

FEDERAL ENERGY REGULATORY COMMISSION

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OFFICE OF ENERGY PROJECTS

Project No. 2503-147 – South Carolina
and North Carolina
Keowee-Toxaway Hydroelectric Project
Duke Energy Carolinas, LLC

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Director, Hydro Strategy and Licensing
Duke Energy Carolinas, LLC
P.O. Box 1006, EC12Y
Charlotte, NC 28201-1006

Reference: Study Plan Determination for the Keowee-Toxaway Hydroelectric Project

Dear Mr. Lineberger:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Keowee-Toxaway Hydroelectric Project No. 2503 (Keowee-Toxaway Project). The determination is based on the study criteria set forth in 18 C.F.R. § 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On August 26, 2011, Duke Energy Carolinas, LLC (Duke) filed its proposed study plan with the following components: (1) Fish Community Assessment, (2) Hydro Structures National Register of Historic Places Eligibility Assessment, (3) Recreation Use and Needs Study, (4) Lake Jocassee Shoreline Erosion Study, (5) Shoreline Classification Map Update, (6) Jocassee Forebay and Tailwater Water Quality Study, (7) Keowee Reservoir Water Quality Model, (8) Reservoir Level and Project Flow Releases Study, (9) Operations Model, (10) Water Supply, (11) Wetlands Study, (12) Avian Study, (13) Mammal Study, and (14) Botanical Study.

On September 13 and 14, 2011, Duke held study plan meetings to discuss the details of the study plan. Comments on the Proposed Study Plan were filed by the U.S.

Fish and Wildlife Service (FWS) and Friends of Lake Keowee Society (FOLKS) on November 28, 2011 and by South Carolina Department of Natural Resources (South Carolina DNR) and Upstate Forever on November 29, 2011.¹ Duke filed a Revised Study Plan on December 22, 2011.² Comments on the Revised Study Plan were filed by FWS on January 12, 2012, and by South Carolina DNR, Upstate Forever, and FOLKS on January 13, 2012.³

General Comments

Some comments were received that do not address study plan issues. This determination does not address these comments, but rather addresses only the merits of the study plan submitted pursuant to § 5.13 of the Commission's regulations and comments received thereon.

Study Plan Determination

Duke's Revised Study Plan, filed December 22, 2011, is approved with staff's recommended modifications. As indicated in Appendix A, of the 14 studies proposed by Duke, ten studies are approved as filed and four are approved with modifications. Of the three studies requested by others, two of the requested studies are not required (the Tributary Stream Fish Assemblage Assessment and the Public Recreation Lands Inventory). The third, the Fish Entrainment Study, is modified and incorporated into Duke's Fish Community Assessment. The specific modifications to the study plan: the

¹ Upstate Forever and South Carolina DNR both electronically filed their comments on the initial Proposed Study Plan after 5:00 PM on November 28, 2011. Under the Commission's Rules of Practice and Procedure, any document received after regular business hours is considered filed at 8:30 a.m. on the next regular business day. 18 C.F.R. § 385.2001(a)(2) (2011).

² Duke filed the Revised Study Plan on December 22, 2011, 6 days earlier than the deadline of December 28, 2011. However, the original deadline for comments on the Revised Study Plan of January 12, 2012, as posted in previously issued process plans, was maintained to avoid confusion and maximize the opportunity for stakeholder participation in the process.

³ Upstate Forever, FOLKS, and South Carolina DNR each electronically filed their comments on the Revised Study Plan after 5:00 PM on January 12, 2012. Under the Commission's Rules of Practice and Procedure, any document received after regular business hours is considered filed at 8:30 a.m. on the next regular business day. 18 C.F.R. § 385.2001(a)(2) (2011).

basis for modifying Duke's study plan, requiring additional studies, and not adopting some requested studies are explained in Appendix B. Studies, for which no issues were raised, are not discussed in Appendix B. Staff considered all study plan criteria in § 5.9 of the Commission's regulations, however, only specific study criteria that are relevant to the determination are referenced in Appendix B.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies.

If you have any questions, please contact Stephen Bowler at (202) 502-6861.

Sincerely,

Jeff C. Wright
Director
Office of Energy Projects

Enclosures: Appendix A-- Approved and modified studies and studies not required
Appendix B-- Staff's recommendations on proposed and requested studies
and study modifications

cc: Mailing List
Public Files

APPENDIX A
Approved and Modified Studies and Studies Not Required

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
Fish Community Assessment	Duke		X	
Hydro Structures National Register of Historic Places Eligibility Assessment	Duke	X		
Recreation Use and Needs	Duke		X	
Lake Jocassee Shoreline Erosion	Duke		X	
Shoreline Classification Map Update	Duke	X		
Jocassee Forebay and Tailwater Water Quality	Duke	X		
Keowee Reservoir Water Quality Model	Duke	X		
Reservoir Level and Project Flow Releases	Duke	X		
Operations Model	Duke	X		
Water Supply	Duke	X		
Wetlands	Duke		X	
Avian	Duke	X		
Mammal	Duke	X		
Botanical	Duke	X		
Fish Entrainment	FWS		X ¹	
Tributary Stream Fish Assemblage Assessment	South Carolina DNR			X
Public Recreation Lands Inventory	Upstate Forever			X

¹ The Fish Entrainment Study was adopted as modified by staff, but was included as a modification to the Fish Community Assessment rather than as a new study, because the entrainment study furthers the goals of the fish community assessment.

APPENDIX B

Staff Recommendations on Proposed and Requested Study Modifications

The following discusses Duke Energy Carolinas, LLC's (Duke) Revised Study Plan filed on December 22, 2011, and comments thereon, including staff's basis for recommending or not recommending certain modifications to the study plan.

Fish Community Assessment

Applicant's Proposed Study

Duke proposes to improve identification and definition of project effects on the project fisheries by collecting fishery data in areas of the project where little existing data is available. Specifically, Duke proposes spring and summer electrofishing of the Lake Jocassee tailwater, Lake Keowee tailrace, reference stations in Lake Keowee and Lake Hartwell, which is a U.S. Army Corps of Engineers impoundment immediately downstream of Lake Keowee, and Little River bypassed reach, which is the reach below Duke's Dam on the Little River that helps to form Lake Keowee. Duke proposes to continue spring and fall estimation of the pelagic, forage fish population using hydroacoustics in spring and fall in combination with purse seining in the fall.¹

The data would be analyzed using correlation and linear regression.

Comments on the Study

The U.S. Fish and Wildlife Service (FWS) proposes a Fish Entrainment Study.² The South Carolina Department of Natural Resources (South Carolina DNR) and Upstate Forever also request an entrainment study but do not provide detailed methods for such a study. In multiple filings, FWS states that it finds evidence to suggest that Jocassee Development operations are having a substantial effect on pelagic, forage fish populations in both Lakes Jocassee and Keowee. FWS cites several sources, but points to no specific information to support its finding. FWS states that it is concerned about effects on fish associated with the new runners at the Jocassee Development and the performance of existing fish screens. FWS outlines a study plan for a Fish Entrainment study involving: (1) characterizing the intake velocities using Acoustic Doppler Current

¹ Pelagic fish are those that spend most of their time in open water, rather than near the shore or the bottom. Forage fish provide the food base for predatory fish, particularly gamefish.

² Though FWS and South Carolina DNR treated this request as a request for a new study, staff addressed it as a modification of the Fish Community Assessment (as did Upstate Forever). South Carolina DNR requested a Tributary Fish Assemblage Study, which is addressed later in Appendix B with the requests for additional studies.

Profiler (ADCP) measurement of intake velocities, (2) performing desktop analysis of entrainment potential and risk of entrainment mortality for each fish species, and (3) conducting a field entrainment assessment. The FWS does not provide details for a field assessment, but mentions that this type of assessment would involve nets and cameras.

Based on studies conducted for Duke, South Carolina DNR provides supporting data regarding the need for a study of fish entrainment in its January 13, 2012, filing of comments on the Revised Study Plan. In short, South Carolina DNR interprets the data as follows: (1) the population of pelagic, forage fish has declined in recent years; (2) in a large set of multiple regression models, independent variables based on average pumping rates at Lake Jocassee over previous months had a statistically significant relationship with the estimated population of pelagic, forage fish in a number of cases; (3) pumping at Lake Jocassee had a stronger statistical relationship with the estimated population of pelagic, forage fish than did other variables suggested by Duke as factors, such as chlorophyll concentration; (4) there was also some evidence that average pumping rates over the months preceding each sampling had a negative relationship with the estimated gamefish biomass; and (5) catch per unit effort for gamefish, as reported in creel surveys declined in recent years.

Upstate Forever acknowledges changes made by Duke to the Fish Community Assessment between the Proposed and Revised Study Plan, but comments that a fish entrainment element is still needed as requested by the agencies.

Discussion

Duke's study goal is to collect information on fishery resources in order to better define or to identify project impacts. Comments focus on additional study needs, including requests for fish entrainment study, rather than on concerns regarding the details of the study elements Duke did propose. Duke responds to the request for a Fish Entrainment Study by asserting that: (1) there is no evidence of a problem; (2) Duke has looked at the issue previously and nothing has changed to alter the finding that there is no problem; and (3) if there were a problem, its likely cause is non-project effects that Duke argues are more strongly linked to the condition of the fishery than project operations.

While it is not definitive, the analysis provided by South Carolina DNR indicates to staff that there is reasonable: (1) concern that the pelagic, forage fish population has declined in recent years, (2) possibility of a link between the pelagic, forage fish population and the operation of the Jocassee pump-turbines, (3) concern with the status of gamefish population, and (4) possibility that signs of decline in the gamefish population might trace back to the operation of the Jocassee pump-turbines. Staff concludes that the reasonable possibility of a relationship between project operations, in the form of

pumping and generating at Jocassee, and the dwindling size of the fishery requires a study plan that can address that issue.

Duke proposes to continue the fish community assessment of the forage base it has been performing historically. Duke proposes electrofishing near the intakes to characterize the fish community in the vicinity of the intakes. Staff concludes, however, that in order to relate the effects of pumping and generation near the intakes, site specific information on fish vulnerability to entrainment is necessary. Staff concludes that hydroacoustic monitoring in the vicinity of the intakes should be conducted. A study of this type would provide specific information of the proportion of vulnerable fish in the vicinity of the intake that succumb to entrainment during pumping operations. Duke's proposed electrofishing would complement the hydroacoustic monitoring by enabling identification of the species of fish in the vicinity of the intake that are observed through hydroacoustic monitoring.

Staff finds that the FWS request for desktop entrainment analysis as a strategy for addressing the effects of pumping and generating on the fish community is only partially appropriate in this case. Regarding desktop analysis of entrainment rates, desktop analysis is too generalized in its transfer of data from other sites to meet the site specific needs staff has identified. However, staff finds that the desktop modeling of fish mortality rates, would be appropriate, because: (1) mortality data based on turbine and fish characteristics should transfer reliably from other studies and (2) field methods available as alternatives are labor intensive and would result in a significantly higher cost.

To understand what, if any, effect project operations may have on the fish community in the vicinity of the intakes, characterization of the flow velocity conditions around the intakes under different operational scenarios is needed. Staff concurs with FWS that use of ADCP would provide critical information on the velocities around the intakes. This information would allow Duke to relate the velocity data to generation and pumping rates.

Staff concludes that adding site specific velocity measurements, hydroacoustic monitoring of entrainment at the intakes, and desktop analysis of mortality rates for entrained fish to Duke's Fish Community Assessment would provide the information to link operations to any effect on pelagic, forage fish in the project reservoirs.

Staff concludes that this plan is necessary to understand the relationship between pumping operations and the fisheries of both lakes (study criteria 5). The information to be generated by this study will be needed in staff's independent environmental analysis and has the potential to lead to specific measures to be included in a license article (study criteria 5). Staff's recommended modifications are based on generally accepted practices

and are selected to provide staff, Duke, and stakeholders the necessary information at a lower cost than alternative approaches (study criteria 6 and 7).

Staff Recommendation

Staff recommends that Duke's Fish Community Assessment be accepted with the following modifications. Duke should add a study goal to determine the effect of project operations of the Lake Jocassee pump-turbines on the fisheries of both reservoirs. The methods should include:

- (1) use of ADCP to describe the velocity around the intakes across operational scenarios to allow Duke to relate velocity data to historical generation and pumping rates;
- (2) use of hydroacoustic monitoring near the intakes to estimate of numbers of fish entrained under the range project operations to provide critical data used in estimating entrainment-related fish mortality; and
- (3) desktop entrainment mortality estimation, based on pump-turbine characteristics and the species and sizes of fish being entrained, to provide a mortality rate for fish entrained to apply to the rate of fish entrainment to estimate fish mortality.

Recreation Use and Needs Study

Applicant's Proposed Study

Duke proposes to conduct a Recreation Use and Needs (RUN) Study to determine the need for enhancing existing recreation facilities and/or for providing new recreation facilities to support current and future demand for public recreation at the project. The objectives of the study are to: (1) characterize current public recreation activity and satisfaction levels, (2) estimate future demand for recreation facilities, (3) estimate current boating density and carrying capacity, (4) assess boater safety in constricted areas on Lake Keowee, and (5) characterize the economic value of recreation as a result of the project. Data collected would be used to update Duke's existing Keowee-Toxaway Recreation Management Plan, approved by the Commission on July 19, 2010 with modifications.³

To characterize existing and future public recreation use and demand, boating density and carrying capacity, and the associated economic value of recreation at the project, Duke proposes to collect data from March 15, 2012 to October 31, 2012, which

³ See 132 FERC ¶ 62,045 (2010).

includes the peak recreation season of March 15, 2012 to September 30, 2012. The data collection efforts would include: (1) public recreation area visitor exit interviews; (2) visitor conversation-type interviews; (3) traffic counts and trail counters; (4) facility manager visitor use estimates; (5) a web-based survey of current shoreline and back lot property owners; (6) a mixed-mode survey of current county residents; and (7) a web-based survey of various entities, such as federal, state, and local agency representatives, commercial recreation facility managers, and non-governmental organizations (NGO).

Comments on the Study

Upstate Forever comments that the proposed RUN Study is limited in scope because it focuses data collection efforts on user satisfaction, rather than potential recreation conflicts resulting from user demand. Upstate Forever, therefore, recommends expanding the RUN Study to examine the need for additional public access in order to meet a demand for recreation activities outside of the project boundary, including fishing and boating in swift water tributaries to the project. Additionally, Upstate Forever comments that Duke's proposed RUN Study does not address current parking problems at areas outside of the project boundary, but nonetheless used by people to access the project for non-motorized boating and shoreline fishing. The Friends of Lake Keowee Society (FOLKS) requests that the proposed RUN Study include an evaluation of recreation opportunities on the islands in Lake Keowee, as well as the possible need for group camping facilities at the project.

Upstate Forever recommends that Duke extend the RUN Study to one year instead of limiting it to the 2012 peak recreation season. Upstate Forever comments that the proposed timeframe would disproportionately exclude hunters from the survey.

Discussion

Staff finds the proposed RUN Study to be sufficient in scope to address both user satisfaction and potential areas for recreation conflict at the project. To determine current and future recreation needs and demand, Duke proposes five separate survey instruments as well as visitor conversation-type interviews and an analysis of existing background information. Duke's survey instruments include questions relating to both project and non-project recreation opportunities including non-motorized boating, fishing, hunting, camping, and recreation along the shoreline and on islands. Duke's Public Recreation Area Exit Interviews and Shoreline and Back Lot and County Resident questionnaires contain specific questions regarding demand for additional recreation facilities, perceptions of boating densities and crowdedness, and safety concerns, which are indicators of recreation conflict at the project. Visitor conversation-type interviews will provide respondents opportunities to comment in greater detail on recreation needs and

user conflict at the project. Staff finds that the requested modifications to the RUN Study would not provide additional data not already addressed by Duke's Proposed Study Plan (study criterion 4).

Staff also does not find the proposed study season to be problematic. As Upstate Forever noted, the public recreation area exit interviews and visitor conversation-type interviews will collect data on visitor experience during the peak recreation season. However, the web-based Shoreline and Back Lot Property Owner and mixed-mode County Resident Questionnaires, which will be conducted from September 1, 2012 through October 31, 2012, ask respondents about their recreation habits for the calendar year extending from Labor Day 2011 through Labor Day 2012. As Duke noted in the introduction to the Revised Study Plan, the 2008 RUN Study yielded few responses from hunters during the off-peak recreation season. Staff concludes that any additional cost to conduct exit interviews and visitor conversation-type interviews from November 1 through March 14 is unwarranted and that the opinions of hunters would be adequately addressed using the Shoreline and Back Lot Property Owner and County Resident Questionnaires (study criterion 7).

In order to clarify the study methodology, staff has identified specific items for Duke to modify in its proposed RUN Study Plan to correct inconsistencies. Section 6.3 of the RUN Study Plan states that the surveys will be distributed to about 1,000 residents and 768 households. The study plan should be modified to define and clarify the terms, "resident" and "household." Additionally, section 6.6.2 of the RUN Study Plan should make clear the criteria for determining instances of high boater conflict. Also, staff finds that for several comparable survey questions, Duke provides additional choices in the hunting subsection that are not provided elsewhere. These questions with inconsistencies are listed below:

- Question 7 in the Public Recreation Area Exit Interview (Exhibit 1);
- Questions 8 and 9 in the Keowee Shoreline and Back Lot Property Owner Questionnaire (Exhibit 2);
- Questions 8 and 9 in the Jocassee Shoreline and Back Lot Property Owner Questionnaire (Exhibit 3); and
- Questions 5, 6, 57, and 58 in the County Resident Questionnaire (Exhibit 4).

To aid in the data analysis, comparable questions should use identical wording to facilitate the comparison of responses among the various surveys.

The methodology for the RUN Study as proposed by Duke is consistent with generally accepted practice in the context of hydroelectric project relicensing (study criterion 6).

Staff Recommendation

Staff recommends that Duke's RUN Study be conducted as proposed, except that Duke correct the detailed issues above as identified by staff.⁴

Lake Jocassee Shoreline Erosion Study

Applicant's Proposed Study

Duke proposes conducting a study for Lake Jocassee similar to a study completed for Lake Keowee in 2010 (using data acquired in 1976, 2005, and 2006). Duke proposes to: (1) determine the current status of shoreline erosion at Lake Jocassee; (2) delineate sites and severity of current shoreline erosion; (3) differentiate where shoreline erosion is active or passive; (4) identify and delineate sites where rare, threatened, or endangered species may be affected by active shoreline erosion; and (5) establish a permanent baseline record of shoreline erosion.

The study area would include the entire shoreline of Lake Jocassee and associated islands. Video data would be collected from a distance of 30 to 150 feet from the shoreline, and integrated into a Geographic Information System (GIS) to document the location and extent of erosion on Lake Jocassee. The shoreline would be classified using minimum 100-foot segments and the following categories: (1) No Erosion; (2) Low Erosion; (3) Moderate Erosion; (4) High Erosion; (5) Active Erosion; and (6) Passive Erosion.

Duke states that an assessment of the prevalent mechanisms causing erosion, such as wave action and project operation, is a subjective exercise. Therefore, Duke's study does not include an evaluation of project-related causes of shoreline erosion. Duke does not propose to include Lake Keowee in the erosion study because Lake Keowee was evaluated in 2010, using the same methodology as proposed for Lake Jocassee. Duke

⁴ In its comments on Duke's initial Proposed Study Plan, filed on November 28, 2011, FOLKS stated that staff had directed Duke to carry out a socioeconomic study. As clarification, staff directed Duke to make the economic portion of the RUN study a distinct section of the RUN study. Duke included that adjustment in its Revised Study Plan. Duke has not been required to perform a separate socioeconomic study.

also claims that there is an absence of substantial evidence demonstrating an erosion problem at Lake Keowee.

Comments on the Study

The FWS does not agree that the study methodology used at Lake Keowee, and proposed for use on Lake Jocassee, is adequate for assessing the extent of shoreline erosion. FWS comments that the study should be revised to evaluate shoreline erosion rates and causes, and include the islands and shoreline of Lake Keowee as well as Lake Jocassee. FWS states that erosion rates clearly are related to project operation and project-induced recreation. FWS suggests a methodology that would use high resolution LIDAR,⁵ combined with field surveys, to measure the erosion on the islands. FWS requests that the study be repeated on an appropriate, regular interval, such as every 5 years.

Upstate Forever similarly requests a reevaluation of shoreline erosion at Lake Keowee arguing that the methodology of the 2010 study was inadequate. Upstate Forever requests a study that would include evaluating the causes of erosion, speed limits for watercraft, impervious cover in the project watershed, effects of land use change, effects of stormwater management, and current and future shoreline development.

FOLKS also requests expanding the erosion study to the Lake Keowee Islands and using LIDAR to determine the rates of erosion. FOLKS disputes the results of the 2010 study for Lake Keowee, which concluded that there was negligible erosion over a 29 year period. In disputing the results of the study, FOLKS argues that: (1) there are significant errors associated with use of aerial photos to estimate erosion rates because of shadows and tree foliage and (2) the erosion rate was estimated based on the aggregate area of all 71 islands, with no individual, large island, erosion rates presented in the final report.

Discussion

Upstate Forever provided photos of visible shoreline erosion at several islands. In addition, Duke's November 2010 study, "Riparian Vegetation Habitat Study of Lake Keowee, SC," concluded (in figures on page 13 of the study report) that 48 miles of shoreline of Lake Keowee exhibited Active High Erosion and 110 miles of shoreline exhibited Active Moderate Erosion. The Lake Keowee shoreline covers approximately

⁵ LIDAR (Light Detection and Ranging) is an optical remote sensing technology that can measure the distance to, or other properties of a target by illuminating the target with light, often using pulses from a laser.

388 miles, including 20 miles of island shoreline, thus a large percentage of Lake Keowee is affected by erosion.

The Commission, in orders issued December 4, 1985 and February 21, 1986,⁶ established that project-induced erosion would not include erosion attributable to flood flows or phenomena, such as wind-driven wave action, run-off from steep terrain during storms, and loss of vegetation due to fire and other natural causes. Thus, Upstate Forever's list of causes,⁷ which are not directly project-related and are beyond the scope of relicensing (study criterion 5), do not need to be addressed within Duke's Proposed Study Plan. However, project-induced factors, including daily reservoir fluctuations and recreation use (such as boating and foot traffic associated with the public's use of the lakes' shorelines and islands) should be considered in any erosion study plan, as shoreline erosion may be potentially influenced by project operations and recreational use of project lands and waters.

The study as proposed by Duke is designed to categorize erosion based on severity and whether erosion is actively occurring or not. Staff concludes that the study also needs to generate data adequate to identify sites of project-induced erosion. Where project-induced erosion is present, the study results need to support identification of protection, mitigation, and enhancement (PME) measures and monitoring needs and opportunities, particularly if the erosion falls into "high" and "active" erosion categories. This evaluation will require field measurements.⁸

Staff finds that, because more information is needed, Lake Keowee should be included in the study. Finally, because of the evidence presented of significant erosion on the islands and the potential for erosion related to project-induced factors stemming from informal recreation, the islands should be included in the study.

Staff Recommendation

Staff recommends that the erosion study should be modified to identify and evaluate significant erosion sites and evaluate rates of erosion. Staff agrees with FWS that the study should address the specific causes of erosion. However, such causes should be limited to direct project-operation or project-induced causes.

⁶ See *Duke Power Company*, 33 FERC ¶ 61,321 (1985), *reh'g denied*, 34 FERC ¶ 61,254 (1986).

⁷ Upstate Forever's list of causes include: (1) wave erosion, (2) impervious cover in the project watershed, (3) effects of land use change, (4) effects of stormwater management; and (5) current and future shoreline development.

⁸ Such measurements may be facilitated by labor saving devices, such as LIDAR.

The Goals and Objectives of the Erosion Study should be modified to include Lake Keowee and its islands. The study should be designed to: (1) characterize the overall erosion at each lake; (2) identify project-induced erosion sites; (3) quantify the level of erosion occurring at those sites; and (4) collect adequate data on the erosion issue and the project effect to evaluate potential needs or opportunities for erosion-related PME and monitoring measures at those sites.

Shoreline Classification Map Update Study Plan

Applicant's Proposed Study

Duke proposed to update the current shoreline classification maps developed for Lake Keowee in 2006 and Lake Jocassee in 2008. The updates to the maps would include: (1) new shoreline uses within the project boundary occurring since the shoreline management plan (SMP) maps were created; (2) adjustments to the existing shoreline classifications determined during Duke's field review of its permitting activities; (3) identification and correction of any mapping errors; and (4) identification of areas for special classification based on information collected as part of the relicensing process such as lands reserved for future public recreation, rare, threatened, and endangered (RTE) species locations/habitats, cultural resources, etc.

The proposed study would use Duke's existing digital aerial photography obtained for Lake Jocassee in April 2009 and new aerial photography that Duke would acquire for Lake Keowee in 2012. Duke would use these images to create new base maps of the Keowee-Toxaway Project showing the project boundary and then merge them into a GIS database with data collected as part of Duke's Avian, Mammalian, Botanical, and other relicensing studies. Duke would review the combined data and update the shoreline classifications to reflect changes in use, to correct any errors, and to identify any new special shoreline classifications. Duke would provide drafts of the updated shoreline classification maps to Study Team members for review and comment before filing its initial study reports with the Commission on January 26, 2013.

Comments on the Study

Upstate Forever supports the concept of this study but suggests that Duke coordinate with natural resource management agencies and use the updated shoreline classification maps to develop target thresholds for each shoreline classification type, including minimums for natural areas, and update the SMP accordingly in order to adequately protect and manage for natural and sensitive shorelines. Upstate Forever also requests that Duke give the highest protective shoreline classification status to habitat for

RTE species that may be identified during the course of the relicensing studies and update its SMP accordingly.

Discussion

It is not clear whether Upstate Forever's suggestion to develop target thresholds for each shoreline classification type refers to minimum/maximum acreages, a requisite level of quality of resources, and/or the level of protection assigned for each shoreline type. Duke proposes to provide the Study Team members with draft versions of its shoreline classification maps in August 2012. Duke's study schedule also indicates that from October 2012 through May 2013, GIS data would be incorporated into the draft shoreline classification maps to reflect the findings of ongoing relicensing studies and stakeholder team discussions. Stakeholders also have the opportunity to review and comment on the compiled data and proposed environmental PME measures during Duke's preparation of its study reports, preliminary licensing proposal, and license application. Staff concludes that there are multiple opportunities for stakeholders to comment on Duke's shoreline classification protocol as well as to propose changes to corresponding shoreline management guidelines such as lake use restrictions to protect RTE species, their habitats, and other sensitive shoreline resources.

Duke's shoreline classification map update study plan is consistent with generally accepted practice in the scientific community (study criteria 6) and will provide information regarding the existing environment that would inform the development of license requirements (study criteria 5).

Staff Recommendation

Staff recommends that Duke's Shoreline Classification Map Update Study Plan be approved as proposed.

Wetlands Study

Applicant's Proposed Study

Duke proposes conducting a study to identify and characterize the existing wetland habitats within the project boundary. The objectives of the study are: (1) to map and classify existing project wetlands; (2) to assess the impacts of project operations, maintenance, and recreational activities on project wetlands; and (3) to provide information to assist in developing proposed PME measures.

The proposed study would use the current SMP maps, FWS' National Wetland Inventory (NWI) maps, Federal Emergency Management Agency (FEMA) floodplain maps, U.S. Geological Survey (USGS) 7.5 minute quadrangles and soil surveys, Duke's 2010 bathymetry survey maps, recent aerial photography, and water surface elevation data. This information would be digitized and merged to create preliminary wetland habitat maps that Duke would use during field surveys to confirm the location, aerial extent, plant species composition and structure, classification and characterization, and relative condition of the existing wetland habitats within the project boundary. Duke would also evaluate project impacts to identified wetlands based on water surface elevation information and through the use of spatial analysis using GIS overlay maps, 2010 bathymetric survey maps, area-elevation curves and CHEOPS™ modeling, and other information collected as part of other relicensing studies.

Comments on the Study

Upstate Forever supports the concept of this study but suggests that Duke collaborate with the appropriate entity to complete the assessment of the wetland resources that occur within a two-mile radius of the project boundary and a one-mile radius of all tributary streams.

Discussion

It is not clear why Upstate Forever suggested expanding Duke's Wetland Study to include an assessment of the wetland resources that occur within a two-mile radius of the project boundary and a one-mile radius of all tributary streams. Upstate Forever did not provide a clear nexus to project effects on wetlands outside the project boundary. Some existing information on wetlands outside the project boundary is publicly available including FWS' NWI maps, FEMA's floodplain maps, USGS 7.5 minute quadrangles, and soil surveys. Duke provided NWI data overlain on USGS topographic maps in its preliminary application document on pages V-26 through V-45. The wetlands potentially affected by current or proposed project operations and maintenance appear to be enclosed within the project boundary. During the course of conducting its relicensing studies Duke may encounter additional wetlands located outside the project boundary that are also potentially affected by current or proposed project operations and maintenance. Duke's proposed Wetlands Study should provide information regarding all wetlands potentially affected by current or proposed project operations and maintenance. In its environmental document, staff will need this updated information on the existing environment to evaluate effects to wetlands.

Duke's Wetlands Study Plan includes methodology consistent with generally accepted practice in the scientific community (study criteria 6) and will provide

information regarding the existing environment that would inform the development of license requirements (study criteria 5).

Staff Recommendation

Staff recommends that Duke's proposed Wetlands Study Plan be approved with the following modification. If Duke identifies hydrologically connected wetlands outside the project boundary that are potentially affected by current or proposed project operations and maintenance, Duke should map and classify, assess the impacts of project operations, maintenance, and recreation, and provide information to assist in developing proposed PME measures for these wetlands.

Avian Study Plan

Applicant's Proposed Study

Duke proposes to conduct a study to characterize the avian resources within and adjacent to the project boundary. The objectives of the study are to: (1) survey and evaluate existing breeding, resident, and migratory avian populations; (2) survey and identify the presence of any state or federal RTE species; (3) assess effects of current and proposed project-related hydropower operations and maintenance on the breeding and migratory species and communities; and (4) provide information to assist in developing potential PME measures.

Duke would use existing information collected from literature reviews, data from other studies, as well as state and federal resource agency databases, and updated RTE listings to prepare a list of avian species including breeding, migratory, wintering, RTE, and proposed RTE known to occur or potentially occur in the project boundary. Duke would then coordinate field surveys with state and federal agencies. The number of transects and point-count stations would be based on the representative habitats within or adjacent to the project boundary. Each point count station would be visited at least twice during the spring migration period (early March through late May), twice during the breeding period (early June through late June), and twice during each of the fall migration and wintering periods (mid-August through mid-January). Duke would evaluate potential project effects to avian species by comparing avian responses to various riparian habitats, water level fluctuations, vegetation management, project maintenance activities, and project recreational facilities. Duke would use GIS overlay maps to conduct a spatial analysis of current and potential project effects on avian abundance, behavior, and habitat.

Comments on the Study

FWS comments that the Avian Study Plan should include extended seasonal sampling (March 2012 through January 2013) to adequately describe use of the project area by migratory birds, including migratory birds during migration, and wintering birds. FWS also states that the Revised Study Plan should include targeted surveys for the common loon (*Gavia immer*) on Lake Keowee using the methods employed during Duke's 2010 survey for the common loon on Lake Jocassee. Upstate Forever recommends that any avian habitat or resources identified through this study be submitted to the National Audubon Society for consideration as an Important Bird Area.

Discussion

Duke's Avian Study Plan provides for at least eight visits to each point count station including two visits each during the spring and fall migrating periods and at least two visits during the wintering period, which extends through mid-January (Appendix L – page 8). While the plan provides more detail regarding the general avian spring and fall migration periods than the wintering period in the North Carolina/South Carolina Appalachian Mountains, this additional detail is needed to describe how Duke would time its surveys in order to collect data on migrating birds' use of the project area *during migration*. Duke's proposal to conduct the spring and fall migration surveys during the peaks of the spring and fall migration periods should allow Duke to document the majority of the migrating bird species using the project area while in transit.

It is not clear why FWS requests targeted surveys for common loons on Lake Keowee. FWS does not indicate why common loons were of special interest in the project area. For common loons, "...fall migration generally begins in September at high latitudes and October in low latitudes and by late November most of migrants have arrived in their wintering areas."⁹ Since the proposed field surveys would include at least four visits to each point count station from mid-August through mid-January, Duke would collect data during both the migrating and wintering periods for common loons. In addition, staff notes that Duke plans to consult and coordinate with state and federal agencies prior to avian field surveys. Through this consultation, Duke should ensure that common loons' usage of Lake Keowee would be captured by the survey.

Upstate Forever's recommendation to submit information on avian habitat or resources identified through this study to the National Audubon Society for consideration

⁹ Evers, D. C. 2004. Status assessment and conservation plan for the Common Loon (*Gavia immer*) in North America. U.S. Fish and Wildlife Service, Hadley, MA.

as an Important Bird Area is not a request for a study modification. Sharing data from relicensing studies with other organizations is a measure that Duke or other stakeholder could take in the interest of protecting avian species. Staff notes that once Duke files its study reports to the Commission's e-library, the data would be available publicly.

Duke's Avian Study Plan includes methodology consistent with generally accepted practice in the scientific community (study criteria 6) and will provide information regarding the existing environment that would inform the development of license requirements (study criteria 5).

Staff Recommendation

Staff recommends that Duke's Avian Study Plan be approved. No modification to the proposed Avian Study Plan is needed.

Tributary Stream Fish Assemblage Assessment¹⁰

South Carolina DNR's Recommended Study

South Carolina DNR recommended a study of the tributary stream fish assemblage in its, July 15, 2011, study plan request and submitted a revised version of the requested study with its, November 29, 2011, comments on Duke's Proposed Study Plan. South Carolina DNR requested the study again and incorporated it by reference in its, January 13, 2012, comments on Duke's Revised Study Plan.

In addressing the study criteria, South Carolina DNR did not identify an explicit goal for the study. South Carolina DNR stated that the agency needed information to: (1) assess the impact of non-native, invasive Alabama spotted bass on native, redeye bass and (2) to understand the extent to which isolation of the tributaries, because of the presence of the reservoir pool, had caused genetic isolation and decline or loss of species. South Carolina DNR provided project-specific information to support its concerns and a description of its recommended methods. South Carolina's concern is that the reservoirs and the introduction of the spotted bass has given the spotted bass access to tributary habitat of the redeye bass, which is disappearing because of hybridization with the spotted bass.

¹⁰ FWS also requests a Fish Entrainment Study. South Carolina DNR endorses the FWS request. Upstate forever requests that the topic of fish entrainment be included in the Fish Community Assessment proposed by Duke. Staff addressed fish entrainment with its discussion of the Fish Community Assessment at the beginning of this Appendix.

FWS did not provide detailed methods for this study proposal though they did endorse South Carolina DNR's request. FWS explained the objectives as: (1) determining spotted bass distribution in the tributaries; (2) determining the extent of hybridization in redeye bass; and (3) comparing fish assemblages in the tributaries of the project impoundments to fish assemblages in similar tributaries not flowing into impoundments.

Upstate Forever also endorsed South Carolina DNR's request. In its comments on the Revised Study Plan, Upstate Forever supported the request with general literature references which cite to the effects of the impoundments on rivers. Also, Upstate Forever argued that changing reservoir levels could change flow gradients close to where project tributaries enter the impoundments. Finally Upstate Forever argued that the issue of tributary fish communities was a logical extension of other fishery studies.

Comments on the Study

Duke declined to adopt this requested study in its study plan because the issues relate to the presence of the lakes rather than the operation of the project. The baseline for analysis is the existing condition, which includes the impoundments, rather than the pre-project condition which would exclude the impoundments. Therefore, Duke argues that it had no responsibility to study the issue.

Discussion

The agencies provide no information to establish a nexus between project operations or potential proposed project changes and the redeye bass hybridization issue or to other fishery issues at the tributary mouths. Upstate Forever connection between changes in tributary stream gradient and genetic flow between species as a result of hybridization is unpersuasive. Without a nexus to project operations or proposed project changes, staff finds no justification for requiring this study (study criteria 5).

Staff Recommendation

Staff does not recommend adoption of South Carolina DNR's Tributary Stream Fish Assemblage Assessment.

Public Recreation Lands Inventory

Upstate Forever's Recommended Study

Upstate Forever recommended a Public Recreation Lands Inventory Study in its July 15, 2011 study plan request and submitted a revised version of the requested study with its November 29, 2011 comments on Duke's Proposed Study Plan. The stated goal of the study is to determine the amount of public recreation lands associated with the project and the project's effect on the availability and costs of the acquisition or sale of these lands since the license was issued. The study would provide data on the real estate transaction history and any costs of acquisition or sale of lands originally identified for recreation and wildlife habitat from pre-construction to the current day. Upstate Forever asserts that the Public Recreation Lands Inventory Study is necessary to determine if Duke has complied with the terms of its current license for project-related recreation and if costs to resource agencies for lands have been reasonable, such as 33,500 acres of land which Duke sold to the State of South Carolina. Further, Upstate Forever recommends the study data be used as a baseline for evaluating recreation needs over the term of a new license.

Comments on the Study

Duke declined to adopt this study. Duke states that its proposed RUN Study will provide sufficient data to determine: (1) the current use of existing recreation facilities and future recreation demand; (2) the need for recreation enhancements, including new project recreation facilities; and (3) the adequacy of project lands and waters for public recreation.

Discussion

In proposing this study, Upland Forever requests an evaluation of Duke's activities under its existing license related to establishing public lands for recreation. Upland Forever intends for the study to establish a baseline for evaluating potential PME measures relating to project recreation. However, in deciding whether to relicense a project, the Commission considers current conditions as a baseline for consideration and evaluation of the appropriateness of enhancement measures.¹¹ Staff finds that this study would not establish the appropriate baseline.

Upland Forever also requests acquisition of data for the purpose of evaluating recreation needs. The Commission requires licensees to provide adequate public access

¹¹ See 47 FERC ¶ 61,225 (1989).

to project lands and waters for recreation. However, Duke has proposed a RUN Study to assess the adequacy of existing public recreation facilities and the potential need for additional facilities, including the adequacy of project lands to support project-related recreation use and demand. The proposed RUN study will provide the necessary information for analysis of recreation issues at project-related facilities (study criterion 4). Therefore, a Public Recreation Lands Inventory Study is not needed.

Staff Recommendation

Staff does not recommend the Public Recreation Lands Inventory Study requested by Upstate Forever.