggested the study team expand the list of organizations receiving the survey to make sure whitewater paddling is appropriately represented. A FERC representative suggested the RUN Study address potential future recreational uses in addition to current uses. FOLKS believes the recreational potential of the islands should be evaluated.

Duke is not proposing a separate study to evaluate land availability for public recreation. The

RUN study will identify if additional facilities and the land to house those facilities is needed. Duke does not currently provide facilities for rock climbing at the Project.

#### E. Other Study Issues

The group discussed studies requested in the cultural resources, shoreline management, and recreation resource areas Duke did not agree to do.

- Environmental Justice (EJ): Huff stated Duke believes an EJ review is typically completed by the FERC during its development of the Environmental Assessment or Environmental Impact Statement. FERC staff agreed and asked for specific input from the EPA representative regarding what EPA believes is needed.
- Socioeconomics: Duke believes the economic information generated through the RUN Study as well as current efforts by the Strom Thurmond Institute to develop a model of the economic effects of varying reservoir levels will provide the information necessary to appropriately address socioeconomics.

#### Day 1 Closing Remarks

Huff closed the meeting by reviewing deadlines and schedules for participants to provide additional comments on the Proposed Study Plan to the FERC with copies to Duke. Huff also noted the Duke relicensing team will evaluate the feedback and questions from the day's discussion and determine if additional RC meetings will be scheduled and how the current study plans can be clarified, as appropriate.

#### *[Day Two]*

Ken Kearns and Jen Huff opened the second day by repeating their Day One opening presentations.

#### F. Water Supply Study (Ed Bruce)

The water use data gathered for the study are actual amounts, not permitted amounts. Bruce explained an assessment of navigational impacts is not proposed as part of this study because USACE projects downstream of the KT Project directly affect the flows in the Savannah River. The USACE representative stated there are no navigational flow requirements from the Thurmond Project, but there are environmental flow requirements. Bruce also noted South Carolina recently passed a water use permitting law. One stakeholder asked if the study will develop an estimated maximum total water withdrawal, or safe yield, for the Project, beyond which the basin's water use may not be sustainable. Since the term "safe yield" now has a regulatory meaning in South Carolina's recently enacted water use permitting law, Duke refers to this as "water yield" and it will be determined as part of this study.

#### G. Operations Model Study Plan (Ed Bruce)

FERC representatives stated Duke may want to consider reporting the calibration and existing operations data separately from results of future alternative scenarios modeling. The two water quantity operations models (HEC-ResSim and CHEOPS™) Duke is developing, and their outputs, will be publicly available. Outputs from these two models will also be used in other resource studies to evaluate effects of potential Project operations. FOLKS suggested a specific scenario to be evaluated; the Water Quantity & Operations RC will be developing the scenario input process.

#### H. Reservoir Level Study (Ed Bruce)

This study is focused on presenting the reservoir level data in a manner that would facilitate the identification of potential operating bands that could then be assessed using the CHEOPS™ model. The reservoir level data used in the Operations Model Study, as well as other operations-related data, will be documented in the model results and calibration report. The data compiled for this study will consist of reservoir level readings at midnight.

#### I. Water Quality Model (Tami Styer)

Meeting participants asked whether and how the study will include projections of possible future water quality conditions under different scenarios. Projections will be done using scenario results of the water quantity operations models and can also be accomplished by running sensitivities with different water quality parameters. FOLKS noted projected increases in nutrient loading under various future scenarios could be better accomplished using a watershed, basin-wide model.

#### J. Jocassee Tailwater Quality Study (Tami Styer)

One attendee asked if the study will evaluate the effects of the pump back operations at Jocassee Pumped Storage Station on dissolved oxygen (DO) in Lake Jocassee. DO data are collected separately in the forebay of Jocassee as part of a Memorandum of Understanding (MOU) between Duke and SCDNR and demonstrate DO levels in the water pumped back meets state water quality standards. FERC noted connecting these data to operations is important (i.e., how DO fluctuates with pump-back operations) and should be discussed in the study report. Bill Foris, Duke Energy, explained there is very little fluctuation between the DO levels in the tailwater and the DO levels of the forebay.

#### K. Fish Community Assessment (Hugh Barwick)

Duke should clarify how fish will be documented in the Newry Reservoir if it is not wadeable.

Duke did not agree to sample Lake Keowee tributaries to analyze the impacts of spotted bass, an introduced species, on native fish and possible habitat fragmentation resulting from the presence of Lake Keowee. Duke sampled four Lake Keowee tributary streams in 2008 and all supported diverse fish populations. This information is available in Duke's relicensing library and the technical library on the Stakeholder Team website. SCDNR stated it had recently completed additional related analyses which might suggest different conclusions. SCDNR will provide these data to the Aquatics RC, which will meet to discuss these new data.

Barwick also explained why Duke did not propose a fish entrainment study. Duke has studied the abundance of both littoral and pelagic species in the two Project reservoirs as part of the Keowee-Toxaway Fisheries MOU between Duke and the SCDNR. These efforts demonstrate fish populations at the Project are equivalent to those found in lakes with comparable productivity and the biological integrity of these lakes does not appear to have been compromised by Project operations. Due to the recently completed runner upgrades at Jocassee Pumped Storage Station, these studies will continue and will include several parameters have not previously been studied. The Aquatics RC will discuss these new analyses when they are completed. Duke believes these efforts will provide much better understanding of the effects of the new Jocassee runners on resident fish populations than would an entrainment study.

#### L. Avian Survey (Hugh Barwick)

The 100 meters referenced in the study plan is 100 meters measured horizontally from the Normal Full Pond Elevation. Portions of the survey will be based on vocalizations; researchers will not exclude calls heard while standing in the study area that might be coming from beyond the study area. Study sites will be randomly selected within areas of identified habitat types. The specific habitat types will be identified as part of the Botanical Study. Potential Project effects will be evaluated by considering how future lake level fluctuations might impact avian communities.

#### M. Botanical Study (Hugh Barwick)

The study will note exotic invasive species; there are no known aquatic invasive species in the Project reservoirs. Like the Avian Survey, this study will also evaluate how lake level fluctuations from potential future operating scenarios might impact botanical communities. The study areas for this study, the avian survey, and the mammal survey are defined differently and should be modified so they are all consistent.

#### N. Wetlands Study (Hugh Barwick)

This study is identifying wetlands based on ecological and habitat criteria, not for permitting-related issues. One stakeholder suggested the study consider the connection between lake levels and the area of a wetland, as lake levels can be a significant variable. Barwick agreed this was an important point. Data collected through this study can be overlaid with bathymetric maps to help with this assessment. One attendee asked if the impacts of recreation on wetlands will be addressed; Barwick responded the RC has not identified potential effects of recreation as an issue to be considered as most recreationists tend to avoid wetlands.

#### O. Mammal Study (Hugh Barwick)

Barwick confirmed there are a number of rare, threatened, and endangered species in the Project area. The phrase “zone of operational influence” should be better defined.

#### P. Other Study Issues

- Tritium: Huff noted Duke was requested to study the effects of Project operations on tritium-contaminated groundwater. There is currently a groundwater well at Oconee Nuclear Station with detectable levels of tritium, but the tritium is not a by-product of Project operations. As stated in the Proposed Study Plan, there is no evidence Project operations are affecting the groundwater in the well. Further, Duke’s data indicate the groundwater in the well is migrating away from Lake Keowee, not towards it. Even if Lake Keowee were drawn down to its current licensed maximum drawdown of 775 ft above mean sea level, the groundwater level in the well would be at a lower elevation than Lake Keowee, so there’s no reason to expect changes in reservoir levels would cause the tritium to move towards Lake Keowee. FERC staff noted this information should be available in the FERC’s record so it can be considered by the FERC staff.
- Mercury at Lake Jocassee: A question was asked regarding the SCDHEC fish consumption advisory at Lake Jocassee due to elevated levels of mercury in some fish. This is not due to Project operations, so Duke has not proposed any studies related to this issue. FERC staff confirmed that while mercury contamination is a serious issue, it is not the result of Project operations, so FERC is unlikely to address it.

- **Bass Spawning Success.** A comment was raised regarding spring lake level stability in relation to bass spawning success in Lake Jocassee. This comment was in response to a concern expressed by a Lake Jocassee angler at the earlier scoping meetings that has not been addressed as a study. Barwick responded Duke currently has no information that would indicate normal Project water level fluctuations are impacting bass recruitment or the recruitment of other species of fish in Lake Jocassee or Lake Keowee. Therefore, a study to address this is not warranted.

### **III. Concluding Remarks**

FERC and then Duke representatives ended the meeting by reviewing near-term actions, deadlines and schedules for participants to provide additional comments on the Proposed Study Plan to the FERC with copies to Duke's Jen Huff. Huff also noted the Duke relicensing team will evaluate the feedback and questions from the days' discussions and determine if additional RC meetings will be scheduled prior to Duke filing the Revised Study Plan.

Attachment A  
Meeting Presentations



## Keowee-Toxaway Hydroelectric Project (FERC No. 2503)

### Proposed Study Plan Overview

September 13, 2011

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## Study Plan Development



- December, 2009: Presented 12 draft study plans to Resource Committees
- March, 2011: 14 draft study plans included in Pre-Application Document (PAD)
- Scoping & Study Requests
  - Study requests – not PM&E measures
  - Existing data
  - FERC Study Criteria
  - FERC practice & precedence



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## Study Presentations



- Studies
  - Hydro Structures National Register of Historic Places Eligibility Assessment (Brett Garrison)
  - Shoreline Management Plan Mapping Update (Brett Garrison)
  - Lake Jocassee Erosion Study (Hugh Barwick)
  - Recreation Use & Needs Study (Scott Jolley)
- Questions
  - Hold until speaker has finished presenting overview of study

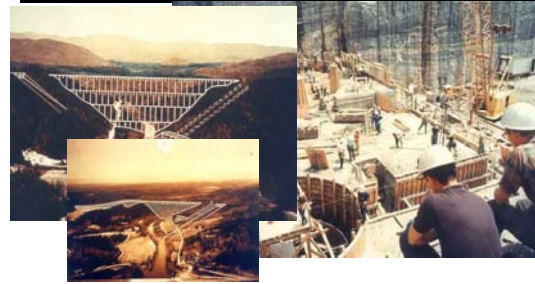


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## Hydro Structures National Register of Historic Places (NRHP) Eligibility Assessment



Brett Garrison



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## Hydro Structures NRHP Eligibility Assessment Goals & Objectives



- Determine if the Project structures are eligible for the NRHP.
- If the Project structures are eligible, identify the features that contribute to their eligibility



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## Hydro Structures NRHP Eligibility Assessment Geographic Scope



- Project Boundary
- All Project structures located in South Carolina



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## Hydro Structures NRHP Eligibility Assessment Methodology



- Evaluation of powerhouses, the dams, saddle dikes, spillways, and other Project structures
- Development of site plans
- Preparation of historic context detailing the development of hydroelectric power in the Upper Savannah River Basin
- Identification of contributing elements



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## Hydro Structures National Register of Historic Places Eligibility Assessment Schedule



- RFP submitted to potential bidders: February 1, 2012
- Begin field data collection: April 1, 2012
- Draft Study Report: August 3, 2012



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## Shoreline Management Plan (SMP) Mapping Update Brett Garrison



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## SMP Map Update Goals and Objectives



Update the current shoreline classification maps for the Project to reflect:

- New shoreline uses since last maps
- Adjustments decided upon during field review of permitting activities
- Correct previous mapping errors
- Other information that may be collected as part of relicensing

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## SMP Mapping Update

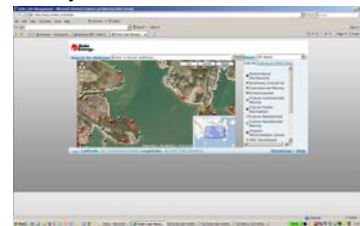


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## SMP Mapping Update Geographic Scope



### Project Boundary



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## SMP Mapping Update Methodology



- Obtain updated digital aerial photography of Lake Keowee.
- Analyze the current shoreline classification maps and:
  - Delineate discrepancies within the Project Boundary since 2006
  - Delineate lands within the Project Boundary
  - Delineate adjoining properties that are conservation lands
  - Correct any known mapping errors
  - Identify other areas for special consideration based on other study results
- Transfer information to a set of base maps of the Project Boundary.

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## SMP Mapping Update Schedule



- Obtain Aerial Digital Photography: November, 2011
- Update shoreline classification GIS data to reflect new shoreline uses and error corrections: February - June, 2012
- Draft versions of maps to Study Team: August, 2012
- Update shoreline classification GIS data to reflect findings from other relicensing studies and Stakeholder Team discussions: October, 2012 – July, 2013

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## Lake Jocassee Shoreline Erosion Evaluation Hugh Barwick



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## Lake Jocassee Shoreline Erosion Study



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## Lake Jocassee Shoreline Erosion



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## Lake Jocassee Shoreline Erosion



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## Lake Jocassee Shoreline Erosion Study Goals & Objectives



- Determine the current status of shoreline erosion
- Delineate sites and severity of current shoreline erosion
- Differentiate where shoreline erosion is active or passive
- Differentiate sites where sensitive shoreline resources may be in jeopardy
- Establish a permanent baseline record of shoreline erosion

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## Lake Jocassee Shoreline Erosion Study Methodology



- Geo-referenced videography
- Entire shoreline
- All islands
- Erosion evaluated (e.g., none, low, moderate, and high based on scarp height)
- Active or passive
- Develop an overlay of sensitive shoreline resources and active areas of low, moderate and high erosion

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## Lake Jocassee Shoreline Erosion Study Schedule



- Geo-referenced videography collected
- Processing begins: February 2012
- Draft report to Study Team: November 15, 2012

### Study Team

- Hugh Barwick, Duke, Study Team Lead
- Brett Garrison, Duke
- Mark Hall, SCDNR
- Bill Marshall, SCDNR
- Mark Cantrell, USFWS

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## Recreation Use & Needs (RUN) Study Scott Jolley



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## Recreation Use & Needs (RUN) Study Goal



Determine the need for  
– enhanced existing recreational facilities

and

– new recreational facilities



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## RUN Study Objectives



- Document
  - Current public recreation activity
  - Current satisfaction levels
  - Future demand
  - Current boating density and carrying capacity
  - Coincidences of high boating density and high boating conflict areas on Lake Keowee
  - Economic value of Project-related recreation
- Benchmark best practices for enhancing boater safety in constricted areas on Lake Keowee
- Provide data for updating the Recreation Management Plan



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## RUN Study Geographic Scope



- Project reservoirs and islands
- Existing public recreation areas
  - Duke access areas
  - state and county parks
  - commercial recreation areas (campgrounds and marinas)
- Information sources:
  - public recreation area visitors
  - shoreline and off-water property owners
  - residents from Oconee and Pickens Counties
  - federal, state, and local agencies
  - NGOs



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## RUN Study Methodology



Assess current use levels at existing public recreation facilities

- Recreation Area Visitor Use Interviews
- Spot Counts
- Traffic Counts
- Trail Counts
- Mixed Mode Questionnaires
  - Local Residents
  - Agencies, Commercial and NGOs
- Future Use Estimates
- Boating Density and Capacity
- Recreation Economic Value Assessment



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## RUN Study Methodology (continued)



- Evaluate if existing facilities will meet future recreation needs at the Project.
- Study methodology and questionnaires align closely with the methodology of the 2008 RUN Study.



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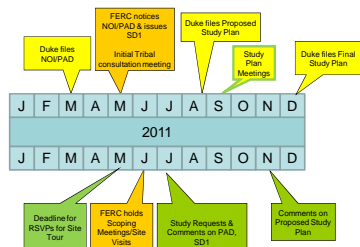
## RUN Study Schedule



- Public access area exit interviews; public access area spot counts; public access area visitor-type interviews; trail and public access area traffic counts: March 15, 2012 – September 30, 2012
- Regional residents, agency, commercial, and NGO surveys: September 1, 2012 – October 31, 2012
- Acquisition of boating density data: June 1, 2012 – September 3, 2012
- Acquisition of boating accident and visitation records: August 1, 2012 – October 31, 2012
- Bi-weekly progress reports: March 1, 2012 – October 31, 2012
- Draft study report: November 30, 2012

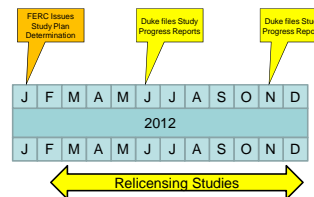
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## Process Schedule - 2011



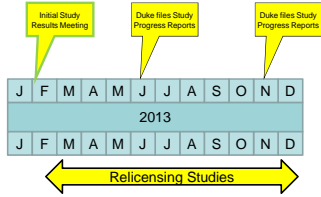
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## Process Schedule - 2012



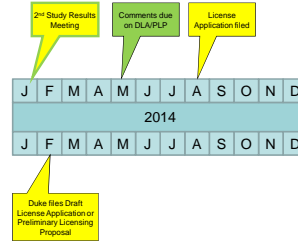
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## Process Schedule - 2013



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## Process Schedule - 2014



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## Keeping informed



- eNewsletter: register by emailing [krelicensing@duke-energy.com](mailto:krelicensing@duke-energy.com)

- Relicensing website:



[www.duke-energy.com/lakes/keowee-toxaway-relicensing.asp](http://www.duke-energy.com/lakes/keowee-toxaway-relicensing.asp)

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## Keowee-Toxaway Hydroelectric Project (FERC No. 2503)

### Proposed Study Plan Overview

September 14, 2011

1

## Study Plan Development



- December, 2009: Presented 12 draft study plans to Resource Committees
- March, 2011: 14 draft study plans included in Pre-Application Document (PAD)
- Scoping & Study Requests
  - Study requests – not PM&E measures
  - Existing data
  - FERC Study Criteria
  - FERC practice & precedence



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## Study Presentations



### Morning Session

- Water Supply Study (Ed Bruce)
- Operations Model (Ed Bruce)
- Reservoir Level Study (Ed Bruce)
- Keowee Water Quality Model (Tami Styer)
- Jocassee Tailwater DO Monitoring (Tami Styer)

### Afternoon Session

- Fish Community Assessment Study (Hugh Barwick)
- Avian Study (Hugh Barwick)
- Botanical Survey (Hugh Barwick)
- Mammal Survey (Hugh Barwick)
- Wetlands Survey (Hugh Barwick)

Questions: Hold until speaker has finished presenting overview of study

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## Water Supply Study Ed Bruce



Photo courtesy K/D Price

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## Water Supply Study Goal



- Document current water withdrawals, water returns and overall water use within the Keowee-Toxaway Basin.
- Estimate future water needs based on reasonable growth projections and assumptions.
- Assess existing and estimated future withdrawals and returns (all use types) downstream of the Keowee Development in the Savannah Basin.

The water use information developed in this study will be used in operations simulation modeling to evaluate:

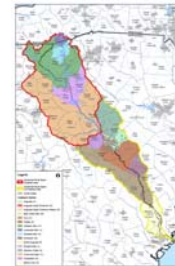
- Project operations
- Proposed changes to Project operations
- Proposed drought management plan (i.e., Low Inflow Protocol)

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## Water Supply Study Geographic Scope



- All portions of the Basin that affect Project operations where water withdrawals and returns are greater than 50,000 gallons per day (gpd).
- Includes an assessment and numerical documentation of existing and projected water withdrawals and returns in the entire Savannah River Basin.
- Allows assessment of impacts of Project operations on downstream resources.



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## Water Supply Study Methodology



- Compilation of current water withdrawals and returns greater than 50,000 gpd, including interbasin transfers.
- Development of 50-year water demand projections using expected changes in population, industry and water use in the Basin and other portions of the Upstate (South Carolina) region with sensitivities provided for low growth and high growth rates and other variables.
- Development of a Project water yield to determine the impact on water supplies under various proposed operating conditions.
- Evaluation of the effects of future water intakes on Lake Keowee.

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## Water Supply Study Schedule

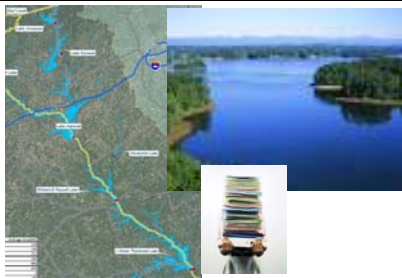


Complete water use projections:	December 31, 2011
Complete existing conditions water yield analysis:	June 30, 2012
Draft study report to Study Team:	August 1, 2012

*Note: Parts of this study have already started in order to have the necessary data for input into the operations simulation model such that model output can support the overall relicensing schedule*

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## Operations Model Study Plan Ed Bruce



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## Operations Model Goal



Simulate Project operations (using simulation models frequently used in relicensing proceedings) that may be proposed during the relicensing process to aid in making decisions regarding the effects of various operating scenarios on:

- Water quantity
- Reservoir levels
- Hydropower generation
- Flow releases from the Project

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## Operations Model Geographic Scope



Keowee-Toxaway Basin, including the Bad Creek Pumped Storage Project (P-2740), and extending downstream to include the USACE Hartwell, Richard B. Russell and J. Strom Thurmond Projects



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## Operations Model Methodology



### Customized

- CHEOPS™ (Computerized Hydro Electric Operations Planning Software); primary model used in the relicensing simulation runs
- HEC- ResSim (USACE's Hydrologic Engineering Center's Reservoir System Simulation)

The specific model development steps are:

- Load structural and operational parameters specific to the projects.
- Program operating logic.

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## Operations Model Methodology (continued)



- Develop Un-impared Inflow (UIF) data set.
- Input current water withdrawals and returns.
- Input reservoir elevation-volume data.
- Input natural surface water evapotranspiration (developed with UIF).
- Develop ability to account for future storage loss due to sedimentation (if needed).
- Calibrate and validate model(s).
- Develop baseline scenario (Existing License Conditions).
- Develop a scenario modeling process.
- Develop a modeling sensitivity process.

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## Operations Model Schedule

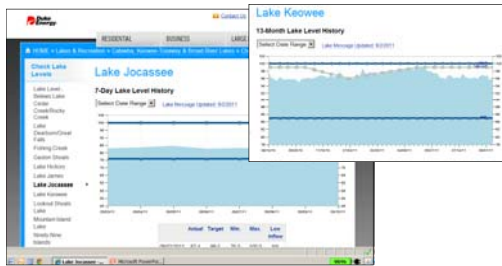


Note: This study has already started in order to have the simulation models in time to support the overall relicensing schedule

- Develop Scenario Modeling Process: September 30, 2011
- Submit Scenario Modeling Process: November 30, 2011
- Study Planning and Data Review Commences for Scenario Analysis: February 1, 2012
- Begin Data Collection for Scenario Analysis: April 1, 2012
- Modeled Scenario Runs Complete: November 1, 2012
- Draft Model Verification Report: December 31, 2012

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## Reservoir Level Study Ed Bruce



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## Reservoir Level Study Goal



- Organize historic lake level data for Lake Keowee and Lake Jocassee into a database format that will allow easy computer access and analysis.
- Identify potential seasonal operating elevation bands for Lake Keowee, based on historical operation under all conditions.
- Identify potential non-drought period seasonal operating elevation bands for Lake Jocassee.

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## Reservoir Level Study Geographic Scope & Methodology



### Geographic Scope

Lake Jocassee and Lake Keowee



### Methodology

- Reservoir Level Data Analysis – Assemble historic lake level data (daily midnight readings from original operation through December 31, 2011) in a database.
- Identification of Potential Normal Operating Ranges – Focus on non-drought periods using statistical methods to identify historical operating ranges.

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## Reservoir Level Study Schedule



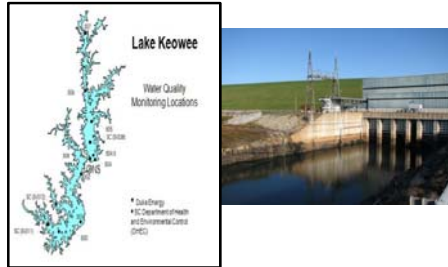
- Study Planning and Lake Level Data Compilation: February 2, 2012 – April 2, 2012
- Potential Lake Level Bands Identified: August 1, 2012
- Draft Report: December 31, 2012



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## Keowee Reservoir Water Quality Model

Tami Styer



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## Keowee Reservoir Water Quality Model Goal

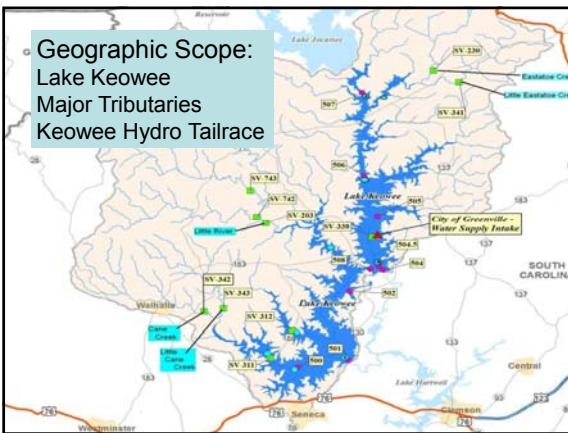


- Evaluate the potential impact of reservoir level fluctuations on water quality in both reservoir and hydro flow releases;
- Compare tailrace simulation results to applicable water quality standards;
- Evaluate need for modification to proposed Project operations if applicable water quality criteria are not met.



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Geographic Scope:  
Lake Keowee  
Major Tributaries  
Keowee Hydro Tailrace

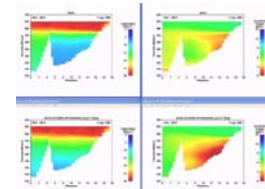


## Keowee Reservoir Water Quality Model Methodology



### CE-QUAL W2

- Two Dimensional Water Quality and Hydrodynamic Model
- Models dynamics of inflows and outflows
- Requires site specific data for physical, chemical and biological parameters used to drive or assess the model.



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## Keowee Reservoir Water Quality Model Methodology (continued)



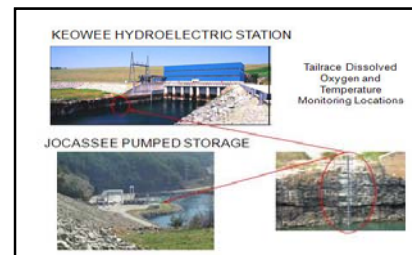
- Data Required
  - Reservoir Bathymetry Data (collected in 2010)
  - Meteorological Data
  - Tributary Inputs - (inflows and pollutant loading, primarily suspended solids, nutrients, and organic mater)
  - Lake dataset
- Model Calibration
  - Comparing model predictions to observed data
  - Model applied to other lake datasets for verification
- Water use scenarios (balanced inflows and outflows) used as inputs for model to evaluate impact on reservoir and tailrace water quality.

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## Keowee Reservoir Water Quality Model 2011 Field Data Collection



Two Tailwater Monitoring Locations



Keowee Reservoir Water Quality Model  
2011 Field Data Collection



- Duke has collected WQ data on Keowee since 1971
- Lake (10 sites) –
  - Monthly sampling
  - In-situ @ 1 m intervals (temperature, DO, pH, specific conductance, chlorophyll a, turbidity)
  - Water samples - nutrients, chlorophyll a, organic matter (top, middle, & bottom)

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Keowee Reservoir Water Quality Model  
2011 Field Data Collection



5 Stream Sites - Flow and Water Quality

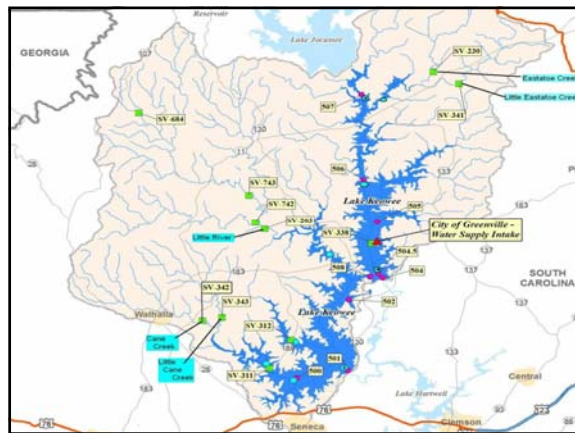
- Continuous monitoring for water level & temperature
- Water quality samples collected monthly at baseflow as well as storm events
- Water quality samples collected for analyses of suspended solids, nutrients, organic matter, temperature & specific conductance

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Keowee Reservoir Water Quality Model -  
2011 Field Data Collection



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Keowee Reservoir Water Quality Model - Schedule



Two Time Periods

- 2011 Data Collection
  - physical and water quality datasets necessary to run and calibrate the model
- 2012
  - Calibration and testing of model to 2011 dataset
  - performing model runs with different hydrologic inputs
- Submit Draft Report to Study Team
  - December 17, 2012

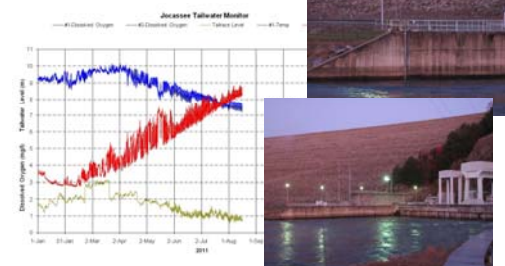


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Jocassee Tailwater Water Quality



Tami Styer



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## Jocassee Tailwater Water Quality Goal and Geographic Scope



- Determine effects of recent Development modification on Water Quality in Jocassee Tailwater
  - Runners on Unit 1 and 2 replaced in 2010 and 2011
- Area directly below the Jocassee Pump Storage Development (Jocassee Tailwater)



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## Jocassee Tailwater Water Quality Methodology

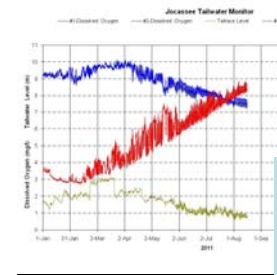


- Continuous water quality data collection using Hydrolab DS4 Minisonde®
- Tailwater Data collected 2008 through 2011
- Study to confirm that new runners do not result in DO concentrations significantly different than previously collected.



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## Jocassee Tailwater Water Quality Methodology



Date	Daily Average DO (mg/l)	Hourly Minimum DO (mg/l)
8/4 - 12/31/2008	8.11	6.88
1/1 - 12/31/2009	8.59	5.80
1/1 - 10/29/2010	8.64	5.71

- Comparison to SC Water Quality Standards
- Information used with SC 401 Water Quality Certification Application

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## Jocassee Tailwater Water Quality Schedule



- Data collection April through October, 2012
- Draft Study Report to Study Team Dec 17, 2012



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## Fish Community Assessment Hugh Barwick



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## Fish Community Assessment Goals and Objectives



- Evaluate spring and summer fish abundance in the immediate tailwater of the Jocassee and Keowee hydro stations and compare that to data collected from downstream reference stations
- Evaluate fish community in the Little River Bypassed Reach

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## Fish Community Assessment Study Area



- Jocassee Tailwater: Immediate tailwater downstream to the Highway 11 Bridge
- Keowee Tailwater: Immediate tailwater downstream to Holder's Landing
- Little River Bypass: Little River Bypass from Little River Dam downstream to Newry Dam

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## Fish Community Assessment Methodology



- Tailwaters: 30 minutes of boat-mounted electrofishing at each location in March, May, and July
- Bypass: Backpack electrofishing in the wadeable stream stretch during summer



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## Fish Community Assessment Schedule & Study Team



- Begin study planning and data review: February 1, 2012
- Field data collection: March 1, 2012 – August 1, 2012
- Draft report due: November 1, 2012

### Study Team

- Hugh Barwick, Duke, Study Team Lead
- David Coughlan, Duke
- Dan Rankin, SCDNR
- Mark Cantrell, USFWS

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## Avian Study Plan

Hugh Barwick



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## Avian Study Goals & Objectives



- Survey existing breeding, resident, and migratory bird populations
- Survey and identify the presence of any state or federal rare, threatened or endangered species
- Assess effects of current and any proposed Project-related hydropower operations on birds
- Provide information to assist in developing any PM&E measures

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## Avian Study Study Area



- Terrestrial and appropriate aquatic habitats
  - Project Boundary
  - state-owned terrestrial areas adjacent to the Project Boundary that are within 100 m (measured horizontally) of the Normal Full Pond Elevation of Project reservoirs
  - selected islands
  - tailwaters
  - Little River Bypassed Reach
  - riverine areas

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## Avian Study Methodology



- Literature review
- Landscape analysis of habitats
- Point-count stations established along transects in various cover or habitat types
- Concentrate on spring (Mar-May) and fall/winter (Aug-Jan) migration periods and summer (Jun) breeding period
- Aerial overflights (or review of aerial/satellite photos) used to document nesting of some species

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## Avian Study Schedule & Study Team



- Planning and data review commences: February 1, 2012
- Field data collection: March 1, 2012 - January 2013
- Draft study report to Study Team: February 1, 2013

### Study Team

- Hugh Barwick, Duke, Study Team Lead
- Scott Fletcher, Duke
- Tom Swayngam, SCDNR
- Mark Hall, SCDNR
- Mary Bunch, SCDNR
- Bill Marshall, SCDNR
- Mark Cantrell, USFWS

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## Botanical Study Plan

Hugh Barwick



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## Botanical Study Goals and Objectives



- Survey and classify existing vegetation
- Assess the impacts of Project operations and maintenance on vegetative communities
- Provide information to assist in developing any PM&E measures

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## Botanical Study Study Area



- Terrestrial habitats within
- Project Boundary
  - State-owned terrestrial areas adjacent to the Project Boundary that are within 100 m (measured horizontally) of the Normal Full Pond Elevation of Project reservoirs
  - Islands
  - Little River Bypassed Reach
  - Access areas

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## Botanical Study Methodology



- Literature review
- Landscape analysis of habitats
- Field sampling using circular sample plots to collect quantitative data within each community type
- Federal- and state-listed rare plants will be given special attention
- Presence and distribution of Oconee bells will be given special attention
- Exotic vegetation will be documented

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## Botanical Study Schedule & Study Team



- Begin study planning and data review: February 1, 2012
- Field data collection: March 1, 2012 – August 31, 2012
- Draft study report to Study Team December 3, 2012

### Study Team

- Hugh Barwick, Duke, Study Team Lead
- Scott Fletcher, Duke
- Tom Swaynham, SCDNR
- Mary Bunch, SCDNR
- Mark Cantrell, USFWS

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## Wetland Study Plan Hugh Barwick



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## Wetland Study Goals and Objectives



- Map and classify existing wetland habitats
- Assess impacts of Project operations on Project wetlands
- Provide information to assist in developing any needed PM&E measures

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## Wetland Study Study Area



Shoreline habitats within the Project Boundary



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## Wetland Study Methodology



- Review of existing data (e.g., SMP maps, NWI maps, FEMA maps, etc.)
- Field surveys
- Wetland determinations and classifications will use a variety of techniques (e.g., USFWS, SCDNR, NCDENR, and to a certain extent USACE)
- Not jurisdictional determinations
  - Hydrophytic vegetation and hydrology
  - Hydric soils may or may not be present

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## Wetland Study Schedule & Study Team



- Begin data review: February 1, 2012
- Field data collection: April 2, 2012 - August 1, 2012
- Draft report: November 1, 2012

### Study Team

- Hugh Barwick, Duke, Study Team Lead
- Scott Fletcher, Duke
- Tom Swaynham, SCDNR
- Mark Hall, SCDNR
- Mark Cantrell, USFWS

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## Mammal Study Plan

Hugh Barwick



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## Mammal Study Goals and Objectives



- Survey and evaluate mammalian populations
- Survey and identify the presence of RTE species
- Provide information to assist in developing PM&E measures

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## Mammal Study Study Area



- Terrestrial and appropriate aquatic habitats
- Project Boundary
  - State-owned terrestrial areas adjacent to the Project Boundary that are within 100 m (measured horizontally) of the Normal Full Pond Elevation of Project reservoirs
  - selected islands
  - tailwaters
  - Little River Bypassed Reach
  - riverine areas.

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## Mammal Study Methodology



- Review voucher specimen
- Field surveys using a variety of techniques starting in terrestrial habitats identified in the Botanical Study Plan
- Using visual encounter surveys, Sherman live-traps, pitfall traps, trail cameras, ANABAT and SONOBAT
- RTE species targeted using specific habitats identified as critical

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## Mammal Study Schedule & Study Team



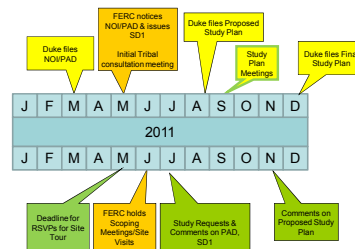
- Begin data review: February 1, 2012
- Field data collection: March 1, 2012 - January 2, 2013
- Draft report: February 1, 2013

### Study Team

- Hugh Barwick, Duke, Study Team Lead
- Scott Fletcher, Duke
- Tom Swayngham, SCDNR
- Mark Hall, SCDNR
- Mary Bunch, SCDNR
- Mark Cantrell, USFWS

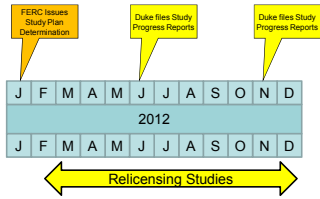
59

## Process Schedule - 2011



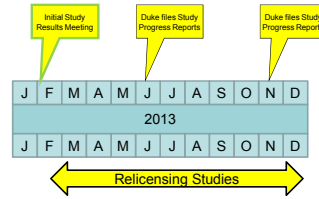
60

## Process Schedule - 2012



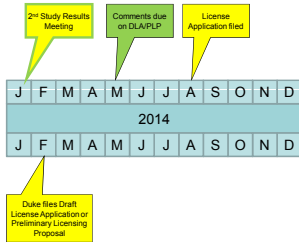
61

## Process Schedule - 2013



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## Process Schedule - 2014



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## Keeping informed



- eNewsletter: register by emailing [ktrelicensing@duke-energy.com](mailto:ktrelicensing@duke-energy.com)

- Relicensing website:

[www.duke-energy.com/lakes/keowee-toxaway-relicensing.asp](http://www.duke-energy.com/lakes/keowee-toxaway-relicensing.asp)



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