Georgia Power

Lloyd Shoals Dam
Lake Jackson

Lloyds Shoals Study Plan Meeting (FERC No. 2336)

January 16, 2019

Georgia Power

Introduction

Courtenay O’Mara, P.E.
Southern Company

Study Plan Meeting Agenda

Morning Session:	***10:00 a.m. – 12:00 p.m.***
• Welcome, Introductions & Operations Presentation	*10:00 – 10:30 a.m.*
• Recreation and Land Use Study	*10:30 – 11:00 a.m.*
• Terrestrial, Wetland, and Riparian Resources Study	*11:00 – 11:30 a.m.*
• Rare, Threatened, and Endangered Species Study	*11:30 a.m. – 12:00 p.m.*
Lunch:	***12:00 p.m. – 1:00 p.m.***
Afternoon Session:	***1:00 p.m. – 5:00 p.m.***
• Water Resources Study	*1:00 – 1:30 p.m.*
• Fish and Aquatic Resources Study	*1:30 – 2:00 p.m.*
• American Eel Abundance & Upstream Movements Study	*2:00 – 2:30 p.m.*
• Geology and Soils Study	*2:30 – 3:00 p.m.*
• Cultural Resources Study	*3:00 – 3:30 p.m.*
• Q&A Discussion (if none, Early Dismissal at 3:30 p.m.)	*3:30 – 5:00 p.m.*

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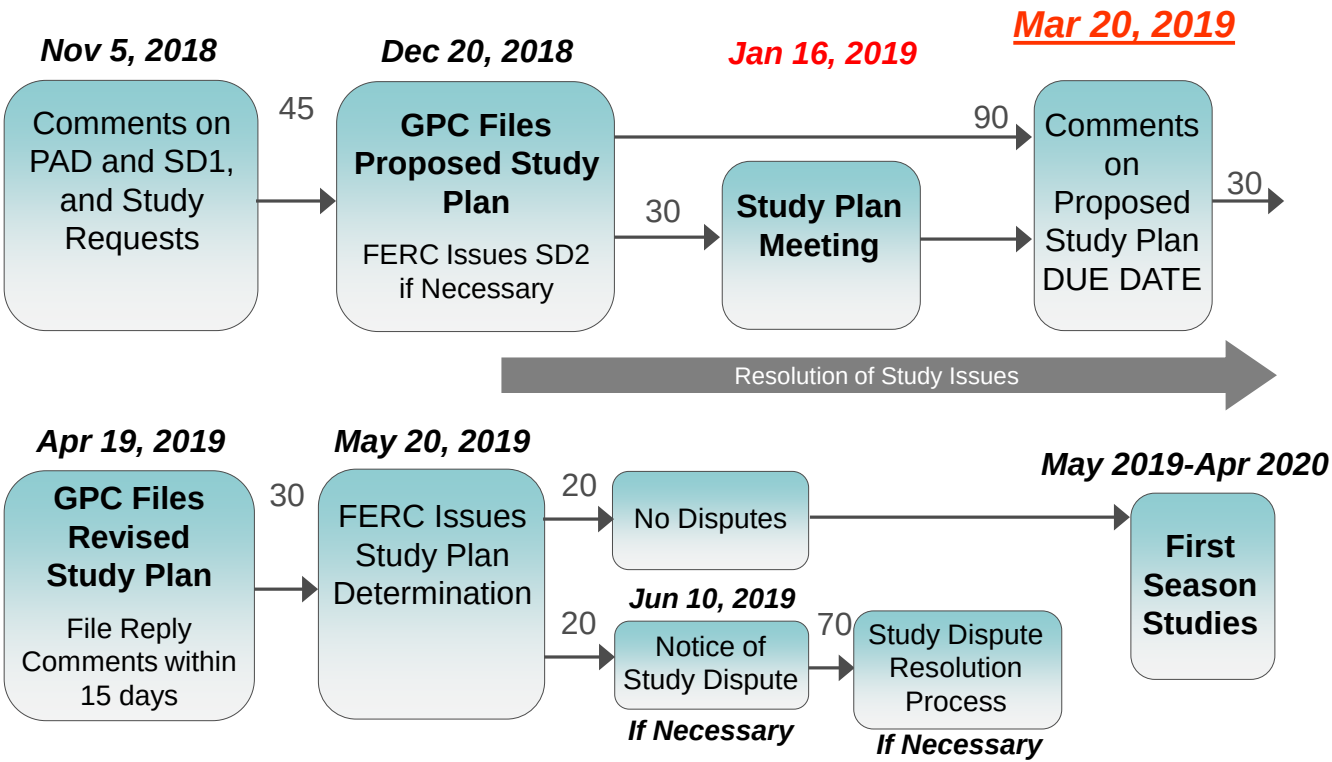
Study Plan Development Schedule



Content of Study Request (18 CFR § 5.9(b))

1. Goals and objectives of study proposal
2. Relevant resource management goals
3. Relevant public interest
4. Existing information, and need for additional information
5. Nexus between project operations and effects
6. Study methodology and generally accepted practice
7. Level of effort and cost

Study Plan Outline by Resource Area

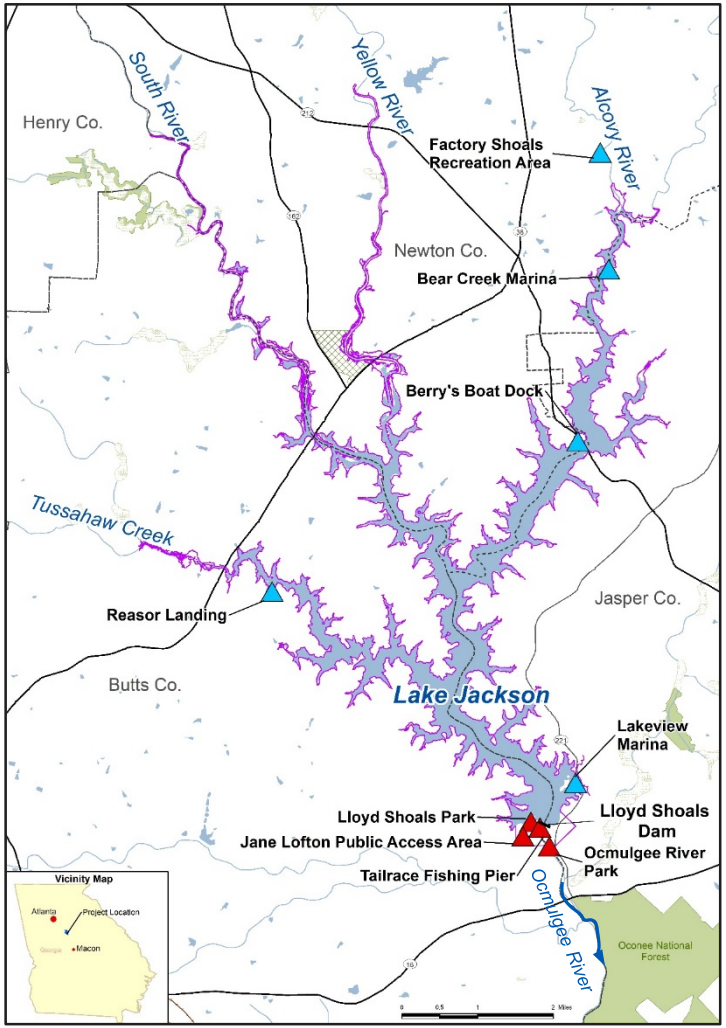
- Introduction
- Goals and objectives
- Study background
  - Issues identified
  - Study requests
  - Resource management goals
  - Existing information
  - Nexus between project operations and effects
- Study area
- Methodology
- Reporting
- Schedule
- References

Master Schedule for Study Implementation

Activity	Start Date	Completion Date or Deadline
Conduct Field Studies • Geology and Soils • Water Resources • Fish and Aquatic Resources • American Eel Abundance & Upstream Movements • Terrestrial, Wetland, and Riparian Resources • Rare, Threatened, and Endangered Species • Recreation and Land Use • Cultural Resources	**May 2019**	**Apr 2020**
Study Progress Report (All Studies)	--	**Jan 31, 2020**
Study Report (First Season of Studies)	--	**May 19, 2020**
Study Results Meeting	--	**Jun 3, 2020**

Project Boundary

- Project Boundary
- Georgia Power Project Recreation Facilities
- Public/Private Recreation Access



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Project Operations

Melissa Crabbe, P.E.
Southern Company

Lloyd Shoals Project (FERC No. 2336)

Generating Capacity	18 MW
Number of units:	6 (horizontal, Francis-type)
Max. hydraulic capacity:	620 cfs/unit or 3,720 cfs total plant capacity
Full reservoir storage:	107,000 acre-feet
Normal operating range:	527 to 530 feet
Average annual inflow:	1,732 cfs
Operation mode:	Modified run-of-river
Minimum flow:	400 cfs or inflow, whichever is less
Spillway Capacity:	16,770 cfs

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Lloyd Shoals Project Works Flow Release Sequence

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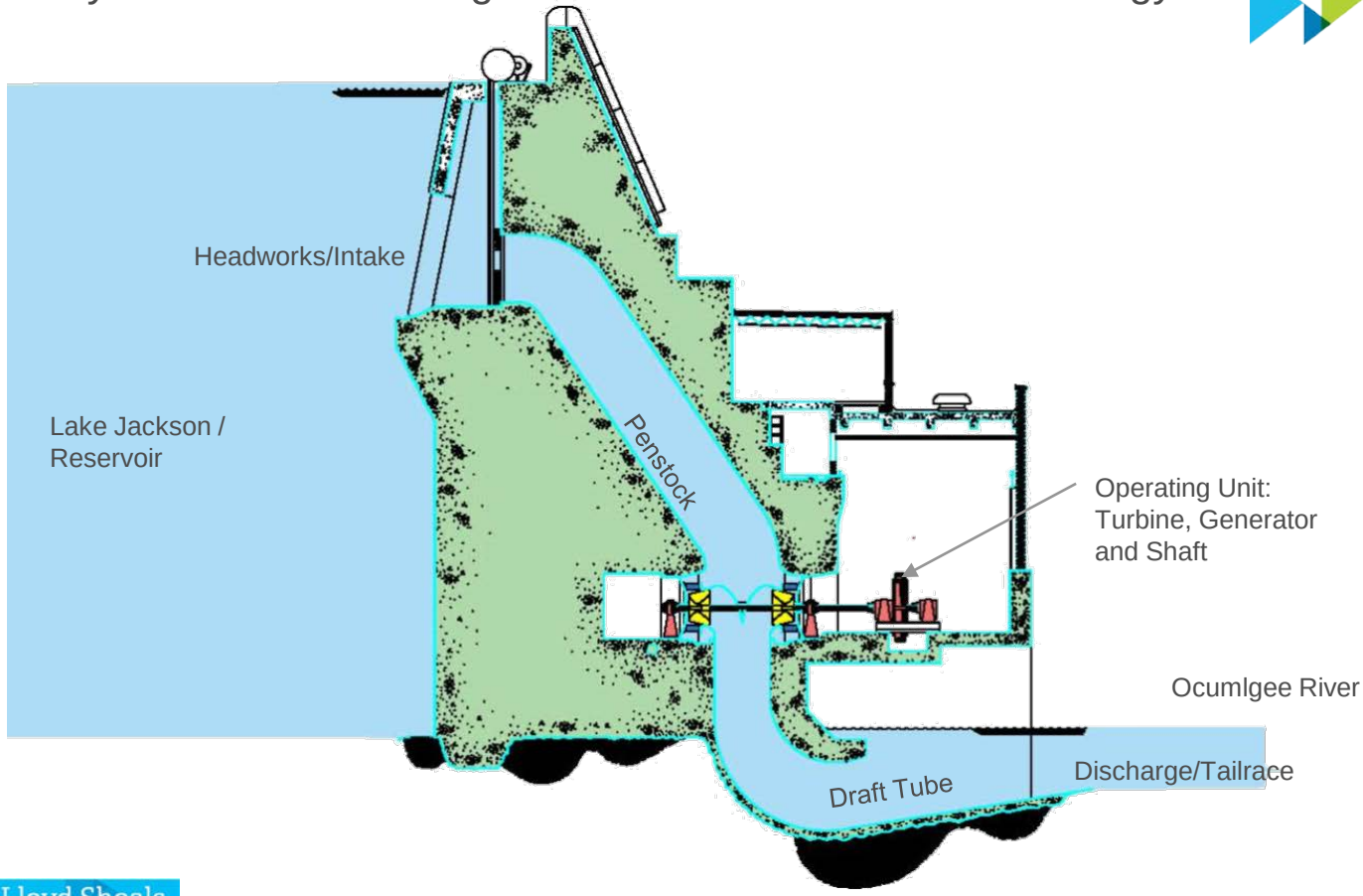
Lloyd Shoals Generating Unit Cross-section and Terminology



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Reservoir Storage and Effect on Operations

Small Reservoirs – Run-of-River Operation

- No storage
- Run-of-River
  Inflow = outflow all the time
- Example: old mill sites where steady power was more important than peaking power
- Project purpose: steady power or no power

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Reservoir Storage and Effect on Operations

Medium Reservoirs – Modified Run-of-River Operation

- Some storage
- Water is stored for hours or days
- Inflow ≠ outflow hourly or daily

- Water is released for the week
  Inflow = outflow on a weekly basis
- Example:
  Lake Jackson (useable storage = 74,750 acre-feet)
- Project purpose: power generation

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Reservoir Storage and Effect on Operations

Large Reservoirs – Storage Operation

- Significant storage
- Water is stored for months or years
  Inflow ≠ outflow
- Capture flows during high flow periods for use in low flow periods

https://media.defense.gov/2017/Nov/29/2001849723/-1/-1/0/171129-A-CE999-006.JPG

- Example:
  Lake Lanier (Useable Storage = 1,087,600 acre-feet)
- Project purposes: power generation, flood control, navigation, and recreation

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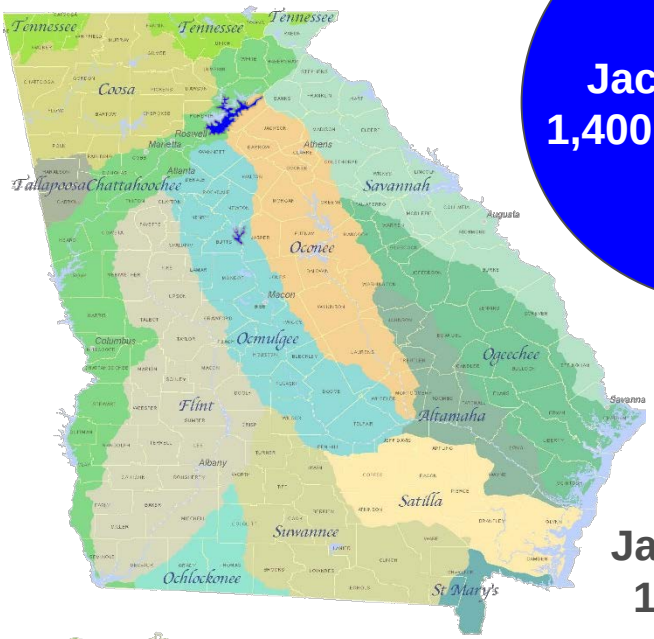
Hydroelectric Project Purpose Comparison



Jackson Basin
1,400 square miles

Jackson Storage
107,000 acre-ft

Lanier Basin
1,040 square miles

Lanier Storage
2,554,000 acre-ft

Georgia Department of Community Affairs

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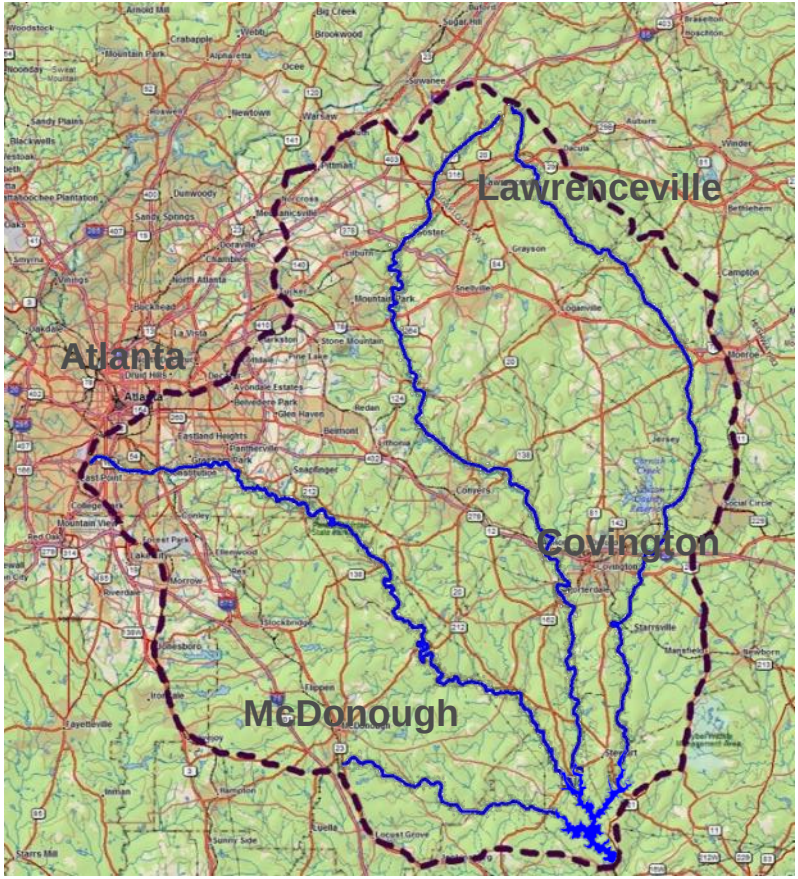
Large Drainage Basin – Small Amount of Storage



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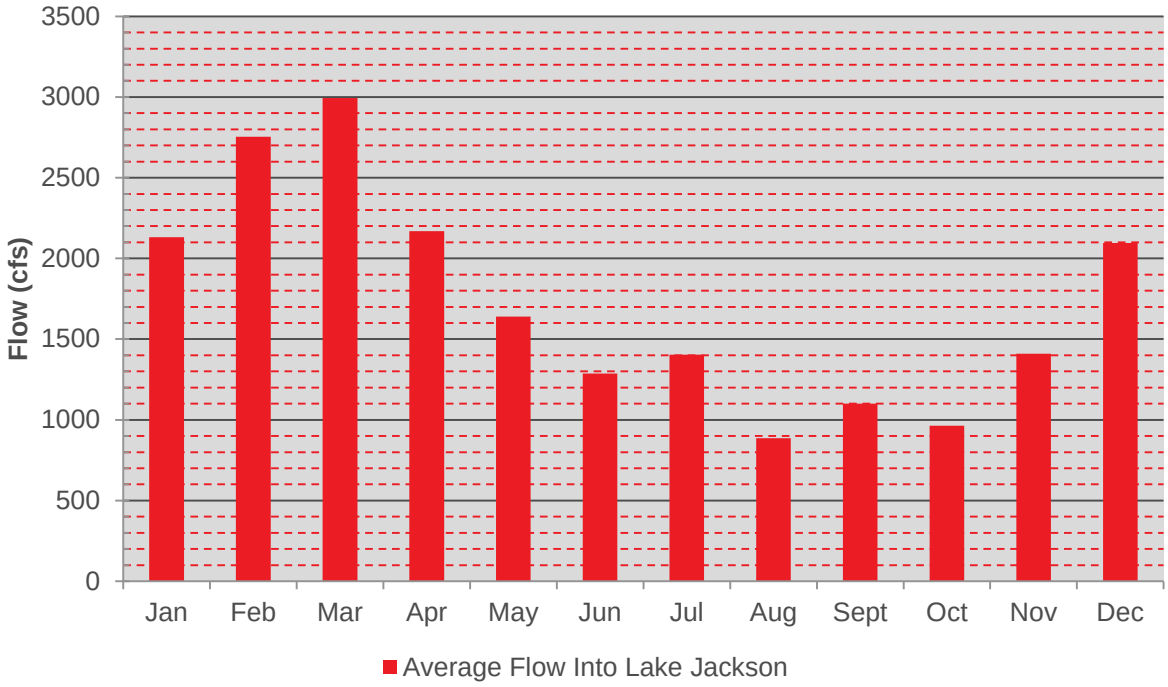
20-Year Average Monthly Calculated Inflow
January 1997 through December 2016



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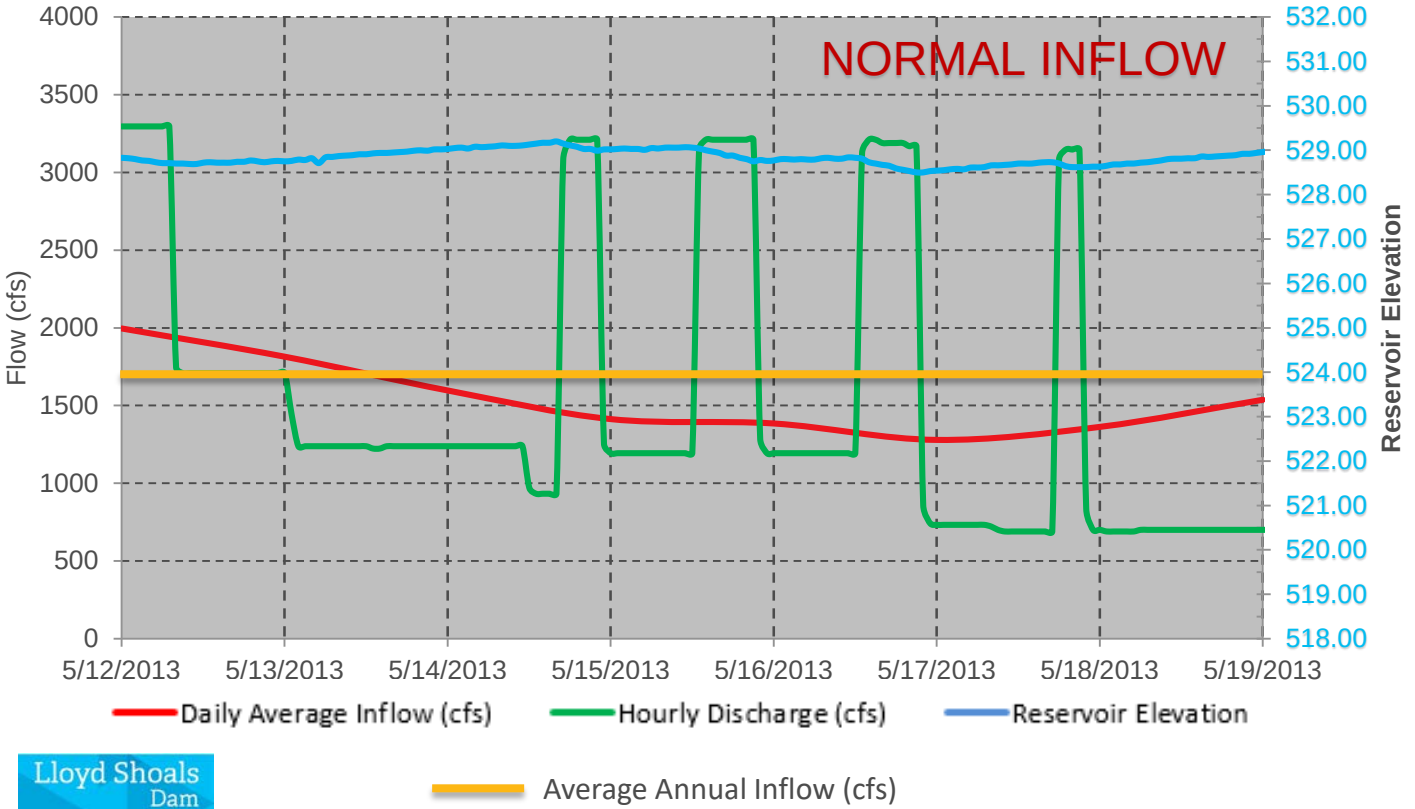
Lloyd Shoals Operations Example

NORMAL Inflow Week of 1,547 cfs, Average Annual Inflow = 1,732 cfs



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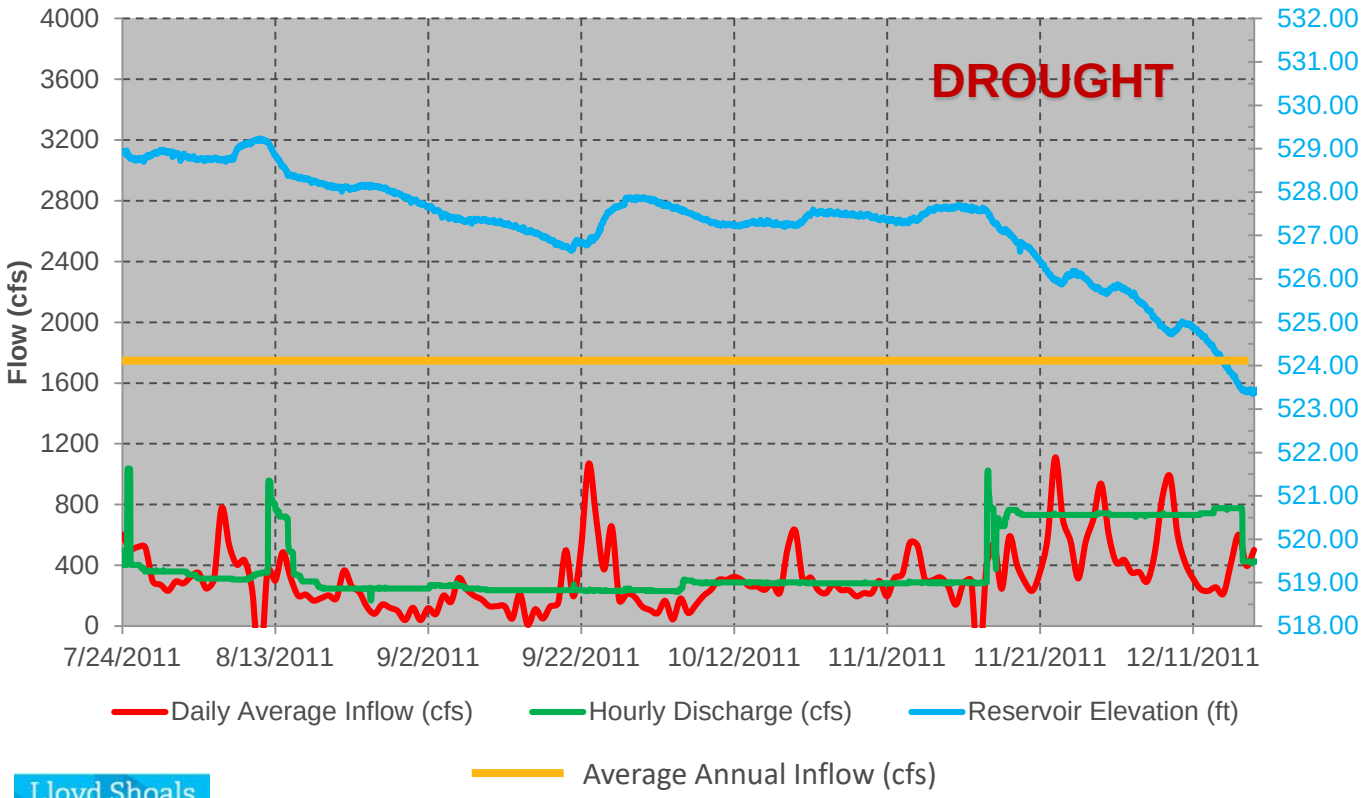
Lloyd Shoals Operations Example
DROUGHT Period of 313 cfs, Average Annual Inflow = 1,732 cfs



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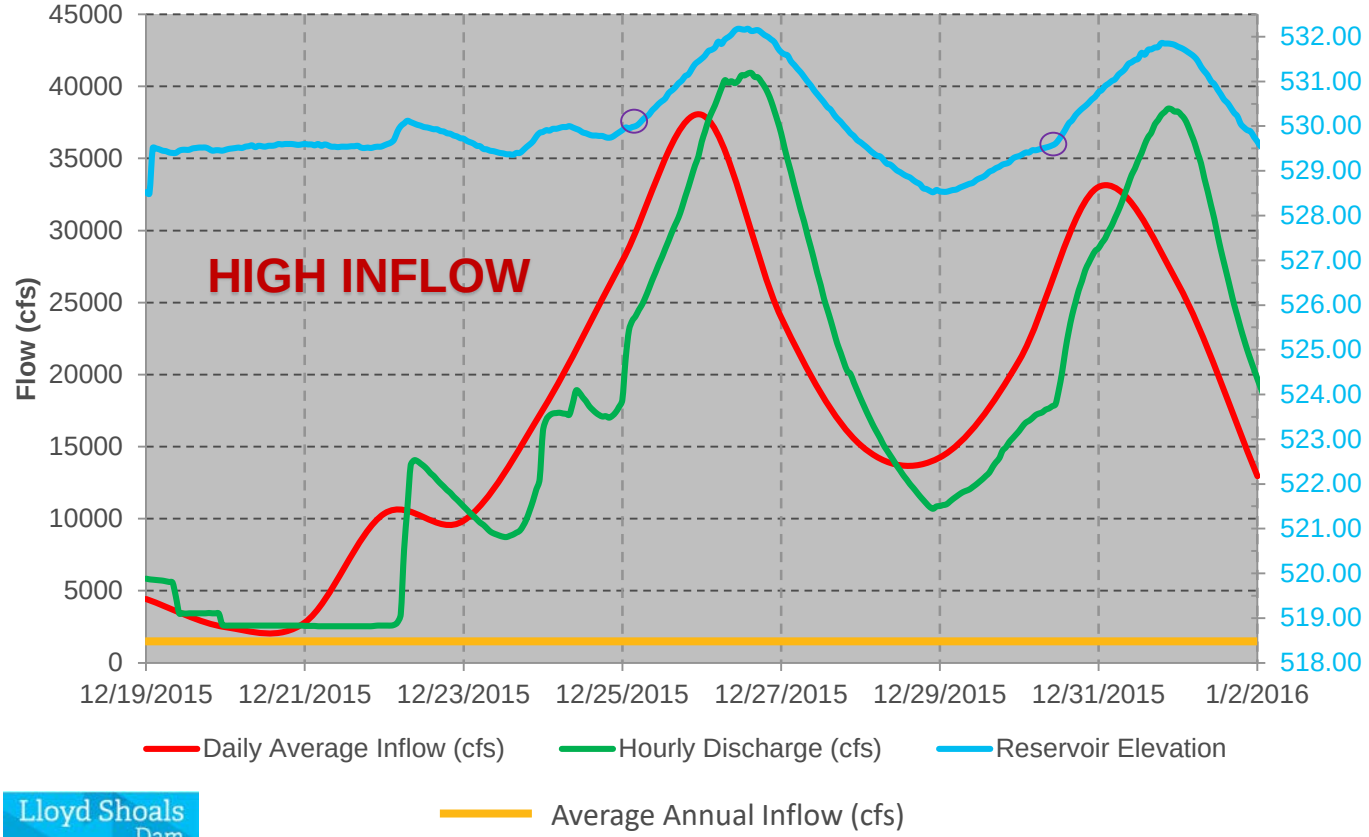
Lloyd Shoals Operations Example

HIGH Inflow Period of 17,544 cfs, Average Annual Inflow = 1,732 cfs



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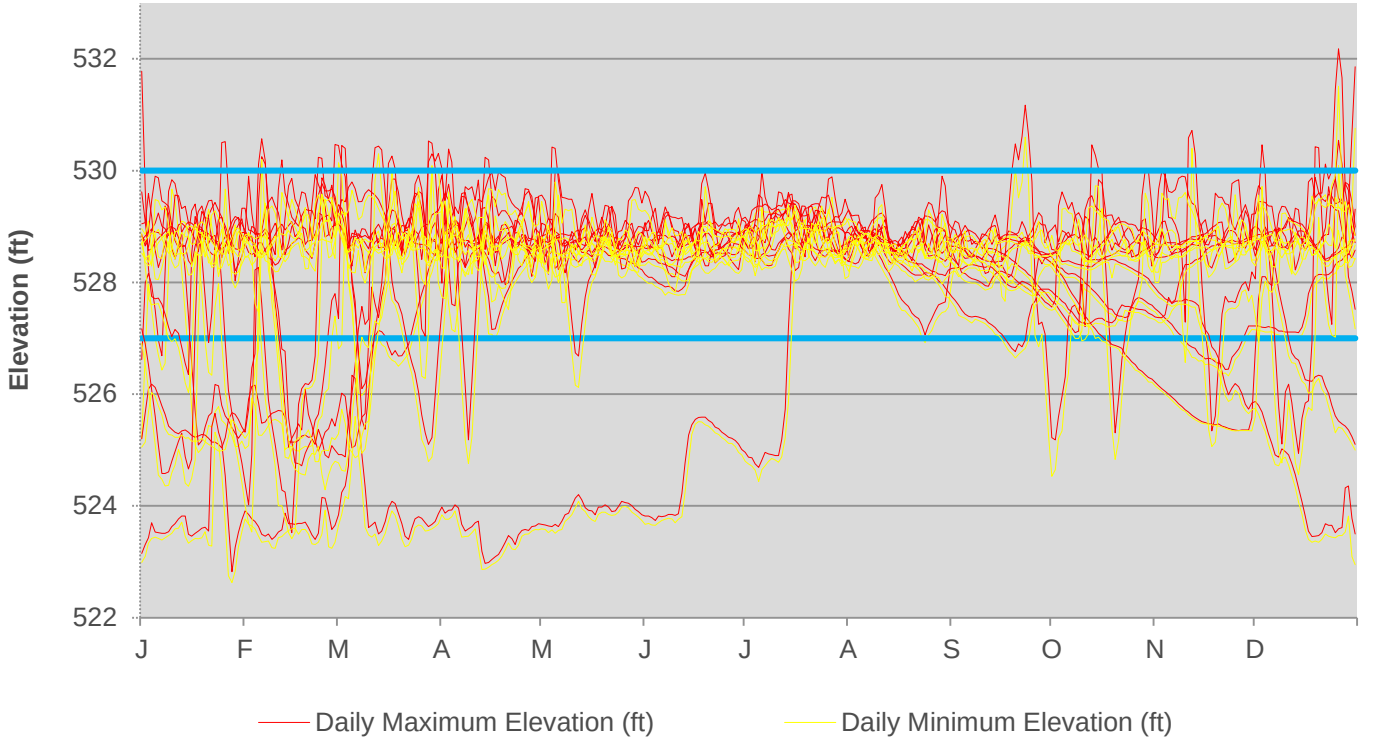
Lake Jackson Elevation 2007-2016
Typical Range Between 527 to 530 Feet



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Spillway Gate Enhancement / Operational Improvements

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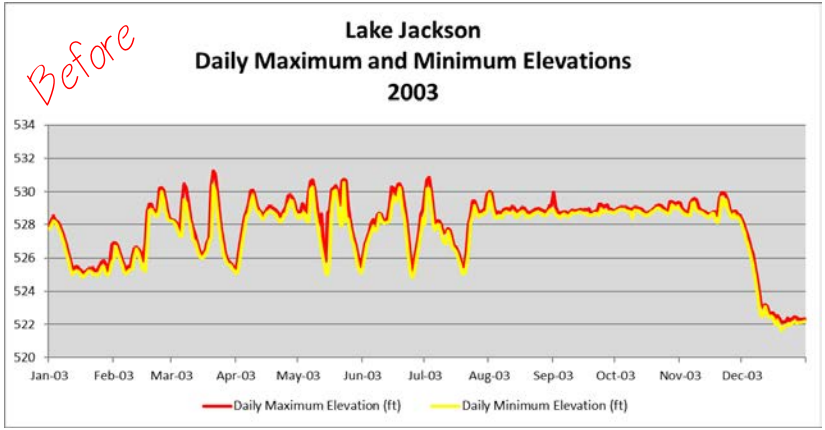
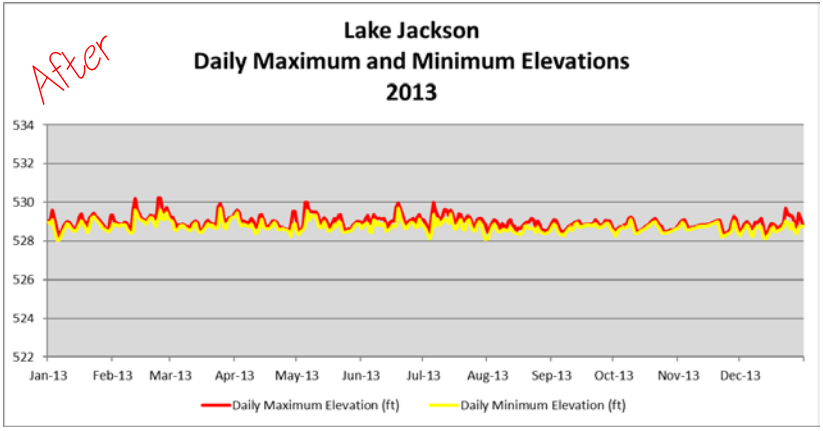
Obermeyer Gates Significantly Reduce Frequency of Reservoir Fluctuations

- Installed in 2011/2012 to replace spillway flashboards
- Decrease frequency of Lake Jackson fluctuations outside of normal pool elevation range caused by high flow events
- Eliminate safety hazards for plant personnel
- Water saved provides more water for reliable, clean, and renewable generation





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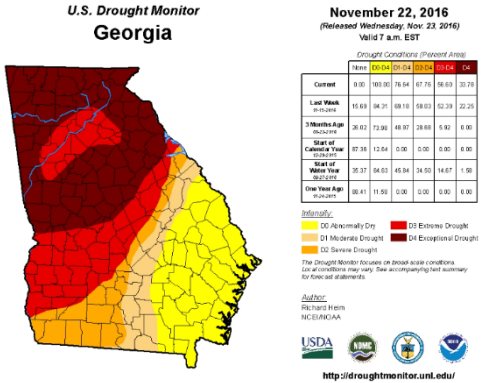
Operations Outside of Normal Pool Elevation Range

- Weather related events
  - High inflows
  - Drought
- Task/goal oriented
  - Emergency
  - Homeowner or dam maintenance



Questions

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Recreation and Land Use Proposed Study Plan

Dawson Ingram
Lake Resources Manager
Georgia Power

Study Objectives

- Describe existing recreation and land use in the 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

Issues Identified during Scoping

- Effects of the 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
- Adequacy of the existing Shoreline Management Program to address land use practices, including erosion, and to protect environmental resources within the project boundary

Study Modification Requests and Comments

- Georgia Department of Natural Resources (GDNR) Wildlife Resources Division (WRD):
  - Clarification needed on how recreational use and capacity data were calculated in the FERC Form 80 from 2015
  - Evaluate existing Georgia Power boating access sites, including the tailrace boat ramp facility, to ensure they adequately support user needs
  - Provide a map of Georgia Power land holdings distinguishing between leased and non-leased lands

Study Modification Requests and Comments (Continued)

- Federal Energy Regulatory Commission (FERC):
  - Show non-project recreation facilities listed in the PAD on a map with respect to the project boundary
  - Address the condition of the project recreation facilities, including any erosion due to project-related recreational use

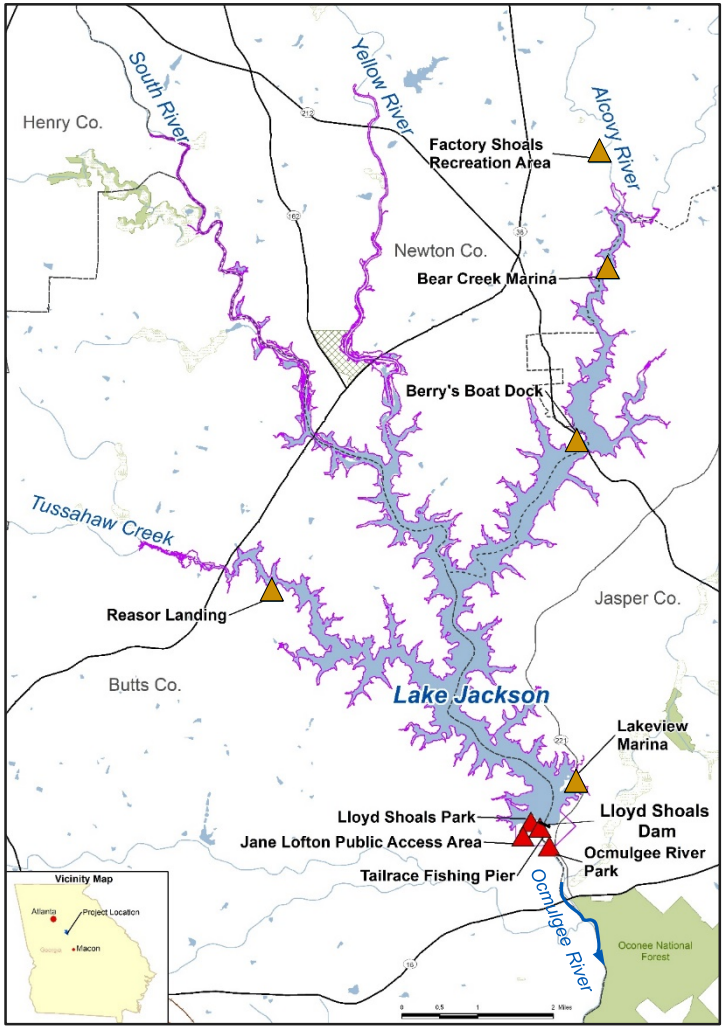
Existing Information

- Form 80 from 2015 and supporting data collected in 2014
- Article 405 Recreation Report completed in 2015
- Available Georgia Bass Chapter Federation and other fishing tournament information
- Statewide Comprehensive Outdoor Recreation Plan (SCORP) for Georgia
- Regional recreation plans
- Georgia Power Shoreline Management Guidelines
- Population and employment projections for the region developed for the state-wide water planning process

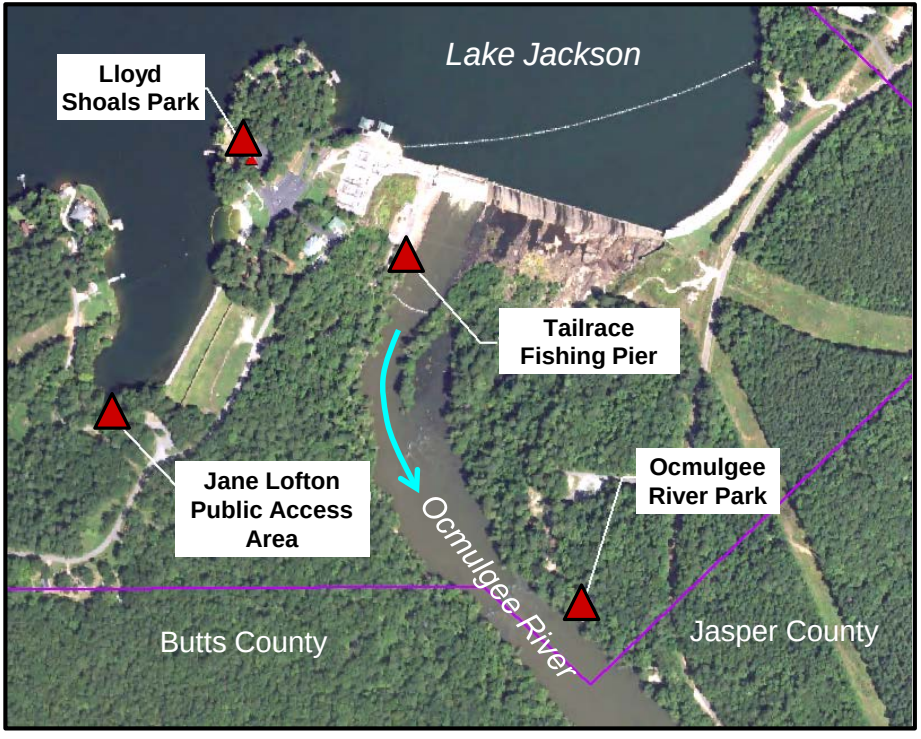
Study Area

- Project boundary around Lake Jackson and the Lloyd Shoals tailrace area
- Butts, Jasper, Newton, and Henry Counties

- Project Boundary
- Project Recreation Facilities
- Public/Private Recreation Access



Project Recreation Facilities



Project Recreation Facility Amenities

Park/Facility	County	Area within PB	Amenities
Lloyd Shoals Park	Butts	5 acres	Boat ramp, dock, picnic tables, pavilion, playground, swimming beach, restrooms, fishing pier, bank fishing
Jane Lofton Public Access Area	Butts	0.7 acre	Bank fishing
Tailrace Fishing Pier	Butts	0.6 acre	Barrier-free ramp, fishing pier
Ocmulgee River Park	Jasper	4 acres	Boat ramp, picnic tables, bank fishing

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Methodology Overview



- Recreational usage trends and demand
- Existing recreation facilities and opportunities
- Recreation field surveys
- Future recreation demands
- Land use assessment

Methodology – Recreational Usage Trends and Demand

- Analyze 2015 Form 80 and supporting data, including Article 405 Recreation Report completed in 2015
  - Annual recreation use estimated for project waters
  - Estimates derived from cameras, traffic counters, attendance records, staff observations, and visitor counts/surveys
  - Describe methods and analyze data
- Summarize fishing tournament information for Lake Jackson from Georgia Bass Chapter Federation reports

Methodology – Existing Recreation Facilities and Opportunities

- **Project recreation facilities**
  - Describe and inventory recreation amenities
  - Delineate area within project boundary and show on map
  - Describe current condition and any project-related erosion
- **Public and private non-project recreation facilities** providing recreation access to project waters
  - Describe recreation amenities, delineate area within project boundary, and show on map
- **Regional recreation opportunities**
  - Describe reservoirs, parks, and other water-based recreation opportunities within a 60-mile radius of the Project

Methodology – Recreation Field Surveys

- Objectives:
  - Assess recreation user satisfaction and user trends
  - Evaluate adequacy of existing facilities
- Conduct surveys at the four project recreation facilities on 5 days in spring and summer 2019
  - 2 weekdays, 2 weekend days, 1 holiday weekend day
- Interview recreation users with prepared questionnaire
- Periodically count vehicles and users throughout the day
- Interview bank anglers at other informal access points

Recreation Survey Form

Site info

County of origin, group size, ages

Duration and frequency of visits

Other parks used

Reasons for visit

Species fished for

Quality of facilities

Improvements desired

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:	___Clear	___Partly Cloudy	___Cloudy	___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)	___18-24	___25-34	___35-44	___45-54	___55+
4. If you came with others, what are their age groups? (check all that apply)					
___Children (infants-12)	___Youth (13-17)	___Adults (18-55)	___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?	___Yes	___No	If "yes", how many times per year? _____times		
9. Are the parks at this reservoir your primary destination for outdoor recreation activities?	___Yes	___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)			
___Boat fishing	___Pontoon boating	___Canoeing/kayaking	___Hiking/walking
___Bank fishing	___Sail boating	___Sailboarding	___Shoreline relaxation
___Tournament fishing	___Water skiing	___Picnicking/playing	___Other (list below):
___Pleasure boating	___Jet skiing	___Swimming/wading	
12. If you came to fish today, what were you fishing for? (check all that apply)			
___Largemouth bass	___Striped bass	___Channel catfish	___ Other (list below):
___Crappie	___Hybrid bass	___Blue catfish	
___Sunfish/bream	___White bass	___Flathead catfish	

13. Please rate the quality of the existing facilities at this access area. (choose one description for each)							
Parking:	___Good	___Fair	___Poor	Restrooms:	___Good	___Fair	___Poor
Boat ramp:	___Good	___Fair	___Poor	Cleanliness:	___Good	___Fair	___Poor
Dock:	___Good	___Fair	___Poor	Bank fishing access:	___Good	___Fair	___Poor

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

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Methodology – Future Recreation Demands

- Estimate future recreational demand based on population forecasts and review of the SCORP and other relevant plans and information
- Compare future demand to the estimated carrying capacity of the existing project recreation facilities

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Methodology – Land Use Assessment

- Evaluate the existing Shoreline Management Program
  - Review available land use and zoning information
  - Apply findings of shoreline survey for Geology and Soils Study
- Prepare a land use map of lands within project boundary and zone extending 2,000 ft beyond
  - Delineate developed and undeveloped lands, and leased and non-leased Georgia Power lands within project boundary
- Evaluate consistency of the Project with federal, state, regional, and local resource management plans

Schedule for Recreation and Land Use Study

Activity	Deadline
Begin literature-based review and field surveys	May 2019
Complete literature-based review and field surveys	October 2019
File progress report	January 31, 2020
File study report	May 19, 2020

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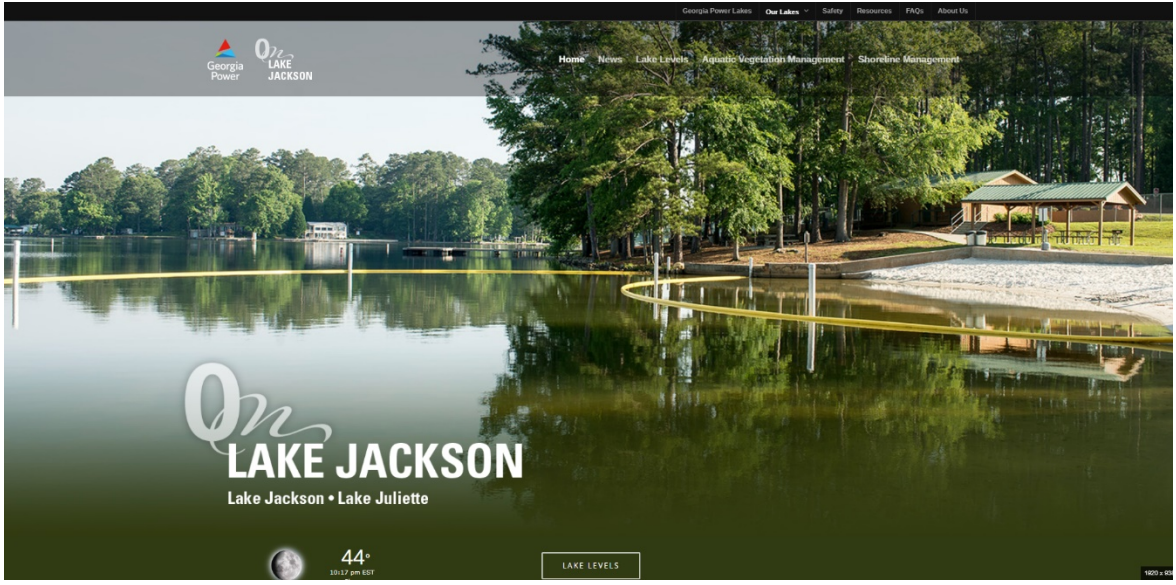
Georgia Power Shoreline Management

Mission – Georgia Power is committed to preserving the scenic, environmental, and recreational values of our lakes



http://georgiapowerlakes.com/lakejackson/

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Georgia Power Shoreline Management Program

- Landowner agreement types
  - Residential lease lots
  - Access lease agreement
  - License agreement

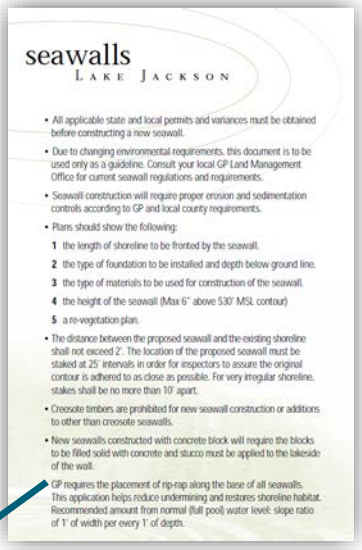
- Permitting Program for all construction, renovation, tree removal, grading, and dredging
- Shoreline Management Guidelines for structure size, setbacks, docks, seawalls, boat houses, gazebos, etc.
- Monitoring and compliance

Permitting Program

- A valid lease agreement or license is required to receive permits for construction on Georgia Power lakes and property
- A permit must be applied for, issued, and posted properly before beginning any construction, renovation, clearing, tree removal, grading, etc.
- To protect the vegetative buffer, no mechanical clearing is permitted within 25 feet of the shoreline

Shoreline Management Guidelines

- Allow reasonable use and enjoyment of lake while limiting aesthetic impact to shoreline
- Limit number, sizes, material, and configuration of shoreline structures (e.g., decks, docks, boat slips, boathouses, seawalls)
- Shoreline erosion control
- Tree removal permitting
- Dredging permitting



seawalls

LAKE JACKSON

- All applicable state and local permits and variances must be obtained before constructing a new seawall.
- Due to changing environmental requirements, this document is to be used only as a guideline. Consult your local GP Land Management Office for current seawall regulations and requirements.
- Seawall construction will require proper erosion and sedimentation controls according to GP and local county requirements.
- Plans should show the following:
  1. the length of shoreline to be fronted by the seawall.
  2. the type of foundation to be installed and depth below ground line.
  3. the type of materials to be used for construction of the seawall.
  4. the height of the seawall (Max 6" above 530' MSL contour)
  5. a re-vegetation plan.
- The distance between the proposed seawall and the existing shoreline shall not exceed 2'. The location of the proposed seawall must be staked at 25' intervals in order for inspectors to assure the original contour is adhered to as close as possible. For very irregular shoreline, stakes shall be no more than 10' apart.
- Creosote timbers are prohibited for new seawall construction or additions to other than creosote seawalls.
- New seawalls constructed with concrete block will require the blocks to be filled solid with concrete and stucco must be applied to the lakeside of the wall.

GP requires the placement of rip-rap along the base of all seawalls. This application helps reduce undermining and restores shoreline habitat. Recommended amount from normal (full pool) water level: slope ratio of 1' of width per every 1' of depth.

GP requires the placement of rip-rap along the base of all seawalls…helps reduce undermining and restores shoreline habitat

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Compliance Program

- Shoreline inspections at renewal and transfer to new owner
- Random inspections
- Proactive communications with HOA, builders, realtors, and contractors
- Enforcement – work with GEPD and Local County Authorities
- Unpermitted structures are subject to removal, no future permits, termination of access lease, legal action

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Q&A
Discussion

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Terrestrial, Wetland, and Riparian Resources Proposed Study Plan

Jim Ozier
Georgia Power

Study Objectives

- Describe upland terrestrial wildlife and botanical resources occurring in the Lloyd Shoals project area
  - Lists of representative plant and animal species
  - Identify invasive species
- Describe floodplain, wetlands, and riparian habitats occurring in the project area
  - Lists of representative plant and animal species
  - Identify invasive species
- Prepare a map of principal vegetative community types, including wetlands

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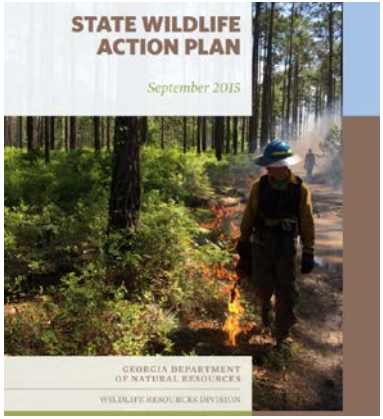
Issues Identified during Scoping

- 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
- Effects of continued project operation and maintenance activities, including shoreline management, and project-related recreation on non-native invasive botanical and wildlife species

Study Modification Requests and Comments

- WRD:
  - Survey and map submersed aquatic vegetation to assist aquatic habitat planning and addressing future issues
  - Develop an aquatic vegetation plan and include notifying WRD of aquatic nuisance vegetation treatment
- FERC:
  - Developing sufficient detail for describing existing resources and assessing potential project-related effects
  - Time field surveys for botanical RTE species to coincide with each species' flowering or fruiting period
  - File documentation of occurrences of federally listed species or their habitats as "Not for Public Disclosure, Privileged"

Sources of Existing Information



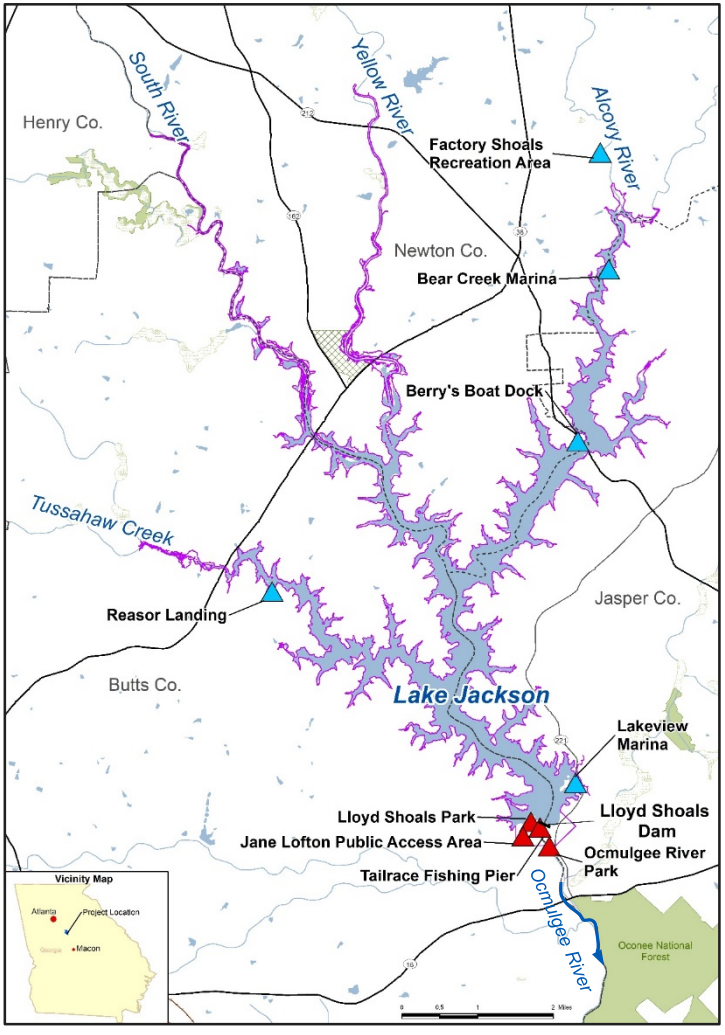
- GDNR State Wildlife Action Plan
- GDNR Wildlife Conservation Section
- Edwards et al. (2013), The Natural Communities of Georgia
- Georgia Museum of Natural History
- National Audubon Society Christmas Bird Count
- USGS North American Breeding Bird Survey
- FWS National Wetlands Inventory (NWI)
- Georgia Exotic Pest Plant Council
- Georgia Power information on monitoring and treatment of terrestrial and aquatic invasive nuisance vegetation

Study Area

- FERC project boundary around Lake Jackson and tailrace area downstream
- For mapping vegetation and wetlands, a zone extending 2,000 ft beyond the project boundary

Project Boundary

Project Recreation Facilities



Methodology – Review of Existing Information

- Review existing information summarized in PAD
- Inspect existing aerial photography and NWI maps
- Compile wildlife and plant species lists for common species
- Describe vegetative community types, including wetlands
- Map vegetative cover, including approximate wetland boundaries
- Describe occurrences of non-invasive aquatic plants
- Describe Georgia Power's invasive vegetation and management activities for Lake Jackson and project lands

Methodology – Field Reconnaissance Survey

- Inspect aerial photography to identify representative communities for field reconnaissance
- Visually assess terrestrial, wetland, and riparian communities from a boat and/or walking on Georgia Power or public lands
- Ground truth aerial photography signatures of representative plant communities

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- Identify and approximately delineate extent of wetlands and submersed aquatic vegetation within project boundary
- Identify occurrence and extent of invasive nuisance plants within project boundary, including project recreation facilities
- Identify Bald Eagle nests and wading bird nesting areas

Schedule for Terrestrial, Wetland, and Riparian Resources Study

Activity	Deadline
Begin field studies and literature review	May 2019
File progress report	January 31, 2020
Complete field studies and literature review	April 2020
File study report	May 19, 2020

Q&A
Discussion

Lloyd Shoals Dam
Lake Jackson

Georgia Power

Lloyd Shoals Dam
Lake Jackson

Rare, Threatened, and Endangered (RTE) Species Proposed Study Plan

Tony Dodd
Georgia Power

Study Objectives

- 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 the habitat requirements of these species
- Describe distributions and habitat use of RTE species presently occurring near the Project

Issues Identified during Scoping

- 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

Michaux's Sumac – Federally Endangered

U.S. Fish and Wildlife Service

Study Modification Requests and Comments

- FWS supports the proposed DO monitoring in the Lloyd Shoals tailrace as part of the Water Resources Study because Robust Redhorse is under federal status review for listing
- FERC 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
- FERC requests that documentation of occurrences of federally listed species or their habitats be filed as "Not for Public Disclosure, Privileged"

Sources of Information and Data

- GDNR Wildlife Conservation Section rare element data portal
- FWS Environmental Conservation Online System
- Fishes of Georgia website
- NatureServe Explorer
- Scientific literature, manuals, texts, and technical reports
- Freshwater mollusk survey planned as part of the Fish and Aquatic Resources Study

Altamaha Shiner – GA Threatened

Nate Tessler, NANFA.org

Bald Eagle – GA Threatened

Shutterstock.com

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Aquatic RTE Species

- No federally listed aquatic species presently known to occur at Project
- Robust Redhorse and Reverse Pebblesnail under federal status review

Scientific Name	Common Name	Georgia Status	Federal Status	Location
Alasmidonta arcula	Altamaha arcmussel	T	--	Lake Jackson and Ocmulgee River
Pyganodon gibbosa	Inflated floater	--	--[a]	Lake Jackson
Somatogyrus alcoviensis	Reverse pebblesnail	--	Under review	Alcovy River upstream of Lake Jackson
Cyprinella xaenura	Altamaha shiner	T	--	Ocmulgee River
Moxostoma robustum	Robust redhorse	E	Under review	Ocmulgee River

[a] Not listed or under review but considered to be at-risk in Altamaha River basin.

Terrestrial RTE Species

- No federally listed terrestrial species presently known to occur at Project
- Granitic outcrops preferred by many of the plant species are absent

Scientific Name	Common Name	Georgia Status	Federal Status	Occurs at Project
Amphianthus pusillus	Pool sprite[a]	T	LT	--
Eriocaulon koernickianum	Dwarf hatpins[a]	E	--	--
Isoetes melanospora	Black-spored quillwort[a]	E	LE	--
Rhus michauxii	Michaux's sumac	E	LE	--
Sedum pusillum	Granite stonecrop[a]	T	--	--
Trillium reliquum	Relict trillium	E	LE	--
Heterodon simus	Southern hognose snake	T	--	--
Haliaeetus leucocephalus	Bald eagle	T	--	X
Picoides borealis	Red-cockaded woodpecker	E	LE	--

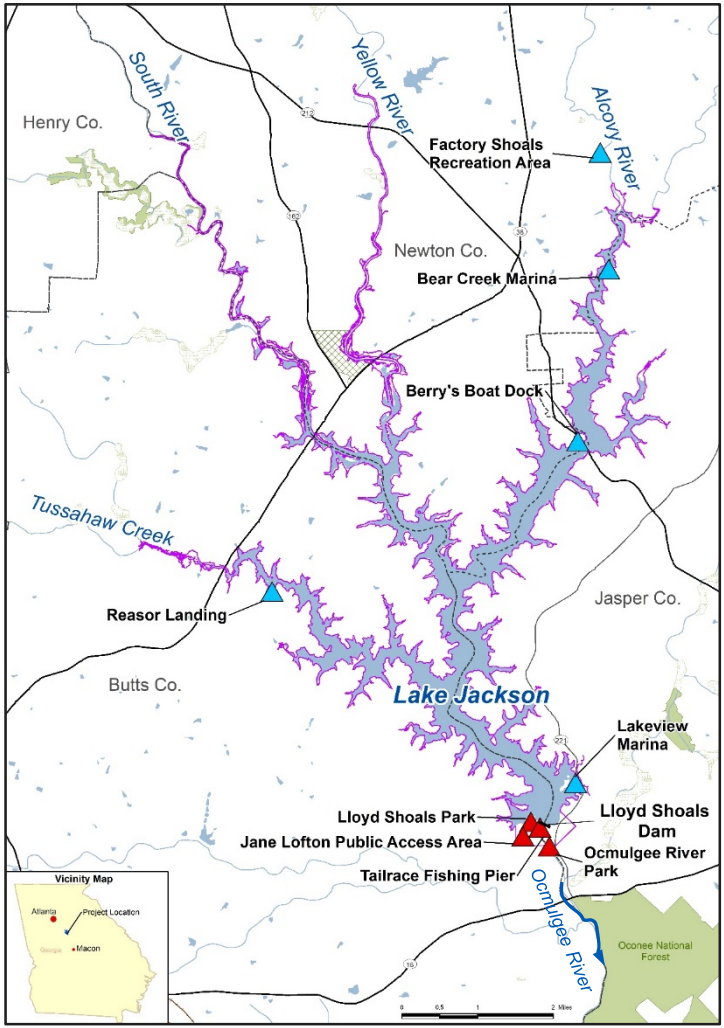
[a] Plant species limited in occurrence to granite outcrop habitats.

Study Area

- FERC project boundary around Lake Jackson and tailrace area downstream, including the project recreation facilities

Project Boundary

Project Recreation Facilities



Methodology – Review of Existing Information

- Known records of RTE occurrence in or near the Project
- Update and refine the list of RTE species from the PAD
- Describe occurrences of RTE species in the project boundary as well as those potentially occurring in the project area

Methodology – Field Surveys

- Identify areas of potentially suitable habitat for RTE species using existing maps, aerial photography, and literature review
- Survey representative habitats species, primarily in spring and early summer, during flowering/fruiting periods of RTE plants
- Conduct field surveys in coordination with field surveys for Terrestrial, Wetland, and Riparian Resources Study

Schedule for RTE Species Study

Activity	Deadline
Begin field studies and literature review	May 2019
File progress report	January 31, 2020
Complete field studies and literature review	April 2020
File study report	May 19, 2020

Q&A
Discussion

Relict Trillium – Federally Endangered

Pete Pattavina, U.S. Fish and Wildlife Service

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Water Resources Proposed Study Plan

Tony Dodd
Georgia Power

Study Objectives

- Characterize water use, availability, and water quality
- Characterize effects of continued project operation on water quality, including dissolved oxygen (DO) concentrations and water temperature, in Lake Jackson and the tailrace area within the project boundary
- Characterize effects of project operations during drought on water uses downstream in the Ocmulgee River

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Lake Jackson

Issues Identified during Scoping

- Scoping Document 1 (SD1):
  - Effects of continued project operation on water quality, including DO concentrations and water temperature, in Lake Jackson and the Ocmulgee River downstream from the Project
- Scoping Document 2 (SD2):
  - Effects of continued project operation on cyanobacteria development and levels in Lake Jackson, including assess the need for measures to address cyanobacteria levels

Study Modification Requests and Comments

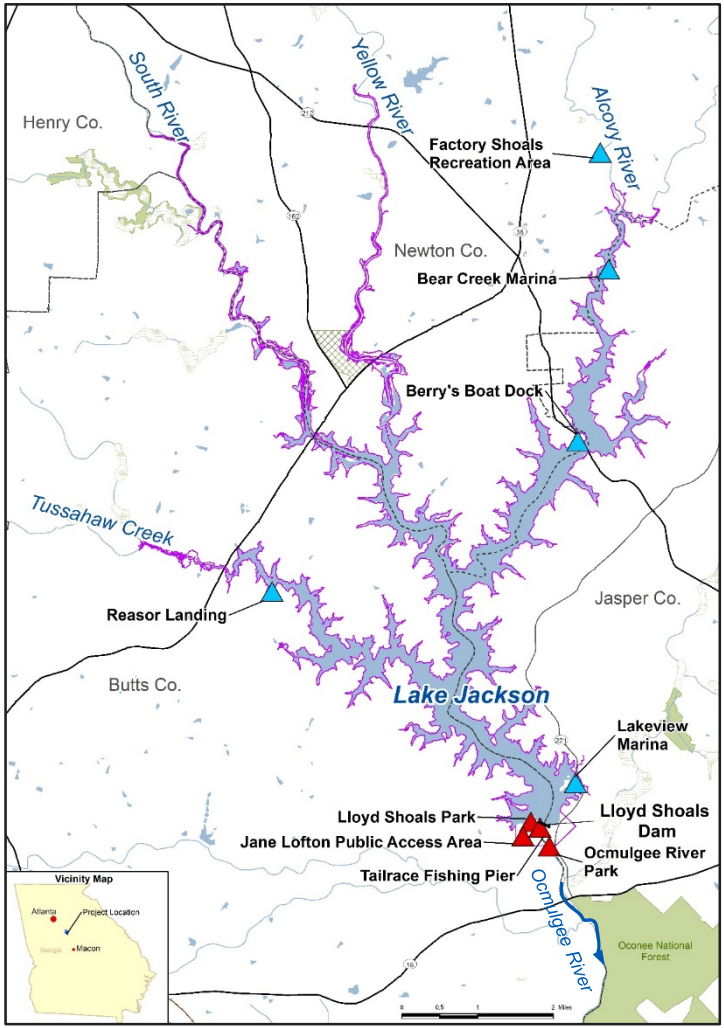
- Georgia Environmental Protection Division (GEPD):
  - Expand proposed tailrace water quality monitoring to a full year
  - Analyze monthly grab samples from tailrace for several water chemistry parameters to support GEPD's hydrodynamic and water quality model for the Ocmulgee River
- EPA:
  - Coordinate with resource agencies to define a downstream boundary for the proposed water quality studies
  - Consider year-round monitoring to demonstrate water-quality standards compliance
  - Acquire downstream baseline data from readily available sources including state and federal agencies

Sources of Existing Information and Data

- Georgia Power seasonal water quality data collected in Lake Jackson at multiple locations from 2000 to 2017
- Water quality data collected in Lake Jackson by Adopt-a-Lake member Jackson Lake Association
- Scientific and technical literature on nutrient loading sources and land use practices upstream of Lake Jackson and their potential influences on water quality, eutrophication, cyanobacteria, and harmful algal blooms in the reservoir
- Middle Ocmulgee Regional Water Plan (2017)
- Water Resource Management Plan of the Metropolitan North Georgia Water Planning District (2017)
- Georgia 305(b)/303(d) listing documents

Study Area

- Lake Jackson and the Lloyd Shoals tailrace area downstream to end of project boundary
- Tributary watersheds upstream of Lake Jackson
- Ocmulgee River downstream of project boundary based on available water quality data



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Methodology Overview

- Review existing water quality monitoring data for Lake Jackson
  - Georgia Power vertical profiles and water chemistry (2000-2017)
  - Adopt-a-Lake, GEPD, and other readily available sources
- Water quality monitoring in Lloyd Shoals tailrace area
  - Continuous monitoring of DO and temperature for 1 year
  - Monthly water chemistry grab samples for 1 year
- Literature review and analysis of occurrences of harmful algal blooms in Lake Jackson

Georgia Power Lake Jackson Water Quality Sampling 2000-2017

- ● Profile & chemistry data at 6 stations
- ◆ Profile & chemistry data at <6 stations
- ○ Profile data only at 6 stations

	Winter			Spring			Summer			Fall		
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000						○	◆	○			◆	
2001						●		◆			●	
2002						●		●			●	
2003						●		●			●	
2004						●		●			●	
2005						●		●	◆	●		
2006						●		●			◆	
2007				◆		●		◆		●		
2008						●		●		●		
2009						●		●		◆		
2010							●	●		●		
2011				●				●			●	
2012				◆				●			●	
2013				●				●	●			
2014		◆		●				●		●		
2015	◆			◆				◆			○	
2016		◆		◆				●		●		
2017	●		○				●					

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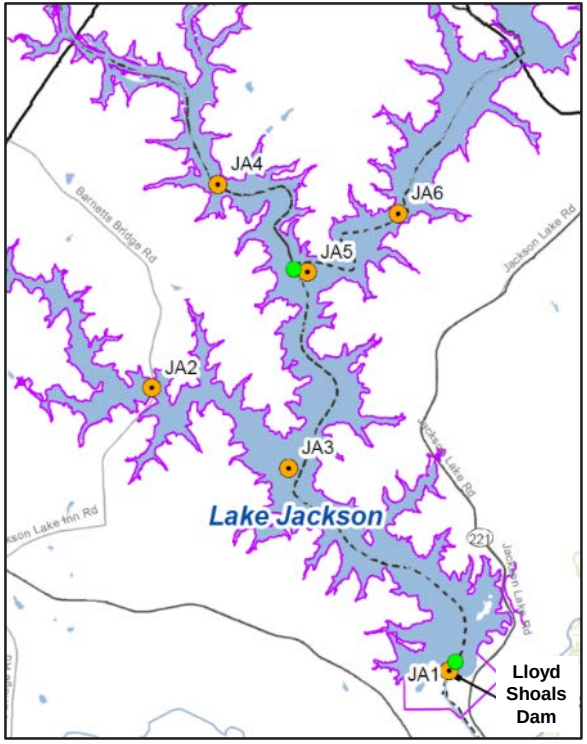
Lake Jackson

Lake Jackson Water Quality Monitoring Stations

- Georgia Power monitored six stations for several decades
- Vertical profiles measured seasonally 2000-2017
- Water chemistry sampled seasonally 2014-2017

Station	Vertical Profiles	Water Chemistry
JA1	●	●
JA2	●	●
JA3	●	
JA4	●	●
JA5	●	
JA6	●	●



Georgia Power water quality station

GEPD station

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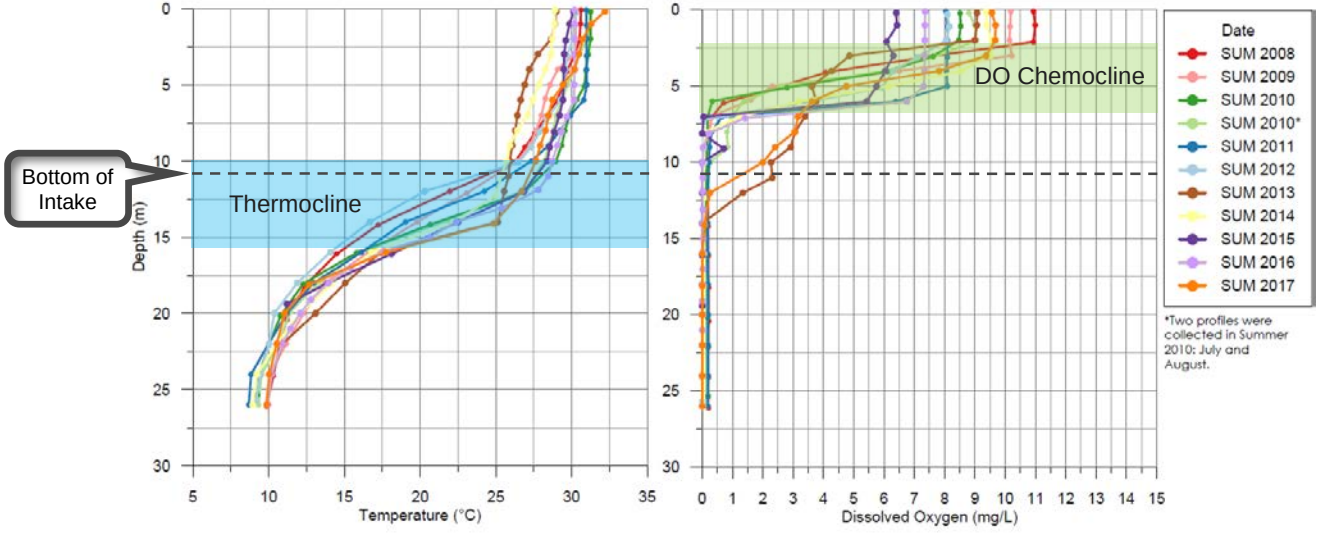
Lake Jackson

Vertical Profiles of Lake Jackson – Forebay

Summer



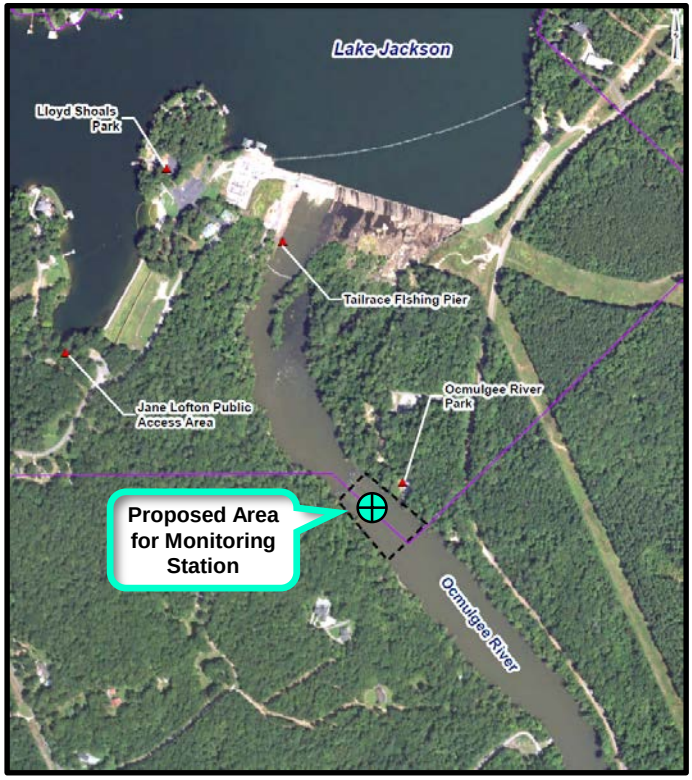
Lake Jackson Seasonal Water Chemistry Parameters

Parameter
Alkalinity (mg/L)
Ammonia (mg/L)
Calcium (mg/L)
Chlorophyll *a* (µg/L)
Fecal coliform bacteria (MPN colonies/100 ml)
Hardness (mg/L)
Iron (mg/L)
Magnesium (mg/L)
Manganese (mg/L)
Nitrate (mg/L)
Nitrite (mg/L)
Total Phosphorus (mg/L)
Turbidity (NTU)

Lloyd Shoals Dam
Lake Jackson

Water Quality Monitoring in the Lloyd Shoals Tailrace Area

- Establish monitoring station in May 2019
- Buoy-mounted data sonde at depth of 1 meter (m)
- DO and water temperature recorded every 60 minutes May 2019-April 2020
- Monthly grab samples at 1-m depth
  - 5-day BOD, ammonia, nitrate-nitrite, organic nitrogen, total phosphorus, ortho-phosphate, organic phosphorus



Analysis of Information and Data

- Lake Jackson
  - Compile seasonal water quality data in tables and graphs
  - Summarize and present other water quality data sources
  - Perform cyanobacteria literature review and analysis
- Lloyd Shoals Tailrace
  - Align continuous water quality and operational data to evaluate effects of operations during summer and performance of existing passive draft tube aeration system
- Ocmulgee River Downstream of Project Boundary
  - Summarize and present available water quality data sources

Literature Review of Cyanobacteria Occurrence and Blooms

- GEPD information and data
- Georgia Power algal reports and sampling information
- Research program of phycologist (algal biologist)
  Dr. Kalina Manoylov, GCSU
- Research program of aquatic community ecologist
  Dr. Alan Wilson, Auburn Univ.
- UGA CyanoTracker Project
- Scientific literature

Schedule for Water Resources Study

Activity	Deadline
Begin field studies and literature review	May 21, 2019
File progress report	January 31, 2020
Complete field studies and literature review	April 2020
File study report	May 19, 2020

Lloyd Shoals Dam
Lake Jackson

Q&A
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Lloyd Shoals Dam
Lake Jackson

Fish & Aquatic Resources Proposed Study Plan

Patrick O'Rouke
Georgia Power

Study Objectives

- Characterize representative shoreline and littoral-zone aquatic habitat (as part of Geology and Soils Study shoreline survey)
- Conduct a survey of native freshwater mussels and snails occurring in project waters

- Evaluate the effects of continued project operations on habitat for primary sport fish species in Lake Jackson
- Evaluate the effects of continued project operations on aquatic habitat in the Ocmulgee River downstream of the Project
- Evaluate the potential for fish entrainment and turbine-induced mortality at the Lloyd Shoals powerhouse

Issues Identified during Scoping (*SD2 additions in italics*)

- 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*

Issues Identified during Scoping (Continued)

- 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
- Effects of continued project operation on state species of concern in the vicinity of the Project

Study Modification Requests and Comments

- U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) requested a study of American Eel abundance and upstream movements
  - Separate study plan
- WRD requested additional objectives for shoreline aquatic habitat survey
  - Part of Geology and Soils Study Plan
- FERC requested that desktop entrainment analysis include an estimate of total number of fish entrained annually by species, size class, and season
- WRD requested estimates of monetary loss of fish due to entrainment and impingement

Key Sources of Existing Information

- WRD annual standardized fishery surveys of Lake Jackson
- Previous relicensing studies for the Project, including an instream flow (IFIM) study in the Ocmulgee River downstream
- Georgia Bass Chapter Federation long-term fishing tournament database of bass catch statistics in Georgia reservoirs
- Scientific literature on the distribution, habitat use, and movements of riverine fish in the Ocmulgee River downstream
- Ongoing monitoring of Robust Redhorse downstream through existing Candidate Conservation Agreement with Assurances
- WRD records of freshwater mussels and snails in the upper Ocmulgee River basin

Summary of GDNR Electrofishing Data for Lake Jackson, 2013-2017

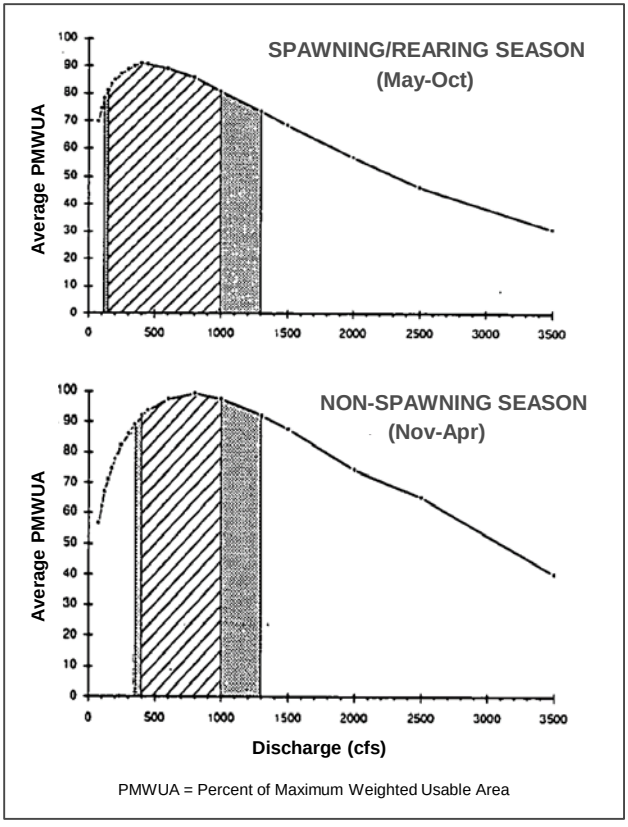
PAD, Table 11:

	Mean Catch per Hour (CPH)[a] and Standard Error (SE)[b]									
	2013		2014		2015		2016		2017	
Common Name	CPH	SE	CPH	SE	CPH	SE	CPH	SE	CPH	SE
Bluegill	44.92	7.82	17.27	3.13	30.30	7.71	58.79	4.95	31.82	5.44
Largemouth bass	40.63	7.39	33.94	5.42	25.87	2.56	38.18	7.12	39.09	8.32
Black crappie	22.42	3.22	21.21	7.11	26.26	2.02	60.61	21.21	37.37	24.14
Redear sunfish	19.15	5.46	25.93	3.82	32.66	5.19	33.03	6.72	32.32	4.34
Spotted bass	12.05	3.31	12.73	2.20	39.39	8.97	23.23	7.42	15.66	3.36
Redbreast sunfish	13.48	4.05	7.58	1.71	20.20	7.61	26.89	7.69	17.88	4.37
	Mean Relative Condition Factor (K_n)[c] and Standard Error (SE)[b]									
	2013		2014		2015		2016		2017	
Common Name	K_n	SE	K_n	SE	K_n	SE	K_n	SE	K_n	SE
Bluegill	0.99	0.02	1.00	0.02	1.04	0.02	1.00	0.01	1.01	0.02
Largemouth bass	0.88	0.01	0.86	0.01	0.93	0.01	0.92	0.01	0.94	0.02
Black crappie	0.91	0.01	0.88	0.01	0.91	0.01	0.92	0.01	0.90	0.01
Redear sunfish	1.03	0.02	1.12	0.01	1.18	0.02	1.03	0.01	1.06	0.01
Spotted bass	1.01	0.02	0.99	0.02	0.96	0.01	0.97	0.02	1.03	0.03
Redbreast sunfish	0.98	0.04	0.96	0.03	1.03	0.03	0.94	0.02	1.00	0.02

Source: GDNR

Habitat-Discharge Relationships for Target Fish Species and Life Stages in Ocmulgee River Instream Flow (IFIM) Study

- Conducted in consultation with GDNR and FWS
- 17-mile study reach
- 12 fish species/life stages
- Habitat suitability criteria derived from site-specific field studies
- Physical Habitat Simulation Model (PHABSIM) produced discharge versus weighted usable area relationships for each species life stage



Freshwater Mollusk Occurrences near Lloyd Shoals Project, 2008-2014

PAD, Table 15:

Scientific Name	Common Name	Lake Jackson[a,b]	Yellow River[a]	Alcovy River[a]	Ocmulgee River[b]
MUSSELS:					
Unionidae:					
Alasmidonta arcula	Altamaha arcmussel[●]	X			X
Elliptio sp. cf. *angustata*	Carolina lance			X[c]	X
Elliptio hopetonensis	Alabama slabshell				X
Elliptio sp.	Elliptio				X
Pyganondon gibbosa	Inflated floater	X			
Utterbackia imbecillis	Paper pondshell	X	X		
Villosa delumbis	Eastern creekshell			X	
SNAILS:					
Hydrobiidae:					
Somatogyrus alcoviensis	Reverse pebblesnail[●]			X	
Viviparidae:					
Campeloma sp.	Campeloma	X			X
Pleuroceridae:					
Elimia catenaria	Gravel elimia			X	
Elimia sp.	Elimia			X	X
Physidae:					
Physa sp.	Physa				X
Planorbidae:	Ramshorn				X

● Georgia state-listed as threatened.

● Petitioned for federal listing; under review.

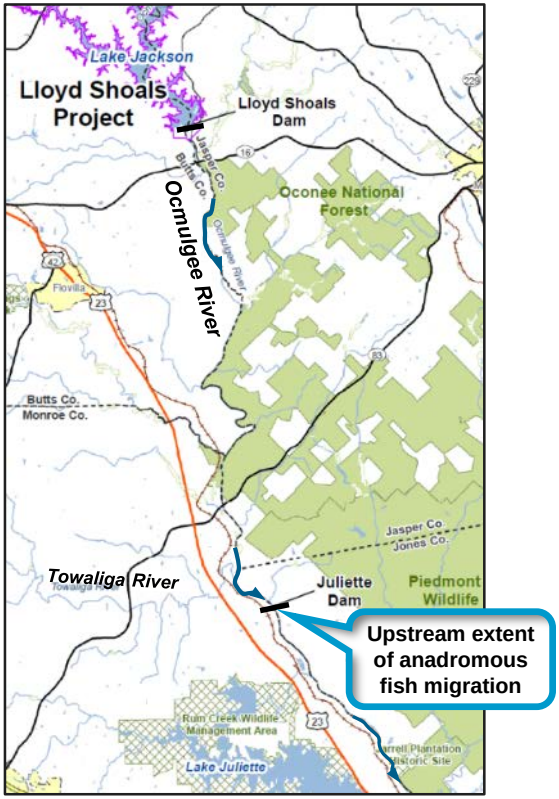
Source: GDNR

Lloyd Shoals Dam
Lake Jackson

Study Area

- FERC project boundary around Lake Jackson and the Lloyd Shoals tailrace area
- Ocmulgee River downstream to Juliette Dam (19 miles)

☐ Project Boundary



Methodology Overview

- Shoreline habitat survey
  - Presented under Geology and Soils Study Plan
- Freshwater mollusk survey
- Habitat for primary sport fish species
- Downstream riverine habitat
- Fish entrainment evaluation

Methodology – Freshwater Mollusk Survey

- **Objectives:**
  - Characterize occurrence, distribution, relative abundance, and species richness of native mollusk community
  - Satisfy survey objectives of Candidate Conservation Agreement for Mollusks of Altamaha River Basin
- **Survey elements:**
  1. Lake Jackson mussel survey
  2. Reverse Pebblesnail survey upstream but near project boundary
  3. Lloyd Shoals tailrace area mussel survey

Altamaha Arcmussel

GDNR Wildlife Resources Division

Lloyd Shoals Dam
Lake Jackson

Methodology – Freshwater Mollusk Survey

- Led by experienced WRD mussel biologists
- Conducted in summer or fall 2019
- Occupancy-based sampling model developed by WRD
- Search methods to include visual observations while wading, hand grubbing, snorkeling, SCUBA, or surface-supplied air
- Survey sites:
  - Up to 12 in Lake Jackson
  - Up to 12 in tailrace area to first shoals below GA Hwy 16
  - To be determined on-site for Reverse Pebblesnail

Methodology – Habitat for Primary Sport Fish Species

- **Objectives:**
  - Evaluate the suitability of summer water quality for sport fish species in Lake Jackson, including Largemouth Bass and Striped Bass
- **Data sources:**
  - Georgia Power water quality monitoring data
  - GDNR standardized fisheries survey data for sport fishes
  - Temperature and DO suitability criteria reported in scientific literature for primary sport fish species

Lloyd Shoals Dam
Lake Jackson

Methodology – Habitat for Primary Sport Fish Species

- Compile and analyze vertical profile data from up to six locations in the reservoir collected annually
- Analyze GDNR fisheries survey data for abundance and growth characteristics of primary sport fish species
  - Length-frequency distribution, relative condition factors, relative abundance, catch per unit effort, and other descriptive statistics
- Evaluate water quality suitability for Largemouth Bass and Striped Bass based on water temperature, DO, and other habitat suitability information from the scientific literature
- Summarize GDNR reports on fish kill events occurring in the project waters during the current license term
- Describe littoral habitat (as part of Geology and Soils study)

Methodology – Downstream Riverine Habitat

- **Water quality** – compare tailrace continuous monitoring data to water temperature, DO, and other relevant habitat suitability information for riverine species from the scientific literature
- **Physical habitat** – present habitat-discharge relationships developed in previous IFIM study for comparison of habitat availability across discharges ranging from 50 to 3,500 cfs
- **Riverine species** – review existing literature and study information for Robust Redhorse, other riverine fish and invertebrate species, and diadromous fishes to further characterize current conditions and the potential for impacts of continued project operations to the riverine aquatic community

Methodology – Fish Entrainment Evaluation

- **Objectives:**
  - Characterize potential entrainment at the Project, including the number of fish entrained annually, their size distribution and species composition, and seasonal variation in entrainment rates
  - Evaluate mortality rates of fish passing through turbines based on survival tests conducted at other projects with similar head and turbine design characteristics to those at Lloyd Shoals
- **Primary data sources:**
  - Scientific literature on hydropower turbines and fish mortality
  - EPRI fish entrainment and turbine passage survival databases
  - Comprehensive entrainment reviews by EPRI and FERC
  - Entrainment field studies from other southeastern hydro projects

Methodology – Fish Entrainment Evaluation

- Apply common trends and data from field studies at other hydroelectric sites with consideration of the physical, operational, and fisheries characteristics of Lloyd Shoals
- Assess potential impacts of entrainment losses based on:
  - Fishery survey data for the reservoir
  - Intake location and other characteristics of the reservoir forebay
  - Natural mortality rates of young fish
  - Other relevant factors
- Evaluate potential implications to Striped Bass and hybrid bass management and experimental stocking of American Shad

Lloyd Shoals Dam
Lake Jackson

Schedule for Fish and Aquatic Resources Study

Activity	Deadline
Begin field studies and literature review	May 2019
File progress report	January 31, 2020
Complete field studies and literature review	April 2020
File study report	May 19, 2020

Q&A
Discussion

Lloyd Shoals Dam
Lake Jackson

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Lake Jackson

American Eel Abundance and Upstream Movements Proposed Study Plan

Patrick O'Rouke
Georgia Power

Study Objectives

Atlantic States Marine Fisheries Commission

- Identify the life stage and size range of American Eels migrating to Lloyd Shoals Dam
- Identify the timing of upstream movements in terms of seasonality and any correlation with discharge, water temperature, and percent of moon illumination
- Calculate indices of abundance of American Eel migrating to Lloyd Shoals Dam

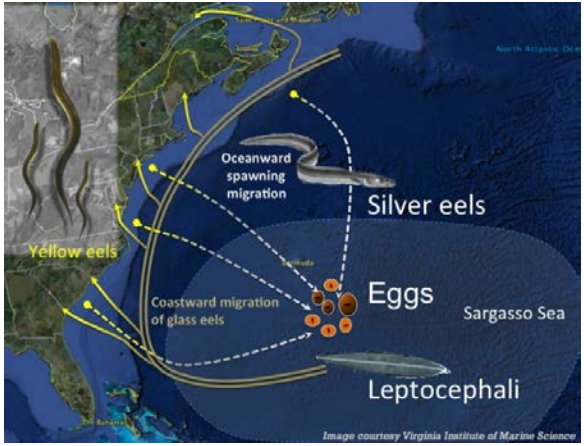
Scoping Issue and Study Requests

- Issue identified during Scoping (*SD2 additions in italics*)
  - 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*

- Study Requests
  - FWS and NMFS requested a study of American Eel abundance and upstream movements
  - This study plan adopts the agencies' study requests, with proposed modifications to reflect existing information

American Eel (*Anguilla rostrata*) Life Cycle

- Catadromous – spending most of life in fresh or brackish water then migrating to sea to spawn
- Life stages:
  - **Eggs** – deposited in Sargasso Sea
  - **Leptocephali** – larvae drift in ocean currents toward coast
  - **Glass eels** – migrate into estuaries and rivers
  - **Elvers** – migrate upstream, surmounting vertical obstacles
  - **Yellow eels** – may continue migrating upstream; occupy wide range of habitats for several years
  - **Silver eels** – reproductively mature; migrate downstream to ocean and to Sargasso Sea to spawn



American Eel Abundance in the Ocmulgee River

American Eel Electrofishing Catch Statistics below Lloyd Shoals Dam, 1988:

	Station 1	Station 2	Station 3	Station 4
Miles below Lloyd Shoals Dam	0.6 – 1.1	4.2 – 4.8	14.0 – 15.0	27.6 – 28.2
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
Lengths (mm)	Mean = 343; range: 168 – 825			

Source: EA Engineering, Science, and Technology, Inc. (1990)

Lloyd Shoals Dam
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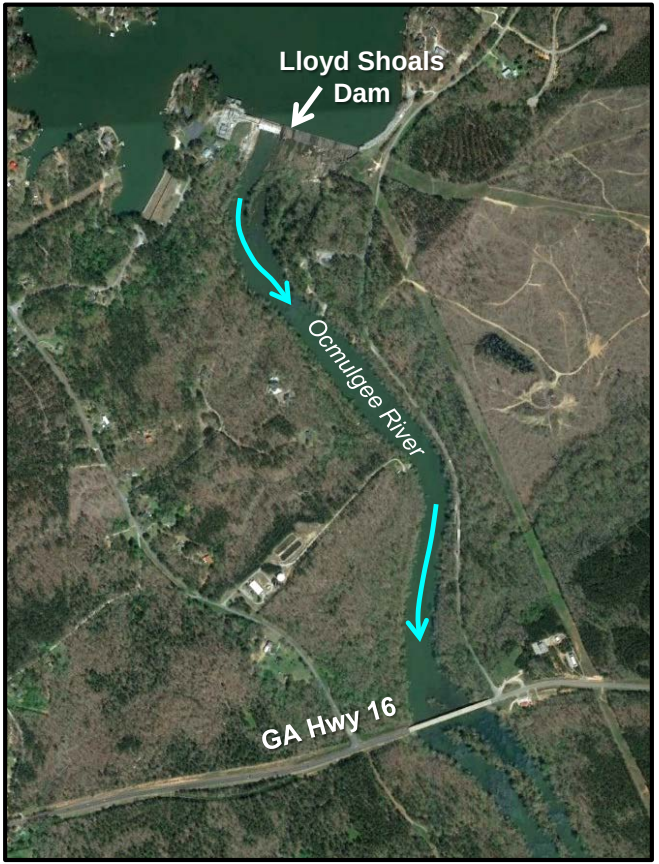
Study Area

- Ocmulgee River from Lloyd Shoals Dam downstream about 1.2 river miles to the Hwy 16 bridge



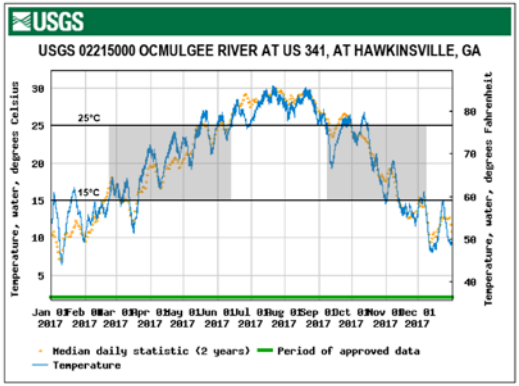
Methodology

- Conduct sampling during 6 months of a 1-year period
  - March, April, May, and June to encompass onset and probable peak of upstream migration (after water temperature rises above 15°C)
  - September and October before water temperature falls below 15°C

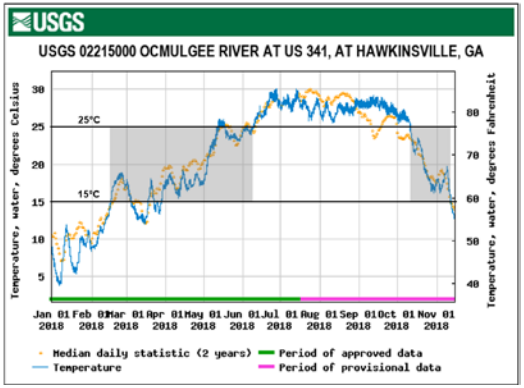
Water temperatures between 15 and 25 °C, suitable for migration

Ocmulgee River Water Temperature

2017



2018



Lloyd Shoals Dam
Lake Jackson

Methodology - Electrofishing

Study Area

- Sample once per month in Mar-Jun and Sep-Oct
- Boat and backpack electrofishing in daylight during off-peak releases
- Timed runs or transects in representative habitats and both sides of river
  - Up to four 30-minute boat electrofishing runs
  - Up to four 15-minute backpack electrofishing runs in wadeable habitats

Lloyd Shoals Dam
Lake Jackson

Methodology – Eel Trapping

- One multi-day sampling event per month in Mar-Jun and Sep-Oct
- Deploy traps overnight for two consecutive nights in up to five locations near base of dam
  - Standard eel traps/pots, baited
  - Ramps with climbing substrate, attraction flow, and bucket in readily accessible locations

Google Earth

South Carolina DNR

Kleinschmidt Associates

Lloyd Shoals Dam
Lake Jackson

Methodology – Data Analysis

- Yellow eels will be anesthetized, measured (total length), weighed, caudal fin-clipped, a Passive Integrated Transponder (PIT) tag inserted, and released to study area
- Large numbers of elvers, if captured, will be counted volumetrically and a subsample measured for total length
- Length-frequency distributions and CPUE by gear type, and mark-recapture population estimates will be presented
- Data for environmental variables will be collected, including:
  - River discharge from USGS gage near Jackson
  - Water temperature from tailrace continuous water quality monitoring
  - Moon illumination from U.S. Naval Observatory
- Eel catch data will be evaluated for correlation to water temperature, discharge, and percent moon surface illumination

Schedule for American Eel Abundance and Upstream Movements Study

Activity	Deadline
Begin field studies and literature review	May 2019
File progress report	January 31, 2020
Complete field studies and literature review	April 2020
File study report	May 19, 2020

Q&A
Discussion

Julie Devers, U.S. Fish and Wildlife Service

Lloyd Shoals Dam
Lake Jackson

Georgia Power

Lloyd Shoals Dam
Lake Jackson

Geology & Soils Proposed Study Plan

Joey Charles
Georgia Power

Ecoregions of Georgia

★ Lloyd Shoals Project

Lloyd Shoals Dam
Lake Jackson

Study Objectives

- Characterize existing shoreline conditions with respect to erosion and sedimentation in Lake Jackson and the Lloyd Shoals tailrace
- Evaluate the effects of continued project operation and project-related recreation on reservoir and tailrace shoreline erosion and sedimentation
- Conduct a survey of shoreline aquatic habitat and literature review on the relationship between shoreline structural stabilization practices and littoral-zone fish habitat

Representative Shorelines









Lloyd Shoals Dam
Lake Jackson

Issues Identified during Scoping

- Scoping Document 1 (SD1):
  - Effects of continued project operation and project-related recreation on reservoir and tailrace shoreline erosion and sedimentation
- Scoping Document 2 (SD2):
  - 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

Study Modification Requests and Comments

- WRD, regarding the shoreline habitat survey:
  - Provide maps representing developed and undisturbed project shoreline areas
  - Survey and map submersed vegetation in the reservoir
  - Complete literature review on how rates and magnitude of shoreline development affect sport fish species such as Largemouth Bass, Black Crappie, and sunfish
  - Incorporate schedules for drawdowns, including magnitude and duration, for planning aquatic plantings and fish stockings inside the project boundary

Study Modification Requests and Comments (Continued)

- FERC:
  - Denote whether erosion is project related, non-project related, or a combination thereof
  - Analyze spatial and temporal changes in geomorphology through a comparison of new and historical data, such as bathymetry, topography, and/or aerial photography
  - Provide a map delineating ownership of lands along the reservoir and tailrace shorelines indicating whether land is privately or project-owned
  - Summarize all dredging permits issued at the Project and available information pertaining to each dredging event

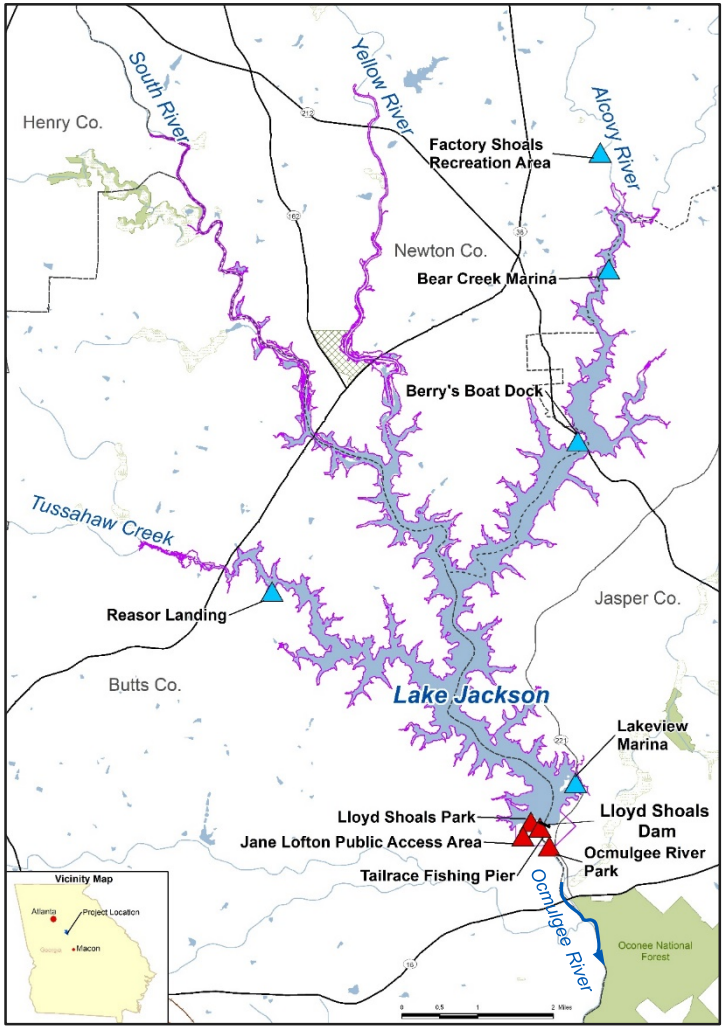
Other Scoping Comments

- Ms. Julia Haar expressed concern about siltation and its consequences for water quality of Lake Jackson
- Mr. Josh Williford expressed concern about accumulated sediment in Lake Jackson with respect to mercury and PCBs
- Altamaha Riverkeeper expressed concern about sedimentation with respect to water and accumulated pollutants

Study Area

- FERC project boundary around Lake Jackson and tailrace area downstream
- Adjacent lands and watersheds upstream of the project boundary for literature review

  - Project Boundary
  - Project Recreation Facilities

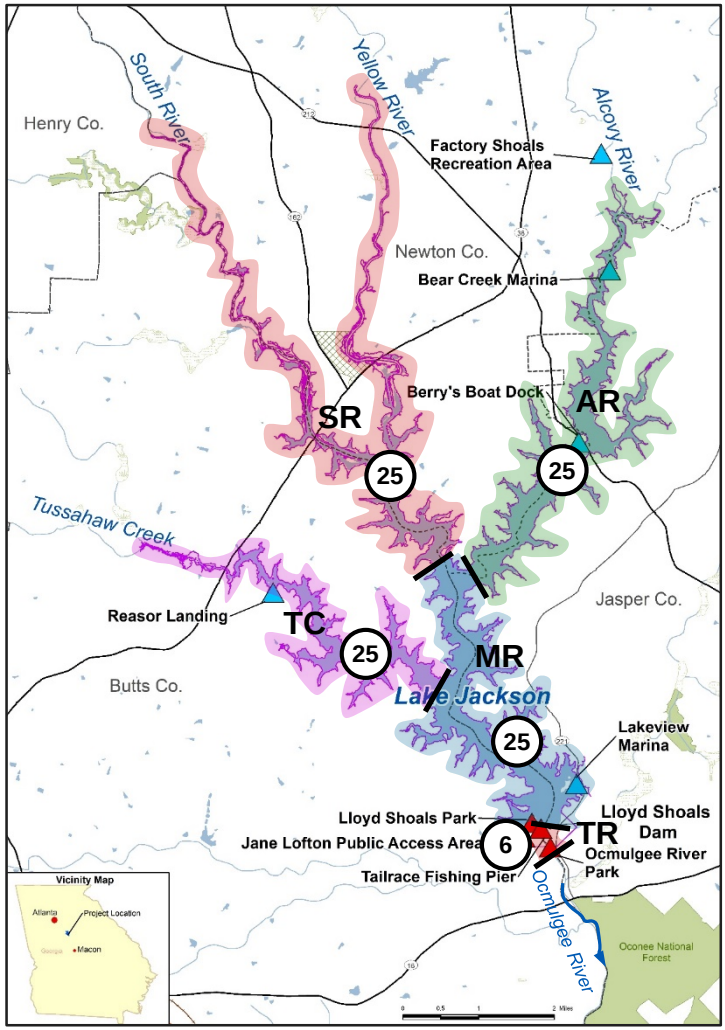


Lloyd Shoals Dam
Lake Jackson

Study Area Sections for Shoreline Survey

- Stratified random selection of 500-ft shoreline sites
- 106 total sites
- Each project recreation facility represented

○ Number of survey sites



Shoreline Survey Form

Site info

Riparian zone

Land uses

Bank stability and protection

Stabilization practices

Erosion causes (project & non-project related)

Shoreline fish habitat

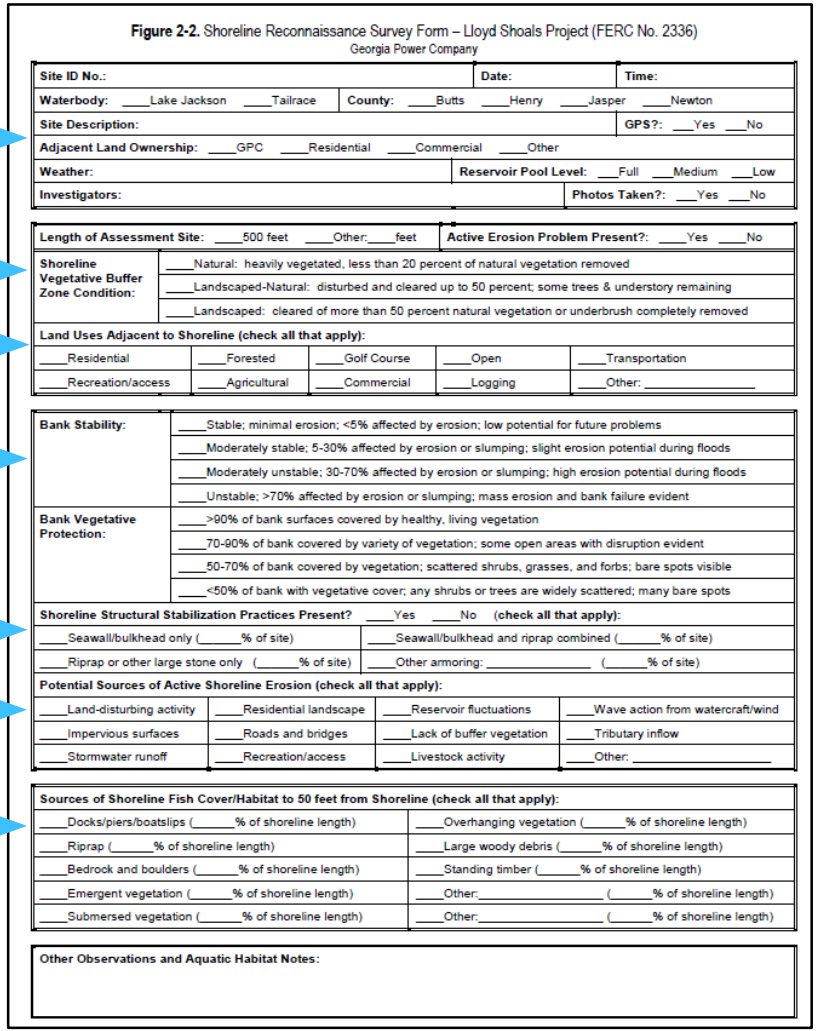


Figure 2-2. Shoreline Reconnaissance Survey Form – Lloyd Shoals Project (FERC No. 2336)
Georgia Power Company

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:

Lloyd Shoals Dam
Lake Jackson

Methodology – Analysis of Existing Information and Data

- Shoreline temporal change analysis using aerial photography since 1993; identify changes & trends in representative areas
- Evaluate effects of project operation on shoreline erosion and sedimentation using data on reservoir fluctuation frequency
- Literature review on shoreline structural stabilization practices and their effects on littoral-zone aquatic habitat in reservoirs
- Summarize dredging permits issued and available information on dredging events (purpose, location, methods, volume)
- Prepare map delineating lands within project boundary as privately or project-owned
- Literature review on sediment transport and accumulation in Lake Jackson, including mercury and PCBs in sediment

Schedule for Geology and Soils Study

Activity	Deadline
Begin temporal change analysis and literature review	May 21, 2019
Conduct shoreline survey	Summer 2019
File progress report	January 31, 2020
Complete data analysis and literature review	February 28, 2020
File final study report	May 19, 2020

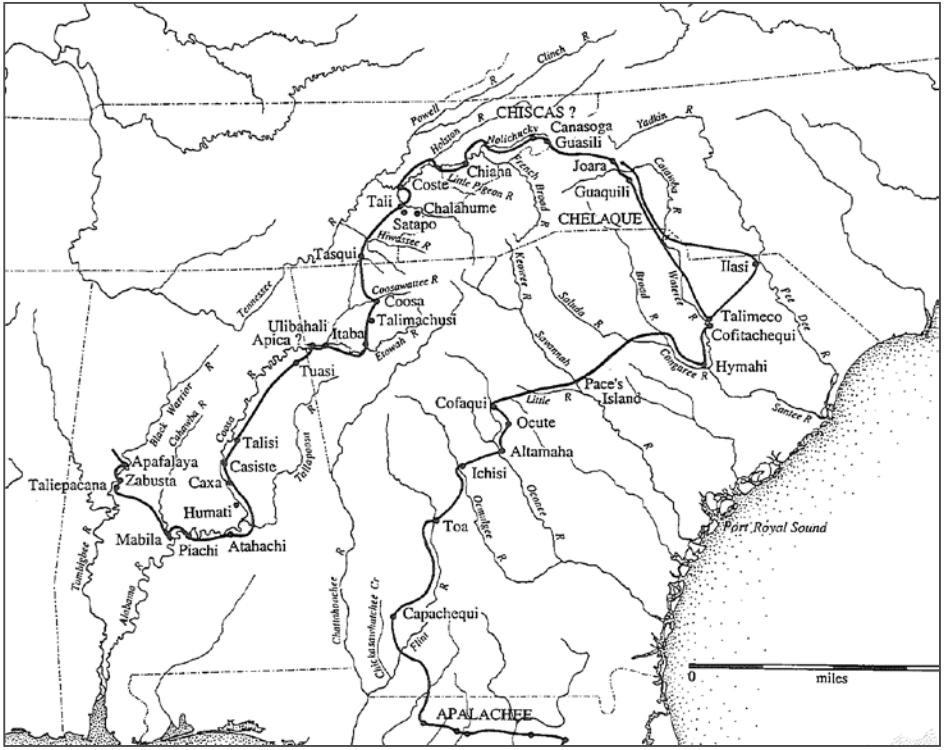
Q&A
Discussion

Georgia Power

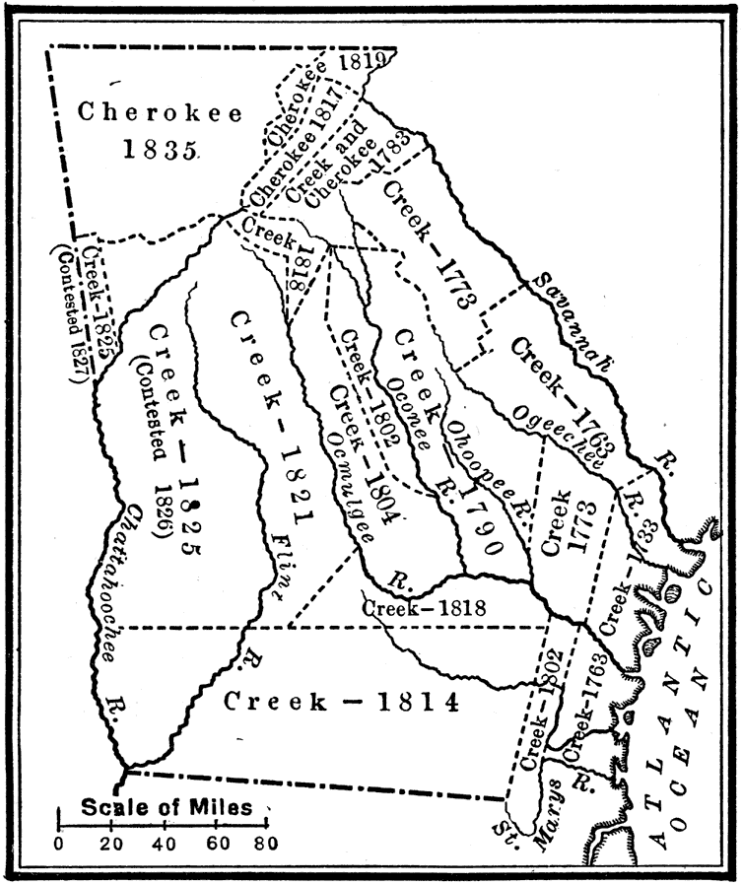
Lloyd Shoals Dam
Lake Jackson

Cultural Resources Proposed Study Plan

Joey Charles
Georgia Power



Source: Hudson (1997). Knights of Spain, Warriors of the Sun


Cherokee
1835
1819
Cherokee 1817
Cherokee and Creek 1783
Creek 1818
Creek – 1773
Savannah R.
Creek – 1763
Ogeechee R.
Creek – 1825
(Contested 1827)
Creek – 1825
(Contested 1826)
Creek – 1821
Creek – 1802
Oconee R.
Creek – 1804
Ocmulgee R.
Creek – 1790
Ohoopee R.
Creek 1773
Creek – 1733
Flint R.
Creek – 1818
Chattahoochee R.
Creek – 1814
Creek – 1802
Creek – 1763
St. Marys R.
ATLANTIC OCEAN
Scale of Miles
0 20 40 60 80

Study Objectives

- Identify and delineate the area of potential effect (APE)
- Identify known historic resources through literature and site file review
- Determine if any historic properties are eligible for listing on the National Register of Historic Places (NRHP)
- 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

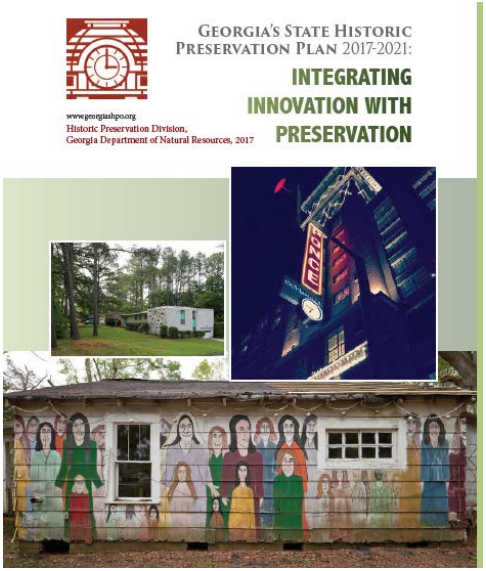
Issues Identified during Scoping

- Effects of continued project operation and maintenance on properties that are included in, or eligible for inclusion in, the NRHP
- Effects of continued project operation and maintenance on archaeological and historic resources at the Project

Study Modification Requests and Comments

- FERC:
  - Provide maps that clearly identify the APE in relation to project boundary
  - Provide documentation of concurrence on the proposed APE from the GDNR Historic Preservation Division (HPD) and potentially affected tribes

Study Background – Resource Management Goals



- GDNR Historic Preservation Division (HPD) administers state historic preservation under *Georgia's State Historic Preservation Plan 2017-2021: Integrating Innovation with Preservation*
- Resource management goals consistent with the plan include:
  - Preventing the unintentional disturbance of historic properties
  - Preserving the integrity of any historical structures of the project dam and powerhouse and historical information regarding the development of the Project

Lloyd Shoals Dam
Lake Jackson

Study Background – Existing Information and Data

- Historic properties investigated during previous relicensing
- Six sites recommended eligible for NRHP now monitored annually as part of existing Cultural Resources Management Plan (CRMP):
  - Lloyd Shoals Construction and Operator's Village
  - Dempsey Ferry – historic artifact scatter, inundated
  - Hendrick's Mill – structural remains, inundated
- Powerhouse and dam also recommended as eligible resources; managed according to CRMP maintenance guidelines

Archaeological Investigations

Brockington and Associates (1989)

Lloyd Shoals Dam
Lake Jackson

NRHP-Eligible Lloyd Shoals Powerhouse

Prior to 1983 transformer explosion and fire (EDAW, 1990)

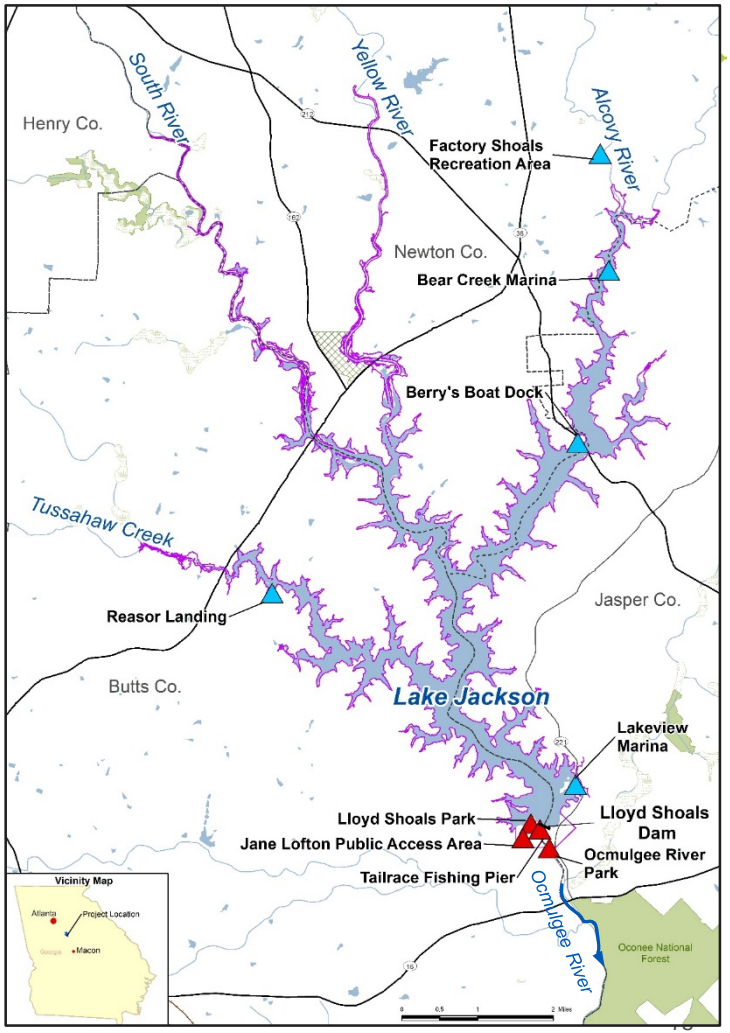
Powerhouse today, with upper floor half the size of the original

The interior of the first floor today remains remarkably similar to historic photographs

Lloyd Shoals Dam
Lake Jackson

Study Area

- Proposed archaeological APE:
  - Area between low daily lake elevation and project boundary
  - Other areas adjacent to project boundary with landowner permission
- Proposed historic hydro APE:
  - Area immediately around dam, powerhouse, and operations areas within project boundary



Project Boundary

Project Recreation Facilities

Lloyd Shoals Dam
Lake Jackson

Methodology

- Performed by professional cultural resources consultant
- Prepare maps showing APE in relation to project boundary
- Review existing information and data
- Conduct further evaluation of sites recommended eligible for NRHP
  - Definitive determination of eligibility and need for monitoring
  - Conducted in consultation with HPD and in accordance with *Georgia Standards and Guidelines for Archaeological Surveys*
- Photo-document current condition of dam, powerhouse, and project works

Tribal Consultation

- FERC initiated government-to-government consultation with tribes identified by FERC as having cultural, religious, or historical ties to the project area
- Georgia Power will participate in consultation as a “non-federal designee”
- Georgia Power will incorporate input from consulting tribes into studies, report findings, and the Historic Properties Management Plan (HPMP) as appropriate

Schedule for Cultural Resources Study

Activity	Deadline
Begin field studies and literature-based review	May 2019
File progress report	January 31, 2020
Complete field studies and literature-based review	March 2020
File final study report	May 19, 2020

Q&A
Discussion