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April 19, 2019

FERC Project No. 2336-094

Lloyd Shoals Project

Revised Study Plan

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Dear Ms. Bose:

On behalf of Georgia Power Company, Southern Company is filing this letter to provide the Revised Study Plan for relicensing the Lloyd Shoals Project, in compliance with Federal Energy Regulatory Commission Integrated Licensing Process regulations at 18 C.F.R. Part 5 5.13(a). Two versions, both a public and privileged version, are being filed. The privileged version includes the complete public version plus the comment letters filed by the Georgia Department of Natural Resources, Historic Preservation Division and The Muscogee (Creek) Nation, and Georgia Power's associated response to comments.

If you require further information, please contact me at 404.506.7219.

Sincerely,

A handwritten signature in cursive script that reads "Courtenay R. O'Mara".

Courtenay R. O'Mara, P.E.
Hydro Licensing and Compliance Supervisor

cc: FERC/OEP – Neetu Deo, Allan Creamer
Geosyntec – Cristin Krachon
Kleinschmidt – Steven Layman, Ph.D.
Troutman Sanders – Hallie Meushaw



Revised Study Plan

Lloyd Shoals Hydroelectric Project

FERC Project Number 2336

Prepared with:

Southern Company Generation Hydro Services

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April 2019

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ACRONYMS AND ABBREVIATIONS

APE	Area of potential effects
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
CPUE	catch per unit effort
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
FERC	Federal Energy Regulatory Commission
ft	feet
FWS	U.S. Fish and Wildlife Service
GDNR	Georgia Department of Natural Resources
GEPD	Georgia Environmental Protection Division
Georgia Power	Georgia Power Company
GPS	Global Positioning System
HPD	Historic Preservation Division
HPMP	Historic Properties Management Plan
HUC	Hydrologic Unit Code
Hwy	Highway
IFIM	Instream Flow Incremental Methodology
ILP	Integrated Licensing Process
mm	millimeters
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NWI	National Wetlands Inventory
PAD	Pre-Application Document
PD	plant datum
PLP	Preliminary Licensing Proposal
PSP	Proposed Study Plan
RSP	Revised Study Plan
RTE	rare, threatened, and endangered
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
WCS	Wildlife Conservation Section
WRD	Wildlife Resources Division

1.0 INTRODUCTION

Georgia Power Company (Georgia Power) is filing with the Federal Energy Regulatory Commission (FERC or Commission) this Revised Study Plan (RSP) in support of the relicensing of the Lloyd Shoals Hydroelectric Project (FERC No. 2336) (Lloyd Shoals Project, the Project). The 18-megawatt Lloyd Shoals Project consists of a dam, powerhouse, and 4,750-acre reservoir (Lake Jackson, or Jackson Lake) on the Ocmulgee River in Butts, Henry, Jasper, and Newton Counties, Georgia (Figures 1-1 and 1-2). Georgia Power is not proposing to make any major modifications to the Project under the new license. The Project does not occupy federal lands. The current license expires December 31, 2023.

Georgia Power filed a Pre-Application Document (PAD) with FERC on July 3, 2018 using FERC's Integrated Licensing Process (ILP) (18 Code of Federal Regulations [CFR] Part 5). The PAD describes the existing facilities and current project operation; characterizes the affected environment and potential resource impacts of continued operation; and establishes the schedule for all pre-application activities, including stakeholder participation.

FERC issued Scoping Document 1 (SD1) on August 20, 2018 and held National Environmental Policy Act (NEPA) scoping meetings and a site visit on October 9-10, 2018. Relicensing stakeholders filed comments on the PAD and SD1, and study requests, by November 5, 2018. On November 5, 2018, FERC issued a letter with staff comments on the PAD, including an additional information request (AIR).

Georgia Power filed its Proposed Study Plan (PSP) and responses to the AIR with FERC on December 20, 2018. FERC issued Scoping Document 2 (SD2) on December 20, 2018. The relicensing stakeholders had until March 20, 2019 to review and file their comments on the PSP.

Georgia Power prepared this RSP to address and incorporate stakeholder comments made during Study Plan Meetings held on January 16 and February 26, 2019, and the written comments filed during the PSP comment period. FERC will issue a Study Plan Determination by May 20, 2019, which Georgia Power will use to implement the studies.

1.1 Document Organization

Sections 2 through 10 present eight study plans by resource area. Each study plan describes the goals and objectives, study background, study area, methodology to be used, reporting, and study schedule, including a progress report and a study report. The study plans include:

- **Section 2** – Geology and Soils;
- **Section 3** – Water Resources;
- **Section 4** – Fish and Aquatic Resources;

- **Section 5** – American Eel Abundance and Upstream Movements;
- **Section 6** – Terrestrial, Wetland, and Riparian Resources;
- **Section 7** – Rare, Threatened, and Endangered Species;
- **Section 8** – Recreation and Land Use; and
- **Section 9** – Cultural Resources.

1.2 Stakeholder Consultation

During the 90-day comment period for the PSP, Georgia Power consulted with resource agencies, homeowners, and other participants in two Study Plan Meetings. The first meeting was held on January 16, 2019 in Jackson, Georgia. The second meeting was a conference call with federal resource agencies on February 26, 2019. The goal of the meetings was to discuss information gathering needs relevant to agencies’ jurisdiction over the resource areas and to work together to resolve issues with respect to the PSP and the initial study requests filed by stakeholders by November 5, 2018.

Stakeholders filed their comments on the PSP by March 20, 2019. The following stakeholders filed comments on the dates indicated below:

- Georgia Department of Natural Resources (GDNR), Wildlife Resources Division (WRD) – March 20, 2019;
- U.S. Fish and Wildlife Service (FWS) – March 18, 2019;
- National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) – March 19, 2019;
- U.S. Environmental Protection Agency (EPA) – March 15, 2019;
- GDNR Historic Preservation Division (HPD) – January 28, 2019;
- The Muscogee (Creek) Nation – March 25, 2019;
- Kathleen O’Neal, Macon, Georgia – March 15, 2019; and
- Leonard C. Blakeley, Monticello, Georgia – March 19, 2019.

The stakeholder comment letters and Georgia Power’s responses to the letters are provided in Appendix A. Georgia Power’s responses also include explanations as to why certain study requests or study modification requests were not adopted in reference to FERC’s study request criteria set forth in 18 CFR § 5.9(b).

1.3 Study Implementation Master Schedule

Table 1-1 provides the master schedule for all proposed studies, including deadlines for filing progress reports and study reports and dates of Study Results Meetings. The first season of studies will commence by May 2019, with a Study Progress Report to be filed by January 31, 2020. The Study Progress Report will describe overall progress in completing the study activities, summarize preliminary findings as available, and explain any variance from the FERC-approved Study Plan and schedule.

The Study Report will be filed by May 19, 2020 and will be followed by a Study Results Meeting on June 3, 2020. Since the field studies will be completed within 1 year of FERC's Study Plan Determination (May 19, 2020), the Study Report will be considered a final report for all studies unless FERC determines that modifications to the Study Plan are necessary. An exception is the American Eel Abundance and Upstream Movements Study, which, based on the findings of the first season of study, may be modified for a second season of study in consultation with FWS and NMFS (see Section 5.0). The Updated Study Report shown in the master schedule is for the American Eel study.

For any studies extending into a second season (May 2020-April 2021), a Study Progress Report will be filed by January 29, 2021, an Updated Study Report will be filed by May 19, 2021, and a Study Results Meeting will be held on June 3, 2021.

TABLE 1-1
Study Implementation Master Schedule for the Lloyd Shoals Project

Activity	Start Date	Completion Date or Deadline
Conduct Field Studies		
Geology and Soils	July 2019	September 2019
Water Resources	May 2019	April 2020
Fish and Aquatic Resources	May 2019	April 2020
American Eel Abundance and Upstream Movements	May 2019	April 2021 ^a
Terrestrial, Wetland, and Riparian Resources	May 2019	April 2020
Rare, Threatened, and Endangered Species	May 2019	April 2020
Recreation and Land Use	May 2019	September 2019
Cultural Resources	May 2019	April 2020
Study Progress Report (All Studies)	NA	January 31, 2020
Study Report	NA	May 19, 2020
Study Results Meeting	NA	June 3, 2020
File Study Results Meeting Summary	NA	June 18, 2020
Stakeholders file any Study Results Meeting Summary Disagreements and/or Modified or New Study Requests	NA	July 20, 2020
File Response to any Study Results Meeting Summary Disagreements and/or Modified or New Study Requests	NA	August 19, 2020

TABLE 1-1
Study Implementation Master Schedule for the Lloyd Shoals Project

Activity	Start Date	Completion Date or Deadline
FERC Resolves any Disagreements (and Modifies Study Plan if Necessary)	NA	September 18, 2020
Study Progress Report (American Eel Study) ^a	NA	January 29, 2021
Updated Study Report (American Eel Study) ^a	NA	May 19, 2021
Updated Study Results Meeting (American Eel Study) ^a	NA	June 3, 2021
File Updated Study Results Meeting Summary ^a	NA	June 18, 2021

NA = not applicable.

^a if necessary.

Georgia Power will communicate with all participants by e-mail, mail, or other available means to ensure the Progress Reports and Study Reports are made available in a timely and efficient manner. Upon filing with FERC, the Study Progress Report and Study Report will be made available electronically for stakeholder review on the Internet at both Georgia Power’s Lloyd Shoals Relicensing Website and FERC’s website (using the eLibrary feature):

<https://www.georgiapower.com/company/energy-industry/generating-plants/lloyd-shoals-dam-project.html>

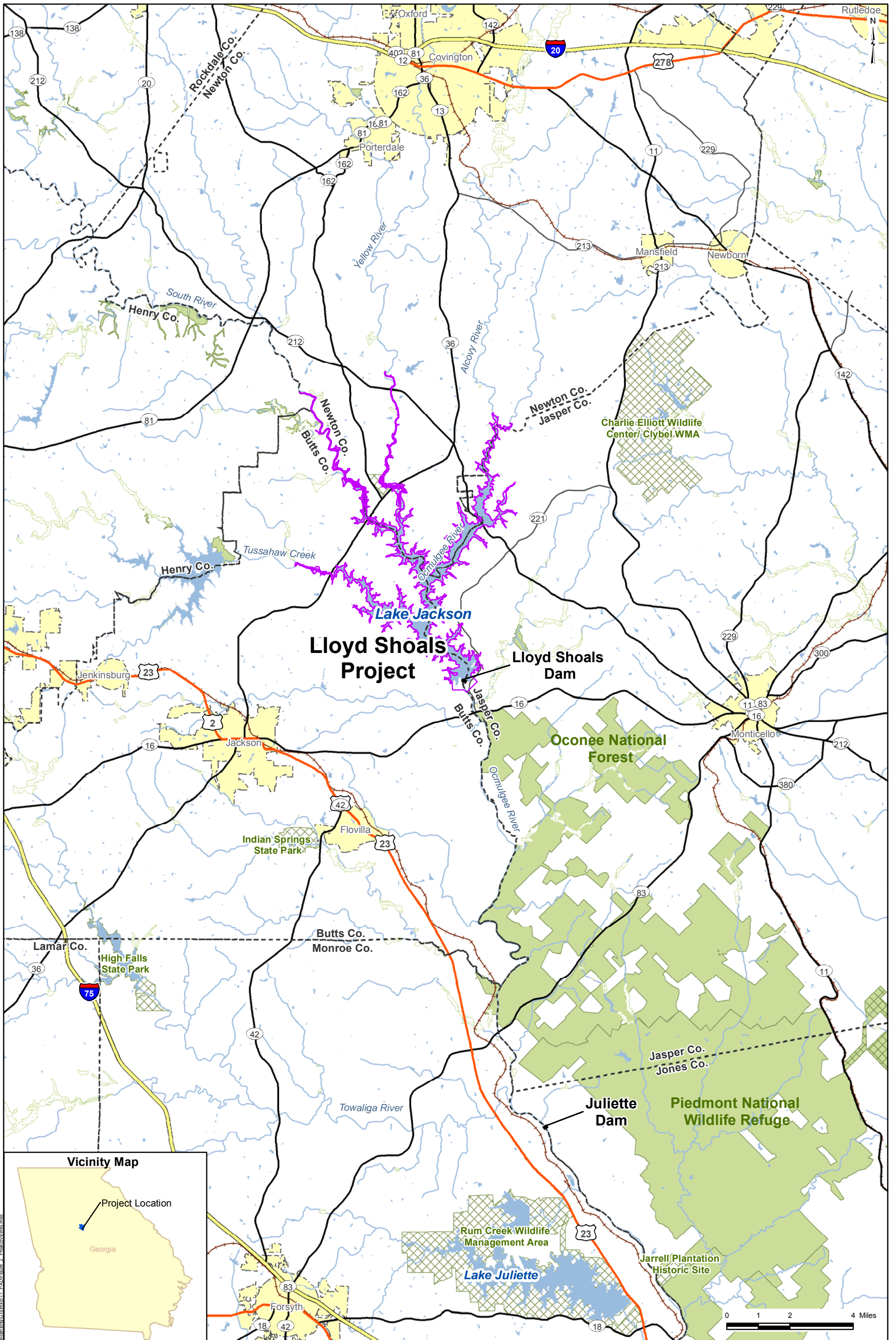
<http://www.ferc.gov/docs-filing/elibrary.asp>

1.4 Relationship of the Resource Studies to the License Application

Each resource study will culminate in the preparation of a Study Report (Table 1-1), which will develop information to be used in characterizing the existing environment and evaluating the potential impacts of continued project operations in Georgia Power’s Preliminary Licensing Proposal (PLP) and subsequent license application. The PLP will be filed by July 1, 2021, and will be made available for public comment (18 CFR § 5.16). The PLP will provide a draft environmental analysis by resource area of the impacts of the proposed action and will propose measures for the purpose of protecting, mitigating impacts to, or enhancing resources affected by the Project.

Based on comments on the PLP filed by stakeholders, Georgia Power will revise and incorporate the PLP into the license application as Exhibit E (18 CFR § 5.18). The license application will be filed by December 31, 2021. Exhibit E will evaluate reasonable and feasible alternatives to the proposed action, address cumulative impacts, and propose measures for protecting, mitigating impacts to, or enhancing environmental resources affected by the project proposal.

Under the ILP, FERC's NEPA document, which is also issued for public comment, will include FERC's determination regarding reasonable and feasible alternatives and cumulative impacts as part of its NEPA analysis.

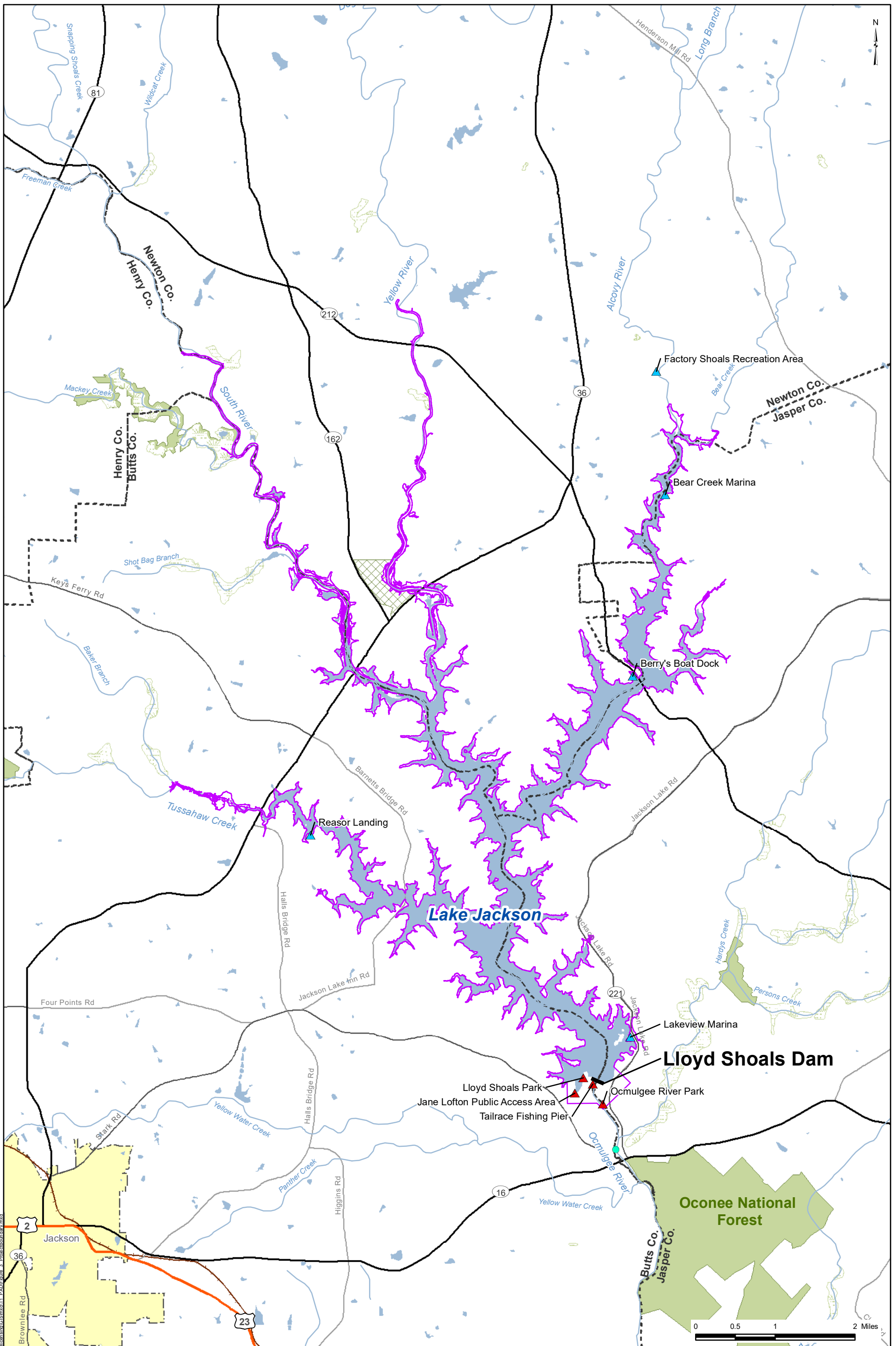


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- | | | | | | |
|--|--------------------|--|------------------|--|--------------------------|
| | Interstate Highway | | Railroad | | Towns/Cities |
| | U.S. Highway | | Dam | | State Managed Lands |
| | State Highway | | Project Boundary | | National Parks or Forest |
| | County Road | | River | | Lake |
| | Minor Road | | Swamp/Marsh | | |



Figure 1-1
Project Vicinity
 Lloyd Shoals Project
 (FERC No. 2336)



J:\GIS\Projects\Lloyd Shoals\Figures\GIS\Map1-2_PAD\Figure_3_Page1Boundary.mxd

- | | | | |
|--------------------|------------------|--------------------------------|--------------------------------|
| Interstate Highway | Railroad | Towns/Cities | NHD Stream Gage (No. 02210500) |
| U.S. Highway | Dam | State Managed Lands | |
| State Highway | Project Boundary | National Parks or Forest | |
| County Road | River | Recreation Access Point | |
| Minor Road | Lake | Georgia Power | |
| | Swamp/Marsh | Public/Private | |



Figure 1-2
Lloyd Shoals Project Boundary
 Lloyd Shoals Project
 (FERC No. 2336)

2.0 GEOLOGY AND SOILS

2.1 Introduction

Georgia Power proposes to conduct a study characterizing existing erosion and sedimentation conditions within the Lloyd Shoals project boundary and evaluating the potential impacts of continued project operation and project-related recreation on erosion and sedimentation in the project area. This will be accomplished through a combination of a shoreline survey within the project boundary and review of existing information and data to analyze erosion and sedimentation as well as the effects of shoreline structural stabilization practices on littoral-zone aquatic habitats.

2.2 Goals and Objectives

The goal of this study is to develop information for: (1) characterizing existing shoreline conditions with respect to erosion and sedimentation in Lake Jackson and the Lloyd Shoals tailrace and (2) evaluating the Geology and Soils resource issues identified during FERC's public scoping process pursuant to NEPA that have a nexus with project operations.

The specific objective of the study is to characterize the distribution and sources of erosion and sedimentation within the FERC project boundary based on a shoreline field reconnaissance survey and review and analysis of existing information.

2.3 Study Background

This study will develop information needed to evaluate potential impacts of continued project operation in the PLP and license application in consideration of: (1) the geology and soils resource issues identified during NEPA scoping; (2) any study modifications requested by resource agencies and other stakeholders; (3) the known resource management goals of the agencies with jurisdiction over resources related to geology and soils; (4) existing information available for the Ocmulgee River basin as summarized in the PAD; and (5) the requirement that there be a nexus between project operations and effects on the resources being evaluated.

2.3.1 Issues Identified

The Commission identified in SD2 the following resource issues pertaining to geology and soils resources:

- effects of continued project operation and project-related recreation on reservoir and tailrace shoreline erosion and sedimentation; and
- effects of continued project operation on sediment transport and accumulation within Lake Jackson, including contaminated sediment and evaluation of the need for measures to address sedimentation (cumulative and site-specific effects).

2.3.2 Study Requests

Georgia Power proposed in the PAD (Section 5.2.1, Preliminary Studies List) to conduct a study to characterize the distribution and sources of erosion and sedimentation within the project boundary based on a shoreline field reconnaissance survey and review and analysis of existing information and aerial photography. A shoreline survey would be conducted within the project boundary, including a shoreline aquatic habitat survey, and a literature review and analysis would be conducted on the effects of shoreline stabilization structures on littoral-zone aquatic habitat.

Georgia Power proposes to include the shoreline aquatic habitat survey as part of this Geology and Soils Study because the survey will be conducted concurrently with the reconnaissance survey for erosion and sedimentation (using the same field data form) and will be integral to the analysis of shoreline conditions and the effects of continued project operations and project-related recreation. The findings of the aquatic habitat survey portion of the field reconnaissance survey also will be summarized in the Fish and Aquatic Resources Study (Section 4.0).

No study requests pertaining to geology and soils were filed by stakeholders following the study criteria under 18 CFR § 5.9(b). In its PAD and SD1 comments letter dated November 5, 2018, the GDNR WRD requested that additional objectives be incorporated into the shoreline aquatic habitat survey study element. These include mapping developed and undisturbed shoreline areas in the project reservoir; surveying and mapping submergent vegetation in the reservoir; incorporating literature review on how rates and magnitude of shoreline development affect sport fish species such as Largemouth Bass, Black Crappie, and sunfish; and incorporating drawdown schedules, including magnitude and duration, to assist planning of aquatic plantings and fish stocking.

Georgia Power proposes to survey shoreline aquatic habitat using a stratified random selection of sites to develop information on the proportions of natural versus modified shoreline with respect to vegetative buffer zone condition, bank stability and vegetative protection, proportions of shoreline with structural stabilization practices, potential causes of shoreline erosion/sedimentation and whether or not they are project-related, and sources of littoral-zone fish cover and habitat. If submergent/submersed vegetation is observed at shoreline sites, its extent of linear coverage of the shoreline site will be estimated. The distribution and abundance of submersed vegetation will be characterized in the Terrestrial, Wetland, and Riparian Resources Study (Section 6.0) based on a separate field reconnaissance survey for those resources. As requested by WRD, the shoreline analysis will review literature on the relationship between structural stabilization practices (i.e., developed shoreline) and littoral-zone fish habitat. Regarding reservoir drawdowns, Georgia Power schedules drawdowns for homeowner and shoreline maintenance every few years and notifies GDNR in advance.

In its PAD and preliminary study proposal comments of November 5, 2018, FERC staff requested a map delineating ownership of lands along the reservoir and tailrace shorelines

indicating whether land is privately, or project owned and any available historical data, including bathymetry, topography, and/or aerial photography that shows how erosion and sedimentation within the project boundary has changed over time. In comments filed September 25, 2018, stakeholder Ms. Julia Haar expressed concern about siltation and its consequences for the water quality of Lake Jackson. As part of the Recreation and Land Use Study, Georgia Power will provide a map of land ownership within the project boundary indicating whether land is privately owned or owned by Georgia Power. As part of the Geology and Soils Study, Georgia Power will also conduct a spatial and temporal analysis of shoreline change over time in representative shoreline areas and coves using available historical aerial photography.

FERC staff requested a summary of all dredging permits issued at the Project and available information pertaining to each dredging event. FERC staff also requested that when erosion areas are being characterized as part of the shoreline reconnaissance survey, that erosion be denoted as project related, non-project related, or a combination of both. These elements have also been incorporated into the Geology and Soils Study Plan.

During the Study Plan Meetings, FERC staff requested that the Geology and Soils Study develop information on sediment transport and patterns of sediment deposition in the project reservoir. The study plan provides for a synthesis of existing watershed information and data for the upper Ocmulgee River basin and a reservoir shoreline temporal change analysis using aerial photography. Objectives of the analysis will include characterizing sources of sediment loading, assessing temporal and spatial trends in reservoir sedimentation patterns; describing reservoir operating rules in use over the current license term, and assessing how current reservoir management affects sediment deposition in Lake Jackson.

2.3.3 Resource Management Goals

GDNR and FWS are the primary state and federal resource agencies having jurisdiction along the Ocmulgee River pertaining to the protection of land and water resources. Relevant resource management goals of these agencies generally include the maintenance and protection of native shoreline vegetation, water quality, and littoral-zone habitats for fish and aquatic species.

2.3.3 Existing Information

The Lloyd Shoals Project is in the Southern Outer Piedmont ecoregion. This ecoregion has low hills, major forest types of loblolly-shortleaf pine, underlying rocks of gneiss, schist and granite, fine sandy loam soils, and a deep, red clayey subsoil. The Lake Jackson shoreline is characterized by gently sloping topography in most areas. Since the Project was constructed in 1911 and due to its proximity to Atlanta, much of the shoreline in the southern and central portions of the reservoir has been developed for residential and commercial use. Many developed portions of the shoreline have structural stabilization practices in place, including riprap, seawalls, or seawalls with riprap at the base. Conversely, substantial stretches of

undeveloped, forested shoreline occur along the Tussahaw Creek arm of the reservoir, west of Georgia Highway (Hwy) 36, and along the South River and Yellow River arms north of Hwy 36. Natural vegetative shoreline cover is prevalent along many of these shorelines.

The shorelines around Lake Jackson and in the Lloyd Shoals tailrace area exhibit low potential for erosion or other forms of instability due to a high degree of vegetative cover and/or the use of shoreline structural stabilization practices. Sites with the greatest potential for shoreline erosion include public recreation access sites where shoreline activity may contribute to localized bank instability.

2.3.4 Nexus between Project Operations and Effects

Georgia Power operates the Lloyd Shoals Project as a modified run-of-river project. Lloyd Shoals generates during peak power demand hours to meet the electrical system demand with renewable, waste-free, low-emission power. Georgia Power operates the Lloyd Shoals Project to maintain reservoir elevations between 530 and 527 feet (ft) plant datum (PD)¹ year-round. Daily fluctuations of Lake Jackson are less than 1.5 ft about 98-percent of the time.

Lloyd Shoals discharges directly into the Ocmulgee River. When the Project is not operating to generate peaking energy, the Project releases a continuous minimum flow of 400 cubic feet per second (cfs), or inflow, whichever is less, for the protection and enhancement of fish and wildlife resources downstream of the Project.

2.4 Study Area

The proposed study area includes the FERC project boundary around Lake Jackson and the tailrace area downstream of Lloyd Shoals Dam. Literature review and analysis of existing information and data will extend to adjacent lands and watersheds upstream of the project boundary.

2.5 Methodology

Georgia Power's proposed approach for completing the Geology and Soils Study consists of the following study elements.

2.5.1 Shoreline Reconnaissance Survey

A single shoreline reconnaissance survey of Lake Jackson and the Lloyd Shoals tailrace area will be conducted in summer 2019 to inventory and characterize existing sources of erosion and sedimentation within the project boundary and to characterize physical aquatic habitat and available sources of littoral-zone cover for fish. Representative shoreline sites within the project boundary will be selected and visually evaluated in the field as described below.

¹ Plant datum = mean sea level elevation (NAVD88) + 0.45 feet.

Site Selection

A geographic information system shapefile will be prepared defining 500-ft shoreline segments for the entire project reservoir and tailrace area within the project boundary. The study area will be partitioned into five sections (Figure 2-1) for stratified random selection of 500-ft shoreline segments for the reconnaissance survey as follows:

- South River (SR) – the northwest portion of Lake Jackson that includes the South River embayment upstream of its confluence with the Alcovy River embayment and the junction of Butts, Newton, and Jasper Counties;
- Alcovy River (AR) – the northeast portion of Lake Jackson that includes the Alcovy River embayment upstream of its confluence with the South River embayment and the junction of Butts, Newton, and Jasper Counties;
- Tussahaw Creek (TC) – the Tussahaw Creek embayment of Lake Jackson on the western side of the reservoir;
- Main reservoir (MR) – the main-stem pool of the reservoir from the confluence of the South River and Alcovy River embayments downstream to Lloyd Shoals Dam; and
- Tailrace Area (TR) – the Lloyd Shoals tailrace area extending downstream to and including Ocmulgee River Park.

A total of 106 shoreline segments, or sites, will be selected for the reconnaissance survey. Twenty-five sites will be selected in each of the four reservoir sections (SR, AR, TC, MR) for a total of 100 on Lake Jackson. Six sites will be selected in the tailrace area section (TR). The stratified random selection will occur as follows:

- One site will be selected at each of the four project recreation facilities (Figure 2-1). These facilities include two in reservoir section MR (Lloyd Shoals Park and Jane Lofton Public Access Area) and two in the tailrace section TR (Tailrace Fishing Pier and Ocmulgee River Park).
- The remaining survey sites will be randomly selected to total 25 sites in each reservoir section and 6 sites in the tailrace area (TR), three on each side of the river.

The geographic coordinates of the midpoint of each selected shoreline site will be determined and tabulated and mapped in the study report.

Field Survey

The shoreline survey will consist of visual observation and assessment of each shoreline segment in summer 2019 during dry weather and normal project operating conditions. The assessment sites will be surveyed from a boat to the extent practical.

Survey teams of three investigators each will complete the visual shoreline assessment using the field data form provided in Figure 2-2. At each site, the survey team will inventory and rate the following shoreline attributes:

- Vegetative buffer zone condition;
- Adjacent land uses;
- Bank stability and vegetative protection;
- Shoreline structural stabilization practices (e.g., seawalls, riprap);
- Potential causes of erosion (project related, and/or non-project related); and
- Sources of littoral-zone fish cover.

These shoreline attributes will be jointly rated by the survey team. The inventory of shoreline structural stabilization structures in place will include visual estimates of the proportional length of seawalls, riprap, a combination of seawalls with riprap at the base, and any other forms of non-vegetated armoring. Proportional length of the various sources of fish cover/habitat available will also be visually estimated for each site. Documentation will include digital photographs of representative shorelines, including any active erosion problem areas as well as least-disturbed shoreline conditions.

The visual assessment protocol (Figure 2-2) has been customized for use on this project. Similar visual habitat and waterbody assessment protocols are widely used by water resource agencies, including EPA (Barbour et al., 1999; EPA, 2002a), GEPD (2007a), and Natural Resources Conservation Service (1998), to evaluate the condition of freshwater ecosystems. Thus, the proposed survey methodology is generally consistent with accepted practice in the scientific community.

2.5.2 Sediment Deposition and Shoreline Temporal Change Analysis

Sediment transport and patterns of sediment deposition within Lake Jackson will be analyzed based on the substantial amount of existing watershed information and data for the upper Ocmulgee River basin and a reservoir shoreline temporal change analysis using reasonably available aerial photography. No bathymetry data are available for Lake Jackson. Objectives of the analysis will be to characterize sources of sediment loading in the major tributary rivers upstream of the Project; assess temporal and spatial changes and trends in reservoir

sedimentation patterns; describe the reservoir operations in use over the current license term, including maintenance drawdowns; and assess how current reservoir management affects sediment deposition in Lake Jackson.

Review of existing information and data pertinent to sediment transport and accumulation and sediment contaminants will include but not necessarily be limited to the following sources:

- Metropolitan North Georgia Water Planning District Water Resource Management Plan (CH2M and Black & Veatch, 2017) for the 15-county Metro Water District, which includes the Ocmulgee River basin upstream of the Project and provides information on management issues and strategies pertaining to nutrients and sedimentation.
- Middle Ocmulgee Regional Water Plan (GEPD, 2017a), developed as part of Georgia's state-wide water planning process, which includes Lake Jackson. The plan summarizes nutrient modeling and a surface water availability assessment for the reservoir.
- GEPD, including total maximum daily load (TMDL) evaluations for numerous stream segments in the Ocmulgee River basin for sediment (GEPD, 2007b, 2017b), which assess known and suspected sources of sediment in upstream watersheds.
- Watershed assessments and watershed improvement plans for upper Ocmulgee River basin streams prepared by local governments, including the City of Atlanta's South River Watershed Improvement Plan Update (BC/DHA, 2018).
- Fish consumption guidelines for Georgia waters (GEPD, 2018).
- TMDLs for total mercury (EPA, 2002b), polychlorinated biphenyls (PCBs) (EPA, 1998a), and chlordane (EPA, 1998b) in fish tissue in Lake Jackson, which include source assessments and estimates of contaminant decay rates.
- Historical reports and accounts of Lake Jackson nutrient enrichment and siltation patterns (EPA, 1975; Kamps, 1989).

Reasonably available aerial photography of the study area will be reviewed and inspected to evaluate spatial and temporal changes in shoreline conditions occurring since 1993, when the current license was issued. The aerial photography will be examined to identify any trends in erosion and sedimentation patterns potentially related to various shoreline uses, sediment loading from upstream watersheds, or water level drawdowns for project operations and maintenance. Imagery sets will be obtained, as available, from sources such as the U.S. Department of Agriculture National Aerial Photography Program and the University of Georgia Map and Government Information Library. Up to six representative areas of the project shoreline will be selected for aerial photography comparisons and evaluation at 5- to 10-year intervals to represent shorelines of the major tributary arms, shallow coves with known sediment accumulation, and the main body of the reservoir. Areas of significant sediment

accumulation, aggradation, and/or new vegetation development visible in the aerial photography will be characterized with respect to sedimentation trends and quantified in area to the extent practical using photogrammetric methods in GIS.

2.5.3 Analysis of Existing Information and Data

The effects of continued project operation on shoreline erosion and sedimentation within the project boundary will be evaluated using: (1) findings of the shoreline reconnaissance survey; (2) aerial photography review of spatial and temporal change in erosion and sedimentation occurring in representative shoreline areas and coves; and (3) operational data characterizing Lloyd Shoals daily maximum and minimum reservoir fluctuations during normal, dry, and wet inflow periods.

The results of the shoreline survey will be presented in tables and graphs and will include photographs of representative survey sites. The shoreline survey will document current active erosion problem areas and their potential causes. Aerial photography review may reveal trends in erosion and sedimentation patterns related to various shoreline uses or upstream loading sources and help to determine whether the condition is project related, non-project related, or a combination of both. Project related erosion is defined as erosion caused primarily by daily reservoir fluctuations or downstream flow fluctuations from project operation, or by shoreline activities at project recreation sites. Non-project related sources of erosion may include flood flows, wind-driven wave action, stormwater run-off from steep terrain, loss of vegetation due to natural causes, and other factors not attributable to project operation. The survey results will also be used to characterize current shoreline and littoral-zone habitat conditions for fish and other aquatic organisms.

In addition, a literature review will be conducted on shoreline structural modifications associated with shoreline development, including seawalls/bulkheads, rock riprap, and combinations of seawalls with riprap at the base, and their effects on littoral-zone aquatic habitats as reflected in fish species composition, diversity, and abundance. The literature review will include studies conducted at southeastern hydropower reservoirs in North and South Carolina (Barwick, 2004) and Alabama (Purcell et al., 2013), and other relevant scientific literature dealing with shoreline structural stabilization practices.

A map will be prepared of the project boundary delineating ownership of lands along the shorelines as to whether land is privately or project-owned. In addition, a summary will be provided of dredging permits issued at the Project and available information pertaining to each dredging event, including: the purpose, volume of material removed, and equipment used; the dates and duration of each event; the location and site characteristics of each event and location and characteristics of disposal sites, including a map as appropriate; and methods used to contain turbidity and prevent the transport of disturbed material downstream.

2.6 Reporting

A Study Progress Report will be prepared and provided to participants prior to the completion of the study. The progress report will describe overall progress in completing the proposed shoreline reconnaissance survey, summarize preliminary findings as available, and explain any variance from the study plan and schedule.

A Geology and Soils Study Report will be prepared and provided to participants for review and comment at the conclusion of the study. The study report will compile the data gathered from the shoreline survey and present the analyses developed through the use of existing information and data.

2.7 Schedule

In accordance with the Lloyd Shoals Process Plan and Schedule and the master schedule provided in Section 1.3, the Geology and Soils Study will be completed according to the milestones listed in Table 2-1 below.

TABLE 2-1
Schedule for Conducting the Geology and Soils Study

Activity	Deadline
Begin Field Studies and Analysis of Existing Data	May 2019
File Progress Report	January 31, 2020
Complete Field Studies and Analysis of Existing Data	February 2020
File Study Report	May 19, 2020

2.8 References

- Barbour, M. T., J. Gerritsen, B. D. Snyder, and J. B. Stribling. 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates and fish, second edition. EPA 841-B-99-002. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.
- Barwick, D. H. 2004. Species richness and centrarchid abundance in littoral habitats of three southern U.S. reservoirs. *North American Journal of Fisheries Management* 24:76-81.
- BC/DHA. 2018. South River watershed improvement plan update. Draft. Prepared for Department of Watershed Management, City of Atlanta, Georgia. June 2018.
- CH2M and Black & Veatch. 2017. Water resource management plan, Metropolitan North Georgia Water Planning District. June 2017. <http://northgeorgiawater.org/plans-manuals/>.

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- Georgia Environmental Protection Division (GEPD). 2007b. Total maximum daily load evaluation for seventy stream segments in the Ocmulgee River basin for sediment (biota impacted). Georgia Department of Natural Resources, Atlanta, Georgia. January 2007.
- Georgia Environmental Protection Division (GEPD). 2017a. Middle Ocmulgee Regional Water Plan. Georgia Department of Natural Resources, Atlanta, Georgia. <https://epd.georgia.gov/middle-ocmulgee-rwp-updates>.
- Georgia Environmental Protection Division (GEPD). 2017b. Total maximum daily load evaluation for eleven stream segments in the Ocmulgee River basin for sediment, 6 fish community impacted, 5 macroinvertebrate community impacted. Georgia Department of Natural Resources, Atlanta, Georgia. April 2017.
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- U.S. Environmental Protection Agency (EPA). 1998a. PCBs TMDL development, Jackson Lake – Newton, Butts and Jasper Counties. Water Management Division, EPA Region 4. February 19, 1998.

- U.S. Environmental Protection Agency (EPA). 1998b. Chlordane TMDL development, Jackson Lake – Newton, Butts and Jasper Counties. Water Management Division, EPA Region 4. February 19, 1998.
- U.S. Environmental Protection Agency (EPA). 2002a. Environmental monitoring and assessment program (EMAP) research strategy. EPA 620/R-02/002. Office of Research and Development, National Health and Environmental Effects Research Laboratory, Research Triangle Park, North Carolina.
- U.S. Environmental Protection Agency (EPA). 2002b. Total maximum daily load (TMDL) for total mercury in fish tissue residue in Jackson Lake and Ocmulgee River including listed segments. Region 4. February 28, 2002.

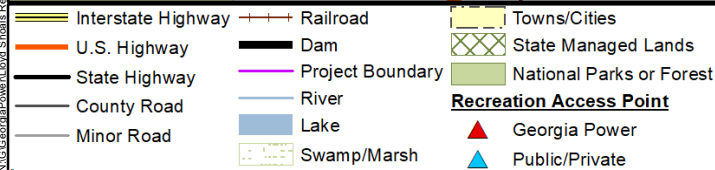
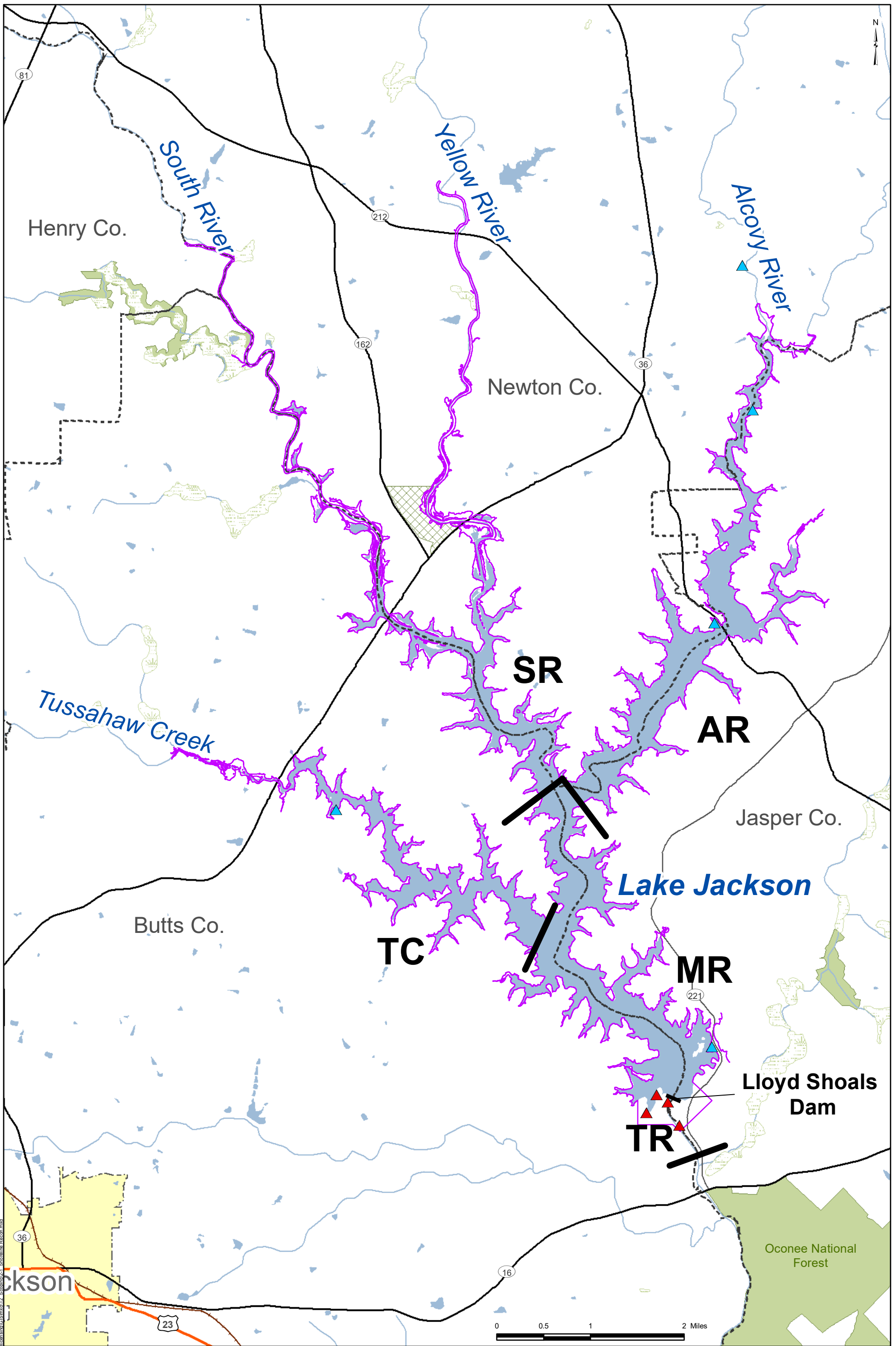


Figure 2-1
Shoreline Reconnaissance Survey Areas

Lloyd Shoals Project
(FERC No. 2336)

Figure 2-2. Shoreline Reconnaissance Survey Form – Lloyd Shoals Project (FERC No. 2336)
Georgia Power Company

Site ID No.:		Date:	Time:
Waterbody: ___ Lake Jackson ___ Tailrace		County: ___ Butts ___ Henry ___ Jasper ___ Newton	
Site Description:			GPS?: ___ Yes ___ No
Adjacent Land Ownership: ___ GPC ___ Residential ___ Commercial ___ Other			
Weather:		Reservoir Pool Level: ___ Full ___ Medium ___ Low	
Investigators:			Photos Taken?: ___ Yes ___ No

Length of Assessment Site: ___ 500 feet ___ Other: ___ feet		Active Erosion Problem Present?: ___ Yes ___ No		
Shoreline Vegetative Buffer Zone Condition:	___ Natural: heavily vegetated, less than 20 percent of natural vegetation removed			
	___ Landscaped-Natural: disturbed and cleared up to 50 percent; some trees & understory remaining			
	___ Landscaped: cleared of more than 50 percent natural vegetation or underbrush completely removed			
Land Uses Adjacent to Shoreline (check all that apply):				
___ Residential	___ Forested	___ Golf Course	___ Open	___ Transportation
___ Recreation/access	___ Agricultural	___ Commercial	___ Logging	___ Other: _____

Bank Stability:	___ Stable; minimal erosion; <5% affected by erosion; low potential for future problems		
	___ Moderately stable; 5-30% affected by erosion or slumping; slight erosion potential during floods		
	___ Moderately unstable; 30-70% affected by erosion or slumping; high erosion potential during floods		
	___ Unstable; >70% affected by erosion or slumping; mass erosion and bank failure evident		
Bank Vegetative Protection:	___ >90% of bank surfaces covered by healthy, living vegetation		
	___ 70-90% of bank covered by variety of vegetation; some open areas with disruption evident		
	___ 50-70% of bank covered by vegetation; scattered shrubs, grasses, and forbs; bare spots visible		
	___ <50% of bank with vegetative cover; any shrubs or trees are widely scattered; many bare spots		
Shoreline Structural Stabilization Practices Present? ___ Yes ___ No (check all that apply):			
___ Seawall/bulkhead only (_____% of site)		___ Seawall/bulkhead and riprap combined (_____% of site)	
___ Riprap or other large stone only (_____% of site)		___ Other armoring: _____ (_____% of site)	
Potential Sources of Active Shoreline Erosion (check all that apply):			
___ Land-disturbing activity	___ Residential landscape	___ Reservoir fluctuations	___ Wave action from watercraft/wind
___ Impervious surfaces	___ Roads and bridges	___ Lack of buffer vegetation	___ Tributary inflow
___ Stormwater runoff	___ Recreation/access	___ Livestock activity	___ Other: _____

Sources of Shoreline Fish Cover/Habitat to 50 feet from Shoreline (check all that apply):	
___ Docks/piers/boatslips (_____% of shoreline length)	___ Overhanging vegetation (_____% of shoreline length)
___ Riprap (_____% of shoreline length)	___ Large woody debris (_____% of shoreline length)
___ Bedrock and boulders (_____% of shoreline length)	___ Standing timber (_____% of shoreline length)
___ Emergent vegetation (_____% of shoreline length)	___ Other: _____ (_____% of shoreline length)
___ Submersed vegetation (_____% of shoreline length)	___ Other: _____ (_____% of shoreline length)

Other Observations and Aquatic Habitat Notes:

3.0 WATER RESOURCES

3.1 Introduction

Georgia Power proposes to conduct a study characterizing existing water resources in Lake Jackson and the Ocmulgee River below the Lloyd Shoals Project, including water use, availability, and water quality, and evaluating potential impacts to water resources associated with continued project operation. A principal element of the study will be an evaluation of the effects of continued project operation on water quality, particularly dissolved oxygen (DO) levels and water temperature in the Ocmulgee River in the tailrace area downstream of the dam. This study will be accomplished through a combination of new water quality monitoring in the project tailrace and compilation and analysis of existing water resources information and data.

3.2 Goals and Objectives

The goal of this study is to develop information for characterizing existing water resources in the project area and evaluating the water resource issues identified during FERC's public scoping process pursuant to NEPA that have a nexus with project operations.

The specific objectives of the study are to:

- Characterize water use, availability, and water quality in the Lloyd Shoals Project study area.
- Characterize the effects of continued project operation on water quality in Lake Jackson and the tailrace area within the project boundary.
- Review the substantial amount of water resources information and data available for the Ocmulgee River, along with the findings of Georgia Power's water quality monitoring in project waters, to evaluate the effects of continued project operation on water quality, including water temperature and DO concentrations, in Lake Jackson and the tailrace area.

3.3 Study Background

This study will develop information needed to evaluate potential impacts of continued project operation on aquatic resources in the PLP and license application in consideration of: (1) the water resource issues identified during NEPA scoping; (2) any studies and modifications to studies requested by resource agencies and stakeholders; (3) the known resource management goals of the agencies with jurisdiction over the water resources; (4) the substantial amount of existing information available for the Ocmulgee River and Lake Jackson as summarized in the PAD; and (5) the requirement that there be a nexus between project operations and effects on the resources being evaluated.

3.3.1 Issues Identified

The Commission identified in SD2 the following resource issue pertaining to water resources:

- effects of continued project operation on water quality, including dissolved oxygen concentrations and water temperature in Lake Jackson and the Ocmulgee River downstream from the project (cumulative and site-specific effects); and
- effects of continued project operation on cyanobacteria development and levels in Lake Jackson, including addressing the need for measures to address cyanobacteria levels (cumulative and site-specific effects).

3.3.2 Study Requests

Georgia Power proposed in the PAD (Section 5.2.1, Preliminary Studies List) to conduct a study to characterize water use, availability, and water quality in the project area; characterize the effects of project operations on water quality in the project reservoir and in the Ocmulgee River tailrace area immediately downstream of the dam; characterize the effects of project operations during drought on water uses downstream in the Ocmulgee River. Seasonal water quality monitoring data collected through 2017 would be analyzed. DO and water temperature would be continuously monitored in the project tailrace in summer 2019, and a literature-based analysis would be conducted for water quantity and quality.

Although no study requests pertaining to water resources were filed by stakeholders following the study criteria under 18 CFR § 5.9(b), resource agencies have made the following comments and recommendations for modifying Georgia Power's proposed study.

Water Quality Monitoring

In its scoping comments filed November 2, 2018, EPA recommended Georgia Power coordinate with resource agencies to define a downstream boundary for the proposed water quality studies. EPA also recommended year-round monitoring to demonstrate water-quality standards compliance. Further, EPA recommended acquiring downstream data to understand changes (if any) in riverine characteristics. EPA suggests downstream data may be available from readily available sources including state and federal agencies. EPA believes the acquisition of downstream data would facilitate an analysis and comparison of upstream and downstream water quality. In its PSP comment letter, EPA requested that it be informed if there are no downstream data available beyond the tailrace and before the next dam.

In its study request letter dated November 2, 2018, the Georgia Environmental Protection Division (GEPD) requested that the tailrace monitoring period be expanded to a full-year from the summer period described in the PAD. GEPD also requested that continuous monitoring, to include DO and water temperature, be performed on at least an hourly frequency. Further, GEPD requested that monthly grab samples be taken from the tailrace and analyzed for the

following water quality parameters: 5-day biological oxygen demand, ammonia, nitrate-nitrite, organic nitrogen, total phosphorous, ortho-phosphate, and organic phosphorous. GEPD indicates that these efforts would support the GEPD hydrodynamic and water quality model for the Ocmulgee River. In 2014, GEPD conducted a water quality model calibration field study of the Ocmulgee River downstream of the dam; however, the data were not collected in the project tailrace but over 1 mile downstream and were limited in duration and parameters modeled. GEPD believes that data collected within the tailrace and over an entire year would better characterize the upstream boundary of the model, and would increase the predictive capability of the model to support GEPD analysis of water quality in the Ocmulgee River downstream of the Project.

Georgia Power has collected a substantial amount of vertical profile and water chemistry data for Lake Jackson representing the full length of the main-stem reservoir and major tributary coves, as summarized in the PAD (Section 4.3.1). Table 3-1 indicates the months in which vertical profile and water chemistry data have been collected since 1995. Older data for Lake Jackson exists in Georgia Power records, but only data since 1995 are included in Table 3-1. Georgia Power has obtained additional water quality data for Lake Jackson, as collected by volunteers in the Adopt-a-Lake program. This dataset includes 11 sample locations with data from 2014 through 2017. Georgia Power will also work with other entities (e.g., GEPD, Butts County, et al. Water and Sewer Authority, EPA National Rivers and Streams Assessment) to collect any additional and relevant water quality data. Georgia Power will work with local citizen-science groups, such as “Adopt-a-Lake”, to gather and analyze data from these efforts. Georgia Power proposes herein to analyze the substantial amount of existing vertical profile and water quality data collected by Georgia Power and others to evaluate the effects of continued project operation on water quality, including temperature and DO, in Lake Jackson and the tailrace area. Georgia Power has not proposed water quality monitoring in Lake Jackson in 2019 because Georgia Power believes that an analysis of the existing data will represent water quality changes occurring over the course of the summer, including normal, dry, and wet years.

TABLE 3-1
Lake Jackson Water Quality Sampling Dates, 1995-2017

Year	Winter			Spring			Summer			Fall		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995			○		○	◆	◆	○	◆	◆	○	
1996		○			○	◆	◆	○	◆	◆	○	
1997						○	◆	○			○	
1998						○	◆	○			○	
1999					○						◆	
2000						○	◆	○			◆	
2001						●		◆			●	
2002						●		●			●	

TABLE 3-1

Lake Jackson Water Quality Sampling Dates, 1995-2017

Year	Winter			Spring			Summer			Fall		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003						•		•			•	
2004						•		•			•	
2005						•		•	◆	•		
2006						•		•			◆	
2007				◆		•		◆		•		
2008						•		•		•		
2009						•		•		◆		
2010							•	•		•		
2011				•				•			•	
2012				◆				•			•	
2013				•				•	•			
2014		◆		•				•		•		
2015	◆			◆				◆			○	
2016		◆		◆				•		•		
2017	•		○				•					

• = profile and chemistry data for 6 stations
 ○ = profile only data for 6 stations
 ◆ = profile and chemistry data for fewer than 6 stations

To address EPA and GEPD interests regarding tailrace monitoring, Georgia Power proposes to conduct continuous tailrace water quality monitoring of temperature and DO for a year-long period in order to represent annual tailrace water quality conditions and their relationship to project operations. Monthly grab samples will be collected from the tailrace and analyzed for the following water quality parameters: 5-day biological oxygen demand, ammonia, nitrate-nitrite, organic nitrogen, total phosphorous, ortho-phosphate, and organic phosphorous.

The existing and newly collected water quality data will be used to analyze the effects of project operations on water quality in Lake Jackson and the Lloyd Shoals tailrace area.

Georgia Power has obtained existing water quality data for the Ocmulgee River downstream of the Project collected by GEPD for modeling purposes and for EPA’s National Rivers and Streams Assessment (EPA, 2016). These data and other potential sources of existing water quality data for the Ocmulgee River downstream of the Project will be reviewed and analyzed in the study report.

In its comments on the PSP, EPA expressed an interest in seeing past and new data sets in the same matrix chart for comparison purposes. Georgia Power will present summary tables of historical and recent data sets together, as appropriate, in the study report.

Algal Blooms

To address FERC and stakeholder interests regarding blue-green algal (cyanobacteria) blooms that have occurred in Lake Jackson in recent years, Georgia Power proposes to include in the Water Resources Study, a literature review and analysis of the occurrences of harmful algal blooms in Lake Jackson, the factors that could lead to harmful algal blooms, and their relationship, if any, to project operations.

3.3.3 Resource Management Goals

GDNR is the primary resource agency having jurisdiction over water resources in the project area. GEPD (2015) classifies the water use of the main pool of Lake Jackson as Recreation. This area extends from South River at Hwy 36, Yellow River at Hwy 36, and Alcovy River at Newton Factory Road Bridge downstream to Lloyd Shoals Dam. The South and Yellow River arms of the reservoir upstream of Hwy 36 are designated for Fishing use. The Ocmulgee River from Lloyd Shoals Dam downstream to Wise Creek, a distance of about 6.2 river miles, is classified for Drinking Water.

3.3.4 Existing Information

As described in the PAD, a substantial amount of existing information and data are available for characterizing water use and water quality in the vicinity of the Lloyd Shoals Project. Georgia Power will review and apply this and other available information as appropriate to evaluating the potential effects of continued project operation on water resources in the Ocmulgee River. Key sources of this information include but are not limited to:

- Georgia Power seasonal water quality data collected in Lake Jackson at multiple reservoir locations, typically in spring, summer and fall, from 2000 to 2017. These data include vertical profile measurements and water chemistry analyses of grab samples from 6 stations distributed longitudinally in the main-stem reservoir and in the major tributary coves.
- Water quality data collected by GEPD in Lake Jackson and the Ocmulgee River downstream of the Project.
- Water quality data collected in Lake Jackson by Adopt-a-Lake member Jackson Lake Association.
- Water chemistry data collected for EPA's National Rivers and Streams Assessment (EPA, 2016), which included sites on the Ocmulgee River downstream of the Project.
- Scientific literature and technical papers assessing nutrient loading sources and land use practices upstream of Lake Jackson and their potential influences on nutrient concentrations, algal abundance, and eutrophication in the reservoir.

- Middle Ocmulgee Regional Water Plan (GEPD, 2017) developed under the Georgia State-wide Water Management Plan.
- Water resource management plan of the Metropolitan North Georgia Water Planning District (CH2M and Black & Veatch, 2017) located upstream of the Project in the Ocmulgee River basin.
- Georgia 305(b)/303(d) list documents (GEPD, 2016), which assess whether surface water bodies in the project area and upstream are supporting their designated uses.

3.3.5 Nexus between Project Operations and Effects

Georgia Power operates the Lloyd Shoals Project as a modified run-of-river project. Lloyd Shoals generates during peak power demand hours to meet the electrical system demand with renewable, waste-free, low-emission power. Water for generation at Lloyd Shoals Dam comes from precipitation in the Ocmulgee River basin upstream of the Project. Inflows are stored for short period of time, generally no longer than 24 hours, and then released through generating turbines during peak power demand periods. Georgia Power operates the Lloyd Shoals Project to maintain reservoir elevations between 530 and 527 PD year-round. Lloyd Shoals discharges directly into the Ocmulgee River. When the Project is not operating to generate peaking energy, the Project releases a continuous minimum flow of 400 cfs, or inflow, whichever is less, for the protection and enhancement of fish and wildlife resources downstream of the Project.

3.4 Study Area

For the purposes of water resources, the proposed study area includes Lake Jackson and the Lloyd Shoals tailrace area within the project boundary, tributary watersheds to Lake Jackson, and the Ocmulgee River downstream to the Lloyd Shoals project boundary at Ocmulgee River Park. New water quality monitoring field studies are proposed in the project tailrace area within the project boundary.

Regarding water quality and site-specific effects downstream of the Lloyd Shoals project boundary, Georgia Power believes that existing data characterizing water quality in the Ocmulgee River are sufficient for evaluating downstream water quality effects. Georgia Power will use existing information in analyzing site-specific and cumulative water quality effects downstream of the Project in the PLP and license application for Lloyd Shoals.

3.5 Methodology

Georgia Power's proposed approach for completing the Water Resources Study consists of the following study elements.

3.5.1 Water Quality Monitoring in the Tailrace

Continuous Monitoring of DO and Water Temperature

Georgia Power proposes to conduct continuous DO and water temperature monitoring in the Lloyd Shoals tailrace beginning in May 2019. A water quality monitoring station (i.e., LSTR) will be established in the tailrace area within the direct influence of generation flows where the channel cross section is relatively uniform in depth and the water is well mixed. Figure 3-1 shows the proposed area in which the station will be located. The exact location will be determined in consultation with GEPD. Georgia Power proposes to collect data at the tailrace location for one year to represent annual variation in water quality conditions.

An electronic multi-parameter water quality measurement sonde and data recorder will be deployed to continuously record DO concentration, pH, specific conductance, water temperature, and turbidity in the Lloyd Shoals tailrace area. Water quality data will be recorded every hour. The sonde will be installed on a buoy-mounted system at a depth of 1 meter, consistent with the application of state DO criteria as set forth in GEPD's Rules and Regulations for Water Quality Control (Chapter 391-3-6). Routine maintenance and necessary equipment calibration will be performed monthly throughout the monitoring period. It is Georgia Power's experience that this frequency prevents any maintenance issues associated with long-term deployment of water quality probes (e.g., biofouling, battery longevity). During monthly calibration, grab samples will be collected at 1-m depth near the buoy location and analyzed for 5-day biological oxygen demand, ammonia, nitrate-nitrite, organic phosphorous, total phosphorous, ortho-phosphate, and organic phosphorous.

Georgia Power will compile continuous DO and water temperature data collected from the tailrace monitoring location and align these data with real-time project operational data for the same periods.

3.5.2 Analysis of Information and Data

Seasonal water quality data, including vertical profile measurements of temperature, DO, pH, specific conductance, and turbidity and water chemistry data including nutrients and metals will be analyzed to evaluate water quality within Lake Jackson. Monthly vertical profiles of temperature and DO in Lake Jackson will be plotted to depict vertical stratification patterns and describe the relationship between the project intake's invert elevation and typical depth at which summer thermal and DO stratification occurs in Lake Jackson. Other data sources, such as Adopt-a-Lake volunteer data will be used to augment the existing data record. Summary tables will be prepared for comparison of various historical and recent data sets, as appropriate. Continuous temperature and DO data collected in the tailrace in 2019-2020 will be summarized in tables and graphs and combined with plots of corresponding turbine operations. Data will be plotted to demonstrate the effects of generation during summer critical conditions.

Monitoring trends and data, and abundant existing information and literature on water use, quantity, quality, and cyanobacteria occurrence and blooms in Lake Jackson and the Ocmulgee River will be used to evaluate the water resource issues identified during scoping. The review of cyanobacteria blooms in Lake Jackson will include factors that could lead to harmful algal blooms, and their relationship, if any, to project operations. Literature review of cyanobacteria occurrence will include but not necessarily be limited to the following sources:

- GEPD information and data;
- Georgia Power algal reports and sampling information;
- Research program of phycologist Dr. Kalina Manoylov of Georgia College and State University pertaining to Georgia reservoirs;
- Research of community ecologist Dr. Alan Wilson of Auburn University pertaining to algal blooms, sedimentation, and nutrients in reservoirs;
- The University of Georgia's CyanoTracker Project – blooms reported by public as trigger for remote sensing estimation of cyanobacteria concentration; and
- Scientific literature.

3.6 Reporting

A Study Progress Report will be prepared and provided to participants prior to the completion of the study. The progress report will describe overall progress in completing the proposed monitoring and analysis, summarize preliminary findings as available, and explain any variance from the study plan and schedule.

A Water Resources Study Report will be prepared and provided to participants for review and comment at the conclusion of the 1-year study.

3.7 Schedule

In accordance with the Lloyd Shoals Process Plan and Schedule and the master schedule provided in Section 1.3, the Water Resources Study will be completed according to the milestones listed in Table 3-2 below.

TABLE 3-2
Schedule for Conducting the Water Resources Study

Activity	Deadline
Begin Field Studies and Analysis of Existing Data	May 2019
File Progress Report	January 31, 2020
Complete Field Studies and Analysis of Existing Data	April 2020
File Study Report	May 19, 2020

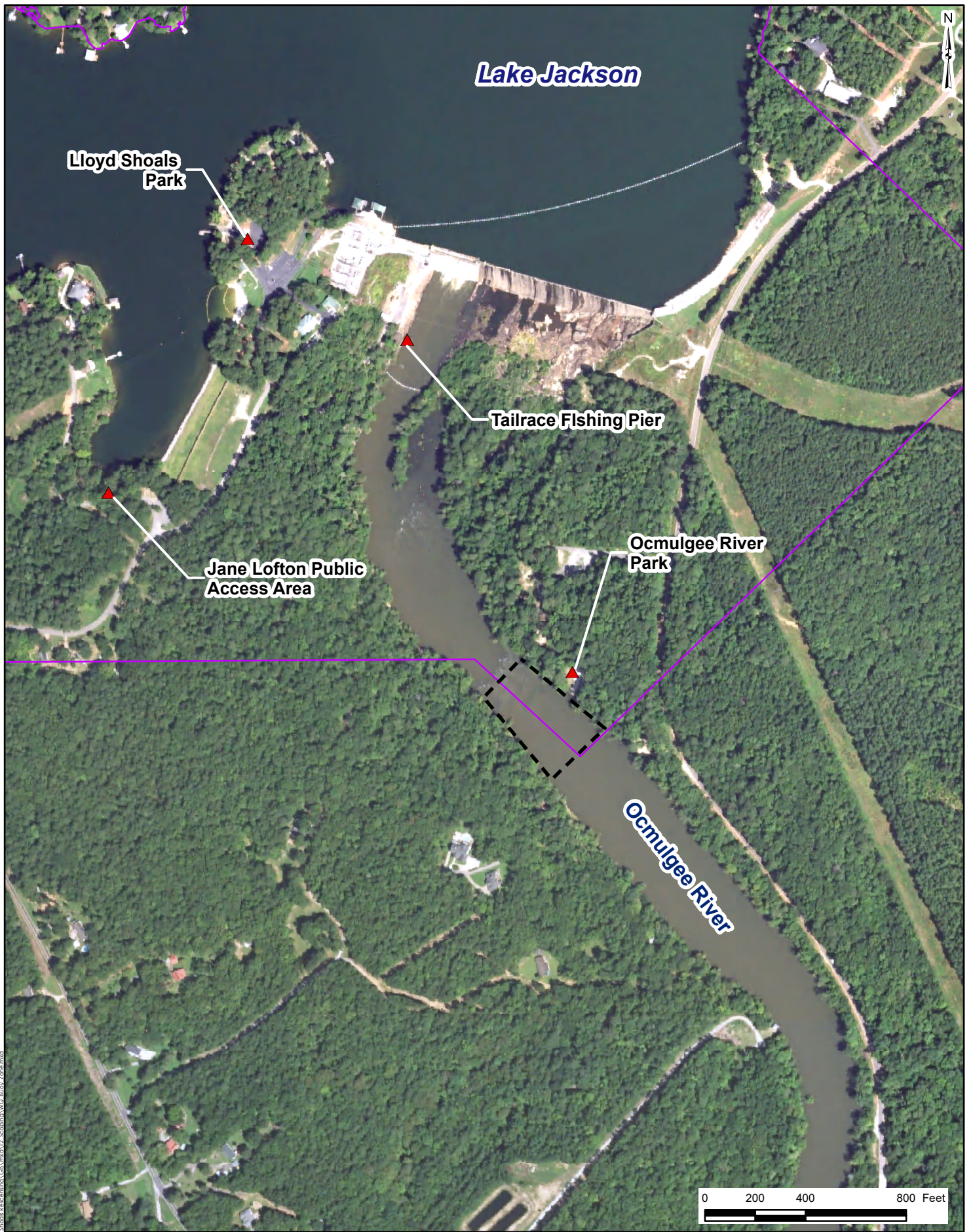
3.8 References

Georgia Environmental Protection Division (GEPD). 2015. Rules and regulations for water quality control, Chapter 391-3-6. Revised May 2015. Georgia Department of Natural Resources, Atlanta, Georgia.

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Legend

- Project Boundary
- Water Quality Monitoring Location (Proposed)

- Recreation Access Point**
- ▲ Georgia Power



Figure 3-1
Proposed Water Quality Monitoring Location
 Lloyd Shoals Project
 (FERC No. 2336)

4.0 FISH AND AQUATIC RESOURCES

4.1 Introduction

Georgia Power proposes to conduct a study characterizing the existing fish and aquatic resources in the Lloyd Shoals Project waters and developing aquatic resource information for evaluating the potential impacts of continued project operation on the fish and aquatic resources of the Ocmulgee River. This will be accomplished through a combination of: analyzing existing fisheries survey data; a shoreline aquatic habitat survey conducted as part of the shoreline reconnaissance survey for the Geology and Soils Study; a freshwater mussel survey; and review of existing fisheries and water quality information and data.

Section 5.0 provides a separate study plan for American Eel Abundance and Upstream Movements, as requested by FWS and NMFS.

4.2 Goals and Objectives

The goal of this study is to develop information for characterizing the existing aquatic environment and evaluating the fisheries-related aquatic resource issues identified during FERC's public scoping process pursuant to NEPA that have a nexus with project operations.

The specific objectives of the study are to:

- Characterize representative shoreline and littoral-zone aquatic habitats occurring in the project reservoir (Lake Jackson).
- Conduct a freshwater mollusk survey within the project boundary to characterize the occurrence and distribution of native mussels and aquatic snails.
- Evaluate the effects of continued project operations on habitat for primary sport fish species in Lake Jackson, including Largemouth Bass and stocked Striped Bass.
- Evaluate the effects of continued project operations on riverine aquatic habitat downstream of the Project using the previously conducted Instream Flow Incremental Methodology (IFIM) study, ongoing conservation efforts for the state endangered Robust Redhorse (*Moxostoma robustum*), and other relevant existing information and data.
- Evaluate the potential for fish entrainment and turbine-induced mortality by applying trends and data from entrainment studies completed at other hydroelectric projects to the physical, operational, and fisheries characteristics of the Lloyd Shoals Project.

4.3 Study Background

This study will develop information needed to evaluate potential impacts of continued project operation on fish and aquatic resources in the Ocmulgee River in the PLP and license application in consideration of: (1) the fish and aquatic resources issues identified during NEPA scoping; (2) any study requests and modifications to studies requested by resource agencies and stakeholders; (3) the known resource management goals of the agencies with jurisdiction over fish and aquatic resources; (4) existing information available for the Ocmulgee River and Lake Jackson as summarized in the PAD; and (5) the requirement that there be a nexus between project operations and effects on the resources being evaluated.

4.3.1 Issues Identified

FERC staff identified in SD2 the following aquatic resource issues pertaining to fisheries:

- effects of continued project operation and shoreline permitting (e.g., docks, seawalls, etc.) on fish habitat and aquatic resources in Lake Jackson, including addressing the need for habitat improvements in Lake Jackson;
- effects of continued project operation on habitat for primary sport fish species in Lake Jackson, including Largemouth Bass and stocked Striped Bass;
- effects of continued project operation on riverine fish and mussel habitat downstream in the Ocmulgee River;
- effects of continued project operation on fish movement in the Ocmulgee River, including addressing the need for fish passage (American Eel and American Shad) at the project (cumulative and site-specific effects);
- effects of continued project operation on fish entrainment and turbine-induced mortality at the Project;
- aquatic non-native invasive species and their effects on native flora and fauna within the project boundary, and the effects of continued project operation and maintenance activities and project-related recreation on non-native invasive aquatic species; and
- effects of continued project operation on state species of concern in the vicinity of the project.

4.3.2 Study Requests

Georgia Power proposed in the PAD (Section 5.2.1, Preliminary Studies List) to conduct a study characterizing existing fish and aquatic resources in the project area and evaluating the effects of continued project operations on fish and aquatic resources inhabiting Lake Jackson and the Ocmulgee River downstream. The study would include: (1) a shoreline aquatic habitat

survey conducted as part of the shoreline reconnaissance survey for shoreline erosion and sedimentation in the Geology and Soils Study; (2) analysis of native mollusk occurrence and habitat use within the project boundary based on existing data and a mussel survey; (3) analysis of GDNR standardized fisheries survey data for the project reservoir for primary sport fishes of interest; (4) analysis of existing IFIM study results for riverine species, existing information on Robust Redhorse habitat use and recruitment downstream of Lloyd Shoals Dam, and the results of ongoing monitoring efforts implemented as part of the Ocmulgee Candidate Conservation Agreement with Assurances (CCAA) for Robust Redhorse; and desktop analysis of the potential for fish entrainment and turbine-induced mortality.

FWS and NMFS each filed study requests for developing baseline data on the life stage, size range, abundance, and timing of upstream movements of American Eel below Lloyd Shoals Dam. Georgia Power's preliminary studies list did not include an American Eel study. Section 5.0 provides a separate study plan adopting with proposed modifications the agencies' study requests.

In its PAD and SD1 comments letter dated November 5, 2018, GDNR's WRD did not propose any additional studies but requested that additional objectives be incorporated into the shoreline aquatic habitat survey study element. These include mapping developed and undisturbed shoreline areas in the project reservoir; surveying and mapping submergent vegetation in the reservoir; incorporating literature review on how rates and magnitude of shoreline development affect sport fish species such as Largemouth Bass, Black Crappie, and sunfish; and incorporating drawdown schedules, including magnitude and duration, to assist planning of aquatic plantings and fish stocking.

Georgia Power proposes to survey shoreline aquatic habitat using a stratified random selection of sites to develop information on the proportion of natural versus modified shoreline with respect to vegetative buffer zone condition, bank stability, vegetative protection, shoreline structural stabilization practices, potential causes of shoreline erosion/sedimentation and whether or not they are project-related, and sources of littoral-zone fish cover and habitat. If submersed vegetation is observed at shoreline sites, its extent of linear coverage of the shoreline site will be estimated (see Figure 2-2) but mapping of submersed vegetation in the reservoir is not a purpose of the survey. The distribution and abundance of submersed vegetation will be characterized in the Terrestrial, Wetland, and Riparian Resources Study (Section 6.0) based on a field reconnaissance survey. As requested by WRD, the shoreline analysis will review literature on the relationship between structural stabilization practices (i.e., developed shoreline) and littoral-zone fish habitat. Regarding reservoir drawdowns, Georgia Power schedules drawdowns for homeowner and shoreline maintenance every few years and notifies GDNR in advance.

In its comments on the PAD and preliminary study proposals dated November 5, 2018, FERC staff requested that the proposed desktop analysis of fish entrainment and mortality develop an estimate of the total number of fish entrained annually by species, size class, and season.

Georgia Power has incorporated estimating the magnitude, species composition and relative abundance, size distribution, and seasonal distribution of annual entrainment into this Fish and Aquatic Resources Study Plan. WRD also requested estimates of monetary loss of fish due to entrainment and impingement. Georgia Power is not proposing to estimate the monetary loss of fish because the potential effects of entrainment on fishery resources have yet to be assessed and there is no basis for finding that mitigation would be justified or that compensation for lost fish would result in appropriate resource-based enhancement.

During the Study Plan Meetings, FERC staff requested that Georgia Power provide more detail about the Freshwater Mollusk Survey methodology in the RSP. The revised methodology further describes the occupancy-based sampling design, which estimates the probability of species occurrence while accounting for incomplete species detection. Supporting references are cited on the occupancy-modeling approach and a case study on its use by WRD and FWS for mussels in the lower Flint River of Georgia.

FERC staff also recommended that review of the existing IFIM study consider the extent to which changes in downstream channel morphology may have occurred during the license term. The revised methodology includes review of a geomorphic analysis of Piedmont rivers in Georgia conducted by the U.S. Geological Survey (USGS) and existing information pertaining to land cover, discharge characteristics, channel morphology, and other factors to evaluate potential changes in channel morphology and their influence on the habitat-discharge relationships previously modeled.

4.3.3 Resource Management Goals

WRD and FWS are the primary resource agencies having jurisdiction over fish and aquatic resources in Lake Jackson and the Ocmulgee River. In addition, NMFS has jurisdiction over diadromous fishery resources in the Altamaha River basin.

WRD manages the project waters to provide a quality outdoor recreational experience. From a fisheries standpoint, important components of this effort include public access to the natural resource and implementing statewide fish harvest regulations to help manage and conserve sport fish populations.

FWS' overall management goal for the Altamaha River basin and its sub-basins is to protect, enhance, and restore a diverse, healthy, and native aquatic community, the aquatic habitats on which this community depends, and especially imperiled species. This goal includes an objective to provide safe, timely, and effective upstream and downstream passage for native Altamaha River basin fishes, particularly diadromous species.

A goal of NMFS is to restore American Eel to historical habitats and ensure safe migratory pathways to build abundance and resilience in the population (see Section 5.0).

4.3.4 Existing Information

A substantial amount of existing information and data are available for characterizing the fish and aquatic resources in the vicinity of the Lloyd Shoals Project and evaluating the potential resource impacts of continued project operation. Key sources of this information include but are not limited to:

- WRD, which has conducted over 30 years of annual standardized fishery surveys of Lake Jackson. WRD uses these data to understand population characteristics and associated fishing trends, make fisheries management decisions, and characterize angler prospects.
- The previous relicensing studies for the Project in the late 1980's, which included fisheries investigations of Lake Jackson and the Ocmulgee River downstream, and an instream flow study in the Ocmulgee River (EA Engineering, Science, and Technology, Inc. [EA], 1990a, 1990b, 1990c).
- The Fishes of Georgia Website (Straight et al., 2009), cooperatively funded by the FWS, GDNR Wildlife Conservation Section (WCS), and the Georgia Museum of Natural History (GMNH). This source provides an online distributional atlas of freshwater fishes in Georgia based on historical and recent collection data.
- Online species accounts and occurrence maps by Hydrologic Unit Code (HUC) 10 watershed for fish species of conservation concern, prepared by GDNR WCS.
- The Georgia Bass Chapter Federation (GBCF, 1996-2015), which has compiled angler catch data annually for Lake Jackson and numerous other Georgia reservoirs from bass tournaments for the past 20 years.
- Fish species distribution, habitat use, and conservation information available in the scientific literature and through NatureServe Explorer (NatureServe, 2017), an online database providing in-depth coverage for rare and endangered species.
- EPA's National Rivers and Streams Assessment (EPA, 2016; GDNR, 2019), which included fisheries surveys in 2009 and 2014 at up to five sites on the Ocmulgee River downstream of the Project, including one about 13 miles downstream within the Piedmont province.
- Scientific literature on the distribution of fishes in the Ocmulgee River, including nongame species (Bart et al., 1994; Nuckols and Roghair, 2004); habitat use and movements of Robust Redhorse (Jennings and Shepard, 2003; Grabowski and Jennings, 2009; Pruitt, 2013); and spawning migrations and habitat use of Atlantic Sturgeon in the Altamaha River basin (Ingram and Peterson, 2016).

- GDNR WCS records of mollusks in the upper Ocmulgee River basin, 2008-2014; and scientific literature on the distribution of and suitable host fishes for freshwater mussels from the Altamaha River basin (Wisniewski et al., 2005; Johnson et al., 2012).

4.3.5 Nexus between Project Operations and Effects

Georgia Power operates the Lloyd Shoals Project in a modified run-of-river mode for generation during peak power demand hours to meet electrical system demand. Inflows are stored for only short periods of time, generally no longer than 24 hours, and then released through the generating turbines during peak power demand periods. Daily fluctuations of Lake Jackson are less than 1.5 ft about 98-percent of the time.

Lloyd Shoals Dam discharges directly into the Ocmulgee River. When the plant is not operating to generate peak energy, the Project releases a continuous minimum flow of 400 cfs, or inflow, whichever is less, for the protection of fish and wildlife resources in the Ocmulgee River downstream.

Lloyd Shoals Dam is one of two major dams on the mainstem Ocmulgee River, the other being Juliette Dam located about 19 miles downstream. Downstream of Lloyd Shoals Dam, the Ocmulgee River flows south and then east-southeast for 250 miles south to its confluence with the Oconee River to form the Altamaha River. The Altamaha River flows 137 miles southeast to the Atlantic Ocean.

4.4 Study Area

The proposed study area includes the FERC project boundary around Lake Jackson and the Lloyd Shoals tailrace area, and the Ocmulgee River downstream to Juliette Dam.

4.5 Methodology

Georgia Power's proposed approach for completing the Fish and Aquatic Resources Study consists of the following study elements.

4.5.1 Shoreline Habitat Survey

Georgia Power proposes to conduct a shoreline habitat survey that will characterize representative shoreline and littoral-zone aquatic habitats occurring throughout the project reservoir. Section 2.0 (Geology and Soils) describes the methodology for the shoreline habitat survey to be conducted concurrently with the shoreline reconnaissance survey for erosion and sedimentation.

4.5.2 Freshwater Mollusk Survey

A survey will be conducted within the Lloyd Shoals project boundary and at certain locations near the project boundary within the period May 2019-April 2020 to characterize the

occurrence, distribution, relative abundance, and species richness of the native freshwater mussel community. Additionally, a survey will be conducted upstream of and near the project boundary in the Alcovy River for the rare gastropod mollusk Reverse Pebblesnail (*Somatogyrus alcoviensis*). The surveys will focus on habitats having the greatest potential to support rare, threatened, and endangered (RTE) species of mollusks.

The mollusk survey of the Lloyd Shoals project area will also be part of field studies associated with the Altamaha Mollusk Candidate Conservation Agreement (CCA). The CCA is a collaborative and cooperative 30-year agreement between Georgia Power, WRD, and FWS to implement conservation measures for certain mollusk species of the Altamaha River basin. Species targeted for conservation in the CCA include Delicate Spike (*Elliptio arctata*), Altamaha Arcmussel (*Alasmidonta arcula*), Inflated Floater (*Pyganodon gibbosa*), Savannah Lilliput (*Toxolasma pullus*), and Reverse Pebblesnail. The first annual survey for the CCA will specifically focus on the Lloyd Shoals Project area.

The survey will be led by WRD. WRD's subject matter expertise includes knowledge of the mollusk fauna of the Altamaha River basin and the Lloyd Shoals project area, and is covered by a Federal Endangered Species Permit. Georgia Power will assist logistics and field work components of the mollusk surveys.

Lake Jackson Mussel Survey

A mussel survey of Lake Jackson will be conducted in representative habitats as determined by pre-survey reconnaissance. The reservoir will be searched for native mussels using an occupancy-based sampling design developed by WRD. This design estimates the probability of species occurrence while accounting for incomplete species detection (Wisniewski et al., 2013; MacKenzie et al., 2018). Up to 12 survey sites will be distributed within coves, tributary embayments, and along the margins of the historic river channel, where habitat is potentially most suitable. The survey will be conducted in daylight hours in summer or fall 2019.

The surveys will be conducted by a team of biologists experienced in mussel collection. The effort spent searching for native mussels at each site will be determined on site by the team leader and recorded in person-hours. The survey will target a reservoir-wide search effort of 20 person-hours or more. The survey methods will be tailored to site-specific conditions of depth, accessibility, water clarity, and safety. Survey methods may include visual observations while wading, hand grubbing while on hands and knees, snorkeling, self-contained underwater breathing apparatus (SCUBA), and surface-supplied air in deeper water. Divers will follow all applicable safety regulations.

The mussel survey in Lake Jackson will target areas containing potentially suitable habitat and habitats previously documented to harbor native species. The survey team will identify and enumerate all live mussels and shells of dead mussels found. All mussel specimens will be measured (length in millimeters [mm]), unless a large number of live specimens is encountered, in which case representative subsamples of shells will be measured. The location

of all survey areas will be documented in the field using a hand-held Global Positioning System (GPS) unit. Representative live specimens of each species will be digitally photographed. Unless a voucher specimen is required for positive identification, all live mussels will be returned to source habitats. Field notes will be recorded to include date and time of the survey and general habitat information about the survey area.

Reverse Pebblesnail Survey

A survey will be conducted for Reverse Pebblesnail upstream of the project boundary in the Alcovy River. The species is very small, often with a shell length of less than 3 mm. The species is known to inhabit rapidly flowing water on surfaces of gravel, cobble, boulder, and bedrock, and Hornleaf Riverweed (*Podostemum ceratophyllum*), but is absent from silty substrates.

The survey will be conducted during summer or fall 2019. Search effort will be conducted in representative habitats for this species. Search effort and results will be managed using WRD's occupancy-based model. The number of survey sites within the shoals will be determined on site by the team leader at the time of the survey, which will be conducted in daylight.

The survey will be conducted by a team of biologists experienced in collection of mussels and gastropods (snails). The effort spent searching for native snails at each site will be determined on site by the team leader and recorded in person-hours. The survey methods will be tailored to site-specific conditions of depth, accessibility, water clarity, and safety. Survey methods may include visual observations while snorkeling, SCUBA, and surface-supplied air. Divers will follow all applicable safety regulations.

The survey team will identify and enumerate all live snails and shells of dead snails. Specimens large enough to measure in the field will be measured (length in mm). If a large number of live specimens is encountered, a subsample of specimens will be measured. The location of all survey areas will be documented in the field using a hand-held GPS unit. If large enough for reasonable viewing, representative live specimens will be digitally photographed. Due to the very small size of Reverse Pebblesnail, voucher specimens may be required for later positive identification and measurement in a laboratory. Otherwise, all live snails will be returned to source habitats. Field notes will be recorded to include date and time of the survey and general habitat information about the survey area.

Lloyd Shoals Tailrace Area Mussel Survey

A mussel survey of the Lloyd Shoals tailrace area will be conducted in representative habitats concurrent with the reservoir mussel survey. The search reach will extend from Lloyd Shoals Dam downstream a distance of up to 1.8 river miles to encompass habitats within the project boundary (to 0.5 mile downstream) and the islands and shoals immediately downstream of the Georgia Hwy 16 bridge (Figure 1-2).

The survey will begin with a reconnaissance of benthic substrates in the tailrace reach. Up to 12 areas in the river channel will be searched for the presence of native mussels. The survey will use the occupancy-based sampling design recommended by WRD, which estimates the probability of species occurrence while accounting for incomplete species detection (Wisniewski et al., 2013; MacKenzie et al., 2018). The effort spent searching for native mussels at each site will be determined on site by the team leader and recorded in person-hours. The survey will target a tailrace area-wide search effort of 20 person-hours or more. The survey methods will be tailored to site-specific conditions of depth, accessibility, water clarity, and safety. Survey methods may include visual observations while wading, hand grubbing, snorkeling, SCUBA, and surface-supplied air in deeper water. Divers will follow all applicable safety regulations.

The survey team will identify and enumerate all live mussels and shells of dead mussels found. All mussel specimens will be measured (length in mm), unless a large number of live specimens is encountered, in which case representative subsamples of shells will be measured. The location of all survey areas will be documented in the field using a hand-held GPS unit. Representative live specimens of each species will be digitally photographed. With exception of necessary voucher specimens, all live mussels will be returned to source habitats. Field notes will be recorded to include date and time of the survey and general habitat information about the survey area.

Georgia Power will obtain WRD's summarized survey information and incorporate it into the Fish and Aquatic Resources Study Report.

4.5.3 Habitat for Primary Sport Fish Species

The availability of suitable summer water quality for sport fish species in Lake Jackson, including Largemouth Bass and Striped Bass, will be assessed using reservoir water quality data collected annually by Georgia Power, standardized fisheries survey data for primary sport fishes collected annually by GDNR, and Largemouth Bass and Striped Bass temperature and DO preference criteria reported in the scientific literature. Georgia Power collected seasonal water quality data at up to six sampling stations throughout Lake Jackson on an annual basis from 2000 to 2017, including vertical profile measurements of water temperature and DO at multiple locations. These existing data will provide the basis for characterizing summer reservoir water quality and habitat for Largemouth Bass and Striped Bass as two popular sport fisheries in the project reservoir.

Vertical profile data for the warmest months, including April through September, will be depicted in graphs of depth versus water temperature and depth versus DO concentration to characterize the spatial and temporal extent of summer vertical stratification that occurs in Lake Jackson. In addition, data will be graphed as monthly isopleths showing the variation in water temperature and DO over the entire length of the reservoir. This analysis will be used to delineate those areas of the reservoir which vertically stratify during the summer and those areas which may tend to mix.

Existing fisheries survey data for Lake Jackson will be analyzed for the abundance and growth characteristics of Largemouth Bass, Striped Bass, and other primary sport fish species. Data available from the standardized fisheries survey database include sampling procedures and effort information, species abundance, length, weight, and other sampling or reservoir specific details. Georgia Power will coordinate with WRD at the outset of the study to obtain the most updated version of the database and associated metadata defining station locations, parameters, units, species-specific weight-length relationships used as the basis for relative condition factors, and other relevant data fields.

The fisheries data will be analyzed to characterize the abundance and well-being and condition of Largemouth Bass and Striped Bass relative to other Georgia reservoirs. Population attributes to be compared may include length-frequency distribution, relative condition factors, species numerical abundance, catch per unit effort (CPUE), and other descriptive statistics.

Habitat suitability for Largemouth Bass and Striped Bass between different areas of the reservoir will be evaluated on the basis of temperature, DO concentration, and time of year with consideration for ranges defined by scientific literature sources as appropriate for each species. For Largemouth Bass, which is a habitat-generalist species, areas will be compared as to the ranges and stability of summer water quality conditions. Documented temperature and DO habitat suitability criteria for adult Striped Bass will be compared to the summer vertical profiles to identify and approximate the areas of the reservoir providing suitable habitat under representative summer conditions. Rather than measuring precise volumes or areas, this approach will characterize variation in habitat suitability for Striped Bass occurring around each water quality station in the reservoir.

In addition, existing information and WRD reports on fish kill events occurring in the project waters during the current license term will be described and summarized in the study report.

4.5.4 Downstream Riverine Habitat

The suitability of summer water temperatures and DO concentrations for fish and other aquatic organisms in the Lloyd Shoals tailrace area will be evaluated using a combination of newly collected water quality monitoring data and literature review. Continuous water temperature and DO monitoring data collected for the Water Resources Study (Section 3.0) will be plotted against contemporaneous generation flows and compared to known water quality tolerance and habitat suitability criteria for representative species as determined from literature sources.

The effects of continued project operations on riverine aquatic habitat downstream of the Project will be evaluated by reviewing the habitat-discharge relationships developed in the previously conducted IFIM study for 12 species and life stages in a 17-mile reach of the Ocmulgee River downstream of Lloyd Shoals Dam (EA, 1990c). The study will be summarized and the results presented in tables and graphs to allow comparison of the physical habitat available, expressed as weighted usable area, across discharge ranging from 50 to 3,500 cfs. Available evidence suggests that the river channel in the IFIM study reach has not changed

appreciably in dimensions or stability over the past 30 years. A geomorphic analysis of stream-gage data for streams within the Piedmont physiographic province of Georgia conducted by USGS (Riley and Jacobson, 2009) found that the Ocmulgee River near Jackson, Georgia exhibited long-term channel stability. Nevertheless, existing information pertaining to land cover, riparian conditions, discharge characteristics, channel morphology, and/or physical habitat will be reviewed to evaluate relative changes in the river channel that may have occurred and their potential to influence the habitat-discharge relationships previously modeled. Potential sources of information include GDNR, USGS, and EPA's National Rivers and Stream Assessment.

In addition, existing literature and available study information will be reviewed for Robust Redhorse, other riverine fish and invertebrate species, and diadromous fishes to further characterize the current condition of potential for impacts to the riverine aquatic community downstream of the Project.

4.5.5 Fish Entrainment Evaluation

The potential for fish entrainment and turbine-induced mortality at the Lloyd Shoals Project will be evaluated using a literature-based approach that draws upon entrainment field studies completed at numerous other hydroelectric projects east of the Mississippi River, including several in the southeastern U.S. Common trends and data from these other studies will be applied with consideration of the site-specific physical, operational, and fisheries characteristics of the Lloyd Shoals Project.

The primary source of turbine entrainment field study information will be the database prepared by the Electric Power Research Institute (EPRI, 1997). The EPRI database includes test data from 43 hydroelectric sites and provides detailed information on the species and size classes of fish collected in monthly entrainment samples. All of these sites are located east of the Mississippi River, and seven are located in the southeastern U.S. (South Carolina, Georgia, and Virginia).

Other sources of turbine entrainment information and data will include comprehensive reviews prepared by EPRI (1992) and FERC (1995a). The FERC (1995a) review provides information for two additional sites in South Carolina and Georgia. Entrainment sampling data for the Stevens Creek Project (Dames and Moore, 1993; FERC, 1995b) and the Richard B. Russell Pumped Storage Project (U.S. Army Corps of Engineers [USACE], 1999) on the Savannah River also will be examined for species composition, relative abundance, and size distribution trends.

The primary source of turbine mortality field study information will be the turbine passage survival database prepared by EPRI (1997). The database includes test data from studies conducted at 51 different turbines (41 hydroelectric sites), including Francis turbines.

Common trends and data from field studies completed at other hydroelectric sites will be applied to the Lloyd Shoals Project to:

- Characterize potential turbine entrainment that could be occurring at the Project, including the magnitude of total annual entrainment, fish size distribution, species composition and relative abundance, and seasonal variation in entrainment rates.
- Evaluate potential mortality rates of fish passing through the turbines based on turbine survival tests conducted at other projects with head and turbine design characteristics similar to those at Lloyd Shoals.

The potential impacts and implications of losses of fish due to entrainment mortality will be assessed based upon fishery survey data for the project reservoir, intake location and related factors in the reservoir forebay, natural mortality rates of young fish, and other relevant factors. In addition, the potential implications of entrainment will be assessed with respect to WRD’s Striped Bass and White Bass-Striped Bass hybrid (hybrid bass) management in Lake Jackson and experimental stocking of American shad in the reservoir.

4.6 Reporting

A Study Progress Report will be prepared and provided to participants prior to the completion of the study. The progress report will describe overall progress in completing the proposed mollusk survey and fisheries analyses, summarize preliminary findings as available, and explain any variance from the study plan and schedule.

A Fish and Aquatic Resources Study Report will be prepared and provided to participants for review and comment at the conclusion of the 1-year study. The study report will compile the data gathered from the mussel survey and present the analyses developed through the use of existing information and data.

4.7 Schedule

In accordance with the Lloyd Shoals Process Plan and Schedule and the master schedule provided in Section 1.3, the Fish and Aquatic Resources Study will be completed according to the milestones listed in Table 4-1 below.

TABLE 4-1
Schedule for Conducting the Fish and Aquatic Resources Study

Activity	Deadline
Begin Field Studies and Analysis of Existing Data	May 2019
File Progress Report	January 31, 2020
Complete Field Studies and Analysis of Existing Data	April 2020
File Study Report	May 19, 2020

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5.0 AMERICAN EEL ABUNDANCE AND UPSTREAM MOVEMENTS

5.1 Introduction

Georgia Power proposes a study to evaluate the abundance and upstream movements of American Eel (*Anguilla rostrata*) in the Ocmulgee River downstream of Lloyd Shoals Dam. This study plan adopts the study requests of FWS and NMFS, with proposed modifications to the methodology to reflect existing information on American Eel in the Ocmulgee River and Altamaha River basin and recent published studies on the seasonality and environmental correlates of the species' upstream migrations.

5.2 Goals and Objectives

The goal of this study is to develop current baseline information on the abundance, life stages, size range, and timing of upstream movements of American Eel that approach Lloyd Shoals Dam within the project boundary. This information will enable FWS and NMFS to evaluate whether passage may be needed for American Eel at Lloyd Shoals Dam.

The objectives of this study are to:

- Objective 1 – Identify the life stage and size range of American Eel migrating to Lloyd Shoals Dam.
- Objective 2 – Identify the timing of upstream movements of American Eel migrating to Lloyd Shoals Dam in terms of seasonality and correlation to environmental variables, including discharge, water temperature, and the percent of moon illumination.
- Objective 3 – Calculate indices of abundance of American Eel migrating to the Lloyd Shoals Project.

5.3 Study Background

This study will develop information on the life stage and abundance of American Eel needed to evaluate potential impacts of continued project operation on the movement of this catadromous² species in the Ocmulgee River in the PLP and license application.

5.3.1 Issues Identified

FERC staff identified as an issue in SD2 the effects of continued project operation on fish movement in the Ocmulgee River, including addressing the need for passage of American Eel at the Project. This issue is to be analyzed for both cumulative and site-specific effects.

² Catadromous species spend most of their lives in fresh or brackish water, then migrate to marine environments to spawn.

5.3.2 Study Requests

Georgia Power's preliminary studies list in the PAD did not identify any potential field studies pertaining to American Eel.

In its PAD and study request comments letter dated November 5, 2018, FWS requested a study on the Life Stage, Size Range, Timing, and Abundance of American Eel below Lloyd Shoals Dam. The study would take place in the mainstem Ocmulgee River below Lloyd Shoals Dam in the 1.2-mile reach extending downstream to the Georgia Hwy 16 bridge. FWS proposes that multiple gear types (boat electrofishing, eel traps) be used to sample American Eel within the study area monthly for a minimum of two years. Information would be obtained on discharge, water temperature, and percent of moon surface illuminated on the last day of each sample for correlation with American Eel abundance. In addition, monthly catch per unit effort (CPUE) would be produced and illustrated by gear types separately and combined and a mark-recapture procedure would be used to derive population estimates (plus 95-percent confidence intervals) of the eel population for each year of sampling.

In its SD1 comments letter dated November 15, 2018, NMFS also requested a study to provide baseline data necessary to evaluate the need for American Eel passage at the Lloyd Shoals Project. The study request shares the same goals, objectives, and proposed methodology as the FWS study request for gathering information on upstream migrant American Eels. NMFS commented that similar data would be necessary for downstream migrants if passage at the Lloyd Shoals Project was recommended.

Georgia Power proposed in the PSP to sample for American Eels within the study area using electrofishing and eel traps during six months of a one-year period, including March-June to encompass the onset and probable peak period of spring upstream migration and September-October to represent fall upstream migration. The approach considered published information on the seasonality and environmental correlates of upstream American Eel migration and quarterly sampling in the Ocmulgee River downstream of the Project in 1987-1988, which generated size-range and CPUE data for 255 eels, including 77 eels from the study area.

In its comments on the PSP, FWS recommended that the study plan include the original request for year-round sampling conducted for a two-year minimum period to capture a range of environmental variation and potential American Eel behavioral responses. In its comments on the PSP, NMFS also recommended the study plan include year-round sampling for a minimum of two years for the same reasons.

Georgia Power proposes herein to sample during eight months of the first year of study (February-June and September-November). This would encompass the probable onset, peak periods, and decline of upstream migration based on literature review, and these months represent all four seasons. The proposed sampling and the quarterly sampling from 1987-1988 will provide two years of data reflecting interannual variation in environmental conditions and eel population characteristics. Georgia Power believes that the sampling approach for a second year of study, if needed, should be developed in consultation with FWS and NMFS after the

first year of study to focus efforts on nighttime surveys of upstream-migrant eels arriving to the base of the dam, and that the methods be tailored to the study area based on the results of the first year of study as discussed in Section 5.5.4.

5.3.3 Resource Management Goals

American Eel is an interjurisdictional diadromous³ fish species and federal trust resource. The Atlantic States Marine Fisheries Commission (ASMFC) coordinates interstate management for American Eel along the Atlantic Coast via an Interstate Fishery Management Plan (ASMFC 2000) and subsequent addenda. Applicable objectives of the fishery management plan include:

- Protect and enhance American Eel abundance in all watersheds where eel now occur.
- Where practical, restore American Eel to those waters where they had historical abundance but now may be absent by providing access to inland waters for glass eel, elvers, and yellow eel, and adequate escapement to the ocean for pre-spawning adult (silver) eel.

FWS' overall management goal for the Altamaha River basin and its sub-basins is to protect, enhance, and restore a diverse, healthy, and native aquatic community and the aquatic habitats on which this community depends. This goal includes an objective to provide safe, timely, and effective upstream and downstream passage for native Altamaha River basin fishes, particularly diadromous species. For diadromous species, FWS' primary goals are to:

- Protect, enhance, and restore passage for existing fish populations, reunify fragmented fish populations, and introduce or re-establish fish migratory pathways.
- Protect, enhance, and restore the habitats on which those populations will depend.

A goal of NMFS is to restore American Eel to historical habitats and ensure safe migratory pathways to build abundance and resilience in the population.

5.3.4 Existing Information

The following life history overview is based primarily on the species accounts of ASMFC (2000) and Shepard (2015) and included references.

American Eel is a catadromous species that ranges in North America along the Atlantic and Gulf coasts in marine and continental waters, penetrating tributary streams far inland. Mature adults spawn in the Sargasso Sea, an area within the western Atlantic Ocean, in winter and early spring. Their progeny disperse in major ocean currents to continental waters. After hatching, the transparent, ribbonlike leptocephalus larvae passively drift westward and northward for about one year before metamorphosing to the glass eel stage. Glass eels are transparent and resemble a miniature free-swimming eel. Glass eels actively migrate toward

³ Diadromous species migrate between freshwater and marine/estuarine environments to complete their life cycles.

land and fresh water, ascending estuaries and river systems during the winter and spring, where they darken into elvers. Elvers migrate upstream primarily at night and are able to surmount vertical obstacles, such as low-head dams with wetted surfaces, that can pose barriers to the upstream movement of other aquatic species.

The yellow eel stage begins with development of full pigmentation at about 100-mm total length. Yellow eel resemble the adult form and range in length up to 280 mm for males and 460 mm for females. They are able to exploit a wide range of habitats, including bays, estuaries, rivers, streams, lakes, and ponds, where they feed opportunistically on invertebrates and smaller fish. Some yellow eel (mostly males) stay behind in brackish areas while others (mostly females) migrate upstream into fresh water and may eventually reach extreme upper portions of the river basin. Helfman et al. (1984) found in the Altamaha River that 94 percent of the eels in fresh water were females. The timing and duration of yellow eel upstream movements is watershed specific and can occur from March through October. Yellow eel may continue moving upstream over many years until they reach sexual maturity. In the Altamaha River, maturation occurs by 3 to 6 years old (Helfman et al. 1984). American Eels in the Altamaha River tend to be smaller, younger, and may mature more rapidly than eels at more northern latitudes.

Hammond and Welsh (2009) studied the movements of radio-tagged yellow eel near Millville Dam on the Shenandoah River, West Virginia, and found the onset of upstream migration in the spring to be associated with an increase in river discharge when water temperature exceeded 15°C. Welsh and Liller (2013) investigated the association between daily counts of upstream migrant yellow eel at the Mill Dam eel fishway and the environmental variables lunar illumination, river discharge, and water temperature. They found elevated river discharge to be associated with almost all peaks of daily eel counts when water temperature ranged from 19 to 28°C. Elevated river discharge and low lunar illumination were also associated with higher counts of upstream migrants. Little yellow eel movement was indicated during low discharge periods, and mass upstream migration was observed during an extreme discharge event.

Yellow eel undergo several physiological changes in maturing into the adult silver eel phase. The silver eel life stage is better suited for ocean migration. Silver eel may begin their seaward spawning migration by the fall. Silver eel in the Altamaha River basin migrate downstream from October to March (Shepard, 2015).

American Eel Abundance in the Ocmulgee River

Fisheries sampling data for the Ocmulgee River from 1987 to 2014 indicate the ongoing presence of a relatively widespread and abundant population of American Eel in the Ocmulgee River basin downstream of the Lloyd Shoals Project. These data include fisheries investigations on the Ocmulgee River in 1987-1988 for the previous relicensing (EA Engineering, Science, and Technology, Inc. [EA], 1990a, 1990b); surveys conducted in 2009 and 2014 related to EPA's National Rivers and Streams Assessment (EPA, 2016); and species occurrence records maintained by GDNR and the Georgia Museum of Natural History.

American Eel sampling data from two years of fisheries investigations on the Ocmulgee River in 1987-1988 (EA, 1990a, 1990b) partly address objectives 1 and 3 of the agencies' study request. They identified the size range and life stage of 77 eels migrating into the proposed study area below Lloyd Shoals Dam (objective 1) and they provided indices of abundance, including CPUE by number and biomass (objective 3).

As summarized in the PAD, fisheries investigations for the previous Lloyd Shoals relicensing included one year of quarterly sampling of the Ocmulgee River at four stations in the Piedmont physiographic province in 1988 (EA, 1990a). The sampling stations each consisted of river segments 0.5- to 1.0-mile in length beginning at distances of 0.6, 4.2, 14.0, and 27.6 river miles downstream of Lloyd Shoals Dam. Three stations were between Lloyd Shoals Dam and Juliette Dam, and one was downstream of Juliette Dam. Boat and backpack electrofishing were used exclusively. All collections were made during daylight hours. American Eel was among the top ten numerically abundant species overall, comprising 2.74 percent of the total catch. Table 5-1 presents the American Eel catch statistics for 1988. Station 1 is within 1.1 miles of the dam (the study area requested by FWS and NMFS). Forty-seven eels were collected at Station 1 and a total of 204 eels were collected from all four stations. The electrofishing catch of eels was highest in April and June and lowest in December at all but Station 3, where only boat electrofishing could be used. CPUE at Station 1 was highest in June at 19.3 fish per half-hour. Most eels in the study were collected by backpack electrofishing during daylight hours (Table 5-2). The eels covered a wide range in length of yellow eels, average length was 343 mm, and the maximum length indicated the possible presence of silver eels in the catch (Table 5-1).

TABLE 5-1
American Eel Quarterly Electrofishing Catch Statistics for the Ocmulgee River below Lloyd Shoals Dam in 1988

	Station 1	Station 2	Station 3	Station 4
Station Location and Habitat				
Miles below Lloyd Shoals Dam	0.6-1.1	4.2-4.8	14.0-15.0	27.6-28.2
Presence by habitat type	Pool, shoal	Pool, shoal	Pool/run	Pool, shoal
Quarterly catch (no. of fish)				
April	11	26	1	10
June	30	29	23	15
September	4	19	5	10
December	2	11	6	2
Total	47	85	35	37
Quarterly CPUE (fish/0.5 hr)				
April	7.3	14.3	0.2	6.0
June	19.3	17.0	3.8	7.6
September	2.7	11.3	0.8	6.3
December	1.0	6.7	1.0	1.3
Quarterly biomass (g)				
April	441	1,786	104	876
June	1,924	2,108	2,840	1,841

TABLE 5-1

American Eel Quarterly Electrofishing Catch Statistics for the Ocmulgee River below Lloyd Shoals Dam in 1988

	Station 1	Station 2	Station 3	Station 4
September	663	2,135	1,013	1,162
December	1,215	1,385	1,198	88
Total	4,243	7,414	5,155	3,967
Quarterly biomass CPUE (g/0.5 hr)				
April	294	981	17	413
June	1,212	1,139	473	824
September	442	1,265	169	645
December	414	819	200	59
Lengths (mm) and Life Stages Present				
	All Stations			
Minimum	168			
Maximum	825			
Mean	343			
Standard Deviation	95			
Life Stages	Juveniles, adults			

Source: EA (1990a)

TABLE 5-2

American Eel Catch per Unit Effort by Electrofishing Gear Type for the Ocmulgee River below Lloyd Shoals Dam in 1988

	Quarterly CPUE (fish/0.5 hr)			
	Station 1	Station 2	Station 3	Station 4
Backpack Electrofishing				
April	7.3	11.3	--	5.3
June	18.7	14.7	--	5.3
September	2.7	10.0	--	6.0
December	0.7	6.0	--	1.3
Boat Electrofishing				
April	--	3.0	0.2	0.7
June	0.7	2.3	3.8	2.3
September	--	1.3	0.8	0.3
December	0.3	0.7	1.0	--

Source: EA (1990a)

As summarized in the PAD, electrofishing sampling at two sites downstream of Lloyd Shoals Dam in September 1987, as part of the instream flow study (EA 1990b), yielded fish species composition and abundance similar to the quarterly sampling in 1988. American Eel was among the top ten numerically abundant species overall, comprising 5.6 percent of the total catch. Fifty-one eels ranged in total length from 190 to 610 mm and averaged 295.2 mm. Thirty

of these eels were captured from the sampling site located between Lloyd Shoals Dam and Georgia Hwy 16 (i.e., the study area requested by FWS and NMFS).

In addition, fisheries surveys conducted for the National Rivers and Streams Assessment (EPA, 2016) document recent occurrence of American Eel in the Ocmulgee River downstream of Lloyd Shoals Dam. Boat electrofishing conducted in July 2009 on the Ocmulgee River upstream of Georgia Hwy 83, about 13 miles downstream of the Project, yielded two American Eels. Sampling conducted by WRD in July 2014 at the same locality on the Ocmulgee River yielded 10 American Eels, representing 2.78 percent of the total catch (GDNR, 2019).

5.3.5 Nexus between Project Operations and Effects

The Lloyd Shoals Project is on the Ocmulgee River at river mile 250.2 in the upper Ocmulgee River basin of the greater Altamaha River basin. The Ocmulgee River joins the Oconee River to form the Altamaha River, which flows 137 miles to the Atlantic Ocean. The Project is located 387 river miles upstream of the Atlantic Ocean above the Fall Line in the Piedmont physiographic province.

Juliette Dam, located about 19 river miles downstream of Lloyd Shoals Dam, is the first dam encountered by upstream migrant American Eel in the Ocmulgee River basin. The fisheries studies summarized above, and occurrence records compiled by the GDNR WCS have established that American Eel are able to ascend Juliette Dam and inhabit the reach of river up to Lloyd Shoals Dam. Occurrence records within the past 25 years include two streams upstream of Lake Jackson.

5.4 Study Area

The proposed study area includes the mainstem Ocmulgee River from Lloyd Shoals Dam downstream about 1.2 river miles to the Georgia Hwy 16 bridge.

5.5 Methodology

Sampling for American Eel within the study area will be conducted using multiple gear types (electrofishing and eel traps) during eight months of a one-year period (2019-2020), including all four seasons. Sampling will be conducted in the months February, March, April, May, and June to encompass the onset and probable peak period of spring upstream eel migration, after water temperature rises consistently above 15°C and river discharge is high on average. Sampling will also be conducted in September, October, and November to represent fall upstream migration. Figure 5-1 shows 2017 and 2018 daily water temperature for the nearest USGS gage downstream on the Ocmulgee River that records temperature (USGS No. 02215000, Ocmulgee River at U.S. 341 at Hawkinsville, Georgia). Water temperature rises above 15°C by late February and ranges up to 25°C into early June. For the months in which water temperature consistently exceeds 15°C (March-October), mean flow by month at Lloyd Shoals Dam is highest in March, April, and May (see Table 5 in the PAD). A combination of water temperature above 15°C and elevated river discharge has been correlated with peaks of

upstream eel migration (Hammond and Welsh 2009; Welsh and Liller 2013). The previous fisheries investigations on the Ocmulgee River (EA 1990a) documented the highest CPUE of American Eel in June and April (Station 1; Table 5-1). Sampling also will be conducted in September, October, and November to characterize seasonal variation in abundance and upstream migration as water temperature approaches and falls below 15°C.

Sampling is not proposed for July-August because water temperature is consistently higher than 25°C (Figure 5-1) and mean river discharge is low. Sampling also is not proposed for December-January because water temperature is consistently below 15°C and studies indicate that eel migration is minimal during winter months (Shepard 2015).

Georgia Power proposes sampling in eight months of the first year of study because the numerical abundance of American Eels from the previous fisheries investigations (Table 5-2) suggests that eight months of sampling will yield sufficient numbers of eels to characterize the life stage and size range of eels migrating into the Lloyd Shoals tailrace area and their abundance. Assuming an average monthly CPUE of 19 eels per hour for backpack electrofishing (average of April, June, and September CPUE in 1988) and 1 hour of backpack electrofishing effort per event, eight months of sampling would be expected to yield about 150 eels. These data would be in addition to the length characteristics and CPUE of 77 American Eels collected seasonally in the same reach in 1987-1988.

Georgia Power proposes that the sampling approach for a second year of study, if needed, be developed in consultation with FWS and NMFS to focus on nighttime sampling and observations of upstream migrant eels arriving to the base of the dam, and that the methods be tailored to the study area based on the results of the first year of study (see Section 5.5.4).

5.5.1 Electrofishing

Electrofishing sampling, including backpack and boat electrofishing as appropriate for depth and habitat conditions, will be conducted once per month in February-June and September-November. Sampling will begin in June 2019 and extend to May 2020 (Table 5-3). This active method of sampling will be effective for characterizing the current size range and life stages of American Eel inhabiting the study area and calculating CPUE. In the previous fisheries investigations, which used daylight boat and backpack electrofishing, numerical CPUE of American Eel in the study area was dominated by the backpack electrofishing catch from wadeable shoal habitats (Table 5-2). All electrofishing will be conducted under daylight conditions during off-peak flow releases from Lloyd Shoals Dam.

Electrofishing methods will be standardized to include timed runs or transects to represent habitats available along the entire length of the study area and both sides of the river. Backpack electrofishing will be conducted in wadeable shoals, shallow pools and backwaters, along shorelines, and in shallow pools near the base of the spillway using a standard backpack electrofisher. A barge-mounted electrofishing unit may also be used to increase the depth of safe access in certain wadeable habitats. Sampling effort will consist of up to six 10-minute runs (totaling 1 hour of effort) to represent the range of wadeable habitats available in the study

area. All fish collected will be held in water-filled buckets or coolers with aeration for processing.

Up to four 30-minute boat electrofishing runs (totaling up to 2 hours of effort) will be made during each sampling event to represent the range of boat-able habitats available in the study area. During each run, the boat will be maneuvered slowly upstream along the shoreline while stunned eels are netted. All fish collected will be held in a live well for processing.

All electrofishing will be conducted under daylight conditions for safety, visibility of stunned eels, and because of the proven capture success of American Eels during daylight electrofishing in previous surveys downstream of Lloyd Shoals Dam. Nighttime sampling using eel trapping methods will also be important for capturing actively migrating eels approaching the base of the dam, as described below.

5.5.2 Eel Trapping

Sampling will also include one multi-day sampling event per month in February-June and September-November, during which eel traps will be deployed overnight for at least two consecutive nights. Sampling will begin in June 2019 and extend to May 2020 (Table 5-3). This passive sampling method will be used to characterize upstream migrant American Eels actively approaching the base of Lloyd Shoals Dam. Eel traps will be deployed in up to five locations near the base of Lloyd Shoals Dam, including shorelines within or approaching the tailrace channel and spillway area, and shallow pools along the base of the spillway.

Eel trap design will be based on the physical habitat conditions and accessibility at the specific locations selected for sampling. Standard eel traps/pots will be constructed from 0.5- by 0.5-inch minimum mesh size wire with 2-inch diameter circular entry rings. Baited traps will be set at sunset and pulled after sunrise the following morning. At readily accessible locations along the dam for tending traps from a staging area, trapping methods may also include the use of a ramp lined with landscape-fabric climbing substrate (Enkamat or Akwadrain), an attraction flow, and a covered collection bucket with aeration or flow-through water supply. Ramp attraction flow will be provided by either gravity-fed or pumped water supply. Ramp traps will be set at sunset and checked and emptied after sunrise the following morning. Trapped eels will be held in water-filled buckets or coolers with aeration for processing.

TABLE 5-3

Sampling Schedule for American Eel Abundance and Upstream Movements Study

Month	Backpack Electrofishing	Boat Electrofishing	Eel Trapping
2019:			
June	X	X	X
July	--	--	--
August	--	--	--
September	X	X	X
October	X	X	X

TABLE 5-3

Sampling Schedule for American Eel Abundance and Upstream Movements Study

Month	Backpack Electrofishing	Boat Electrofishing	Eel Trapping
November	X	X	X
December	--	--	--
2020:			
January	--	--	--
February	X	X	X
March	X	X	X
April	X	X	X
May	X	X	X

5.5.3 Data Analysis

All captured yellow eels will be anesthetized with an approved anesthetic such as Finquel Tricaine Methanesulfonate (MS 222), measured to the nearest mm total length, weighed in grams, caudal fin-clipped, tagged with a Biomark Passive Integrated Transponder (PIT) tag, and released to the study area. Large numbers of elvers, if captured, will be counted volumetrically and a subsample measured for total length. Length-frequency distributions will be produced by month of sampling, area of capture (e.g., base of spillway versus river channel), gear type, and combined gear types for the entire sampling period. Minimum, maximum, and mean total lengths will be reported. American Eels collected near the base of the spillway also will be analyzed separately as life stages and sizes of fish likely to have been actively migrating upstream at the time of capture.

Data for the environmental variables river discharge, water temperature, and percent of moon illumination will be collected for the sampling periods for correlation to eel catch. Discharge data will be obtained from the USGS gage located about 1 mile downstream (USGS No. 02210500, Ocmulgee River near Jackson, Georgia). Water temperature data are available from the USGS gage on the Ocmulgee River at Hawkinsville (USGS No. 02215000) but water temperature data will be continuously recorded in the study area as part of the tailrace water quality monitoring proposed by Georgia Power in the Water Resources Study (Section 3.0); these data will be used when they coincide with eel sampling periods. Readily available percent of moon surface illumination data will be obtained online from the U.S. Naval Observatory for the last day of each sampling event.

The number of eels captured by date will be graphed separately by gear type and combined for the entire sampling period. Any resulting trends will be interpreted. The eel catch by date will also be evaluated for correlation to river discharge, water temperature, and percent moon surface illumination. These data will be presented in graphs and any resulting trends will be interpreted.

Monthly CPUE by separate and combined gear types will be presented. A mark-recapture procedure will also be used to generate a population estimate (plus 95-percent confidence interval) of the American Eel population in the study area.

5.5.4 Second Year of Study

Existing information on the occurrence and abundance of American Eels in the Ocmulgee River indicate the likelihood that one year of electrofishing data from the study area will yield numbers of eels sufficient for characterizing the life stages, size distribution, and abundance of the American Eel population occurring below Lloyd Shoals Dam. Continued electrofishing sampling throughout the 1.2-mile study area in a second year of study may yield limited additional information on eels actively migrating upstream because:

- Yellow eels residing in upstream habitats of the Altamaha River basin (mostly females) may live up to 6 years or longer before maturing to silver eels (Helfman et al., 1984; Facey and Helfman, 1985). The wide length ranges of eels collected in 1987 (190-610 mm) and-1988 (168-825 mm) indicate that multiple age classes were present. After their first years of life, most yellow eels establish a home range where they live and grow until maturity (ASMFC, 2012). Thus, many of the eels collected in the study area may be sedentary and no longer seeking to migrate upstream.
- The elvers and young yellow eels likely to be actively migrating upstream would be most readily detected and/or captured, and differentiated from sedentary yellow eels in the study area, by surveying along the base of the dam at night.

Georgia Power believes that a second year of study, if needed, should focus on nighttime surveys of eels arriving at the base of Lloyd Shoals Dam. Nighttime survey methods could include flashlight surveys to visually document the arrival of upstream migrants and eel trapping to characterize the life stage and size characteristics of the migrating eels. Georgia Power proposes that any study approach for a second-year of study be developed in consultation with the resource agencies after reviewing the findings of the first year of study to better inform the specific survey methods (see also Georgia Power's responses to the PSP comment letters in Appendix A).

5.6 Reporting

A Study Progress Report will be prepared and provided to participants prior to the completion of the study. The progress report will describe overall progress in completing the proposed sampling and data analysis, summarize preliminary findings as available, and explain any variance from the study plan and schedule.

An American Eel Abundance and Upstream Movements Study Report will be prepared and provided to participants for review and comment at the end of the first year of study. The study report will compile the data gathered, present the findings in tables and graphs, interpret any resulting trends, and propose study plan modifications for a second year of study.

5.7 Schedule

In accordance with the Lloyd Shoals Process Plan and Schedule and the master schedule provided in Section 1.3, the American Eel Abundance and Upstream Movements Study will be completed according to the milestones in Table 5-4. Following the filing of the Study Report, a Study Results Meeting will be held on June 3, 2020. During the meeting, Georgia Power will consult with FWS and NMFS on any proposed modifications to the Study Plan for a second year of study, as informed by findings of the first year of study. The second year of study will be completed and an Updated Study Report filed by May 19, 2021.

TABLE 5-4
Schedule for Conducting the American Eel Abundance and Upstream Movements Study

Activity	Deadline
Begin Field Studies	June 2019
File Progress Report	January 31, 2020
Complete First Year of Field Studies	May 2020
File Study Report	May 19, 2020
Study Results Meeting – Consultation on Second Year of Study	June 3, 2020
Second Year of Field Studies (if Necessary)	June 2020-May 2021
Updated Study Report	May 19, 2021

5.8 References

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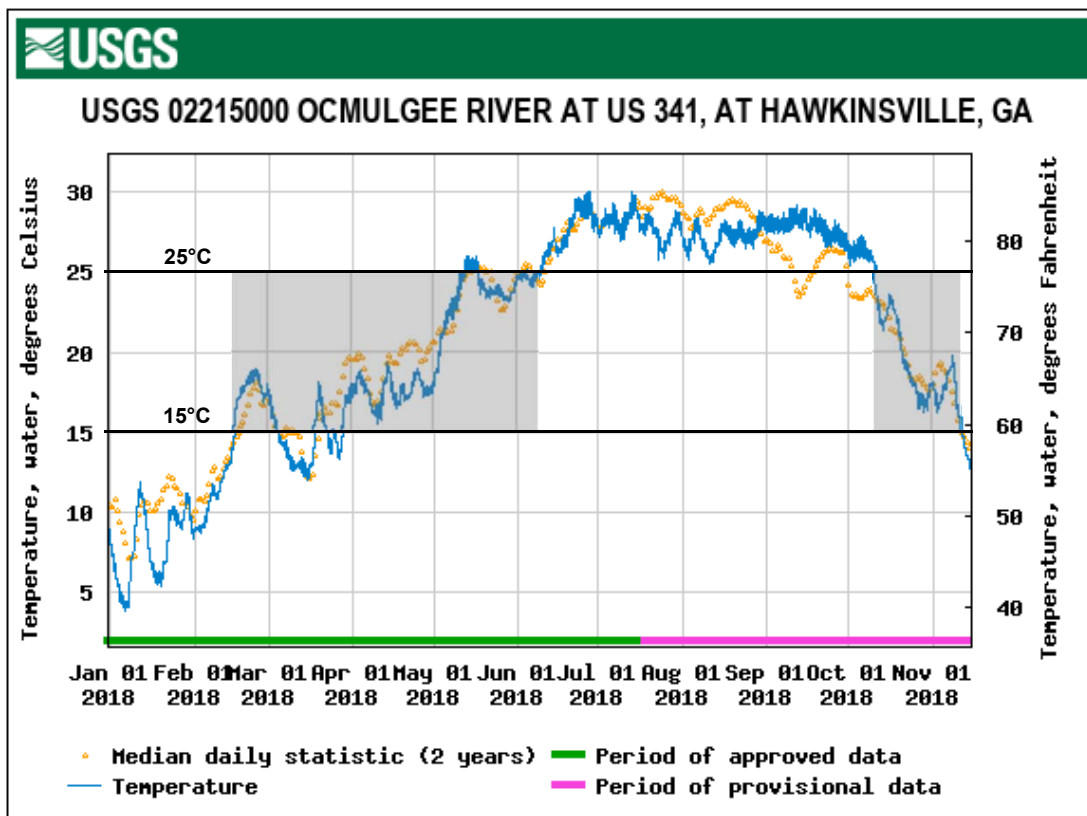
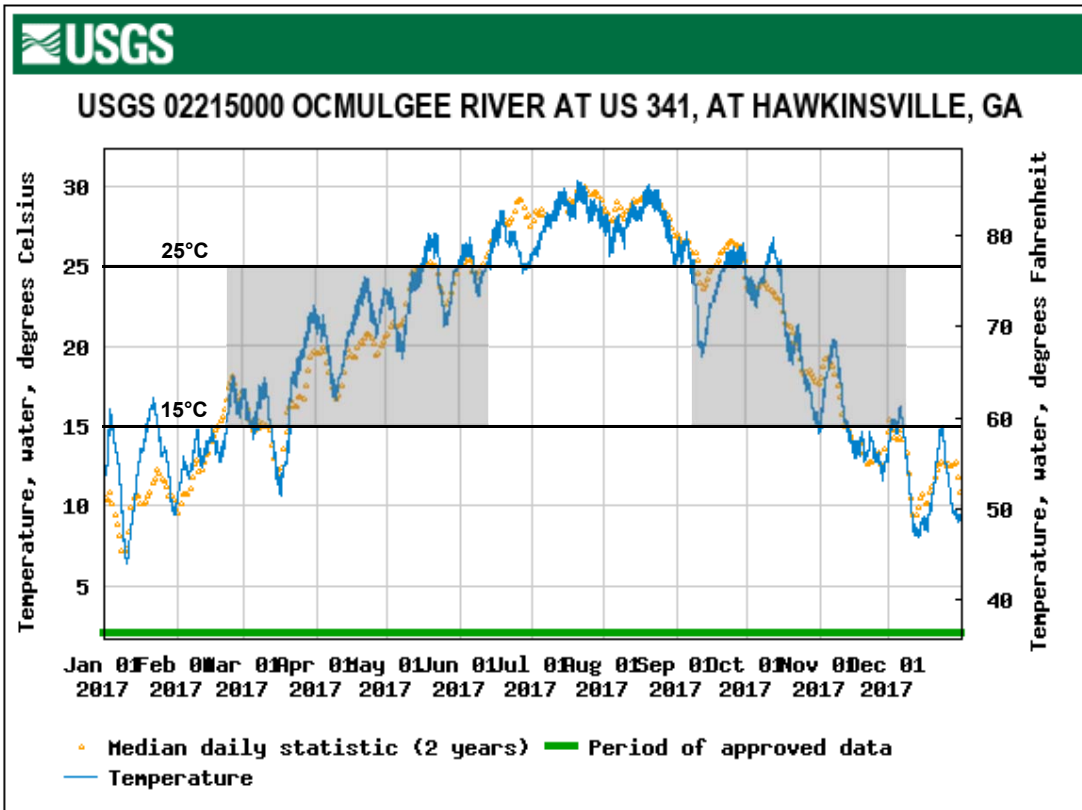


Figure 5-1
 Ocmulgee River Water Temperature in 2017 and 2018 with Suitable Temperature Range for Upstream Movement of American Eel Indicated by Shading
 Lloyd Shoals Project (FERC No. 2336)

6.0 TERRESTRIAL, WETLAND, AND RIPARIAN RESOURCES

6.1 Introduction

Georgia Power proposes to characterize existing terrestrial, wetland, and riparian resources at the Lloyd Shoals Project through a field reconnaissance survey and the use of existing information and data. This study plan combines wildlife and botanical resources as described in Section 4.5 of the PAD with wetlands, riparian, and littoral habitat as described in Section 4.6 of the PAD into a single consolidated study effort.

6.2 Goals and Objectives

The goal of the study is to characterize existing terrestrial, wetland, and riparian resources for evaluating the associated resource issues identified during FERC's public scoping process pursuant to NEPA that have a nexus to project operations.

The specific study objectives are to:

- Describe terrestrial wildlife and botanical resources occurring in the Lloyd Shoals Project area, including providing lists of representative plant and animal species that use representative upland habitats, and to identify invasive species in these habitats.
- Describe the floodplain, wetlands, and riparian habitats occurring in the project area, including lists of representative plant and animal species that use representative habitats, to identify invasive species, and to prepare a map delineating wetland, riparian, and littoral habitat.

6.3 Study Background

This study will develop information needed to evaluate potential impacts of continued project operation in consideration of the terrestrial resource issues identified during scoping, known resource management goals of the agencies with jurisdiction over terrestrial resources, the availability of existing relevant information as to plant and animal species using upland and wetland, riparian, and littoral habitats in the project area, and the requirement that there be a nexus between project operations and effects on terrestrial resources.

6.3.1 Issues Identified

FERC staff identified in SD2 the following list of terrestrial resource issues, which include those also pertaining to wetlands, riparian, and littoral habitat:

- effects of continued project operation and maintenance, project-related recreation, and shoreline development on upland habitat, reservoir wetland, and littoral habitats, and associated wildlife;

- effects of continued project operation and maintenance, as well as project-related recreation, on state species of concern in the vicinity of the project; and
- effects of continued project operation and maintenance activities, including shoreline management, and project-related recreation on non-native invasive botanical and wildlife species.

6.3.2 Study Requests

Georgia Power's preliminary studies list (PAD Section 5.2.1) identified separate studies for wildlife and botanical resources, and for wetlands, riparian, and littoral habitat. These studies would describe terrestrial wildlife and botanical resources, as well as floodplain, wetlands, riparian, and littoral habitats occurring the study area based on a field reconnaissance survey and through review of existing information and data. Because these resource areas tend to overlap spatially, and the field reconnaissance survey would be performed concurrently for both sets of objectives, Georgia Power has consolidated these proposed efforts under a single Terrestrial, Wetland, and Riparian Resources Study.

No study requests pertaining to wildlife and botanical resources or wetlands, riparian, and littoral habitats were filed by stakeholders following the study criteria under 18 CFR § 5.9(b).

In its comments on preliminary study proposals pertaining to wildlife, botanical resources, and threatened and endangered species (letter dated November 5, 2018), FERC staff highlighted the need for sufficient project-specific information for analysis of potential project-related effects on these resources, including information regarding non-native invasive species, RTE species, and their habitats. FERC requests that the study plans include methodologies for collecting sufficient detail allowing its staff to accurately describe the existing natural resources in the project area and assess potential project-related effects on those resources within the project boundary, including at existing formal and informal project facilities (e.g., recreation access sites), and at any other areas under consideration for potential development as part of the licensing proposal. FERC further requests that the timing of field surveys for the botanical RTE species coincides with each species' flowering or fruiting period, as appropriate, for accurate identification. Georgia Power has incorporated these elements into this Terrestrial, Wetland, and Riparian Resources Study Plan.

In its PAD and SD1 comments, WRD requested that Georgia Power survey and map submergent aquatic vegetation in Lake Jackson to assist aquatic habitat planning and addressing future issues, should they occur. WRD also requested that Georgia Power develop an aquatic vegetation plan for the reservoir, which should outline all principles and practices as they relate to aquatic vegetation in the project reservoir and include notifying WRD of aquatic nuisance vegetation treatment in the project area.

Georgia Power proposes to describe the distribution and abundance of submergent/submersed vegetation in Lake Jackson based on familiarity with the reservoir gained from ongoing

shoreline and resource management activities and through the proposed field reconnaissance survey. In addition, there has been no evidence to date of the occurrence of Hydrilla (*Hydrilla verticillata*), a highly invasive exotic aquatic plant species, in the reservoir. Regarding aquatic invasive species management, the information developed in this study through the field reconnaissance survey and review of past treatment of aquatic nuisance vegetation in the reservoir will allow Georgia Power to develop proposals for aquatic vegetation management, as appropriate, in the PLP.

6.3.3 Resource Management Goals

GDNR and FWS are the primary state and federal resource agencies having jurisdiction along the Ocmulgee River pertaining to the protection of terrestrial and wetland resources.

6.3.4 Existing Information

The Lloyd Shoals Project is located in the Southern Outer Piedmont ecoregion. Major forest types include loblolly-shortleaf pine, oak-hickory, and oak-pine forests. The PAD describes dominant native vegetation and other natural community types in the region and lists the Georgia invasive plant species posing the most serious problems or potential to become serious problems in the four counties occupied by the Project.

The wildlife community in the project area includes many terrestrial mammal species, a wide variety of birds using diverse, wetland, upland, and open-water habitats in the project vicinity, as well as diverse reptile and amphibian communities. The Bald Eagle, a Georgia threatened species, occurs year-round within the project area and nests along the shoreline of Lake Jackson on Georgia Power land. The PAD describes and lists the wildlife species occurring in the project area based on an extensive amount of existing information and data.

The wetlands surrounding the Lloyd Shoals Project are primarily palustrine forested, scrub-shrub, and emergent wetlands associated with Lake Jackson. Overall, there are approximately 400 acres of wetlands within the project boundary, and forested/shrub wetlands are the dominant type. The wetlands and riparian areas provide habitat for wildlife, including birds, reptiles, amphibians, and small mammals.

Georgia Power proactively monitors the occurrence of and periodically treats invasive terrestrial and aquatic plants within the project boundary. Georgia Power has occasionally treated the emergence of aquatic weeds in Lake Jackson. Identified taxa include the cyanobacteria *Microcystis* spp., *Lyngbya* spp., and *Cylindrospermopsis raciborskii*; and the vascular aquatic plant Alligatorweed (*Alternanthera philoxeroides*).

Forested stands found on floodplains of Lake Jackson include Green Ash, Red Maple, and Sweet Gum in the canopy, Box Elder and Red Maple within the understory, and River Birch and Water Willow along the water's edge. Natural shoreline vegetation and riparian habitat

within the floodplains of Lake Jackson have been reduced by development, primarily for residential land use and some businesses.

6.3.5 Nexus between Project Operations and Effects

Georgia Power operates the Lloyd Shoals Project in a modified run-of-river mode for generation during peak power demand hours to meet electrical system demand. Inflows are stored for only short periods of time, generally no longer than 24 hours, and then released through the generating turbines during peak power demand periods. Georgia Power normally operates the Lloyd Shoals Project to maintain reservoir elevations between approximately 530 and 527 ft PD year-round, excluding planned drawdowns and drought. Daily fluctuations of Lake Jackson are less than 1.5 ft about 98-percent of the time.

The FERC project boundary generally follows the full-pool elevation contour of 530 ft PD, except in some areas where it follows metes-and-bounds property lines, including areas for public recreation and around the powerhouse (Figure 1-2). Georgia Power maintains four project recreation access areas within the project boundary. The project boundary extends downstream of Lloyd Shoals Dam approximately 0.5 mile to encompass Ocmulgee River Park.

6.4 Study Area

The proposed study area includes the project boundary around Lake Jackson and project lands adjacent to Lloyd Shoals Dam and the tailrace area, including the project recreation facilities.

For the purposes of mapping vegetative cover types and wetlands, the study area will also include a zone extending to 2,000 ft beyond the project boundary around Lake Jackson to encompass a conservatively large area for characterizing the existing environment.

6.5 Methodology

Georgia Power's approach for completing the Terrestrial, Wetland, and Riparian Resources Study consists of the following elements.

6.5.1 Review of Existing Information

Descriptions of existing terrestrial, wetland, and riparian resources in the project study area (i.e., wildlife and botanical resources, and wetlands, riparian, and littoral habitat) will be based on review of existing information summarized in the PAD and other sources, inspection of existing aerial photography and National Wetlands Inventory (NWI) maps, and a field reconnaissance survey for observing habitat and specific plant and wildlife species occurrences and verifying approximate wetland boundaries and locations of significant beds of submergent/submersed aquatic vegetation (see below).

Terrestrial habitats will be quantitatively described and mapped in areas where project-related disturbances would occur. A map of vegetative cover types, including approximate wetland

boundaries, will be prepared for the project boundary around Lake Jackson. Available habitat types will be compared against habitat requirements of wildlife known from the region to refine the list of species most likely to occur within the project area. Wildlife and plant species lists will be compiled for the common species found in the project area.

Wetlands, Bald Eagle nests, and any wading bird nesting areas identified within the project boundary will be approximately delineated and quantitatively described. The extent to which these habitats may extend beyond the project boundary will also be described. Wildlife and plant species lists will be compiled for the common species found in the project area, and the extent of any known occurrences of terrestrial and aquatic non-native invasive plant species within the project boundary will be quantitatively described. Potentially sensitive information pertaining to Bald Eagle nesting and other RTE species locations will be separated out and marked as “privileged” information upon filing the study results. The reservoir elevation-area relationship for Lake Jackson will be evaluated to estimate the area of wetland and littoral zone habitats potentially affected by typical daily reservoir fluctuations.

In addition, Georgia Power will describe its invasive vegetation monitoring and management practices for Lake Jackson and project lands, including the species of invasive plants previously reported from within the project boundary around Lake Jackson, species and acreage treated, management techniques and frequency of maintenance applications, and guidance and best management practices used by Georgia Power in invasive vegetation management.

6.5.2 Field Reconnaissance Survey

A field reconnaissance survey of the study area, concentrating mainly on lands and waters within the project boundary around Lake Jackson, will be conducted in appropriate seasons from May 2019 to April 2020 to observe representative terrestrial communities and associated wildlife habitat and to characterize wetland, riparian, and littoral habitats.

- Field biologists will inspect existing, recent aerial photography prior to and during the survey to identify signatures of representative upland, wetland, and riparian vegetation community types for reconnaissance.
- Teams of biologists will visually assess upland, wetland, and riparian communities around and above the Lake Jackson and Lloyd Shoals tailrace shoreline from a boat and/or walking on Georgia Power and public lands. Areas inaccessible by boat or public lands will be evaluated by inspecting available recent aerial photography.
- Field notes will be recorded, and aerial photographs annotated as to dominant vegetative cover classes including wetlands, unique or unusual habitat types, observations of bird, reptile, amphibian, and mammal species, evidence of wildlife (nests, burrows, etc.), and locations of invasive pest plant species.

- A community evaluation form will be completed for each vegetative community observed (Figure 6-1). The form will be standardized for the survey to include a general habitat description, including moisture regime, and will document common species, invasive pest plant species, and any animal observations.
- Wetland areas, including submergent aquatic beds, will be documented on the community evaluation form (Figure 6-1), including common species, invasive pest plant species, and any animal observations. Wetlands will be characterized according to the FWS classification system (Cowardin et al., 1979).
- Where non-native invasive pest plant species are observed, biologists will estimate the size of the infestation and note whether the species appears to be actively spreading.
- Aerial photography and NWI maps will be used to help locate and verify approximate wetland boundaries for mapping purposes. Mapping will include ground-truthing of NWI wetland boundaries and annotating aerial photographs to update approximate wetland boundaries. Soils, hydrology, and plant composition will be evaluated consistent with the USACE (1987) three-parameter approach, but wetland boundaries will not be formally delineated.

The field reconnaissance survey will be completed within approximately 5 to 7 field days by teams of two biologists. The field reconnaissance will not include a delineation of boundaries of wetlands suitable for a USACE jurisdictional determination but will verify approximate boundaries of existing wetlands for mapping purposes.

Mapping of vegetative cover types, including wetlands, will be developed in a GIS database. Tables will be generated showing acreages of each vegetative and wetland community type within the project boundary and within a zone extending 2,000 ft beyond the project boundary around Lake Jackson.

6.6 Reporting

A Study Progress Report will be prepared and provided to participants prior to the completion of the study. The progress report will describe overall progress in completing the field survey, summarize preliminary findings as available, and explain any variance from the study plan and schedule.

A Terrestrial, Wetland, and Riparian Resources Study Report will be prepared and provided to participants for review and comment at the conclusion of the study. The study report will compile the information gathered from the field survey and the review of existing information and data.

6.7 Schedule

In accordance with the Lloyd Shoals Process Plan and Schedule and the master schedule provided in Section 1.3, the Terrestrial, Wetland, and Riparian Resources Study will be completed according to the milestones listed in Table 6-1 below.

TABLE 6-1
Schedule for Conducting the Terrestrial, Wetland, and Riparian Resources Study

Activity	Deadline
Begin Field Studies and Analysis of Existing Data	May 2019
File Progress Report	January 31, 2020
Complete Field Studies and Analysis of Existing Data	April 2020
File Study Report	May 19, 2020

6.8 References

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 131 pp.

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Figure 6-1
Community Evaluation Form – Lloyd Shoals Project (FERC No. 2336)
Georgia Power Company

Community ID#: _____

Date: _____

General Community Description

Common Species	Canopy	Subcanopy	Ground Cover

IPP Species Observations Species	Canopy	Subcanopy	Ground Cover

Wildlife Observations

7.0 RARE, THREATENED, AND ENDANGERED SPECIES

7.1 Introduction

Georgia Power proposes to conduct a study to characterize existing federal and state RTE species of plants and wildlife that may be present in the Lloyd Shoals Project area through review of existing information and field surveys. For the purposes of this study, RTE species includes species listed as federal and state protected species, species under review for federal listing, and other rare species being tracked by GDNR as species of concern.

7.2 Goals and Objectives

The goal of the study is to characterize existing RTE species, including candidate and special concern species, that may be present in the project area for evaluating significant issues identified during FERC's public scoping process conducted pursuant to NEPA that have a nexus to project operations. The specific study objectives are to:

- List federal and state RTE plant and animal species, and species currently under federal status review, with known records of occurrence near the Project.
- Identify habitat requirements of species included in the list described above.
- Describe distributions and habitat use of RTE species presently occurring near the project.
- Assess the potential effects of project operation on these species and their habitats.

Information compiled in the PAD will be analyzed and updated for this study based on the findings of field surveys and other new information.

7.3 Study Background

This study will develop information needed to evaluate the potential impacts of continued project operation in consideration of the RTE species issues identified during scoping, the resource management goals of the agencies having jurisdiction over RTE species, the availability of current relevant information, and any nexus between project operations and effects on RTE species.

7.3.1 Issues Identified

FERC staff identified in SD2 the following resource issue pertaining to RTE species:

- Effects of continued project operation and maintenance, and project-related recreation, on federally listed endangered, threatened, and candidate species, and their habitat, in the vicinity of the project, including the endangered Gulf Moccasinshell, Oval Pigtoe,

Shinyrayed Pocketbook, Black-spored Quillwort, Michaux's Sumac, Relict Trillium, and Red-cockaded Woodpecker; the threatened Purple Bankclimber, and Little Amphianthus (also known as Pool Sprite); and the candidate Robust Redhorse, Altamaha Arcmussel, Inflated Floater, and Reverse Pebblesnail.

7.3.2 Study Requests

In the PAD (Section 5.2.1), Georgia Power proposed to conduct a study evaluating federal and state RTE plant and animal species, and species currently under federal status review, with known occurrence records near the Project. The study would identify their habitat requirements and describe distributions and habitat use of RTE species presently occurring near the Project. Information compiled in the PAD would be reconsidered and updated based on the findings of field surveys, consultation with the resource agencies, and other new information.

No study requests pertaining to RTE species were filed by stakeholders following the study criteria under 18 CFR § 5.9(b). In its PAD and Study Request comments letter dated November 5, 2018, FWS identified that it has been petitioned to list the Robust Redhorse under the Endangered Species Act. FWS subsequently issued a partial 90-day finding that listing may be warranted. Because this species inhabits the Ocmulgee River downstream of the Lloyd Shoals Project, FWS supports the proposed DO monitoring and analyses that will be conducted in the Lloyd Shoals tailrace as part of the Water Resources Study (Section 3.0).

In its comments on preliminary study proposals pertaining to RTE species (letter dated November 5, 2018), FERC staff requests that the RTE Species Study include an assessment of the potential effects of project operation on these species and their habitats and that the timing of field surveys for the botanical RTE species coincides with each species' flowering or fruiting period, as appropriate, for accurate identification. This RTE Species Study Plan incorporates these elements. FERC also requests that documentation of occurrences of federally-listed species, or their habitats, be filed as "Not for Public Disclosure, Privileged."

7.3.3 Resource Management Goals

FWS and GDNR are the resource agencies having jurisdiction over federal and state RTE species, respectively. In addition, NMFS has jurisdiction over federally listed diadromous fishery resources in the Altamaha River basin.

7.3.4 Existing Information

Information on RTE species potentially occurring in the Ocmulgee River basin of Butts, Henry, Jasper, and Newton Counties, Georgia was obtained for the PAD from rare species databases maintained by the GDNR WCS, FWS (Environmental Conservation Online System) and NatureServe (2017). Literature review also included manuals on Georgia's rare plants (Patrick et al., 1995; Chafin, 2007) and recovery plans and recent species evaluations completed by FWS for federally listed species.

Based on known element of occurrence records (historic or present) and species range and habitat data, 21 state and/ or federally protected species of plants and wildlife potentially occur in the vicinity of the Lloyd Shoals Project. Table 7-1 briefly describes known habitat for each of the 21 species as well as 28 other species of concern being tracked by GDNR.

Federally Protected Species

Nine threatened and endangered species potentially occur within the 4-county project vicinity (Table 7-1). These include four plant species, one bird species, and four mussel species:

- Little Amphianthus (*Amphianthus pusillus*) – threatened;
- Black-spored Quillwort (*Isoetes melanospora*) – endangered;
- Michaux’s Sumac (*Rhus michauxii*) – endangered;
- Relict Trillium (*Trillium reliquum*) – endangered;
- Red-cockaded Woodpecker (*Picoides borealis*) – endangered;
- Gulf Moccasinshell (*Medionidus penicillatus*) – endangered;
- Oval Pigtoe (*Pleurobema pyriforme*) – endangered;
- Purple Bankclimber (*Elliptoideus sloatianus*) – threatened; and
- Shinyrayed Pocketbook (*Hamiota subangulata*) – endangered.

Brief accounts of the four federally protected plant species and one federally protected bird species are provided in the PAD. Critical habitat has not been designated for any of these plant and bird species.

As described in the PAD, the four freshwater mussel species, although reported for Henry County (and listed above by FERC [Section 7.3.1]), do not occur in the Ocmulgee River or the Altamaha River basin. They inhabit the adjacent Flint River basin to the west, where they are endemic to the Apalachicola-Chattahoochee-Flint River (ACF) basin of Georgia, Alabama, and Florida (FWS, 2007). Hence, these four mussel species will not be evaluated any further in the RTE Species Study.

There are no known occurrences of federally threatened or endangered species within the Lloyd Shoals project boundary.

State Protected Plant Species

Five other Georgia listed plants potentially occur in the project vicinity, including one listed as endangered, two as threatened, and two as rare (Table 7-1). Two of the state-protected plant species, Dwarf Hatpins (endangered) and Granite Stonecrop (threatened), inhabit granite outcrops and do not presently occur within the Lloyd Shoals project boundary. Based on available information, Oglethorpe Oak (threatened), Mountain Catchfly (rare), and Silky Camellia (rare) are not presently known to occur within the Lloyd Shoals project boundary.

State Protected Wildlife Species

Seven other Georgia listed wildlife species potentially occur in the project vicinity, including one mussel, three fish, one crayfish, one reptile, and one bird species (Table 7-1). The freshwater mussel species Altamaha Arcmussel is currently present in the Ocmulgee River downstream of Lloyd Shoals Dam and was also recently discovered in Lake Jackson (Georgia Power, 2017b).

Of the three fish species, Altamaha Shiner and Robust Redhorse presently occur in the project vicinity. The Altamaha Shiner, a Georgia threatened species, occurs in tributary streams upstream of Lake Jackson and in the Ocmulgee River downstream of Lloyd Shoals Dam. The species is currently undergoing a status review by FWS to determine whether listing as a threatened or endangered species is warranted (FWS, 2011). The Goldstripe Darter occupies spring-fed headwaters and creeks in the Coastal Plain and is unlikely to occur near the Project.

One established nesting pair of Bald Eagles occurs along the shoreline of Lake Jackson on Georgia Power land. The species is protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

The Southern Hognose Snake is primarily found in the Coastal Plain of Georgia. A single specimen from near Lake Jackson represents the only Piedmont record of the species in Georgia, but this occurrence is historical, and the species may be extirpated from the area. The Southern Hognose Snake is unlikely to occur within the Lloyd Shoals project boundary.

Species of Concern

An additional 28 species tracked by GDNR as species of special concern potentially occur in the project vicinity (Table 7-1). These include 17 plants, one mussel, two freshwater snails, four fishes, one amphibian, one reptile, one bird, and one bat. The mussel species (Inflated Floater) has been found in the Ocmulgee River including Lake Jackson (Georgia Power, 2017). The Reverse Pebblesnail inhabits shoals with rapidly flowing water and is known from two locations in Newton County; both are upstream of the project boundary (Georgia Power, 2017). The species is currently undergoing a status review by FWS to determine whether listing as a threatened or endangered species is warranted. The fish species Brassy Jumprock inhabits the

Ocmulgee River and has been reported from tributaries to Lake Jackson including the South River and Yellow River systems.

7.3.5 Nexus between Project Operations and Effects

Georgia Power normally operates the Lloyd Shoals Project to maintain reservoir elevations between approximately 530 and 527 ft PD year-round, excluding planned drawdowns and drought. Daily fluctuations of Lake Jackson are less than 1.5 ft about 98-percent of the time.

Lloyd Shoals Dam discharges directly into the Ocmulgee River. When the plant is not operating to generate peak energy, the Project releases a continuous minimum flow of 400 cfs, or inflow, whichever is less, for the protection of fish and wildlife resources in the Ocmulgee River downstream.

The FERC project boundary generally follows the full-pool elevation contour of 530 ft PD, except in some areas where it follows metes-and-bounds property lines, including areas for public recreation and around the powerhouse (Figure 1-2). Georgia Power maintains four project recreation access areas within the project boundary. The project boundary extends downstream of Lloyd Shoals Dam approximately 0.5 mile to encompass Ocmulgee River Park.

TABLE 7-1Rare, Threatened, and Endangered Species with Known Records of Occurrence in the Lloyd Shoals Project Vicinity^a

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
PLANTS:						
<i>Amphianthus pusillus</i>	Little Amphianthus	LT	T	G2	Shallow, flat-bottomed depressions (solution pits, vernal pools) on granite outcrops, with thin gravelly soils and winter-spring inundation.	Butts, Henry, Newton
<i>Anemone caroliniana</i>	Carolina Windflower			G5	Openings in seepage swamps over Iredell soils; wet meadows.	Jasper
<i>Carex seorsa</i>	Weak Stellata Sedge			G5	Moist depressions in forests and deciduous swamps.	Newton
<i>Cyperus lupulinus ssp. macilentus</i>	Meagre Hop Flatsedge			G5T5	Open sandy or coarse soil habitats along roadsides, sandy shores of lakes or rivers, rock outcrops in forests, and disturbed soils.	Jasper
<i>Cypripedium acaule</i>	Pink Ladyslipper			G5	Upland pine and mixed pine-hardwood forests with acidic soils; in the mountains, near edges of rhododendron thickets and mountain bogs.	Henry, Jasper
<i>Dryopteris celsa</i>	Log Fern			G4	Wet slopes, hammocks and swamps with calcareous soils.	Jasper
<i>Eriocaulon koernickianum</i>	Dwarf Hatpins		E	G2	Seepage areas and wet depressions on granite outcrops, often with horned bladderwort.	Newton
<i>Eurybia avita</i>	Alexander Rock Aster			G3	Granite outcrops; rooted in shallow soils of moist depressions in light shade.	Newton
<i>Eurybia jonesiae</i>	Piedmont Bigleaf Aster			G3?	Rich deciduous forests bordering rivers and streams; moist ravines	Butts
<i>Glyceria septentrionalis</i>	Floating Manna-grass			G5	Swamps and marshes, either in shallow water or very wet soil; alluvial forests, borders of streams, and shores of ponds or lakes.	Newton

TABLE 7-1Rare, Threatened, and Endangered Species with Known Records of Occurrence in the Lloyd Shoals Project Vicinity^a

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
<i>Gratiola graniticola</i>	Granite Hedge-hyssop			G3	Restricted to ephemeral vernal pools on granite outcrops.	Butts, Newton
<i>Isoetes melanospora</i>	Black-spored Quillwort	LE	E	G1	Shallow, temporarily flooded, flat-bottomed pools formed by natural erosion on granite outcrops.	Butts, Newton
<i>Listera australis</i>	Southern Twayblade			G4	Low, moist woods with rich humus and a shady understory.	Jasper
<i>Panax quinquefolius</i>	American Ginseng			G3G4	Rich, cool, moist but not extremely wet woods under a closed canopy.	Jasper
<i>Pilularia americana</i>	American Pillwort			G5	Granite outcrops, seasonally exposed muddy shores.	Butts
<i>Portulaca umbraticola</i> ssp. <i>coronata</i>	Wingpod Purslane			G5T2	Sandy soils of granite and sandstone outcrops	Newton
<i>Quercus oglethorpensis</i>	Oglethorpe Oak		T	G3	Wet clay soils of seepage swamps, stream terraces, and moist hardwood forests.	Jasper
<i>Quercus prinoides</i>	Dwarf Chinquapin Oak			G5	Roadsides, hillside pastures, and barren slopes with dry rocky or sandy soils.	Newton
<i>Quercus similis</i>	Swamp Post Oak			G4	Rich, moist bottom lands; pine woods, gulf prairies, and marshes.	Jasper
<i>Rhus michauxii</i>	Michaux's Sumac	LE	E	G2G3	Sandy or rocky open woods in areas where disturbance has provided open areas.	Newton
<i>Sedum pusillum</i>	Granite Stonecrop		T	G3	Granite outcrops, usually in mats of moss beneath cedar trees	Henry, Newton
<i>Silene ovata</i>	Mountain Catchfly		R	G3	Rich, deciduous forests over limestone or amphibolite in the Coastal Plain and in Fall Line Ravines.	Jasper
<i>Solidago porteri</i>	Porter's Goldenrod			G1Q	Dry woods and barrens; mix of native grasslands and oak savannah).	Jasper

TABLE 7-1Rare, Threatened, and Endangered Species with Known Records of Occurrence in the Lloyd Shoals Project Vicinity^a

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
<i>Stewartia malacodendron</i>	Silky Camellia		R	G4	Rich ravine and slope forests; lower slopes of sandhills above bogs and creek swamps.	Butts
<i>Trillium reliquum</i>	Relict Trillium	LE	E	G3	Mature hardwood forests in rich ravines and on stream terraces on amphibolite or limestone.	Jasper
<i>Zanthoxylum americanum</i>	Northern Prickly-ash			G5	Along riverbanks and in moist ravines, thickets, and woods; upland rocky hillsides, bluffs, and open woods.	Newton
MUSSELS:						
<i>Alasmidonta arcuata</i>	Altamaha Arcmussel		T	G2	Sloughs, oxbows, or depression areas in large creeks to large rivers with silt, mud, and/or sand substrates.	Jasper, Newton
<i>Elliptoideus sloatianus</i>	Purple Bankclimber	LT			Small to large rivers with sandy to silty substrates and moderate current.	Henry
<i>Hamiota subangulata</i>	Shinyrayed Pocketbook	LE			Medium streams to large rivers with slight to moderate current and sandy to muddy substrates.	Henry
<i>Medionidus penicillatus</i>	Gulf Moccasinshell	LE			Small streams to large rivers moderate flow and sandy substrates.	Henry
<i>Pleurobema pyriforme</i>	Oval Pigtoe	LE			Small streams to large rivers with moderate flow and sand or gravel substrates.	Henry
<i>Pyganodon gibbosa</i>	Inflated Floater			G3Q	Rivers with soft substrates of mud, silts, or fine sands; pool and slack-water habitats of rivers.	Jasper, Newton
CRAYFISH:						
<i>Cambarus howardi</i>	Chattahoochee Crayfish		T	G3Q	Clear, free-flowing waters in riffle habitat in small tributaries to large rivers.	Newton
FRESHWATER SNAILS:						

TABLE 7-1Rare, Threatened, and Endangered Species with Known Records of Occurrence in the Lloyd Shoals Project Vicinity^a

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
<i>Elimia mutabilis</i>	Oak Elimia			G2Q	Large rivers on granite shoals in clear silt-free areas; downstream sides of granite boulders and outcrops in moderate to swift current.	Henry, Newton
<i>Somatogyrus alcoviensis</i>	Reverse Pebblesnail	UR		G1Q	Shoals with rapidly flowing water, on surfaces of gravel, cobble, boulder, and bedrock, as well as vegetation.	Newton
FISH:						
<i>Cyprinella xaenura</i>	Altamaha Shiner		T	G2G3	Small tributaries and rivers; often found in small pools with rocky to sandy substrates.	Butts, Henry, Jasper, Newton
<i>Etheostoma parvipinne</i>	Goldstripe Darter		R	G4G5	Small streams, spring seeps, and runs with aquatic vegetation; occurs below the Fall Line.	Butts, Jasper
<i>Micropterus cataractae</i>	Shoal Bass			G3	Rocky riffles and pools of creeks and small to medium rivers; shoal areas of rivers of and creeks.	Butts, Henry, Jasper
<i>Micropterus sp.</i>	Altamaha Bass				Rocky riffles and pools of creeks and small to medium rivers; shoal areas of rivers of and creeks.	Butts
<i>Moxostoma robustum</i>	Robust Redhorse	UR	E	G1	Medium to large rivers, shallow riffles to deep flowing water; moderately swift current.	Butts, Jasper
<i>Notropis chalybaeus</i>	Ironcolor Shiner			G4	Low gradient creeks and small rivers with sandy substrate; pools and slow runs; clear well-vegetated water.	Jasper
<i>Moxostoma sp. 4</i>	Brassy Jumprock			G4	Silty to rocky pools and slow runs of large creeks; small to medium rivers; impoundments.	Butts, Newton
AMPHIBIANS:						

TABLE 7-1Rare, Threatened, and Endangered Species with Known Records of Occurrence in the Lloyd Shoals Project Vicinity^a

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
<i>Hemidactylium scutatum</i>	Four-toed Salamander			G5	Under objects or among mosses in swamps, boggy streams, and wet areas near quiet pools.	Butts, Jasper, Newton
REPTILE:						
<i>Heterodon simus</i>	Southern Hognose Snake		T	G2	Long leaf pine and/or scrub oak areas with well drained, xeric, sandy soils; wiregrass understory.	Butts
<i>Lampropeltis calligaster rhombomaculata</i>	Mole Kingsnake			G5T5	Areas of soft soil, including abandoned or cultivated fields; adept burrowers and rarely encountered aboveground.	Henry, Jasper
BIRDS:						
<i>Haliaeetus leucocephalus</i>	Bald Eagle		T	G5	Almost always nest near open waters (rivers, lakes, coastal waters, wetlands). Usually found in large, open-topped pines near open water.	Butts, Henry, Jasper, Newton
<i>Picoides borealis</i>	Red-cockaded Woodpecker	LE	E	G3	Large expanses of mature, open pine forest, particularly longleaf, slash, or loblolly pine. Nests in old living pines.	Jasper
<i>Tyto alba</i>	Barn Owl			G5	Nests in large hollow trees or old barns in areas with pasture, grassland, or open marsh.	Henry, Newton
MAMMAL:						
<i>Perimyotis subflavus</i>	Tri-colored Bat			G2G3	Forested landscapes and along waterways; foraging occurs in riparian areas and roosting occurs near openings.	Jasper

Sources: GDNR (2018); FWS (2018).

^a This list is for rare species with known element of occurrence records in Butts, Henry, Newton and Jasper Counties, Georgia.^b Federal status: **LE** = listed endangered; **LT** = listed threatened; **UR** = under review to determine if listing may be warranted.^c Georgia state status: **E** = Georgia endangered; **T** = Georgia threatened; **R** = Georgia Rare.

TABLE 7-1Rare, Threatened, and Endangered Species with Known Records of Occurrence in the Lloyd Shoals Project Vicinity^a

Scientific Name	Common Name	Federal Status^b	Georgia Status^c	Global Rank^d	Habitat	County
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^d Global ranks: G1 = critically imperiled, at very high risk of extinction due to extreme rarity; G2 = imperiled, at high risk of extinction due to very restricted range; G3 = vulnerable, at moderate risk of extinction due to restricted range; G4 = apparently secure, uncommon but not rare; G5 = secure – common, widespread, abundant; ? = denotes inexact numeric rank.

7.4 Study Area

The proposed study area includes the project boundary around Lake Jackson and project lands adjacent to Lloyd Shoals Dam and the tailrace area, including the project recreation facilities.

7.5 Methodology

Georgia Power's approach for completing the RTE Species Study consists of the following elements.

7.5.1 Review of Existing Information

The review will result in a tabular listing of RTE species with known records of occurrence in and near the Lloyd Shoals Project, their federal or state status (or that they have been petitioned for federal listing), their global and state ranks, their habitat requirements, and county of known occurrence. The listing will be prepared based on review of existing information sources listed above including the FWS and GDNR WCS.

This activity will update and refine the listing of RTE species in Table 7-1 (reproduced from the PAD). RTE species with known records of occurrence in the project vicinity will be identified with respect to their historic and present distributions, their habitat use, and the potential availability of such habitats in the study area. Species potentially occurring in the project area will be characterized further as to their documented occurrences within the study area). Any present occurrences of RTE species within the project boundary will be identified. Information on species being tracked by GDNR as species of concern and species petitioned for federal listing (e.g., Robust Redhorse) will also be summarized.

The following sources of existing information will be reviewed for the RTE Species Study:

- The GDNR WCS's on-line Georgia Rare Natural Element Data Portal providing inventory data by county, quarter quad sheet, and watershed (HUC 10) for protected species and species of concern in Georgia.
- The FWS Environmental Conservation Online System and associated listing information, critical habitat designations, recovery plans, and status reviews; and the FWS Georgia Ecological Services Field Offices website, which provides links to endangered species information and facilitates requests for county listings of species.
- The Fishes of Georgia website (Straight et al. 2009), which provides an online distributional atlas of freshwater fishes based on historical and recent collection data from a variety of sources including the Georgia Museum of Natural History, and maps developed by the GDNR WCS.
- The freshwater mussel and snail surveys planned as part of Fish and Aquatic Resources Study described in Section 4.5.2.

- Distribution information for RTE species compiled and maintained by NatureServe (2018).
- Research publications, manuals, regional texts, and other technical reports on Georgia's protected plants and wildlife.

7.5.2 Field Surveys

A field survey for freshwater mollusk species, including freshwater mussels and Reverse Pebblesnail, is proposed under the Fish and Aquatic Resources Study Plan in Section 4.5.2.

Georgia Power proposes to conduct a field reconnaissance survey that will identify potentially suitable habitats for RTE species of plants and wildlife within the study area around Lake Jackson. This survey will be conducted concurrently with the survey of wildlife, botanical, wetlands, riparian, and littoral habitats proposed in the Terrestrial, Wetland, and Riparian Resources Study Plan (Section 6.5). As described in Section 5.5.2, the field work would likely be completed in about 5 to 7 field days by teams of two biologists.

Field surveys will be conducted according to the following methods:

- Existing topographic maps, NWI maps, and recent aerial photography will be inspected prior to the survey to identify areas of potentially suitable habitat for protected species of interest.
- Surveys will be conducted by biologists visually assessing habitats along and above the shoreline from a boat and/or walking on public lands during spring or early summer to coincide with flowering times of RTE plants having the greatest potential to occur in the study area.
- Observations of federally protected or state-protected species will be recorded on the appropriate GDNR WCS reporting forms available for special concern plants and animals (Figures 7-1 and 7-2).
- Areas inaccessible by boat or public lands relevant to the project area will be evaluated by inspecting existing aerial photography.
- Particular attention will be given to any areas containing potentially suitable habitat for RTE terrestrial species, such as granite outcrops, mature coniferous forests relative to the Red-cockaded Woodpecker, or other areas of unique or sensitive habitat, as determined by field observation.
- Occurrences of RTE plants will be recorded as either an area polygon containing many plants, or a point for a single plant or a few plants, using a GPS unit. Habitat and demographic information will be recorded for the occurrence.

Should potentially suitable habitat be found within the project boundary for federally listed plants, additional surveys could be required to determine whether these species occur. Any additional surveys will be timed to occur during the species' flowering or fruiting period or other optimum time, as appropriate, for accurate identification.

7.5.3 Analysis of Information and Data

Existing, relevant, and reasonably available information and data gathered during the RTE surveys in the form of log books, notes, and field data sheet entries will be compiled into electronic tabular and narrative form to describe existing and likely occurrences of RTE species in and near the Project. The results of the freshwater mollusk survey conducted separately will be incorporated into this analysis. Potentially sensitive information pertaining to RTE species locations will be separated out and marked as “Not for Public Disclosure, Privileged” upon filing the study results. This body of information will ultimately be used to evaluate the effects of continued project operations on RTE species in the project area.

7.6 Reporting

A Study Progress Report will be prepared and provided to participants prior to the completion of the study. The progress report will describe overall progress in completing the field survey, summarize preliminary findings as available, and explain any variance from the Study Plan and schedule.

An RTE Species Study Report will be prepared and provided to participants for review and comment at the conclusion of the study year. The study report will summarize current presence or absence of RTE species within the project area and, if RTE species are present, discuss any potential effects associated with continued project operations.

7.7 Schedule

In accordance with the Lloyd Shoals Process Plan and Schedule and the master schedule provided in Section 1.3, the RTE Species Study will be completed according to the milestones listed in Table 7-2 below.

TABLE 7-2
Schedule for Conducting the RTE Species Study

Activity	Deadline
Begin Field Studies and Analysis of Existing Data	May 2019
File Progress Report	January 31, 2020
Complete Field Studies and Analysis of Existing Data	April 2020
File Study Report	May 19, 2020

7.8 References

- Chafin, L.G. 2007. Field guide to the rare plants of Georgia. The State Botanical Garden of Georgia. Athens, Georgia.
- Georgia Department of Natural Resources (GDNR). 2018. Georgia rare element data portal. <http://georgiabiodiversity.org/>. Accessed January 2018.
- Georgia Power Company (Georgia Power). 2017. Candidate conservation agreement (CCA) for mollusks of the Altamaha River Basin, Georgia. Prepared in cooperation with the U.S. Fish and Wildlife Service and the Georgia Wildlife Resources Division, April 2017.
- NatureServe. 2017. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>.
- Patrick, T.S., J.R. Allison, and G.A. Krakow. 1995. Protected plants of Georgia. Georgia Department of Natural Resources, Wildlife Resources Division. 246 pp.
- U.S. Fish and Wildlife Service (FWS). 2011. Endangered and threatened wildlife and plants: partial 90-day finding on a petition to list 404 species in the southeastern United States as endangered or threatened with critical habitat. Federal Register 76(187):59836-59862. September 27, 2011.
- U.S. Fish and Wildlife Service (FWS). 2018. ECOS environmental conservation online system. <https://ecos.fws.gov/ecp/>. Accessed January 2018.



Nongame Conservation Section
2065 US Hwy 278 SE
Social Circle, GA 30025
Phone: (770) 918-6411

SPECIAL CONCERN ANIMAL OBSERVATION AND COLLECTION DATA SHEET

Species Scientific Name: _____

Date Observed / Collected: _____ County: _____

Method of Observation/Capture: _____

Observer / Collector: _____

Affiliation / Address: _____

Field Collection Number: _____

Museum & Accession Number: _____

Site Name: _____ Topographic Quad: _____

Directions To Site From Known Landmark: _____

General Description of Habitat: _____

Specimen Data: _____

Weight: _____ Sex: _____

Additional Notes (e.g. behavior, condition): _____

*****Attach a photocopy from a 7.5-minute U.S.G.S. topographic map showing the location of the observation or collection site. Please mark the precise location of the site.*****

Send to: Katrina Morris, Wildlife Biologist
Georgia Department of Natural Resources
Wildlife Resources Division
Nongame Conservation Section
2065 U.S. Hwy. 278, SE
Social Circle, Georgia 30025

Figure 7-2
Georgia Special Concern Plant Data Sheet



Nongame Conservation Section
2065 US Hwy 278 SE
Social Circle, GA 30025
Phone: (770) 918-6411

SPECIAL CONCERN PLANT DATA SHEET

Species Scientific Name: _____

Date Observed / Collected: _____ County: _____

Observer / Collector: _____

Affiliation / Address: _____

Was a Voucher Specimen Collected? Yes _____ No _____

Where Will specimen Be Deposited? _____

Was a Photo Taken? Yes _____ No _____

Where Will Photo Be Located? _____

Was live material collected? Yes _____ No _____

Where will specimen be grown? _____

Site Name: _____ Topographic Quad: _____

Directions To Site From Known Landmark: _____

General Description of Habitat: _____

Landowner information: _____

Additional Notes (size of population, vigor, flowering, fruiting, etc.): _____

*****Attach a photocopy from a 7.5-minute U.S.G.S. topographic map showing the location of the observation/collection site. Please mark the precise location of the site.*****

Send to: Greg Krakow, Data Manager
Georgia Department of Natural Resources
Wildlife Resources Division
Nongame Conservation Section
2065 U.S. Hwy. 278, SE
Social Circle, Georgia 30025

8.0 RECREATION AND LAND USE

8.1 Introduction

Georgia Power proposes to conduct a study characterizing existing recreational use and land use at the Lloyd Shoals Project and to evaluate the potential impacts of continued project operation on these resource areas. This study will be accomplished through the compilation and analysis of abundant existing recreational use information and new field surveys conducted at project recreation facilities to determine recreation usage trends and demand.

8.2 Goals and Objectives

The goal of this study is to develop information for characterizing existing recreation and land use at the Project and evaluate recreation and land use issues identified during FERC's public scoping process pursuant to NEPA that have a nexus with project operations.

The specific objectives of this study are to:

- Review existing information to describe existing recreation and land use in the Lloyd Shoals project area.
- Characterize the effects of continued project operation on recreational opportunities at the Project.
- Characterize existing recreational capacity and usage on Lake Jackson and in the Lloyd Shoals tailrace area.
- Evaluate the adequacy of existing recreational facilities to meet current and future recreational demand.
- Evaluate the adequacy of the existing Shoreline Management Program to address land use practices, including erosion, and protect environmental resources within the project boundary.

8.3 Study Background

This study will develop information needed to evaluate potential impacts of continued project operation in the PLP and license application in consideration of: (1) the recreation and land use issues identified during NEPA scoping; (2) any studies and modifications to studies requested by resource agencies; (3) the known resource management goals of the agencies with jurisdiction over recreation and land use; (4) existing information and data concerning recreation and land use in the project area; and (5) the requirement for there being a nexus between project operations and effects on the resources being evaluated.

The PAD described the existing recreation facilities providing access to Lake Jackson and the Lloyd Shoals tailrace area in detail (Figures 1-2 and 3-1). Table 7-1 summarizes the operational responsibility, type of use, and amenities for each Georgia Power project recreation facility. Numerous other privately-owned facilities provide direct access to Lake Jackson, as described in the PAD.

8.3.1 Issues Identified

FERC staff identified in SD2 the following resource issues pertaining to recreation and land use:

- effects of the daily water level changes of up to 3 ft on recreational opportunities in Lake Jackson;
- effects of continued project operation on downstream recreation in the Ocmulgee River;
- adequacy of existing public access and recreational facilities in the project boundary to meet current and future recreation demand, including special events (e.g., fishing tournaments) at the Project; and
- adequacy of the existing Shoreline Management Guidelines to address land use practices, including erosion, and to protect environmental resources within the project boundary.

Regarding water level changes in Lake Jackson, as described in the PAD (on page 9 and in Appendix D), Georgia Power maintains reservoir elevations within a 3-foot range (530 and 527 ft PD) year-round. For the years 1997 through 2016, daily reservoir fluctuations were less than 1.5 ft 98-percent of the time and less than 1.0 ft 95-percent of the time. Moreover, since the installation of the Obermeyer gate system in 2012, reservoir fluctuations have been reduced.

8.3.2 Study Requests

Georgia Power proposed in the PAD (Section 5.2.1, Preliminary Studies List) to conduct a study to review existing information to describe recreation, land use, and visual aesthetic qualities in the Lloyd Shoals project area; characterize current types and levels of recreational use on Lake Jackson and in the tailrace area; and evaluate the need for additional recreational access or facilities at Lake Jackson. The study effort would include: (1) review and analysis of the Licensed Hydropower Development Recreation Report (Form 80) recreational use information gathered at the project recreation facilities in 2014 based on car counters, cameras, and visual observations; (2) review and analysis of available fishing tournament information; and (3) assessing the adequacy of existing facilities, determining individual access site pressure and user conflicts, and estimate the number of recreation user days per year.

No study requests pertaining to recreation and land use were filed by stakeholders following the study criteria at 18 CFR § 5.9(b). In its PAD and SD1 comments, WRD commented on the difficulty of assessing the recreational use and capacity data as reported in the Form 80 from 2015. Georgia Power proposes to review and analyze the data in detail, including the dates of field collection and the camera counts, traffic counts, attendance records, staff observation and estimation, and methods for extrapolating recreation days for a full calendar year. WRD also requested a map of Georgia Power land holdings distinguishing between leased and non-leased lands. A map of land ownership within the project boundary indicating whether land is privately owned or owned by Georgia Power will be included as part of this Recreation and Land Use Study. The map will also distinguish whether Georgia Power lands are fee-simple or leased lands.

In its comments on the PAD and preliminary study proposals, FERC staff requested that the non-project recreation facilities listed in the PAD be shown on a map with respect to the project boundary and that the condition of the project recreation facilities, including any erosion due to project-related recreational use be addressed in the study. These elements have been incorporated into the study plan.

In its comments on the PSP, FERC staff requested that the recreation analysis include analyzing the effects of reservoir level fluctuations on recreation access and that the recreation survey methods specify the frequency of vehicle/user accounts at recreation survey sites. These elements have been included in the RSP.

TABLE 8-1
 Recreation Facilities Providing Access to the Lloyd Shoals Project

Park/Facility	County	Acreage	Address	Amenities
Georgia Power Owned and Operated Facilities (located within Project Boundary):				
Lloyd Shoals Park	Butts	5 acres	155 Dam Rd, Jackson, GA 30233	50 parking spaces (with trailer slots), picnic/day use area; swimming beach; large "pirate ship" playground; barrier-free fishing pier; restrooms; 2-lane barrier-free boat ramp, extensive shoreline fishing.
Lloyd Shoals Tailrace Fishing Pier	Butts	0.6 acre	155A Dam Rd, Jackson, GA 30233	10 parking spaces, trash can, barrier-free boardwalk path to fishing pier with seats for fishing as well as a secluded seated area for viewing.
Ocmulgee River Park Public Access	Jasper	4 acres	8484 Jackson Lake Rd, Monticello, GA 31064	15 parking spaces, 1-lane boat ramp; picnic/day use area; bank fishing, trail to eastern tailrace
Jane Lofton Public Access Area	Butts	0.7 acre	Just off Hendricks Road @ Dam Road / Power Plant Road	Bank fishing, gravel parking, and a trash can.

8.3.3 Resource Management Goals

WRD is the primary resource agencies having jurisdiction over recreation resources on Lake Jackson and the Ocmulgee River.

WRD has the goal of managing the project waters to provide a quality outdoor recreational experience, including components related to quality public access to the natural resource as well as implementing statewide fish harvest regulations to help manage and conserve sport fish populations.

8.3.4 Existing Information

The following sources of existing information will be evaluated in completing the Recreation and Land Use Study:

- Form 80 Licensed Hydropower Development Recreation Report from 2015 and supporting data collection in 2014;
- Article 405 Recreation Report completed in 2015;
- Available Georgia Bass Chapter Federation and other fishing tournament information;
- American Whitewater and Georgia Canoeing Association for information on canoeing and kayaking in the Ocmulgee River downstream;
- The Statewide Comprehensive Outdoor Recreation Plan (SCORP) for Georgia (Georgia State Parks, 2016);
- Regional Recreation Plans (Three Rivers RC, Northeast Georgia RC Resource Management Plan, Atlanta Regional Commission Resource Plan);
- Georgia Power Shoreline Management Guidelines; and
- Population and employment projections developed by the University of Georgia for the Georgia state-wide water planning process.

8.3.5 Nexus between Project Operations and Effects

Georgia Power normally operates the Lloyd Shoals Project to maintain reservoir elevations between approximately 530 and 527 ft PD year-round, excluding planned drawdowns and drought. Daily fluctuations of Lake Jackson are less than 1.5 ft about 98-percent of the time and less than 1.0 ft about 95-percent of the time.

The FERC project boundary generally follows the full-pool elevation contour of 530 ft PD, except in some areas where it follows metes-and-bounds property lines, including areas for public recreation and around the powerhouse (Figure 1-2). Georgia Power maintains four

project recreation access areas within the project boundary. The project boundary extends downstream of Lloyd Shoals Dam approximately 0.5 mile to encompass Ocmulgee River Park.

8.4 Study Area

For the purposes of recreation and land use resources, the proposed study area includes: the project boundary extending around Lake Jackson and the Lloyd Shoals tailrace area, including the four project recreation facilities; and the four counties directly adjacent to the Project (Butts, Henry, Jasper, and Newton Counties) for future recreational demands analysis based on forecasted population growth.

The land use assessment will also include a zone extending to 2,000 ft beyond the project boundary to encompass a conservatively large area for characterizing existing land use around the Project, including the preparation of a land use map.

8.5 Methodology

Georgia Power's study approach for completing the Recreation and Land Use Study will analyze existing information and data to identify recreational usage trends and recreation demand. Existing recreation and land use in the project study area will be described based on: review of existing information sources listed in Section 8.3.4; analysis of the most recent recreational use information gathered by Georgia Power in 2014 for the 2015 Form 80; and review of available fishing tournament information.

The four project recreation facilities will be delineated as to their associated acreage within the project boundary, and inventoried and described in terms of numbers of boat ramps, picnic tables, grills, picnic shelters, benches, restrooms, fishing docks, playgrounds, hiking/nature trails, and car and boat trailer parking areas; detailed maps and/or drawings will be provided. The barrier-free characteristics of these facilities will be noted as well as their ability to provide access to persons with physical disabilities. The current condition of the project recreation facilities will be assessed, including any erosion due to project-related recreational use. Georgia Power will evaluate the need for updating and replacing comfort stations during the recreation surveys. In addition, the elevations of the boat ramps will be provided as a basis for assessing effects of water level changes on recreational access and opportunities.

Public and private non-project recreation facilities providing access to project waters, including those listed in the PAD, will also be shown on a map in relation to the project boundary and their recreation amenities described. Fishing tournament information for Lake Jackson will be summarized from Georgia Bass Chapter Federation reports. In addition, regional recreation opportunities will be characterized with respect to reservoirs, parks, fishing, canoeing/kayaking, and other water-based recreation opportunities within a 60-mile radius of the Project.

Georgia Power will review current and future recreation needs identified in the SCORP, applicable plans, comprehensive plans, and resource management plans, as identified in the PAD (Sections 4.8, 5.3, and 5.4).

8.5.1 Recreation Assessment

2015 Form 80 Data Analysis

Annual recreation use of the project reservoir will be estimated by analyzing data collected in 2014 for the development of the 2015 Form 80, including the Article 405 Recreation Report completed in 2015. In completing Form 80, Georgia Power utilized a variety of recreational use sampling methods including trail cameras, traffic counters, attendance records, staff observations, visitor counts/surveys, and estimation. Sampling was conducted according to a planned schedule to target both winter and summer seasons, as well as to capture all the summer “peak” weekends (Memorial Day, Independence Day, and Labor Day).

The methods used in developing Form 80 values will be fully described. Trail cameras were installed in high-use areas to allow for observations of boat ramps and parking lots. Photographs were reviewed to count the number of axles and vehicles. Axle count was used to determine the number of vehicles and trailers recorded on traffic counters. The raw data for Form 80 will be analyzed in detail for the Lloyd Shoals Dam recreation assessment.

Recreation Field Surveys

To supplement the 2015 Form 80, recreation surveys will be conducted at four Georgia Power recreation facilities on five days in 2019: Lloyd Shoals Park, Jane Lofton Public Access Area, Tailrace Fishing Pier, and Ocmulgee River Park. The purpose of these on-site surveys will be to assess recreational user satisfaction and to further characterize user trends, carrying capacity, competing uses, and the adequacy of existing recreation facilities. Two survey instruments, a Recreational Survey Form (Figure 8-1) and a Recreation User Count Form (Figure 8-2), will be used to collect project-related information.

The facility surveys will be administered in spring and summer to include two weekdays, two weekend days, and one holiday weekend day for a total of five survey days. All survey events will be targeted toward fair-weather conditions to maximize the return of user surveys for the effort spent. Each survey event will last approximately 8 to 10 hours. Surveyors will interview users with a prepared questionnaire. The questionnaire will solicit information on group size, county of residence, age groups of visitors, frequency and duration of visits, reasons for visit, species fished for (if fishing), and qualitative ratings of existing facilities, including parking, boat ramps, docks, bank fishing access, restrooms, and facility cleanliness. Open-ended questions will solicit feedback on specific improvements needed and other comments and suggestions. The interviews will also include general creel-related questions to provide information on fishing.

A team of surveyors will administer the surveys at all four access points. The surveyors also will periodically count parked vehicles, trailers, boats, bank anglers, and other users, and

record notes about recreation activities. Vehicle/user counts will be performed upon arriving at and leaving a survey site, and when there is any noticeable change in users while present at the site. Any congestion at the access points will be noted as well. Roving recreation surveys also will be administered to interview bank anglers at informal recreation access points located elsewhere within the project boundary.

User response trends and other findings of the access point surveys will be summarized in tabular format. The information obtained during the access point surveys will be used to supplement the recreational use information collected in 2014 for the 2015 Form 80 and to refine annual use estimates.

The Recreation and Land Use Study Report will provide maps showing the project recreation sites, and privately-operated recreation access facilities and tables of their associated acreage in relation to the project boundary.

The proposed recreation assessment approach will develop the information required for the FERC license application as set forth at 18 CFR § 5.18(b) and will be consistent with guidance provided by FERC (1996) on recreation development at hydropower projects. The recreation survey methodology and level of effort proposed are consistent with generally accepted practice at FERC-licensed projects, employing field reconnaissance, traffic/trail cameras, vehicle counts, discussions with user groups, and the use of existing data.

Future Recreation Demands

Future annual visitation to the Lloyd Shoals Project will be estimated based on review of existing population forecasts. This information will be evaluated, along with information from the SCORP and other relevant sources, to estimate future demand for recreation facilities in the project study area. Future demand will be compared to the estimated carrying capacity of existing facilities on Lake Jackson to characterize future facility needs.

8.5.2 Land Use Assessment

Land use information collected for the PAD will be augmented by reasonably available land use and zoning information from adjacent local governments, literature review, as well as observations from the shoreline reconnaissance survey described in the Geology and Soils Study Plan (Section 2.0). This information will be used to characterize and evaluate the existing shoreline management and shoreline and buffer zone within the Project. A land use map will also be prepared. The mapping will be developed in a GIS database. Tables will be generated showing acreages of each land use classification within the project boundary and a zone extending 2,000 ft beyond the project boundary around Lake Jackson. The land use map will delineate developed and undeveloped lands within the project boundary, as well as any Georgia Power-owned lands (leased and non-leased) adjacent to, and within 2,000 ft of, the project boundary. The study will also evaluate the consistency of the Project with federal, state, regional, and local ordinances and resource management plans.

8.6 Reporting

In accordance with 18 CFR § 5.15(b), a Recreation and Land Use Study Progress Report will be prepared and provided to participants prior to the completion of the study. The progress report will describe overall progress in summarizing preliminary findings as available and explain any variance from the study plan and schedule.

In accordance with 18 CFR § 5.15(c)(1), a Recreation and Land Use Study Report will be prepared and provided to participants for review and comment at the conclusion of the study. The study report will characterize existing recreation and land use and evaluate the need for additional recreational access or facilities.

8.7 Schedule

In accordance with the Lloyd Shoals Dam Process Plan and Schedule and the master schedule provided in Section 1.3, the Recreation and Land Use Study will be completed according to the milestones listed in Table 7-2 below.

TABLE 8-2
Schedule for Conducting the Recreation and Land Use Study

Activity	Deadline
Begin Field Surveys and Analysis of Existing Data	May 2019
Complete Field Surveys and Analysis of Existing Data	October 2019
File Progress Report	January 31, 2020
File Study Report	May 19, 2020

8.8 References

Atlanta Regional Commission (ARC). 2015. Regional resource plan, revised 10.6.2015. https://www.dca.ga.gov/development/PlanningQualityGrowth/Regional%20Plans/Adopted%20Regional%20Plans/Atlanta%20Regional%20Commission/Regional_Resource_Plan-2016.pdf.

Georgia State Parks. 2016. Georgia Plan for Outdoor Recreation, 2017-2021. Georgia's Statewide Comprehensive Outdoor Recreation Plan. Georgia Department of Natural Resources, Stockbridge, Georgia.

Northeast Georgia Regional Commission. 2011. Resource management plan for regionally important resources. April 2011.

Three Rivers Regional Commission (TRRC). 2012. Regionally Important Resources Plan. Griffin, Georgia. February 2012.

Figure 8-1
Recreational Survey Form

Georgia Power Company Lloyd Shoals Project Recreation Use Survey	Georgia Power Company is conducting this survey to learn about recreational use at Lake Jackson, user satisfaction with existing recreation facilities, and whether facility improvements may be needed. Please take a few minutes to answer some questions about your visit today. Thank you for your participation.
---	---

Location:			Date:		Time:
Weather:	<input type="checkbox"/> Clear	<input type="checkbox"/> Partly Cloudy	<input type="checkbox"/> Cloudy	<input type="checkbox"/> Rainy	Temperature:
Investigator:					

1. What is your county and state of residence?		County:			State:	
2. How many people (including you) are in your group today? _____ people						
3. What is your age? (check one)		<input type="checkbox"/> 18-24	<input type="checkbox"/> 25-34	<input type="checkbox"/> 35-44	<input type="checkbox"/> 45-54	<input type="checkbox"/> 55+
4. If you came with others, what are their age groups? (check all that apply)						
<input type="checkbox"/> Children (infants-12)	<input type="checkbox"/> Youth (13-17)	<input type="checkbox"/> Adults (18-55)	<input type="checkbox"/> Senior Adults (over 55)			
5. How many hours will you have spent here today? _____ hours						
6. How many times (including today) have you visited Lake Jackson or its parks in the last 30 days? _____ times						
7. How many times do you visit Lake Jackson annually? _____ times						
8. Do you use the reservoir at night?		<input type="checkbox"/> Yes	<input type="checkbox"/> No	If "yes", how many times per year? _____ times		
9. Are the parks at this reservoir your primary destination for outdoor recreation activities?					<input type="checkbox"/> Yes	<input type="checkbox"/> No
10. What other parks and lakes in the area do you frequent for recreation? (list below)						

11. What is the primary reason for your visit today? (check all that apply)							
<input type="checkbox"/> Boat fishing	<input type="checkbox"/> Pontoon boating	<input type="checkbox"/> Canoeing/kayaking	<input type="checkbox"/> Hiking/walking				
<input type="checkbox"/> Bank fishing	<input type="checkbox"/> Sail boating	<input type="checkbox"/> Sailboarding	<input type="checkbox"/> Shoreline relaxation				
<input type="checkbox"/> Tournament fishing	<input type="checkbox"/> Water skiing	<input type="checkbox"/> Picnicking/playing	<input type="checkbox"/> Other (list below):				
<input type="checkbox"/> Pleasure boating	<input type="checkbox"/> Jet skiing	<input type="checkbox"/> Swimming/wading					
12. If you came to fish today, what were you fishing for? (check all that apply)							
<input type="checkbox"/> Largemouth bass	<input type="checkbox"/> Striped bass	<input type="checkbox"/> Channel catfish	<input type="checkbox"/> Other (list below):				
<input type="checkbox"/> Crappie	<input type="checkbox"/> Hybrid bass	<input type="checkbox"/> Blue catfish					
<input type="checkbox"/> Sunfish/bream	<input type="checkbox"/> White bass	<input type="checkbox"/> Flathead catfish					
13. Please rate the quality of the existing facilities at this access area. (choose one description for each)							
Parking:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor	Restrooms:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
Boat ramp:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor	Cleanliness:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
Dock:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor	Bank fishing access:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor

14. List any specific improvements you would like to see at this access area, and any other comments or suggestions.

FIGURE 8-2
Recreation User Count Form

Georgia Power Company Lloyd Shoals Project User Count Form	<u>Location:</u> _____
	<u>Investigator:</u> _____
Date:	
Time:	
Weather:	
# of Vehicles with Trailers	
# of Vehicles without Trailers	
# of Boats Visible on Reservoir:	
Fishing Boats	
Canoes/Kayaks	
Pontoon Boats	
Power Boats	
Sail Boats	
Rowing Boats/Sculls	
# of Bank Fishers in Observed	
Fill in Location:	
Rec. Area Name, Tailrace, road name	
# of Parties using other facilities and list (e.g., beaches)	
# of Parties Using or Waiting to Use Picnic Tables	
# of Parties Using or Waiting to Use Boat Lanes	
Other Activities Observed – (list recreation activity and number of persons participating):	
# of Vehicles with County Tag from:	
Butts Co., GA	
Henry Co., GA	
Jasper Co., GA	
Newton Co., GA	
Co., GA	
Co., _____	
Co., _____	
Co., _____	
Comments (in particular, note any congestion observed):	

9.0 CULTURAL RESOURCES

9.1 Introduction

Georgia Power proposes to conduct a cultural resources study of the Lloyd Shoals Project to identify and evaluate archaeological and historical resources within the area of potential effects (APE). The study will consist primarily of review of available information on known archaeological and historical sites in the project area, including cultural resources assessments as summarized in the PAD. In addition, limited new field testing will be conducted of previously recorded archaeological sites within the project boundary recommended as eligible for the National Register of Historic Places (National Register). The results of this work will be provided in a report describing the archaeological and historical resources at the Lloyd Shoals Project.

9.2 Goals and Objectives

The goal of this study is to identify, and document historic properties located within the project boundary and immediately adjacent areas that could be affected by the continued operation and maintenance of the Project. This information will be used to develop a Historic Properties Management Plan (HPMP) based upon the guidelines established by the Advisory Council on Historic Preservation and FERC.

Specific objectives of this study are to:

- Identify and delineate the APE.
- Identify known historic resources through literature and site file review.
- Determine if any historic properties are eligible for listing on the National Register.
- Evaluate the potential for effects upon historic resources by the operation and maintenance of the Project or by activities conducted along the shoreline of the project reservoir.

9.3 Study Background

9.3.1 Issues Identified

The Commission identified in SD2 the following resource issues pertaining to cultural resources:

- effects of continued project operation and maintenance on properties that are included in, or eligible for inclusion in, the National Register; and

- effects of continued project operation and maintenance on archaeological and historic resources at the Project.

9.3.2 Study Requests

Georgia Power proposed in the PAD (Section 5.2.1, Preliminary Studies List) to conduct a cultural resources study. The study would identify known historic resources through literature site file review, determine if any historic properties are eligible for listing on the National Register, and evaluate the potential for effects upon historic properties by the continued operation of the Project or by activities conducted along the project reservoir. The study effort would entail further assessments of sites being monitored by Georgia Power to assess effectiveness of the current management plan and provide photographic documentation of the project dam, powerhouse, and associated equipment. FERC listed Georgia Power's proposed study in SD1 as Study No. 12, Cultural Resources.

In its comments on preliminary study proposals pertaining to cultural resources (letter dated November 5, 2018), FERC staff requested that the study include map(s) that clearly identify the APE in relation to the project boundary and provide documentation of concurrence on the proposed APE from the Georgia Historic Preservation Division (HPD) and potentially-affected tribes. These elements have been incorporated in the study plan.

In its comments on the PSP, HPD concurred with revisiting the six archaeological sites currently being monitored to evaluate their current state and assess the need for potential revisions to the management plan for these resources. HPD recommended identifying any structures that are 40 years of age or older located in and adjacent to the project tract, including any nearby properties that could have indirect effects, reviewing topographic maps and the county tax assessor site, and conducting a field survey in order to identify historic resources. Georgia Power has incorporated or otherwise addressed HPD's comment in the study approach as described below and Appendix A.

In its comments on the PSP, the Muscogee (Creek) Nation agreed with the goal of the study to identify and document historic properties within the project boundary. The Tribe requested that the review of previously conducted surveys consider whether they adequately covered the area and also asked to be notified, at the same time as HPD and FERC, in the event of any inadvertent discovery of remains. These elements are incorporated in the study plan.

9.3.3 Resource Management Goals

The GDNR HPD is Georgia's State Historic Preservation Office. *Georgia's State Historic Preservation Plan 2017-2021: Integrating Innovation with Preservation* is the guiding document for the state historic preservation program administered by HPD. Resource management goals consistent with this plan and applicable to the relicensing of the Lloyd Shoals Project include preventing the unintentional disturbance of historic properties by planning for the use of protective measures in activities that may cause a disturbance of the

site and preserving the integrity of any historical structures of the Project's dam and powerhouse and the historical information regarding the development of the Project.

The primary resource management goal of the Muscogee (Creek) Nation, consistent with its tribal goals, is to ensure the protection and preservation of valued historic and cultural resources of the Muscogee Nation for future generations.

9.3.4 Existing Information

The Lloyd Shoals project area was used for thousands of years before European settlers arrived at the Ocmulgee River. Cultural resources studies have been conducted on lands in and adjacent to the Project which have helped to develop an overall cultural context for the project area. Individual sites identified include the Lloyd Shoals Construction and Operator's Village, Dempsey Ferry, Hendrick's Mill, and the hydropower plant/dam itself. These sites are eligible for the National Register (Table 25 of the PAD) and are monitored and reported to FERC annually (Georgia Power, 2017).

9.3.5 Nexus between Project Operations and Effects

Georgia Power normally operates the Lloyd Shoals Project to maintain reservoir elevations between approximately 530 and 527 ft PD year-round, excluding planned drawdowns and drought. Lloyd Shoals Dam discharges directly into the Ocmulgee River. When the plant is not operating to generate peaking energy, the Project releases a continuous minimum flow of 400 cfs, or inflow, whichever is less, through the turbines into the Ocmulgee River downstream for the protection and enhancement of fish and wildlife resources. Project operations and shoreline activities within the FERC project boundary could affect exposure of sub-surface archeological resources.

9.4 Study Area

The study area for cultural resources will include the area between the normal low Lake Jackson pool elevation of 527 ft PD and the project boundary (Figure 9-1). Other areas immediately adjacent to the project boundary may be added to the area evaluated, provided adjoining ownership is willing for cultural resource specialists to be present on adjoining property. Georgia Power proposes that this study area be considered the APE for archaeological resources. The study area for hydro-engineering resources evaluation will include the area immediately around the dam, powerhouse, and operations areas (i.e., the project works) within the project boundary. Georgia Power proposes that this study area be considered the APE for documentation of hydro-engineering resources.

9.5 Methodology

Georgia Power will prepare map(s) clearly showing the APE in relation to the project boundary and will document concurrence of the proposed APE from Georgia HPD and potentially-affected Indian tribes.

Georgia Power will contract the services of a professional cultural resources consultant who will use currently accepted practices as defined under Section 106 of the Historic Preservation Act of 1966 (as amended) and implementing regulations (36 CFR 800) for the identification and evaluation of historic properties. The identification of historic resources will include any structures 40 years of age or older located within the APE. The literature and site file review will include topographic maps and the county tax assessor site. Specific field methods will conform to applicable state guidelines such as HPD's *Archaeological Assessment Reports Components and Guidelines* (2004).

Historic properties at Lloyd Shoals were investigated during a previous relicensing. For the current study, the six sites recommended eligible for the National Register, will be have further evaluation testing and will provide the basis for a definitive determination as to their eligibility and whether or not they warrant continued monitoring. The evaluation testing will be conducted in consultation with HPD and in accordance with the *Georgia Standards and Guidelines for Archaeological Surveys* (Georgia Council of Professional Archaeologists, 2014).

For any human remains accidentally or inadvertently exposed or discovered as part of the cultural resources field evaluation, Georgia Power personnel will:

- Stop all activity leading to the discovery or exposure of the human remains; secure the area from public access, protect and treat the remains respectfully, and notify the Georgia Power project manager.
- Notify the local law enforcement agency, other agencies (HPD, FERC) and the Muscogee (Creek) Nation as appropriate of the discovery or exposure, and schedule a site visit to occur within 24 hours.

The study will culminate in updating the HPMP for the Lloyd Shoals Project.

9.6 Reporting

In accordance with 18 CFR § 5.15(b), a Cultural Resources Study Progress Report will be prepared and provided to participants prior to the completion of the study. The progress report will describe overall progress in completing data collection and explain any variance from the study plan and schedule.

In accordance with 18 CFR § 5.15(c)(1), a Cultural Resources Study Report will be prepared and provided to participants for review and comment at the conclusion of the studies.

9.7 Schedule

In accordance with the Lloyd Shoals Dam Process Plan and Schedule and the master schedule provided in Section 1.3, the Cultural Resources Study will be completed according to the milestones listed in Table 8-1.

TABLE 9-1
Schedule for Conducting the Cultural Resources Study

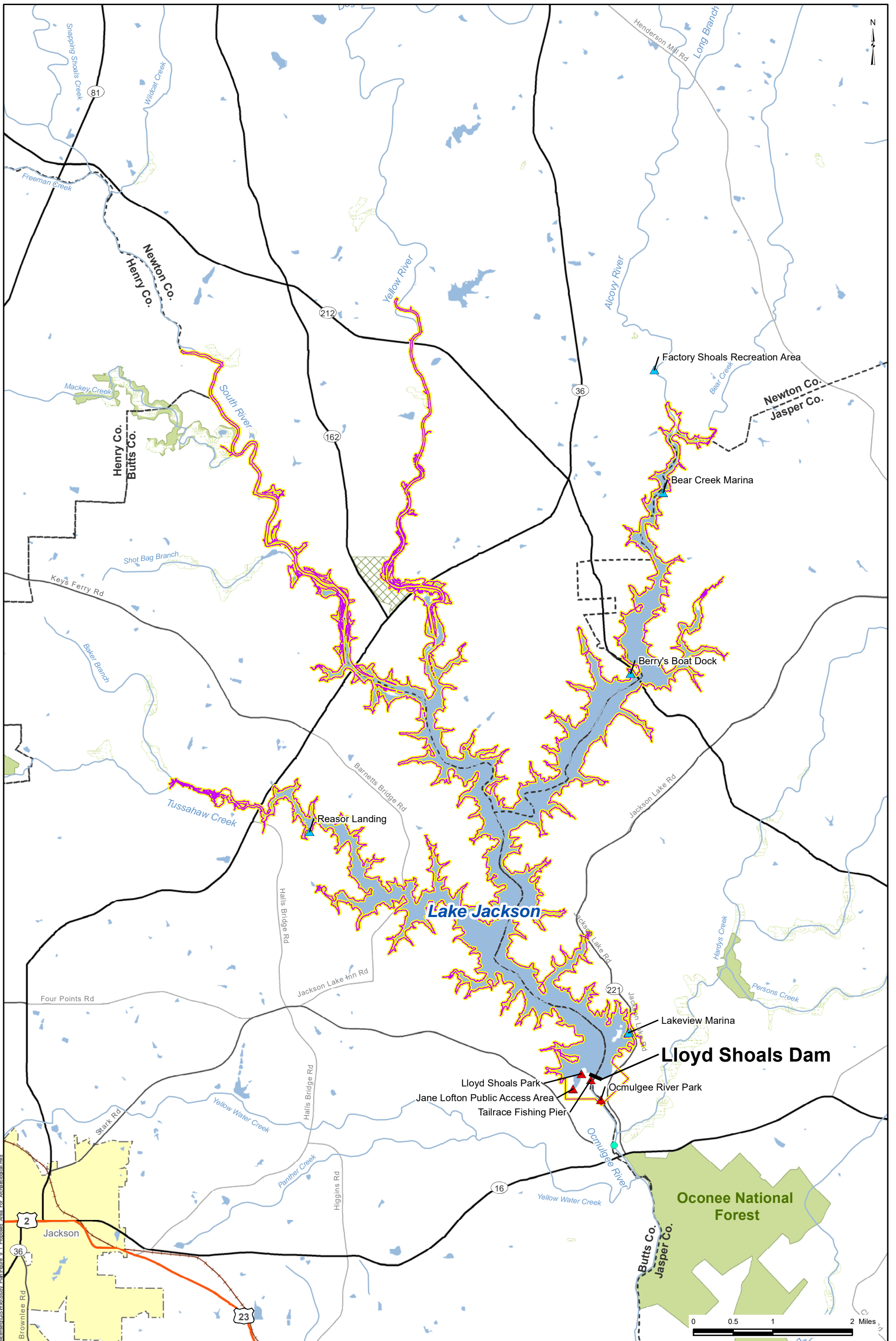
Activity	Deadline
Begin Field Studies and Analysis of Existing Data	May 2019
File Progress Report	January 31, 2020
Complete Field Studies and Analysis of Existing Data	March 2020
File Study Report	May 19, 2020

9.8 References

Georgia Council of Professional Archaeologists. 2014. Georgia standards and guidelines for archaeological surveys. Revised April 2014. <http://georgia-archaeology.org/GCPA/wp-content/uploads/2007/05/GA-Arch-Standards-and-Guidelines-revised-April-2014.pdf>.

Georgia Power Company (Georgia Power). 2017. Annual cultural resources monitoring at FERC Project Nos. 485, 2336, 1218, 2413, 2354, 2341, 2177, and 2350. Letter report to the Federal Energy Regulatory Commission, dated December 19, 2017.

Historic Preservation Division (HPD). 2017). Georgia's state historic preservation plan 2017-2021: integrating innovation with preservation. Georgia Department of Natural Resources. Stockbridge, Georgia.



U:\GIS\Power\Lloyd Shoals\Publications\GIS\Map\Study_Plan\Figure 9-1 Proposed Area For Archaeological.mxd

- | | | | |
|--|--|--------------------------------|----------------|
| | | | |
| | | | (No. 02210500) |
| | | | |
| | | Recreation Access Point | |
| | | | |
| | | | |



Figure 9-1
Proposed Area of Potential Effects for
Archaeological Resources
 Lloyd Shoals Project
 (FERC No. 2336)

APPENDIX A

Georgia Power Responses to Comments on the Proposed Study Plan

INTRODUCTION

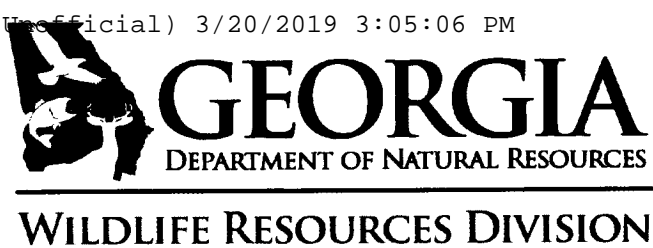
Georgia Power has reviewed all comments on the Lloyd Shoals Proposed Study Plan (PSP) filed by relicensing participants pursuant to 18 Code of Federal Regulations (CFR) § 5.12. Recommendations and requests for modifications to the PSP have been considered in light of the Study Plan Meetings held on January 16 and February 26, 2019 and Georgia Power's subsequent discussions with stakeholders concerning the Study Plan.

In accordance with 18 CFR § 5.13(a), this section further describes Georgia Power's efforts to resolve differences over study requests by either: (1) describing how the Study Plan was revised to address particular comments; or (2) explaining why the request or proposed modification was not adopted in reference to the criteria set forth at § 5.9(b).

The PSP comment letters, and Georgia Power's responses, are presented in the following order:

- Georgia Department of Natural Resources (GDNR), Wildlife Resources Division (WRD) – March 20, 2019
- U.S. Fish and Wildlife Service (FWS) – March 18, 2019
- National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS) – March 19, 2019
- U.S. Environmental Protection Agency (EPA) – March 15, 2019
- GDNR Historic Preservation Division (HPD) – January 28, 2019
- The Muscogee (Creek) Nation – March 25, 2019
- Kathleen O'Neal, Macon, Georgia – March 15, 2019
- Leonard C. Blakeley, Monticello, Georgia – March 19, 2019

The HPD and Muscogee (Creek) Nation letters and responses are filed as Privileged Proprietary/Confidential Information



MARK WILLIAMS
COMMISSIONER

RUSTY GARRISON
DIRECTOR

March 20, 2019

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E., Room 1A
Washington, DC 20426

RE: Comments on Proposed Study Plan, Lloyd Shoals Dam Project (2336-094)

Dear Secretary Bose:

Thank you for the opportunity to review and comment on Georgia Power Company's (GPC) Proposed Study Plan for the Lloyd Shoals Hydroelectric Project (P-2336-094). We recognize that this project has impacts to the water quality, aquatic habitat, fisheries resources, and recreational opportunities within, upstream and downstream of the project area. The considerations we requested as related to fish and aquatic resources, habitat, and recreation/land use described in our November 5, 2018 Pre-Application Document and Scoping Document 1 comment letter have been adequately addressed in the PSP.

We appreciate GPC's commitment to the conservation of natural and aquatic resources, as evident by the recent signing of the Altamaha Candidate Conservation Agreement (CCA) for mollusks and the Robust Redhorse CCA with Assurances, pending renewal in 2024. Our staff looks forward to working closely with GPC, through these agreements and the relicensing process, to mitigate impacts of the project within its boundaries and downstream.

Sincerely,

A handwritten signature in black ink, appearing to read "R. Garrison".

Rusty Garrison

cc. Matt Thomas
Jon Ambrose

RESPONSE TO LETTER FROM GEORGIA DEPARTMENT OF NATURAL RESOURCES, DATED MARCH 20, 2019

Georgia Power appreciates the comments of the Georgia Department of Natural Resources Wildlife Resources Division and looks forward to working closely with the agency throughout the relicensing process.



United States Department of the Interior



Fish and Wildlife Service
RG Stephens, Jr. Federal Building
355 East Hancock Avenue, Room 320
Athens, Georgia 30601

West Georgia Sub Office
P.O. Box 52560
Ft. Benning, Georgia 31995-2560

Coastal Sub Office
4980 Wildlife Drive
Townsend, Georgia 31331

March 18, 2019

Ms. Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: Comments on Pre-Application Document and Study Request for the Lloyd Shoals Hydroelectric Project, FERC Project Number P-2336-094

Dear Ms. Bose:

The U.S. Fish and Wildlife Service (Service) has reviewed the Proposed Study Plan (PSP) for the relicensing of the Lloyd Shoals Hydroelectric Project (LSHP). This facility, operated by Georgia Power Company (GPC), is located on the Ocmulgee River in east-central Georgia, within Butts, Henry, Jasper, and Newton Counties. We submit the following comments and recommendations under the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq.*) and the Federal Power Act (FPA)(16 U.S.C. § 791a, *et seq.*).

GPC's PSP incorporates many details from the Service's American Eel study request, while modifying the sampling period of the study. This study has a goal of developing current baseline information on abundance, life stages, size range, and timing of movements of American Eel that approach the LSHP. GPC proposes to sample for American Eel during six months of a one-year period, with sampling proposed for March, April, May, June, September and October. The Service recommends the study plan include the original request for year-round sampling conducted for a two-year minimum period. A minimum sampling period of two years will capture a range of environmental variation and potential American Eel behavioral responses. Additionally, existing information for American Eel at the LSHP is limited. Data collected through this proposed study would allow for a more complete characterization of American Eel in the study area and enable the Service to evaluate future passage at the LSHP.

We appreciate the opportunity to comment during the planning stages of your project. If you have any questions, please contact staff biologist Alice Lawrence at (706) 208-7507.

Sincerely,

A handwritten signature in blue ink that reads "Donald W. Imm". The signature is written in a cursive style with a large, looped initial "D" at the end.

Donald Imm
Field Supervisor

cc: T. Litts, GDNR, Social Circle, GA
K. Weaver, GDNR, Social Circle, GA
B. Albanese, GDNR, Social Circle, GA
P. Marcinek, GDNR, Social Circle, GA
F. Rohde, NMFS, Beaufort, NC
T. Cheatwood, NMFS, Beaufort, NC

RESPONSE TO LETTER FROM U.S. FISH AND WILDLIFE SERVICE, DATED MARCH 18, 2019

Response 1

Georgia Power proposes modifying the U.S. Fish and Wildlife Service (FWS) request for two years of year-round, monthly sampling based on existing information on the American Eel population in the Ocmulgee River. Section 5.3.4 of the Revised Study Plan (RSP) presents and describes the relevance of this existing information to the proposed study (study request criterion at 18 CFR §5.9(b)(4)). As these data were not presented in detail until the Proposed Study Plan, FWS did not consider the previous fisheries investigations when making its original study request. Georgia Power proposes sampling in eight months of the first year of study because the numerical abundance of American Eels from the previous seasonal fisheries investigations in 1987-1988 suggest that eight months of sampling will yield sufficient numbers of eels to characterize the life stage and size range of eels migrating into the Lloyd Shoals tailrace area and their abundance. Since the Proposed Study Plan, Georgia Power has added sampling in the months of February and November, increasing effort from six to eight months, to address FWS interests for encompassing the seasonal onset and decline, respectively, of upstream migration, and to include all four seasons. The proposed sampling and the quarterly sampling from 1987-1988 will provide two years of data reflecting interannual variation in environmental conditions and eel population characteristics, addressing the objectives of the study.

Georgia Power does not propose sampling in July and August because water temperature consistently rises above 25°C (RSP, Figure 5-1) and mean river discharge is seasonally low. Upstream eel movements may sometimes coincide with water temperatures above 25°C but they tend to do so only during high discharge events (Welsh and Liller, 2013). American Eels move little during low discharge periods. Notwithstanding the possibility of an extreme mid-summer discharge event (e.g., hurricane) that could induce upstream eel movements, sampling in July-August would not inform the seasonal limits of upstream migration. Sampling also is not proposed for December and January because water temperature is consistently below 15°C (Figure 5-1) and upstream movements are expected to be minimal. Studies indicate that yellow eels decrease activity and their migration becomes minimal during winter months (Shepard, 2015). Moreover, in consideration of level of effort and cost, not sampling during these four months would save Georgia Power on the order of \$48,000 in study costs.

Section 5.5.4 of the RSP describes Georgia Power's rationale and proposed study approach for a second year of study. Georgia Power believes that a second year of study, if needed, should focus on nighttime surveys of eels arriving at the base of Lloyd Shoals Dam. Therefore, Georgia Power proposes that any study approach for a second year of study be developed in consultation with the resource agencies after reviewing the findings of the first year of study. The schedule in Section 5.7 provides for consultation on modifying the Study Plan after the first year of study.


UNITED STATES DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office

263 13th Avenue South

St. Petersburg, Florida 33701-5505

<http://sero.nmfs.noaa.gov>

March 19, 2019

F/SER47:TC:pw

(Sent by Electronic Mail)

Courtenay R. O'Mara, P.E.
 Southern Company
 241 Ralph McGill Boulevard-Bin 10193
 Atlanta, GA 30308

Re: Comments on the Proposed Study Plan for the Lloyd Shoals Hydroelectric Project, FERC
 Project Number 2336-094

Dear Ms. O'Mara:

NOAA's National Marine Fisheries Service (NMFS) reviewed the Proposed Study Plan (PSP) Southern Company provided December 20, 2018, on behalf of Georgia Power Company (GPC) for the relicensing of the Lloyd Shoals Hydroelectric Project (LSHP). GPC is seeking a new license from the Federal Energy Regulatory Commission (FERC) through the Integrated License Process; the existing license expires on December 31, 2023. GPC filed a Pre-Application Document (PAD) with FERC on July 3, 2018. FERC issued Scoping Document 1 (SD1) on August 20, 2018, and held National Environmental Policy Act scoping meetings and a site visit on October 9 and 10, 2018. On November 5, 2018, FERC issued a letter with staff comments on the PAD, including an additional information request. The NMFS provided FERC comments on SD1 on November 15, 2018. FERC issued Scoping Document 2 on December 20, 2018, based on written comments it received. GPC conducted study plan meetings on January 16, 2019, and February 26, 2019, and requested stakeholder comments on the PSP by March 20, 2019. As the nation's federal trustee for the conservation and management of marine, estuarine, and anadromous fishery resources, the NMFS provides the following comments on the PSP pursuant to authorities of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 USC § 661 et seq.), the Federal Power Act (FPA) (16 USC § 791a, et seq.), the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC §§ 1801, et seq.), and the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA) (as amended; 16 USC §§ 5101, et seq.).

The comments the NMFS provided November 15, 2018, included a request for a detailed study of American eel. While GPC incorporated into the PSP many details from our request, GPC also reduced the length of the study and altered the proposed monitoring criteria. GPC proposes to sample for American eel within the study area downstream of Lloyd Shoals Dam during six months of a one-year period. To encompass the onset and probable peak period of spring upstream eel migration, sampling is proposed for March, April, May, and June, after water temperatures rise consistently above 15°C and river discharge is normally high. Sampling would resume in September and October to examine upstream migration during the fall. The NMFS recommends the study plan include the original request for year-round sampling conducted

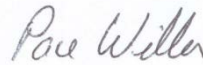


within the study area for a minimum period of two years. Sampling for two years is necessary to capture a range of environmental variation and potential American eel behavioral responses. A study goal is to develop baseline information on abundance, life stages, size range, and timing of upstream movements of American eel approaching the Lloyd Shoals Dam. Existing information on American eel populations in the Ocmulgee River are limited. A 1984 study conducted in the Altamaha River sampled American eel for a one-year period, providing limited insight into the age, sex, and life history stages¹. Data collected through the proposed study for the Ocmulgee River would allow for a more complete characterization of the American eels population migrating further inland in the river system and enable the NMFS to evaluate more completely the need for passing American eel at the Lloyd Shoals Dam.

1
2

Thank you for the opportunity to comment during the planning stages of this project. Please direct related questions or comments to the attention of Ms. Twyla Cheatwood at our Beaufort Field Office, 101 Pivers Island Road, Beaufort, North Carolina 28516-9722, or at (252) 728-8758.

Sincerely,



/ for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc: Southern Company, cromara@southernco.com
FERC, Allan.Creamer@ferc.gov
GDNR, Thom.Litts@dnr.state.ga.us
GDNR, Keith.Weaver@dnr.state.ga.us
GDNR, Paula.Marcinek@dnr.state.ga.us
USFWS, Alice_Lawrence@usfws.gov
USFWS, Donald_Imm@usfws.gov
F/SER47, Fritz.Rohde@noaa.gov

¹ Helfman, G.S., Bozeman, E.L., and E.B. Brothers. 1984. Size, age, and sex of American eels in a Georgia river. Transactions of the American Fisheries Society 113:132-141.

RESPONSE TO LETTER FROM NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL MARINE FISHERIES SERVICE, DATED MARCH 19, 2019

Response 1

Georgia Power proposes modifying the National Marine Fisheries Service (NMFS) request for two years of year-round, monthly sampling based on existing information on the American Eel population in the Ocmulgee River. Section 5.3.4 of the Revised Study Plan (RSP) presents and describes the relevance of this existing information to the proposed study (study request criterion at 18 CFR §5.9(b)(4)). As these data were not presented in detail until the Proposed Study Plan, NMFS did not consider the previous fisheries investigations when making its original study request. Georgia Power proposes sampling in eight months of the first year of study because the numerical abundance of American Eels from the previous seasonal fisheries investigations in 1987-1988 suggest that eight months of sampling will yield sufficient numbers of eels to characterize the life stage and size range of eels migrating into the Lloyd Shoals tailrace area and their abundance. Since the Proposed Study Plan, Georgia Power has added sampling in the months of February and November, increasing effort from six to eight months, to address NMFS interests for encompassing the seasonal onset and decline, respectively, of upstream migration, and to include all four seasons. The proposed sampling and the quarterly sampling from 1987-1988 will provide two years of data reflecting interannual variation in environmental conditions and eel population characteristics, addressing the objectives of the study.

Georgia Power does not propose sampling in July and August because water temperature consistently rises above 25°C (RSP, Figure 5-1) and mean river discharge is seasonally low. Upstream eel movements may sometimes coincide with water temperatures above 25°C but they tend to do so only during high discharge events (Welsh and Liller, 2013). American Eels move little during low discharge periods. Notwithstanding the possibility of an extreme mid-summer discharge event (e.g., hurricane) that could induce upstream eel movements, sampling in July-August would not inform the seasonal limits of upstream migration. Sampling also is not proposed for December and January because water temperature is consistently below 15C (Figure 5-1) and upstream movements are expected to be minimal. Studies indicate that yellow eels decrease activity and their migration becomes minimal during winter months (Shepard, 2015). Moreover, in consideration of level of effort and cost, not sampling during these four months would save Georgia Power on the order of \$48,000 in study costs.

Section 5.5.4 of the RSP describes Georgia Power's rationale and proposed study approach for a second year of study. Georgia Power believes that a second year of study, if needed, should focus on nighttime surveys of eels arriving at the base of Lloyd Shoals Dam. Therefore, Georgia Power proposes that any study approach for a second year of study be developed in consultation with the resource agencies after reviewing the findings of the first year of study.

The schedule in Section 5.7 provides for consultation on modifying the Study Plan after the first year of study.

Response 2

As presented and described in Section 5.3.4 of the RSP, existing information concerning the American Eel population in the Ocmulgee River includes seasonal fisheries investigations downstream of Lloyd Shoals Dam in 1987-1988 and fisheries surveys conducted in the Ocmulgee River in 2009 and 2014 related to the U.S. Environmental Protection Agency's National Rivers and Streams Assessment. The existing information and data indicate the ongoing presence of a relatively widespread and abundant population of American Eel in the Ocmulgee River basin downstream of the Lloyd Shoals Project.

From: [Clark, Maria](#)
To: ["O'Mara, Courtenay R."](#)
Cc: [Militscher, Chris](#); [Buskey, Traci P.](#); [Maria Clark](#)
Subject: EPA comments - Lloyd Shoals Hydro Study Plan
Date: Friday, March 15, 2019 12:39:00 PM
Importance: High

Courtenay R. O'Mara, P.E.
Hydro Licensing and Compliance Supervisor
Southern Company

Dear Courtenay,

The comments below are a follow-up to the comments made by the EPA during the multiagency call, and a few additional recommendations. First, the EPA would like to acknowledge everyone's hard work. We truly appreciate the responsive back and forth communications from the past several months.

Data - In reference to the baseline data to be utilize for the purposes of comparison to the proposed data to be obtained by the planned monitoring, the EPA would like to see all data sets in the same matrix chart. The arrangements of histograms or other visualizations to interpret old and new data are always welcome and are useful if past and new sets are plotted together.

1

Study Area – It was mentioned that the boundaries of the study area would depend on the availability of past monitoring data (please let me know if this statement is/is not accurate.) The EPA would like to request that if there is no data available beyond the tail race and before the next dam, to please inform such find to the agencies before any decisions are made regarding the extent of the study area.

2

Wetlands – Mapping wetlands while mapping erosion issues will work, but it was not clear to the EPA if the new mapped wetlands will get to be linked to the wetlands mapped before the project was built. Further, the EPA would like to see wetlands migration correlated to species changes and wetlands migration changes as it relates to any water changes.

3

Recreation – The EPA commented before regarding the opportunity to include green technology into the new recreational plans. For example, new compostable toilets could be more money up front, but they can be a great long-term investment that is cost-effective and with beneficial environmental results. Also, the EPA would like to suggest the use of porous materials for all cleared/pave (existing and) proposed areas, and the availability of recycling with educational posters.

4

Thank you, and as always, please feel free to contact me if you have any questions.
Best regards,

Maria R. Clark

NEPA Program Office - Region 4
U.S. Environmental Protection Agency
61 Forsyth, Street South West
Atlanta, GA 30303
404-562-9513

RESPONSE TO LETTER FROM U.S. ENVIRONMENTAL PROTECTION AGENCY, DATED MARCH 15, 2019

Response 1

Regarding the U.S. Environmental Protection Agency's (EPA's) interest in seeing past and new data sets in the same matrix chart for comparison purposes, Georgia Power will present summary tables of historical and recent data sets together, as appropriate, in the study report.

Response 2

Georgia Power has obtained existing water quality data for the Ocmulgee River downstream of the Project collected by the Georgia Environmental Protection Division for modeling purposes and for EPA's National Rivers and Streams Assessment (EPA, 2016) thus far. These data and other potential sources of existing water quality data for the Ocmulgee River downstream of the Project will be analyzed and summaries presented in the study report.

Response 3

Georgia Power proposes to map wetlands within the project boundary as part of the Terrestrial, Wetland, and Riparian Resources Study, as described in Section 6.0 of the Revised Study Plan. Wetlands and other vegetation communities will be mapped to represent existing baseline conditions for analyzing the effects of continued project operation. The shoreline temporal change analysis proposed as part of the Geology and Soils Study (Section 2.0) will use available aerial photography of the study area to evaluate spatial and temporal changes in shoreline conditions since 1993, when the current license was issued. To the extent this analysis identifies areas of significant sediment accumulation, aggradation, or formation of new wetland vegetation in the representative areas examined, these patterns and trends will be characterized and quantified in area to the extent practical using photogrammetric methods.

Response 4

Georgia Power appreciates EPA's suggestions regarding opportunities to include green technology into new recreational plans. The findings of the resource studies will be incorporated into Georgia Power's Preliminary Licensing Proposal (PLP). The PLP will provide an environmental analysis of the impacts of continued project operation and propose measures for protecting, mitigating impacts to, or enhancing resources affected by the Project. Upon conclusion of the resource studies, Georgia Power will consider EPA's suggestions among possible measures to include in our relicensing proposal.

Kathleen ONeal, Macon, GA.

When considering recreational use of the Ocmulgee, the impact of power generation and water release is much greater than the immediate lake and spillway. Generation is felt as far south as Macon. If water is released, it can raise the level in the river enough that paddling canoes and kayaks is enjoyable and not a hike along the shoals pulling a boat behind you as you walk the river. A website with both intended power generation and projected water release and real time release would be beneficial and much appreciated by paddlers and other river users. Many thanks.

1

RESPONSE TO LETTER FROM KATHLEEN O'NEAL, DATED MARCH 15, 2019

Response 1

Georgia Power appreciates the comments of Ms. Kathleen O'Neal regarding downstream recreational boating in the Ocmulgee River and her suggestion for a website providing information on scheduled generation releases. This phase of the relicensing process is focused on developing a Study Plan that will address information needs for describing the existing environment and evaluating the potential impacts of continued project operation. The study findings will be incorporated into Georgia Power's Preliminary Licensing Proposal (PLP). The PLP will provide an environmental analysis of the impacts of continued project operation and propose measures for protecting, mitigating impacts to, or enhancing resources affected by the Project. Upon conclusion of the resource studies, Georgia Power will consider her suggestion further as a possible measure to include in our relicensing proposal.

Leonard C Blakeley, Monticello, GA.

Good afternoon and thank you for taking time to read my email, I am praying that you will be able to help me and others in Jasper County with a very big problem. I am a homeowner and live on lake front property on Jackson lake and for the past year and a half I have been going through a huge issue with erosion and flooding of my property that has been causing severe damage to my property and to our state waters. I am receiving this problem from 2 different areas both of them are problems that our county has control over. I have been trying to get help from the director of planning and zoning, the county manager and my county commissioner all of them have even been to my property and saw the damage first hand and agreed that there is a problem. One area of the problem is from a property owner next to me that was going to build a home and installed a culvert pipe incorrectly and directly to my property. While doing this work he has buried trees on the property and covered up a natural ditch line and has redirected water that is coming from county roads and his property also. I hired a engineer that came out and assessed the issue and even was present when I had all the county officials onsite, she made them aware that there were at least 7 state and federal laws of the clean water act that where in violation at the property. The county has never conducted any inspections for the culvert or for silt fencing from time the permit was issued even though we have been making them aware of the issue and damage that we have had. We have been documenting this issue for the entire time and have photos, videos and all of our emails and any correspondence from them. We have even been told by the county planning and zoning director that they were making the homeowner repair the problem but nothing whatsoever has been done at all. Through all of our du diligence we have even learned that the director of planning and zoning who is supposed to be the issuing authority for jasper county has no current certifications for soil and erosion and that nobody else in the county does either. Being directly on State Waters this issue has been letting silt go directly into state waters and polluting our lake to the point of losing a substantial amount of our lake depth in our cove. I have also been going through a lot of other areas in our county that are having all the same issues and also have all the documentation of that. I am also a general contractor that has been involved with construction for over 28 years and know that erosion is a very big problem all over and to have county officials that do nothing but make solve the issues is very disappointing. I have been told that this is a civil issue but when the county hasn't completed inspections and the problem is continuing to cause substantial damages to my property and our state waters. The 2nd area is from a feeder stream that is from county road ditches and culverts that's coming in from at least 5 different roads and then flows directly into our cove . I also have photos and videos of this issue. Since we have had these issues I have been trying to reach out to multiple agency including Ga Power, EPA,EPD,all of my county officials but to this day still nothing at all has been done. The damages are so severe in our cove we are lucky to have 4' of depth to our water. Please feel free anytime to contact me anytime and I can provide you with all of our documentation and photos of the issues we are having in our lake

RESPONSE TO LETTER FROM LEONARD C. BLAKELEY, DATED MARCH 19, 2019

On March 26, 2019, the Federal Energy Regulatory Commission (FERC) Office of Energy Projects' Division of Hydropower Administration and Compliance issued a letter requesting that Georgia Power provide additional information in response to Mr. Leonard C. Blakeley's March 19, 2019 letter. Georgia Power is responding to that information request, under the assigned docket Project No. 2336-098, in a submittal being filed with FERC by April 25, 2019.