

August 3, 2021

Lloyd Shoals Hydroelectric Project (FERC No. 2336-094)
Preliminary Licensing Proposal

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

Dear Secretary Bose:

On behalf of Georgia Power Company, Southern Company is filing with the Federal Energy Regulatory Commission (Commission) the Lloyd Shoals Hydroelectric Project Preliminary Licensing Proposal in compliance with the Commission's Integrated Licensing Process regulations at 18 CFR § 5.16.

If you require further information, please contact me at 404.506.7219 or cromara@southernco.com.

Sincerely,



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Attachment

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PRELIMINARY LICENSING PROPOSAL

LLOYD SHOALS HYDROELECTRIC PROJECT (FERC No. 2336)

Prepared with:

Southern Company Generation Hydro Services

and

Kleinschmidt

August 2021

**PRELIMINARY LICENSING PROPOSAL
LLOYD SHOALS HYDROELECTRIC PROJECT
(FERC No. 2336)**

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EXECUTIVE SUMMARY

This document is Georgia Power Company's (Georgia Power's) Preliminary Licensing Proposal (PLP) for Federal Energy Regulatory Commission (FERC) relicensing of the existing Lloyd Shoals Hydroelectric Project (Lloyd Shoals Project, the Project) (FERC No. 2336). Georgia Power is using the Integrated Licensing Process and is filing a PLP instead of a draft license application. Relicensing participants may file comments on the PLP with FERC within 90 days of the August 3, 2021 filing date; comments are due by November 1, 2021.

The 19-megawatt¹ 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. Georgia Power operates the Project in a modified run-of-river mode for generation during peak power demand hours to meet electrical system demand. 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.

This PLP provides a draft environmental analysis by resource area of the impacts of Georgia Power's proposal to continue operating the Lloyd Shoals Project. The analysis focuses mainly on the environmental measures Georgia Power is considering. Georgia Power developed this PLP based on input received during consultation with state and federal resource agencies, Indian Tribes, and members of the public, and by using information generated by eight resource studies conducted under the FERC-approved Study Plan. Additional input on preliminary environmental measures received from stakeholders during the comment period for the PLP will be analyzed in Exhibit E, the environmental exhibit, of the license application, which will be filed by December 31, 2021.

¹ Lloyd Shoals was described as an 18-megawatt (MW) project in previous Integrated Licensing Process documents prior to the PLP. During Georgia Power's recent license application preparation, it was discovered that Unit 2 received a generator rewind in 1998, which resulted in a 1-MW nameplate capacity increase to the unit. The unit remains generator-limited with the increased rating. Georgia Power does not have a record of a license amendment for this maintenance work.

Project Setting

The Lloyd Shoals Project is located on the Ocmulgee River at river mile 250.2 in the Piedmont physiographic province of north-central Georgia. The Project is situated in the upper Ocmulgee River basin of the greater Altamaha River basin. The headwater streams of the Ocmulgee River, including the South, Yellow, and Alcovy Rivers drain the southeastern and eastern portions of metropolitan Atlanta and converge at Lake Jackson to form the Ocmulgee River. Tussahaw Creek, a large tributary stream, also enters Lake Jackson from the west. Lloyd Shoals Dam is about 7 air miles east-northeast of the City of Jackson in Butts County, 9 air miles northwest of the City of Monticello in Jasper County, 19 air miles south of the City of Covington in Newton County, and 19 air miles east-southeast of the City of McDonough in Henry County. Lloyd Shoals Dam is about 35 air miles north-northwest of the City of Macon and 40 air miles southeast of the City of Atlanta.

The watershed upstream of Lloyd Shoals Dam covers an area of 1,400 square miles, comprising about 23 percent of the Ocmulgee River basin. Lake Jackson has a surface area of 4,750 acres at the normal full-pool elevation of 530 feet (ft) plant datum (PD) and has 135 miles of shoreline. The full-reservoir gross storage capacity is approximately 107,000 acre-feet. Lake Jackson extends upstream from the dam about 13 river miles into the South and Yellow Rivers each, 11 miles into the Alcovy River, and 8 miles into Tussahaw Creek.

Current Operation

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 with clean, renewable, low-emission power. There are no large dams reregulating streamflow upstream of the Project. Thus, project inflows depend primarily on the timing, duration, and volume of precipitation. Inflows are stored for 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 530 and 527 ft PD year-round, excluding drawdowns, high inflows, 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 cubic feet per second (cfs), or inflow, whichever is less, through the turbines into the Ocmulgee River downstream for the protection and enhancement of fish and wildlife resources. During low-flow periods when calculated project inflow is less than 250 cfs, Georgia Power supplements flow with a continuous 250-cfs release into the Ocmulgee River downstream to ensure adequate stream flows for downstream uses.

Preliminary Licensing Proposal

Georgia Power proposes to continue operating the Lloyd Shoals Project in a modified run-of-river mode for generation during peak power demand hours. Georgia Power proposes the following environmental measures for the continued operation of the Project. These proposed measures are based on Georgia Power's assessment of the Project, the findings of resource studies conducted under the FERC-approved Study Plan, and discussions with resource agencies and stakeholders. They are subject to change based upon comments received on the PLP and in light of project economics and other considerations:

- Continue to operate the Project in a modified run-of-river mode for generation during peak power demand hours to meet electrical system demand with renewable, waste-free, low-emission power.
- Continue to operate the Project to release a continuous minimum flow of 400 cfs, or inflow, whichever is less, into the Ocmulgee River downstream for the protection and enhancement of fish and wildlife resources. This would optimize habitat availability across multiple species and life stages of riverine fish and also support operation of downstream public water supply intakes.
- When calculated project inflow is less than 250 cfs, operate the Project to supplement flows in the Ocmulgee River downstream by releasing a continuous flow of 250 cfs to maintain adequate stream flows for aquatic life and other downstream uses.
- Continue to operate the passive draft tube aeration system on Units 2, 3, and 4 to improve summer DO concentrations in the tailrace area from May 15 through September 30. This would benefit downstream water quality, fisheries, aquatic resources, and recreation opportunities by supporting applicable water quality standards.
- Prepare an operational procedure for the draft tube aeration system that specifies priority for the use of aerating units under different generation scenarios.

- Enhance recreation amenities at Lloyd Shoals Park by relocating the existing boat ramp to nearby Jane Lofton Public Access Area and constructing a non-motorized boat (canoe/kayak) step-down ramp in its place, replacing the existing courtesy dock with a barrier-free fishing pier, constructing barrier-free parking next to the new fishing pier, restriping existing parking areas for vehicle-only spaces, and updating the existing restroom and bathhouse. These improvements would enhance access for canoeing, kayaking, and bank fishing, alleviate parking congestion on peak-use weekends, and continue to support quality recreation opportunities.
- Enhance recreation amenities at the Jane Lofton Public Access Area by constructing a new two-lane boat ramp, a barrier-free fishing pier, barrier-free parking next to the fishing pier, a concrete-lined vault toilet, and expanded parking. These improvements would expand and improve the quality of recreation opportunities at this site.
- Enhance recreation amenities at Ocmulgee River Park by rehabilitating the existing boat ramp, redefining and paving the existing parking area, landscaping with boulders to discourage parking near the shoreline, installing one concrete-lined vault toilet, and relocating picnic tables closer to the existing parking area. These improvements would continue to support quality recreation opportunities at the site.
- Enhance recreational access to Lake Jackson by developing formal access on Georgia Power land at the Highway 36 Bridge at Tussahaw Creek. New amenities would be constructed to include an access road off of Winding Way, a small gravel parking area, one picnic table and one trash can, and a path leading to bank fishing areas and a step-down ramp for canoeing/kayaking access. The new project recreation facility would enhance bank fishing access, provide paddling access to the Tussahaw Creek embayment, and become formally known as the Hendricks Mill Public Access Area.
- Develop and implement a Shoreline Management Plan in accordance with the existing Shoreline Management Guidelines for Georgia Power Lakes and promote the maintenance of vegetative buffers around the reservoir to protect water quality, aquatic habitat, and cultural and aesthetic resources.
- Implement a Historic Properties Management Plan through a Programmatic Agreement to assure the preservation and long-term management of archaeological sites and historic buildings and structures within the project boundary.

ACRONYMS AND ABBREVIATIONS

AIR	additional information request
ARC	Atlanta Regional Commission
ASMFC	Atlantic States Marine Fisheries Commission
BGEPA	Bald and Golden Eagle Protection Act
BMPs	best manage practices
CCA	Candidate Conservation Agreement
CCAA	Candidate Conservation Agreement with Assurances
CFR	Code of Federal Regulations
cfs	cubic feet per second
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
FCCLA	Family, Career, and Community Leaders of America
FERC	Federal Energy Regulatory Commission
ft	Feet
FS	U.S. Forest Service
FWS	U.S. Fish and Wildlife Service
GDNR	Georgia Department of Natural Resources
GDOT	Georgia Department of Transportation
Georgia Power	Georgia Power Company
GEPD	Georgia Environmental Protection Division
GSWCC	Georgia Soil and Water Conservation Commission
HCWA	Henry County Water Authority
hp	horsepower
HPMP	Historic Properties Management Plan
HUC	Hydrologic Unit Code
Hwy	Highway
IFIM	Instream Flow Incremental Methodology
ILP	Integrated Licensing Process
kV	kilovolt
lbs	pounds
m	meter
MBTA	Migratory Bird Treaty Act
Metro Water District	Metropolitan North Georgia Water Planning District
mg/L	milligrams per liter
MGD	million gallons per day
mm	millimeters

ACRONYMS AND ABBREVIATIONS (CONT'D)

MVA	megavolt-ampere
MWA	Macon Water Authority
NEGRC	Northeast Georgia Regional Commission
NEPA	National Environmental Policy Act
NF	National Forest
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
PAD	Pre-Application Document
PCBs	polychlorinated biphenyls
PD	plant datum
PHABSIM	Physical Habitat Simulation
PLP	Preliminary Licensing Proposal
PSP	Proposed Study Plan
rpm	revolutions per minute
RSP	Revised Study Plan
RTE	rare, threatened, and endangered
SD1	Scoping Document 1
SD2	Scoping Document 2
SHPO	State Historic Preservation Officer
SMP	Shoreline Management Plan
SP	State Park
sq mi	square miles
TMDL	Total Maximum Daily Load
TRRC	Three Rivers Regional Commission
USGS	U.S. Geological Survey
WMA	Wildlife Management Area
WRD	Wildlife Resources Division
WSA	Water and Sewer Authority

**PRELIMINARY LICENSING PROPOSAL
LLOYD SHOALS HYDROELECTRIC PROJECT
(FERC No. 2336)**

1.0 INTRODUCTION

Georgia Power Company (Georgia Power) is filing with the Federal Energy Regulatory Commission (FERC) its Preliminary Licensing Proposal (PLP) for relicensing the Lloyd Shoals Hydroelectric Project (Lloyd Shoals Project, the Project) (FERC No. 2336). Georgia Power is using the Integrated Licensing Process (ILP) to develop the license application following FERC regulations at 18 Code of Federal Regulations (CFR) Part 5. As provided for in 18 CFR § 5.15 and set forth in the FERC-approved Process Plan and Schedule for the Project issued May 5, 2020, Georgia Power is filing a PLP instead of a draft license application. Following receipt of comments by relicensing participants within 90 days of the PLP filing, the final license application will be filed by December 31, 2021.

The 19-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 (Figure 1). Georgia Power operates the Project in a modified run-of-river mode for generation during peak power demand hours to meet electrical system demand. 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.

1.1 PURPOSES

In accordance with 18 CFR § 5.16, the purposes of this PLP are to:

- Describe the existing project facilities, including project lands and waters.
- Describe the existing and proposed project operation and maintenance plan, to include measures for the protection, mitigation, and enhancement (environmental measures) with respect to each resource area affected by the project proposal.
- Provide a draft environmental analysis by resource area of the continuing and incremental impacts of Georgia Power's proposal.

The draft environmental analysis in this PLP focuses mainly on Georgia Power’s proposed environmental measures, as required at 18 CFR § 5.16(b)(3). Recommendations made by stakeholders are also evaluated. Any preliminary environmental measures received from the resource agencies, Indian Tribes, or the public during the comment period for the PLP will be analyzed in Exhibit E (environmental exhibit) of Georgia Power’s final license application, as required at 18 CFR § 5.18(b)(5)(ii)(C).

Georgia Power developed this PLP in consultation with state and federal resource agencies, local governments, Indian Tribes, various stakeholders, and other members of the public, and by using the information generated by eight resource studies conducted under the FERC-approved Study Plan (Georgia Power 2019; FERC 2019), as amended (Georgia Power 2020a, 2020b). The results of Georgia Power’s resource studies are detailed in nine Study Reports² filed with FERC on May 19, 2020, a study report addendum filed on August 7, 2020 supplementing the initial American Eel Abundance and Upstream Movements study report, and three Updated Study Reports filed on May 19, 2021. A study report addendum supplementing the updated American Eel study report will be filed in August 2021, marking the completion of all resource studies.

1.2 REVIEW SCHEDULE

Relicensing stakeholders and FERC staff may file comments on Georgia Power’s PLP with FERC within 90 days of the August 3, 2021 filing date of this PLP, in accordance with 18 CFR § 5.16(e). Comments must be filed with FERC by November 1, 2021.

1.3 DOCUMENT ORGANIZATION

This PLP follows the content requirements at 18 CFR § 5.16 and is organized according to the following major sections:

- Section 2 – Proposed action, including descriptions of the existing project facilities, project lands and waters, current operation, Georgia Power’s proposed operation, and a summary listing of Georgia Power’s proposed environmental measures.

² The nine study reports were: Geology and Soils; Water Resources; Fish and Aquatic Resources; American Eel Abundance and Upstream Movements; Terrestrial, Wetland, and Riparian Resources; Rare, Threatened, and Endangered Species; Recreation and Land Use; and Cultural Resources, including separate Archaeological and Historic Hydro-Engineering Assessments.

- Section 3 – Pre-filing consultation summary, including a listing of all agencies, governments, and non-governmental organizations consulted and an overview of the National Environmental Policy Act (NEPA) scoping process conducted by FERC, the study plan development process, Georgia Power’s resource study reports, and stakeholder meetings.
- Section 4 – Environmental analysis, presented by resource area and consisting of descriptions of the affected environment and the environmental impacts of Georgia Power’s proposal, including environmental measures.
- Section 5 – References cited in the text.

2.0 PROPOSED ACTION

This section sets out Georgia Power’s proposal for continuing to operate the Lloyd Shoals Project under the new license. The section first describes the existing Project, including the facilities, lands, and waters. Current and proposed operations are then described, followed by a summary of the environmental measures proposed with respect to each resource area.

2.1 PROJECT DESCRIPTION

The Lloyd Shoals Project is located on the Ocmulgee River in central Georgia (Figure 1). Lloyd Shoals Dam is located at river mile 250.2, just south of the confluence of the Alcovy, Yellow, and South Rivers (Figure 2). Lloyd Shoals Dam is about 7 air miles east-northeast of the City of Jackson in Butts County, 9 air miles northwest of the City of Monticello in Jasper County, 19 air miles south of the City of Covington in Newton County, and 19 air miles east-southeast of the City of McDonough in Henry County. Lloyd Shoals Dam is about 35 air miles north-northwest of the City of Macon and 40 air miles southeast of the City of Atlanta. The Lloyd Shoals powerhouse is on the west side of the river in Butts County. The spillway portion of the dam is on the east side of the river, mostly in Jasper County. Lloyd Shoals Dam discharges directly into the Ocmulgee River. The dam is about 1.1 river miles upstream of the Georgia Highway (Hwy) 16 bridge and about 19 river miles upstream of Juliette Dam.

The watershed upstream of Lloyd Shoals Dam covers an area of 1,400 square miles (sq mi), comprising about 23 percent of the Ocmulgee River basin (Figure 1). The Lloyd Shoals project reservoir, referred to herein as Lake Jackson (also known as Jackson Lake), has a surface area of 4,750 acres at the normal full-pool elevation of 530 feet (ft) plant datum (PD)³ and has 135 miles of shoreline (Figure 2). The full-reservoir gross storage capacity is approximately 107,000 acre-ft. Lake Jackson extends upstream from the dam about 13 river miles into the South and Yellow Rivers each, 11 miles into the Alcovy River, and 8 miles into Tussahaw Creek.

2.1.1 PROJECT FACILITIES

The Lloyd Shoals Project began operation in 1911. The Project consists of a reservoir (Lake Jackson), a concrete gravity dam founded on rock, a powerhouse integral with the dam, a

³ Plant datum = mean sea level elevation (NAVD88) + 0.45 ft.

spillway section with Obermeyer gates and a trash gate, an approximately 2,000-ft-long tailrace, voltage transformation with connection directly to the primary transmission system, appurtenant structures, and recreation facilities (Figure 2 and Figure 3).

Lloyd Shoals Dam has a spillway crest elevation of 525.2 ft (elevation at bottom of the Obermeyer gates), a maximum height from riverbed to spillway crest of about 105 ft, and a length of 1,599.5 ft.

The project works across the main dam consist of the following components (and their length) from west to east (Figure 3):

- West concrete non-overflow section (143 ft);
- Powerhouse intake section (198 ft);
- Concrete spillway section with Obermeyer gates and one trash gate (728.5 ft); and
- East earth embankment tie-in to bank (530 ft).

The west non-overflow section and powerhouse have a crest elevation of 540 ft PD. There are twelve 7-ft, 9-in by 11-ft intake openings at the entrance of each unit's penstock, each having a designated headgate. The intake section contains six, 12-ft by 12-ft octagonal, cast-in-place concrete water passages (penstocks) that supply water to the turbines. The invert elevation of the intake is 495 ft PD, which is 35 ft below the normal full-pool elevation of Lake Jackson.

Further design specifications of the trash racks are as follows, as requested by FERC staff in an additional information request for the Pre-Application Document (PAD). The upstream face of the dam has 12 inlet openings, each covered by four steel trash racks. The inlet openings are 10.5-ft wide and 19.4-ft in height. The trash racks rest on a 6-inch-high sill that is integral to the powerhouse and are supported by a guide structure. The guide structure is composed of three 12-inch #50 steel horizontal I-beam members and three 1.75-inch vertical guides. The trash racks are 21-ft long and 2-ft 4.625-inches wide. Each trash rack has seventeen 3-inch by 0.25-inch flat-bar vertical members, two 3-inch by 0.375-inch on-vertical members on each end, and nine horizontal 2.5-inch rod members. Steel trash racks in front of the inlet opening consist of vertical

bars with clear spacing between bars of 1.3125 inches. The calculated intake approach velocity is 1.56 ft per second at full gate/full pool and 1.03 ft per second at best gate/full pool.⁴

The concrete-and-brick powerhouse contains six turbine-generator units, numbered 1 through 6 from east to west (Table 1). Table 2 summarizes the turbine design characteristics. The turbines are horizontal, Francis-type, double-runner units each rated 5,650 horsepower (hp) at 96.8 ft of net head. Net head is about 105 ft at full pool and with normal tailrace conditions. The rated normal turbine speed of all six units is 300 revolutions per minute (rpm). The maximum hydraulic capacity of each turbine unit is 620 cubic feet per second (cfs), for a total powerhouse maximum hydraulic capacity of 3,720 cfs. The efficient/best gate hydraulic capacity of each turbine unit is 410 cfs.

The spillway section contains from west to east a 30-ft-wide trash bay with a bottom-hinged, 19-ft by 12-ft trash gate; a 98.5-ft-wide section of 2-ft-high Obermeyer gates; a 420-ft-wide section of 5-ft-high Obermeyer gates; and a 180-ft-wide section of 2-ft-high Obermeyer gates. The top of the spillway gates is elevation 530 ft PD. The crest of the concrete spillway is elevation 525.2 ft PD at the bottom of the 5-ft-high Obermeyer gates, elevation 528.2 ft PD at the bottom of the 2-ft-high Obermeyer gates, and elevation 518.0 ft PD at the trash gate. The east earth embankment has a crest elevation of 542.0 ft PD.

A 2,100-ft-long saddle dike with a crest elevation of 545.0 ft PD is located adjacent to and east of Jackson Lake Road (County Road 364) about 3,000 ft upstream of the east end of the main dam.

A 500-ft-long auxiliary spillway is located about 900 ft southwest of the main dam (Figure 3). The auxiliary spillway has a crest elevation of 526.0 ft PD and contains 10-ft-high flashboards maintained in the dry by a 6-ft-high 560-ft-long sacrificial earth embankment.

Lake Jackson covers a surface area of 4,750 acres at the normal full-pool elevation of 530 ft PD. The full-reservoir gross storage capacity is approximately 107,000 acre-ft. The upstream drainage area of the Ocmulgee River basin at Lloyd Shoals Dam is about 1,400 sq mi.

⁴ Approach velocities specified are based on the hydraulic capacity of single unit operation at the full pool elevation 530 ft (620 cfs full gate/410 cfs best gate). Single unit generation results in the absolute maximum best gate and full gate flows. The hydraulic capacity through units decreases in generating scenarios in which more than one unit is generating.

The nameplate rating generating capacity of the Lloyd Shoals Project is 19 MW. The dependable capacity of the Project is 22.5 MW in the summertime, the most critical power-demand season. Dependable capacity is defined as average simulated capacity available for 8 hours each day for 5 consecutive days using a 20-year average summer inflow. Average annual generation for the years 2013 through 2020 was 70,600 megawatt-hours.

There are no transmission lines included in the Lloyd Shoals Project. Two 2.3-kilovolt (kV) project generator leads exit the powerhouse to two, three-phase outdoor step-up transformers rated 10/12-megavoltampere (MVA) and 10-MVA, located in the substation at the west dam abutment. Connection to existing 69-kV and 115-kV transmission lines is made within the substation.

2.1.2 PROJECT LANDS AND WATERS

Lands and waters within the FERC project boundary are located within Butts, Henry, Jasper, and Newton Counties (Figure 2). The FERC project boundary around Lake Jackson 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. In areas where Georgia Power-owned residential lease lots and privately owned residential lots abut the project reservoir, the project boundary is the 530-ft PD contour. Only three percent of the project boundary is marked by metes-and-bounds property lines (Georgia Power 2017a).

Georgia Power maintains four project recreation facilities within the project boundary, including Lloyd Shoals Park, the Tailrace Fishing Pier, Ocmulgee River Park, and the Jane Lofton Public Access Area (Figure 2 and Figure 3) (see Section 4.3.6). The project boundary extends downstream of Lloyd Shoal Dam approximately 0.4 mile to encompass Ocmulgee River Park.

Project lands provide a buffer for aesthetics, wildlife habitat, water quality protection, and recreation. Through fee-simple ownership, Georgia Power controls approximately 1,138 acres of lands within the Lloyd Shoals project boundary, including approximately 106 miles of shoreline. Included in these numbers are 606 leased lots and 1,351 lots on which Georgia Power owns a strip of land between the shoreline and the privately owned residential property. Georgia Power

possesses flood rights beyond the project boundary on 326 additional lots, including the remaining 29 miles of shoreline within the project. Georgia Power manages the shoreline of Lake Jackson under its Shoreline Management Guidelines to ensure compliance with the Lloyd Shoals FERC license and other applicable federal and state laws and regulations (Georgia Power 2015a).

2.2 CURRENT OPERATION

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 with clean, renewable, low-emission power. Water for generation at Lloyd Shoals Dam comes from precipitation in the Ocmulgee River basin upstream. There are no large dams reregulating streamflow upstream of the Project. Thus, project inflows depend primarily on the timing, duration, and volume of precipitation. Inflows are stored for short periods of time, generally no longer than 24 hours, and then released through the generating turbines during peak power demand periods.

2.2.1 NORMAL OPERATION

Under normal conditions, Georgia Power operates the Lloyd Shoals Project to maintain reservoir elevations between 530 and 527 ft PD year-round. Normal conditions exclude drawdowns, high inflows, and drought. The reservoir rises slightly as inflow is temporarily stored during periods outside of peak power demand (i.e., off-peak hours). As power demand increases into the peak power demand period, Lloyd Shoals is operated to release water through the powerhouse turbines to produce energy from the plant generators. This cycle repeats daily and varies seasonally with peak power demands.

Generation typically is highest during late winter and early spring (February-April), when project inflow is also the highest. During the summer, Georgia Power usually operates Lloyd Shoals generating units throughout the afternoon peak demand period, about seven to eight hours. During fall and winter, peak generation typically lasts five to six hours split between a morning and evening peak, when energy demand is highest.

For the years 2013 through 2020 (since installation of the Obermeyer gates in 2012), daily reservoir fluctuations were 2.0 ft or less 99.8-percent of the days.

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, as required by Article 402 of the current license. An instream flow study conducted in 1990 for the previous Lloyd Shoals relicensing showed that a minimum flow of 400 cfs (increased from 100 cfs) would optimize aquatic habitat across multiple fish species life stages (EA Engineering, Science, and Technology, Inc. [EA] 1990a) (see Section 4.3.3).

Georgia Power operates a passive draft tube aeration system that was installed on Units 2, 3, and 4 (two aeration ports per unit) in 2006 to improve tailrace dissolved oxygen (DO) concentrations in downstream releases during the summer critical period. Georgia Power opens the aeration system valves from May 15 through September 30 each year, unless dry conditions extend into October, when they may remain open until mid-October.

Georgia Power conducts periodic fall drawdowns of Lake Jackson for homeowner and shoreline maintenance. In recent years, planned drawdowns have occurred about every three years.

2.2.2 HIGH-FLOW OPERATION

During high-flow events at the Lloyd Shoals Project, flows are first run through the turbine/generator units, where electricity is generated. Plant operators monitor stream gages upstream of Lake Jackson. As inflow to the Project exceeds the maximum hydraulic capacity of the turbines, spillway gates are opened incrementally to approximate inflow. Water is not released in advance of a storm because predicted storms often do not materialize. Water is only released as an increase in inflows is evident at the upstream gages and the dam. The Obermeyer gate system provides Georgia Power the ability to make incremental adjustments to flows released from the spillway, enhancing control of the reservoir level during the course of high-flow operations. These gates allow the plant discharges to be closely matched with inflows into the Project.

2.2.3 LOW-FLOW OPERATION

During low-flow periods at Lloyd Shoals Dam, calculated inflows may drop below the 400-cfs minimum flow requirement. Although not required by the current license, when calculated

inflow is less than 250 cfs, Georgia Power provides supplemental flow with a continuous 250-cfs release into the Ocmulgee River downstream to ensure adequate stream flows for downstream uses, such as the Butts County and Macon Water Authority water supply intakes. During the refill period after a low-flow period, Georgia Power continues to release 250-cfs minimum flow to raise the elevation of Lake Jackson prior to increasing discharges from the Project.

During a recent drought in summer/fall 2016, the lowest recorded elevation of Lake Jackson was 525 ft PD (by comparison, the target low-level elevation during the homeowner drawdown in 2015 was 523 ft). During this time, Lloyd Shoals supplemented flows in the river downstream of the Project with a 250-cfs minimum release for approximately 64 days, causing the reservoir elevations to decline. In 2016, calculated daily inflows were less than 400 cfs on 28.1 percent of the days and less than 250 cfs on 20.5 percent of the days (Georgia Power 2018).

For the period 2001-2020, daily average discharge from the Project to the Ocmulgee River downstream exceeded 250 cfs on 99 percent of the days, 400 cfs on 86 percent of the days, and 1,000 cfs on 54 percent of the days.

2.3 PROPOSED OPERATION

Georgia Power proposes to continue operating the Lloyd Shoals Project in a modified run-of-river mode for generation during peak power demand hours. During normal operation, the Project would continue to release a continuous minimum flow of 400 cfs, or inflow, whichever is less, into the river downstream for the protection and enhancement of fish and wildlife resources. During low-flow periods when calculated inflow is less than 250 cfs, the Project would supplement flows in the river downstream with a 250-cfs minimum release to ensure adequate stream flows for aquatic life and other downstream uses.

Georgia Power is not proposing to add capacity or make any major modifications to the Project under the new license.

2.4 PROPOSED ENVIRONMENTAL MEASURES

Georgia Power proposes the following measures to protect, mitigate adverse impacts to, or enhance environmental resources at the Lloyd Shoals Project.

These proposed environmental measures are based on Georgia Power's assessment of the Project, the findings of the resource studies conducted under the FERC-approved Study Plan, and discussions with resource agencies and stakeholders. The measures are subject to change based upon comments received on the PLP and in light of project economics and other considerations:

- Continue to operate the Project in a modified run-of-river mode for generation during peak power demand hours to meet electrical system demand with renewable, waste-free, low-emission power.
- Continue to operate the Project to release a continuous minimum flow of 400 cfs, or inflow, whichever is less, into the Ocmulgee River downstream for the protection and enhancement of fish and wildlife resources. This would optimize habitat availability across multiple species and life stages of riverine fish and also support operation of downstream public water supply intakes.
- When calculated project inflow is less than 250 cfs, operate the Project to supplement flows in the Ocmulgee River downstream by releasing a continuous flow of 250 cfs to maintain adequate stream flows for aquatic life and other downstream uses.
- Continue to operate the passive draft tube aeration system on Units 2, 3, and 4 to improve summer DO concentrations in the tailrace area from May 15 through September 30. This would benefit downstream water quality, fisheries, aquatic resources, and recreation opportunities by supporting applicable water quality standards.
- Prepare an operational procedure for the draft tube aeration system that specifies priority for the use of aerating units under different generation scenarios.
- Enhance recreation amenities at Lloyd Shoals Park by relocating the existing boat ramp to nearby Jane Lofton Public Access Area and constructing a non-motorized boat (canoe/kayak) step-down ramp in its place, replacing the existing courtesy dock with a barrier-free fishing pier, constructing barrier-free parking next to the new fishing pier, restriping existing parking areas for vehicle-only spaces, and updating the existing restroom and bathhouse. These improvements would enhance access for canoeing, kayaking, and bank fishing, alleviate parking congestion on peak-use weekends, and continue to support quality recreation opportunities.
- Enhance recreation amenities at the Jane Lofton Public Access Area by constructing a new two-lane boat ramp, a barrier-free fishing pier, barrier-free parking next to the fishing pier, a concrete-lined vault toilet, and expanded parking. These improvements would expand and improve the quality of recreation opportunities at this site.

- Enhance recreation amenities at Ocmulgee River Park by rehabilitating the existing boat ramp, redefining and paving the existing parking area, landscaping with boulders to discourage parking near the shoreline, installing one concrete-lined vault toilet, and relocating picnic tables closer to the existing parking area. These improvements would continue to support quality recreation opportunities at the site.
- Enhance recreational access to Lake Jackson by developing formal access on Georgia Power land at the Hwy 36 Bridge at Tussahaw Creek. New amenities would be constructed to include an access road off of Winding Way, a small gravel parking area, one picnic table and one trash can, and a path leading to bank fishing areas and a step-down ramp for canoeing/kayaking access. The new project recreation facility would enhance bank fishing access, provide paddling access to the Tussahaw Creek embayment, and become formally known as the Hendricks Mill Public Access Area.
- Develop and implement a Shoreline Management Plan in accordance with the existing Shoreline Management Guidelines for Georgia Power Lakes and promote the maintenance of vegetative buffers around the reservoir to protect water quality, aquatic habitat, and cultural and aesthetic resources.
- Implement a Historic Properties Management Plan through a Programmatic Agreement to assure the preservation and long-term management of archaeological sites and historic buildings and structures within the project boundary.

3.0 PRE-FILING CONSULTATION SUMMARY

3.1 STAKEHOLDER CONSULTATION

Georgia Power identified and consulted with numerous stakeholders prior to filing the PLP. In addition to FERC, the following agencies, governments, Indian Tribes, and non-governmental organizations were contacted via telephone, email, mail, website distribution of information, and face-to-face and virtual meetings in accordance with the distribution protocol established in the PAD (Georgia Power 2018):

- American Rivers
- Altamaha Riverkeeper
- Butts County
- Butts County Water and Sewer Authority
- City of Covington
- City of Jackson
- City of Locust Grove
- City of McDonough
- Georgia Bass Federation
- Georgia Department of Community Affairs – Historic Preservation Division (formerly of Georgia Department of Natural Resources)
- Georgia Department of Natural Resources – Environmental Protection Division
- Georgia Department of Natural Resources – Wildlife Resources Division
- Henry County
- Homeowners – 1,756 individual homeowners
- Jackson Lake Homeowners Association
- Jasper County
- Macon Water Authority
- Muscogee (Creek) Nation
- National Oceanic and Atmospheric Administration – National Marine Fisheries Service
- Newton County
- South River Water Alliance

- U.S. Department of Agriculture, Forest Service – Chattahoochee-Oconee National Forests
- U.S. Environmental Protection Agency, Region 4
- U.S. Fish and Wildlife Service

3.2 SCOPING PROCESS

Pursuant to FERC’s ILP regulations at 18 CFR § 5.6, Georgia Power filed its PAD for the Lloyd Shoals Project on July 3, 2018. The PAD described the existing facilities and the current and proposed operation of the Project; characterized the affected environment and potential resource impacts of continued operation or maintenance under a new license; and provided the initial version of the Process Plan and Schedule for all pre-application activities and stakeholder participation.

Pursuant to NEPA, FERC (2018a) issued Scoping Document 1 (SD1) on August 20, 2018, to federal, state, and local agencies, Indian Tribes, non-governmental organizations, and the public to solicit comments on the scope of FERC’s environmental assessment and encourage stakeholder participation in the relicensing process. FERC staff held two scoping meetings and a site visit on October 9-10, 2018. Relicensing stakeholders subsequently filed their comments on the PAD and SD1, as well as 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 responses to the AIR on December 18, 2018.

Based on written comments filed during the scoping comment period, FERC (2018b) issued Scoping Document 2 (SD2) on December 20, 2018. SD2 presents FERC staff’s current view of issues and alternatives to be considered in the environmental assessment and supersedes SD1.

3.3 STUDY PLAN DEVELOPMENT

Georgia Power filed its Proposed Study Plan (PSP) with FERC on December 20, 2018, for review and comment by relicensing stakeholders, who filed their comments through March 25, 2019. The PSP included a total of eight resource studies: geology and soils; water resources; fish and aquatic resources; American Eel abundance and upstream movements; terrestrial, wetland, and riparian resources; rare, threatened, and endangered species; recreation and land use; and cultural resources, including archaeological and historic hydro-engineering assessments.

During the 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 these meetings was to discuss information gathering needs and any differences between the PSP and study requests filed by stakeholders. On April 19, 2019, Georgia Power filed its Revised Study Plan (RSP) to resolve any issues and accommodate stakeholder input on the PSP.

On May 29, 2019, FERC's Office of Energy Projects Director issued a Study Plan Determination (FERC 2019), approving Georgia Power's RSP with staff-recommended modifications to the American Eel Abundance and Upstream Movements Study.

3.4 RESOURCE STUDY REPORTS

Georgia Power conducted the first season of studies between June 2019 and May 2020. A Study Progress Report was filed with FERC on January 31, 2020. After completing the first season of studies, Georgia Power filed an Initial Study Report on May 19, 2020. The Initial Study Report consisted of nine individual study reports, one for each of the eight resource studies with the exception of cultural resources, which had separate archaeological and historic hydro-engineering reports.

Georgia Power hosted an Initial Study Results Meeting on July 29, 2020 via Skype⁵ and filed a Study Results Meeting Summary with the Commission on August 13, 2020. On August 7, 2020, Georgia Power filed an American Eel Abundance and Upstream Movements Study Report Addendum, which documented modifications to the methods and schedule for the remainder of the first study season made in consultation with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS), and provided additional study results for May-July 2020.

⁵ On April 30, 2020, Georgia Power filed a letter requesting that FERC modify the Process Plan and Schedule to account for the effects of COVID-19 and high inflow conditions by 1) allowing Georgia Power to conduct the study results meeting on July 29, 2020, instead of June 3, 2020, and 2) extending the first study season by about two months. FERC approved the request and issued a revised Project Plan and Schedule on May 5, 2020.

Based on stakeholder comments on results from the first study season during the Study Results Meeting, comments on the Study Plan Results filed by the Georgia Department of Natural Resources (GDNR) Wildlife Resources Division (WRD) on September 14, 2020, consideration of the effects of COVID-19, and consultation with NMFS and FWS, Georgia Power filed two proposed Study Plan Amendments on October 14, 2020. A Study Plan Amendment for the American Eel Abundance and Upstream Movements Study adjusted sampling methods and extended the study through a second season ending in June 2021. A Study Plan Amendment for Recreation and Land Use rescheduled two recreation surveys for spring 2021 that were originally planned for spring 2020 but had to be cancelled due to COVID-19 restrictions at the time.

Georgia Power conducted the second season of studies according to the approved Study Plan, as amended, between November 2020 and June 2021. A Study Progress Report was filed with the Commission on January 29, 2021. After completing the second season of studies, Georgia Power filed an Updated Study Report on May 19, 2021. The Updated Study Report consisted of three individual study reports: an Updated Water Resources Study Report to incorporate the tailrace water quality monitoring data collected in May-July 2020; an Updated American Eel Abundance and Upstream Movements Study Report to compile the results of the two seasons of study through April 2021; and an Updated Recreation and Land Use Study Report to incorporate the results of recreation surveys and user counts completed in spring 2021. The Updated Study Reports supersede the Initial Study Reports for these three studies.

Georgia Power hosted an Updated Study Results Meeting on June 3, 2021 via TEAMS and filed a Study Results Meeting Summary with the Commission on June 17, 2021. In August 2021, Georgia Power will file an updated study report addendum for the American Eel Abundance and Upstream Movements Study to provide the results from the remainder of the second season of study completed in May-June 2021, marking the end of that study.

In summary, Georgia Power completed the following resource studies:

- Geology and Soils (Initial Study Report);
- Water Resources (Updated Study Report);
- Fish and Aquatic Resources (Initial Study Report);

- American Eel Abundance and Upstream Movements (Updated Study Report and addendum);
- Terrestrial, Wetland, and Riparian Resources (Initial Study Report);
- Rare, Threatened, and Endangered Species (Initial Study Report);
- Recreation and Land Use (Updated Study Report); and
- Cultural Resources (Initial Study Report; two separate study reports – Archaeological Assessment and Historic Hydro-engineering Assessment).

3.5 STAKEHOLDER MEETINGS

Since November 2017, Georgia Power has held numerous stakeholder consultation meetings, including in public forums and in one-on-one and small-group settings. On November 16, 2017, several months prior to filing the PAD, Georgia Power held two public information sessions on Lloyd Shoals relicensing near the Project, in Jackson, Georgia. These sessions provided attendees information about the Project and the Commission’s relicensing process. Members of Georgia Power’s relicensing team were on-hand during the sessions for one-on-one discussions with stakeholders. On February 23, 2018, members of Georgia Power’s relicensing team attended a meeting of the Jackson Lake Homeowner’s Association to share information about the upcoming relicensing process.

On August 15, 2018, Georgia Power participated in a teleconference with the Muscogee (Creek) Nation and FERC staff to discuss project operations, cultural resources, previous studies, and the Process Plan and Schedule for the relicensing process. Georgia Power hosted a boat tour of the Project for the Muscogee (Creek) Nation on September 14, 2018.

After Georgia Power filed its PAD and the relicensing proceeding began in July 2018, FERC held two public scoping meetings in Jackson, Georgia, and a site visit on October 9-10, 2018, during which Georgia Power’s relicensing team oriented participants to project operations and shared resource information about the Project. Georgia Power held Study Plan Meetings on January 16, 2019 in Jackson and on February 26, 2019 as a virtual meeting, with the goals of informally discussing Georgia Power’s PSP and resolving any issues with respect to study requests filed by stakeholders.

Upon completion of the first season of studies, Georgia Power held an Initial Study Results Meeting on July 29, 2020 as a virtual meeting due to COVID-19 restrictions. The meeting provided an opportunity for Georgia Power to present the study results and for stakeholders to ask questions and provide their feedback on the findings.

Most recently, Georgia Power held an Updated Study Results Meeting, also as a virtual meeting because of COVID-19 concerns, on June 3, 2021, to present updated findings of its final studies on Water Resources, American Eel Abundance and Upstream Movements, and Recreation and Land Use.

In addition to public meetings, Georgia Power has met with many stakeholders in one-on-one and small-group settings throughout the licensing process, and electronic and telephone communications continue. Among these stakeholders are GDNR, FWS, NMFS, the Muscogee (Creek) Nation, Jackson Lake Homeowners Association, and others. The input received from these stakeholder meetings has been carefully considered and incorporated into preparation of Georgia Power's relicensing documents, including this PLP. Stakeholder consultation is ongoing and will continue through preparation of the license application, which Georgia Power will file by December 31, 2021.

4.0 ENVIRONMENTAL ANALYSIS

4.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Lloyd Shoals Project is located on the Ocmulgee River at river mile 250.2 in the upper Ocmulgee River basin of the greater Altamaha River basin (Figure 4). The Altamaha River basin includes the Ocmulgee, Oconee, and Altamaha Rivers. The headwater streams of the Ocmulgee River, including the South, Yellow, and Alcovy Rivers, originate in the Piedmont physiographic province, drain the southeastern and eastern portions of metropolitan Atlanta, and converge at Lake Jackson to form the Ocmulgee River. Tussahaw Creek, a large tributary stream, also enters Lake Jackson from the west. From Lloyd Shoals Dam, the Ocmulgee River flows south and then east-southeast for 250 miles to its confluence with the Oconee River in the Coastal Plain physiographic province to form the Altamaha River. The Altamaha River flows 137 miles southeast to the Atlantic Ocean. The Altamaha River basin drains an area of 14,000 sq mi and is located entirely within Georgia.

The Ocmulgee River basin drains a watershed area of 6,085 sq mi in central Georgia (Georgia Environmental Protection Division [GEPD] 2003). The watershed upstream of Lloyd Shoals Dam covers an area of 1,400 sq mi., comprising about 23 percent of the Ocmulgee River basin (Figure 1). From Lloyd Shoals Dam, the river flows south toward Macon. The Towaliga River, a larger tributary, enters the Ocmulgee River from the west about 17 river miles downstream of Lloyd Shoals Dam. As it approaches Macon, the Ocmulgee River enters the Fall Line area, the transition zone between the Piedmont and Coastal Plain physiographic provinces. Downstream of Macon, the river meanders through the Coastal Plain in wide floodplains to its confluence with the Oconee River.

4.1.1 DAMS IN THE BASIN

Two dams are located on the Ocmulgee River: Lloyd Shoals Dam and Juliette Dam. No other dams are on the main stems of either the Ocmulgee or Altamaha Rivers. Juliette Dam, located about 19 miles downstream of Lloyd Shoals Dam, is a 20-ft-high concrete gravity dam built in 1921 (Figure 1). It creates a 78-acre impoundment. Juliette Dam poses a barrier to the upstream passage of diadromous and highly migratory fish migrating upstream into the upper Ocmulgee River basin. Formerly operated by Eastern Hydroelectric Corporation as the East Juliette

Hydroelectric Project (FERC No. 7019), FERC revoked the license in October 2014 because the licensee failed to comply with the terms of the license pertaining to an approved fishway that was never constructed (FERC 2015). In July 2016, Thomas Hydropower, JV LLC, filed a draft application for exemption from licensing for the East Juliette Project. In September 2016, FWS and NMFS commented on the applicant's proposal, questioning the technical feasibility of the upstream fish passage plan and recommending studies. No final application for exemption has been filed for the project.

Two small hydroelectric dams are on the Yellow River upstream of the Lloyd Shoals Project. Porterdale Dam is located 11 river miles upstream of Lake Jackson in Newton County. The dam is 12-ft high and forms a 5-acre impoundment. The Porterdale Hydroelectric Project previously operated under a FERC exemption from licensing (FERC No. 2568) but the exemption was surrendered effective June 2016. The project's gated intake was sealed and the dam remains in-place. The Milstead Hydroelectric Project (FERC No. 7141), with a capacity of 1 MW and currently authorized under a licensing exemption, is located 15 miles farther upstream on the Yellow River in Rockdale County. The project includes a low-head dam, headrace canal, and powerhouse.

Several reservoirs are in tributary systems upstream of the Lloyd Shoals Project, including water supply reservoirs. Tussahaw Reservoir, a 1,466-acre water supply reservoir of the Henry County Water Authority (HCWA), is located on Tussahaw Creek about 3.5 miles upstream of Lake Jackson in Butts and Henry Counties (Figure 2). Other reservoirs upstream of the Project include 850-acre Lake Varner in the Alcovy River system (Newton County); 650-acre Randy Poynter Lake in the Yellow River system (Rockdale County); 600-acre Lake Spivey in the South River System (Henry and Clayton Counties); 260-acre Blalock Reservoir in the South River System (Henry County); and others.

Reservoirs on tributaries to the Ocmulgee River downstream of the Project include a network of water supply reservoirs operated by HCWA in the Towaliga River system: Cole Reservoir (1,100 acres), Rowland Reservoir (277 acres), Gardner Reservoir (209 acres), and Strickland Reservoir (121 acres). High Falls Lake (650 acres) impounds the Towaliga River at High Falls State Park (SP) (Figure 1). Lake Juliette, a 3,600-acre reservoir constructed to provide cooling

water for Georgia Power's Plant Scherer, is located on Rum Creek, which enters the Ocmulgee River about 10 river miles downstream of Juliette Dam.⁶

4.1.2 MAJOR LAND USES

The Ocmulgee River basin drains all or portions of 30 counties in central Georgia. More than 100 cities and towns are located within the basin. The Ocmulgee River basin drains southeastern and eastern metropolitan Atlanta. Cities upstream of the Project include Covington, Conyers, and McDonough, with populations of 13,977, 15,919, and 23,964, respectively (U.S Census Bureau 2016). Their land uses comprise significant portions of the watershed upstream of Lake Jackson. The closest cities to the Project are Jackson to the west and Monticello to the east, with populations of 5,071 and 2,618, respectively (U.S Census Bureau 2016). These small cities are within tributary watersheds that drain downstream of the Project.

The upper Ocmulgee River basin in the vicinity of the Lloyd Shoals Project includes portions of two water management planning regions in Georgia: the Metropolitan North Georgia Water Planning District (Metro Water District) and the Middle Ocmulgee Water Planning Region. The 15-county Metro Water District, centered on metro Atlanta, includes 982 sq mi of the upper Ocmulgee River basin upstream of Lake Jackson in Clayton, DeKalb, Fulton, Gwinnett, Henry, and Rockdale Counties (CH2M and Black & Veatch 2017). The northern basin in Gwinnett and DeKalb Counties is predominantly suburban in character. More densely developed urban areas occur in headwaters of the South River in the cities of Atlanta and Decatur. Overall, land use is predominantly residential, with 36 percent remaining undeveloped as agricultural or forest lands, open space, water, or wetlands. About 100 miles of interstate highway corridors traverse this upper portion of the basin. Watershed imperviousness is high throughout much of the upper basin and exceeds thresholds considered detrimental to stream stability, water quality, aquatic habitat, and biotic integrity (CH2M and Black & Veatch 2017).

The Middle Ocmulgee Water Planning Region includes Lake Jackson; surrounding Butts, Newton, and Jasper Counties; and nine counties extending downstream past Macon to the upper Coastal Plain (GEPD 2017a). The Lloyd Shoals Project is in the upstream end of the planning

⁶ Lake Juliette is an impoundment of Rum Creek and is distinct from Juliette Dam on the Ocmulgee River.

region. Land use in the region transitions from suburban in northern areas near metro Atlanta to rural in the south. Approximately 54 percent of the region's land area is covered by forested land, 19 percent by agriculture, 10 percent by wetlands, and 9 percent by urban development (GEPD 2017a).

Land uses adjacent to the Project include the 500-acre Georgia FFA-FCCLA Center in Newton County, a premier camp facility and conference center for the National FFA Organization and Family, Career, and Community Leaders of America (FCCLA). The facility is open year-round and serves 30,000 campers annually.

The 116,731-acre Oconee National Forest (NF), part of the overall Chattahoochee-Oconee NF, lies generally east of the Lloyd Shoals Project in eight central Georgia counties (U.S. Forest Service [FS] 2012). The southern section of Oconee NF extends west to the Ocmulgee River beginning about 1 mile downstream of Lloyd Shoals Dam, on the east side of the river and south of Georgia Hwy 16 (Figure 1). Oconee NF includes 30,312 acres in Jasper County (FS 2012), the majority being within the Ocmulgee River basin downstream of the Project. No NF lands are located within the Lloyd Shoals project boundary.

Piedmont National Wildlife Refuge (NWR) adjoins Oconee NF to the south and lies east of the Ocmulgee River (Figure 1). FWS manages Piedmont NWR to conserve land for fish, wildlife, botanical resources, and their habitats (FWS 2010). The refuge covers 34,955 acres, including 28,552 acres in Jones County and 6,403 acres in Jasper County.

Rum Creek Wildlife Management Area (WMA) is located south of the Project on the west side of the Ocmulgee River in Monroe County. The WMA consists of 5,739 acres surrounding Lake Juliette and offers hunting opportunities for deer, turkey, dove, waterfowl, and small game. Charlie Elliott Wildlife Center/Clybel WMA, located east of Lake Jackson, is in the adjacent Oconee River basin.

Parks in the upper Ocmulgee River basin include Panola Mountain SP and Stone Mountain Park upstream of the Project, and Indian Springs SP, High Falls SP, Jarrell Plantation Historic Site, and Amerson River Park downstream of the Project.

4.1.3 MAJOR WATER USES

Public water supply is a major water use in the upper Ocmulgee River basin. In the Metro Water District, the upper Ocmulgee River basin is the primary drinking water supply source for all or parts of three counties, including Clayton, Henry, and Rockdale Counties (CH2M and Black & Veatch 2017). Surface water from storage reservoirs serves as the main source of water supply. Drinking water supply watersheds upstream of the Project include headwaters and tributaries of the Alcovy River, Yellow River, South River, and Tussahaw Creek. Existing permitted surface water supply withdrawals in the upper Ocmulgee River basin within the Metro Water District total a monthly average daily withdrawal of 121.5 million gallons per day (MGD); actual annual average withdrawals are about 46.7 MGD (CH2M and Black & Veatch 2017).

Public water supply is also a primary use of the Ocmulgee River basin downstream of Lake Jackson. Butts County, et al. Water and Sewer Authority (WSA) (partnership with the cities of Jackson and Jenkinsburg) operates a water supply intake on the river just downstream of Lloyd Shoals Dam outside of the project boundary. The City of Macon has a water supply intake on the river about 38 river miles downstream of Lloyd Shoals Dam.

As estimated by the U.S. Geological Survey (USGS), the principal uses of water withdrawals (surface water and groundwater) in the Middle Ocmulgee planning region (in descending order of magnitude) are public supply, thermo-electric generation⁷, irrigation use, industrial use, domestic use, mining, livestock and aquaculture, and commercial use (Lawrence 2016). Counties upstream of the Fall Line (Piedmont) rely mainly on surface water sources, while counties downstream (Coastal Plain) withdraw more water from principal aquifers.

The upper Ocmulgee River also serves as a primary receiving water for assimilating treated sanitary effluent in the basin. In the Metro Water District, the upper Ocmulgee River basin has 18 municipal wastewater treatment facilities with a permitted capacity of 132 MGD average daily flow for maximum-month flow (CH2M and Black & Veatch 2017). Surface-water returns in the Middle Ocmulgee planning region total about 59 MGD and include public wastewater (85 percent), industrial (8 percent), and surface mining (7 percent) returns (Lawrence 2016).

⁷ Georgia Power's Plant Scherer is located in Monroe County, just north of Macon, and uses Lake Juliette as part of a closed-cycle recirculating cooling water system.

The water and wastewater systems of the Metro Water District upstream of the Project are interconnected. With interbasin transfers being common within counties that straddle two or more river basins, the upper Ocmulgee River receives a net estimated water gain of about 54.6 MGD (CH2M and Black & Veatch 2017).

The Middle Ocmulgee Regional Water Plan (GEPD 2017a), developed as part of Georgia's state-wide water planning process, assesses current and future water and wastewater needs in the 12-county region that includes the Lloyd Shoals Project. The plan recommends appropriate water management practices to be employed by local governments/water utilities and other permitted water users through 2050. The surface water availability resource assessment indicated that surface water sources in the region are generally adequate to meet future water demands. An Alternative Flow Regimes Pilot Study conducted by GEPD for the Ocmulgee River in 2018 modeled alternative flow regimes to the low-flow threshold used in the surface water availability resource assessment as an indicator of potential impacts (GEPD 2018a). The model outputs provide the Middle Ocmulgee Regional Water Planning Council with additional tools to assess potential impacts of future water demands to flow-related services.

4.1.4 TRIBUTARY STREAMS

Four tributaries converge at Lake Jackson to form the Ocmulgee River. They include the following streams in descending order of watershed area (Figures 1 and 2):

- South River – originates in southeast metro Atlanta in DeKalb, Fulton, and Clayton Counties; flows southeast through Rockdale, Henry, and Newton Counties; becomes the South River arm of Lake Jackson; drainage area of 553 sq mi.
- Yellow River – originates in Gwinnett County; flows south through DeKalb, Rockdale, and Newton Counties; becomes the Yellow River arm of Lake Jackson; drainage area of 448 sq mi.
- Alcovy River – originates in Gwinnett County, flows southeast then south through Walton and Newton Counties; becomes the Alcovy River arm of Lake Jackson; drainage area of 255 sq mi.
- Tussahaw Creek – originates in Henry County; flows east into Butts County; becomes impounded by Tussahaw Reservoir before continuing to flow east into the Tussahaw Creek arm of Lake Jackson; drainage area of 72 sq mi.

4.1.5 CLIMATE

The Ocmulgee River basin is characterized by mild winters and hot summers. Average daily temperatures vary from 31-55°F in January to 67-90°F in July (Weather Channel 2017). Winter low temperatures fall below freezing for only short periods. Average annual precipitation is 40 to 52 inches per year. Rainfall occurs throughout the year. The wettest month is March and the driest month is October (GEPD 2003).

4.2 CUMULATIVE EFFECTS

4.2.1 GEOGRAPHIC SCOPE

The geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of the proposed action's effect on the resources and contributing effects from other hydropower and non-hydropower activities within the Ocmulgee River basin (FERC 2018b). Because the proposed actions would affect the resources differently, the geographic scope may vary by resource area.

Georgia Power has analyzed water resources and fishery resources as cumulatively affected resources in this PLP. The geographic scope for cumulative effects on water quality includes the upper Ocmulgee River basin from its headwaters in the Metro Water District, the Lloyd Shoals Project, and the Ocmulgee River downstream to Juliette Dam, a distance of approximately 19 river miles downstream of the Project. This scope of analysis includes those lands and activities upstream in the basin that contribute to water quality conditions in Lake Jackson and the Ocmulgee River tailrace area.

The geographic scope of analysis for cumulative effects on fisheries focuses on resident and diadromous fish and includes the Ocmulgee River from the headwaters of Lake Jackson (within the project boundary) downstream to the confluence of the Ocmulgee and Oconee Rivers. The presence and operation of the Lloyd Shoals Project, along with the downstream Juliette Dam, could affect the movements of fish and fish populations in the Ocmulgee River.

4.2.2 TEMPORAL SCOPE

The temporal scope of Georgia Power's cumulative effects analysis includes a discussion of the past, present, and reasonably foreseeable future actions and their effects on each resource that could be cumulatively affected. The temporal scope considered the potential for actions occurring

30 to 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. This historical discussion is limited, by necessity, to the amount of available information for each resource. Georgia Power has identified the present resource conditions in this PLP based on the best information available.

4.3 PROPOSED ACTION

4.3.1 GEOLOGY AND SOILS

4.3.1.1 AFFECTED ENVIRONMENT

The Lloyd Shoals Project lies in the Washington Slope District of the Piedmont physiographic province (Clark and Zisa 1976). The Piedmont is a hilly, gently rolling upland province underlain by crystalline metamorphic and igneous rocks. Streams in the Washington Slope District occupy broad, shallow valleys separated by broad, rounded divides. Local relief typically varies from 50 to 100 ft, except near the Ocmulgee River, which flows in a steep-walled valley 150-200 ft below the adjacent area (Clark and Zisa 1976).

The Washington Slope District is bordered to the south by the Fall Line Hills District, a dissected transitional zone between the Piedmont and Coastal Plain provinces (Griffith et al. 2001). The Fall Line Hills begin about 43 river miles downstream of the Project near the City of Macon.

The 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 (Griffith et al. 2001; Edwards et al. 2013).

The Lake Jackson shoreline is characterized by gently sloping topography in most areas. Much of the shoreline in the southern and central portions of the reservoir has been developed for residential and commercial use. Significant stretches of undeveloped, forested shoreline occur along the South River and Yellow River arms of the reservoir north of Hwy 36 and along the Tussahaw Creek arm west of Georgia Hwy 36.

Shoreline Erosion and Sedimentation

Georgia Power (2020c) conducted a shoreline reconnaissance survey of Lake Jackson and the Lloyd Shoals tailrace area in August 2019. The survey inventoried existing shoreline conditions and potential sources of erosion and sedimentation within the project boundary and characterized physical aquatic habitat available as fish cover in the littoral zone. A total of 107 shoreline

segments (sites), each 500 ft long, were surveyed, including 101 sites distributed approximately evenly among four sections of the reservoir (South River, Alcovy River, Tussahaw Creek, Mainstem Reservoir) and six sites in the tailrace area. All four project recreation facilities were represented. The remaining survey sites were randomly selected in each section. Each site was visually assessed and rated for vegetative buffer zone condition, adjacent land uses, bank stability and vegetative protection, shoreline structural stabilization practices (e.g., seawalls, riprap), potential causes of shoreline erosion (project related and non-project related) and sources of littoral-zone fish cover.

The shoreline survey found the vast majority of sites (94 percent) to have stable or moderately stable banks, either due to a high degree of bank vegetative protection or the use of shoreline structural stabilization practices, including seawalls, seawalls with riprap at the base, and riprap. Thirty-three percent of the surveyed sites had natural vegetative buffer zone conditions. Their buffer zones were heavily vegetated with less than 20 percent of the natural vegetation removed. Forty-one percent of the sites had landscaped buffer zones; they were cleared of more than 50 percent of the natural vegetation or had the underbrush completely removed. Twenty-six percent of the sites had a mix of landscaped and natural vegetative buffer zone conditions; they were cleared up to 50 percent but with some trees and understory remaining.

Sites with natural vegetative buffer zone conditions were most concentrated in the South River section, which included the Yellow River embayment. Many of these sites had forested riparian zones. Sites with landscaped riparian zones were widespread but were most numerous in the Tussahaw Creek and Mainstem Reservoir sections, reflecting the predominance of shoreline residential lots in these sections. The landscaped-natural sites typically included some residential land uses and were most numerous in the Alcovy River section. The tailrace area had both natural and landscaped-natural shoreline buffer zone conditions.

The most common potential sources of shoreline erosion observed on Lake Jackson were residential landscaping and wave action from watercraft/wind, at 53 percent and 26 percent of the reservoir sites, respectively. Neither of these sources are related to project operations. Reservoir fluctuations, which are related to project operations, were identified as a potential source of erosion at 12 sites in three sections of the reservoir. However, wave action from watercraft and wind was also a factor at half of these sites. All but one of the sites where

reservoir fluctuation was a potential source of erosion had stable or moderately stable banks, and none of these sites were associated with project recreation facilities or the project works.

Sixty-four percent of the surveyed sites had shoreline structural stabilization practices in place. The distribution of these sites corresponded with those areas of the reservoir having the most residential lots, including the Mainstem Reservoir, Alcovy River, and Tussahaw Creek. Forty-six percent of the shoreline length surveyed had structural stabilization in approximate proportions of 50 percent seawall, 28 percent seawalls with riprap at the base, and 21 percent riprap only. Forty-nine percent of the length of observed stabilization practices included the use of riprap.

The most commonly observed sources of littoral zone fish cover, in descending frequency of observation, were overhanging vegetation, docks/piers/boatslips/boathouses, large woody debris, riprap, and bedrock/boulders. Shorelines with larger proportions of overhanging vegetation were most common in the upper reaches of the South River and Tussahaw Creek embayments and in the tailrace area, where natural shoreline vegetative buffer zone conditions were most common. Docks, piers, and boatslips/boathouses were widespread in association with residential lots. Emergent vegetation was most commonly observed in the South River embayment, where sediment deposition has been greater than other areas of the reservoir.

Sediment Transport and Deposition Characteristics

Georgia Power (2020c) analyzed sediment transport and patterns of sediment deposition with Lake Jackson based on review of existing watershed information and data, minor dredging activities authorized under the Small Dredging Permit Program for the Project, and temporal comparison of available aerial photography for representative areas of the project shoreline, as summarized below. No bathymetry data are available for Lake Jackson.

The upper Ocmulgee River basin upstream of Lloyd Shoals Dam covers an area of 1,400 sq mi. About 70 percent of this area (982 sq mi) drains southeastern and eastern metropolitan Atlanta, including portions of Clayton, DeKalb, Fulton, Gwinnett, Henry, and Rockdale Counties within the highly developed Metro Water District (Section 4.1.2). Larger cities within the river basin upstream of the Project include Atlanta, Conyers, Lawrenceville, Snellville, Stockbridge, and McDonough. The South River, Yellow River, Alcovy River, and Tussahaw Creek are the main tributaries draining the Metro Water District (Section 4.1.4). The South River watershed is the largest tributary, covering approximately 553 sq mi (BC/DHA 2019).

Lake Jackson is downstream of the Metro Water District. The main tributaries converge at Lake Jackson to form the Ocmulgee River. As such, land use and watershed conditions within the Metro Water District substantially affect sediment transport and deposition within Lake Jackson. Within the Metro Water District, 406 stream miles or 80 percent of the 506 stream miles assessed in the upper Ocmulgee River basin are not supporting their designated uses for one or more parameters (CH2M and Black & Veatch 2017). Seventy percent (354 miles) do not meet water quality standards for fecal coliform bacteria as a result of nonpoint source pollution and urban runoff, which carries sediment into streams and increases stream-bank erosion. Twenty-nine percent (146 miles) do not meet water quality standards for biota, indicative of high sediment loads degrading aquatic habitat for benthic macroinvertebrates and fish. Increased imperviousness from urbanization increases the volume of runoff entering streams, which in turn causes stream erosion and downstream transport of sediment.

The watershed upstream of the Project also drains about 418 sq mi of the upper end of the Middle Ocmulgee Water Planning Region (Section 4.1.2), including portions of Butts, Newton, and Jasper Counties around Lake Jackson. The lower reaches of the South River and Yellow River before they enter Lake Jackson are not supporting water quality standards due to fecal coliform bacteria from nonpoint sources and urban runoff (GEPD 2020). The lower reach of the Alcovy River before it enters Lake Jackson is not supporting water quality standards due to *Escherichia coli* (*E. coli*) bacteria from nonpoint sources. The lower reach of Tussahaw Creek before it enters the reservoir is impaired for biota due to sedimentation.

Sediment Sources

Sediment sources upstream of Lake Jackson include nonpoint source runoff, soil erosion from construction sites, other regulated stormwater discharges, and streambank erosion due to accelerated streamflow velocities from impervious cover associated with urbanization. GEPD (2007, 2017b) completed Total Maximum Daily Load (TMDL) evaluations for 81 stream segments in the Ocmulgee River basin listed as not meeting water quality standards for biota (fish or macroinvertebrates) due to sedimentation. The segments included 23 stream segments totaling 145 miles in the watershed upstream of Lake Jackson (GEPD 2002a, 2007, 2017b). Sediment-impaired segments of the South River and three direct tributaries total 50 miles. Most of the other segments are in headwaters of the South River, Yellow River, and Tussahaw Creek.

GEPD (2007, 2017b) assessed known and suspected sources of sediment in the watershed upstream of Lake Jackson, including point and nonpoint sources. Stormwater runoff from roads and developed urban areas were identified as major sources of erosion and sedimentation. Increased imperviousness from urbanization increases the volume of runoff entering the streams, which in turn causes stream erosion (widening and down-cutting), loss of riparian vegetative cover, and the transport of sediment downstream. Based on small differences in modeled sediment yields between biologically impaired (due to sedimentation) and least-impacted watersheds, GEPD (2007, 2017b) concluded that most of the sediment found in Ocmulgee River basin streams may be legacy sediment resulting from past land use practices. Thus, maintaining sediment loads at or below current levels may allow habitat to recover in many streams over time as sediment is transported downstream.

GEPD (2017b) recommends management practices to help maintain or reduce sediment loads in the Ocmulgee River basin upstream of the Project that include:

- Complying with National Pollutant Discharge Elimination System (NPDES) permit levels and requirements for regulated stormwater and wastewater discharges;
- Implementing water quality management practices recommended in regional water plans, such as low impact development, reducing runoff from impervious surfaces, and watershed improvement/restoration projects; applicable regional plans include the Metro Water District's Water Resource Management Plan (CH2M and Black & Veatch 2017), the City of Atlanta's South River Watershed Improvement Plan (BC/DHA 2019), and the Middle Ocmulgee Regional Water Plan (GEPD 2017a);
- Implementing best manage practices (BMPs) for forestry (Georgia Forestry Commission 2009) and agriculture (Georgia Soil and Water Conservation Commission [GSWCC] 2013);
- Implementing individual Erosion and Sedimentation Control Plans for land-disturbing activities and applying the Manual for Erosion and Sediment Control in Georgia (Green Book) (GSWCC 2016); and
- Implementing the Georgia Stormwater Management Manual (Blue Book) (Atlanta Regional Commission [ARC] 2016) to facilitate prevention and mitigation of stream bank erosion due to increased stream flow and velocities caused by urban runoff through structural stormwater BMP installation.

Sediment Contaminants

Four segments of the South River (51 stream miles) upstream of Lake Jackson in the Metro Water District do not support their designated use due to elevated concentrations of legacy polychlorinated biphenyls (PCBs) detected in fish tissue (Fish Consumption Guidelines) (GEPD 2020). The PCB contamination has been attributed to urban runoff and combined sewer overflows (GEPD 2002b). The use of PCBs was banned in the U.S. in the late 1970s, loadings have been removed or reduced to zero, and levels are decreasing in the water column, sediments, and fish tissues over time. The current fish consumption guidelines (GDNR 2020) for the South River upstream of the Project (DeKalb/Rockdale County, Henry County) recommend limiting consumption of three sport-fish species tested (Bluegill, Snail Bullhead, Black Crappie) to one meal per week due to PCBs. Fish consumption guidelines for the South River at Georgia Hwy 36 (within the project boundary) recommend limiting consumption of Channel Catfish to one meal per week due to PCBs.

Lake Jackson currently supports its designated Recreation and Fishing uses (GEPD 2020). Previously, the reservoir had been listed as not supporting due to elevated concentrations of legacy PCBs in fish tissue, attributed to urban runoff and nonpoint source pollution. A TMDL was completed for PCBs in Lake Jackson to address the impairment (U.S. Environmental Protection Agency [EPA] 1998a). Nevertheless, even without the TMDL, PCBs have been banned in the U.S. and their levels in the environment are declining and will continue to decline. Their detection in fish tissue at Lake Jackson was unrelated to project operations. There is no longer a fish consumption advisory for Lake Jackson due to PCBs (GDNR 2020), reflecting the declining trend.

Fish consumption guidelines remain for Lake Jackson due to mercury for limiting consumption of certain size classes of Largemouth Bass to one meal per week (GDNR 2020). EPA (2002) developed a TMDL for mercury in Lake Jackson. The predominant source of mercury loading to the lake is air deposition, which is unrelated to project operations. Fish consumption advisories for Largemouth Bass and other sport fishes due to mercury are widespread in Georgia public reservoirs (GDNR 2020).

EPA (1998b) also completed a TMDL for chlordane (a pesticide) in Lake Jackson. Similar to PCBs, chlordane use has been banned, its levels in water and sediment have been declining, and

its detection in fish tissue was unrelated to Lloyd Shoals project operations. There is no longer any fish consumption advisory for Lake Jackson due to chlordane.

Dredging Activities within the Project Boundary

Under the current license, Georgia Power implements a Small Dredging Permit Program to authorize minor dredging activities within the project boundary involving quantities ranging up to 500 cubic yards of sediment per lot (Georgia Power 2020c). The sole purpose for dredging is to remove silt or sedimentation that has accumulated over time. Georgia Power files annual reports listing the small dredging permits issued and the estimated quantities of sediment proposed for removal.

Twenty-nine permits were issued for small dredging activities from 2006 through 2018, authorizing the removal of a total of 3,690 cubic yards of sediment (Georgia Power 2020c). The majority of permits and the greatest quantities authorized were in the South River and the Tussahaw Creek embayments of the reservoir. Eleven permits totaling 1,885 cubic yards were issued to property owners in the South River embayment, mainly in the area from just upstream of the Hwy 36 bridge downstream to the confluence with the Alcovy River. Ten permits totaling 921 cubic yards were issued to property owners in the Tussahaw Creek section, mostly in the upper reach. Five permits totaling 784 cubic yards were issued in the Mainstem Reservoir section and three permits totaling 100 cubic yards were issued in the Alcovy River section.

Location information for small dredging permits issued prior to 2006 was not as detailed. For the period 1997-2005, a total of 20 permits were issued for minor dredging activities totaling about 7,100 cubic yards.

Shoreline Temporal Change

Six representative areas of the Lloyd Shoals Project were evaluated for temporal change in shoreline and sedimentation conditions (Georgia Power 2020c). Based on aerial photography comparisons over the period 1993 to 2019, there has been little overall change in the predominant land uses surrounding the Project. Comparison of aerial imagery revealed that the primary changes to land use along the reservoir shoreline were related to residential construction. Primary changes to land use in upland areas outside of the project boundary were residential construction and logging. Shoreline change within the reservoir has been most common in the more natural upper reaches of the South River/Yellow River, Alcovy River, and Tussahaw Creek

sections. Sediment deposition and the formation and reshaping of sandbars and islands were most apparent in these transition areas from a riverine to a lacustrine system. Changes in shoreline conditions in the Mainstem Reservoir section and other more residential areas of the reservoir were less common, likely due to the widespread use of shoreline structural stabilization practices. The higher rates of sedimentation observed from aerial imagery in the South River embayment, including the Yellow River, can be attributed to high rates of sediment transport and deposition from the highly urbanized watershed upstream of the Project.

4.3.1.2 ENVIRONMENTAL IMPACTS AND RECOMMENDATIONS

Georgia Power proposes to continue operating the Lloyd Shoals Project in a modified run-of-river mode for generation during peak power demand hours. The Project would continue to release a continuous minimum flow of 400 cfs, or inflow, whichever is less, into the river downstream for the protection and enhancement of fish and wildlife resources. During low-flow periods when inflow falls below 250 cfs, the Project would release a continuous flow of 250 cfs to ensure adequate stream flows for aquatic life and other uses. In addition, Georgia Power proposes to continue implementing the Small Dredging Permit Program to authorize minor dredging activities by property owners within the project boundary.

Reservoir and Tailrace Shoreline Erosion and Sedimentation

Georgia Power's proposed operation would not adversely affect shorelines within the project boundary as a result of erosion and sedimentation. For normal operation, Lake Jackson would continue to be operated year-round to maintain reservoir elevations between approximately 530 and 527 ft PD, with daily reservoir fluctuations of 2.0 ft or less about 99.8-percent of the days. Daily fluctuations would be 1.5 ft or less about 99.5-percent of the days. Since installation of the Obermeyer gate system in 2012, the operators have the ability to incrementally adjust flows released from the spillway, which enhances control over the water levels in the reservoir during and following high-inflows periods. Once the Obermeyer gate system began operation, the prior practice of conducting annual seasonal drawdowns of Lake Jackson to prevent spilling water during high inflows ended. These gates allow the plant discharges to be more closely matched with inflows to the Project.

During low-flow periods there may be a sustained drawdown of the project reservoir as Georgia Power supplements river flows downstream; however, there would typically be only minor daily

elevation fluctuations because there would be diminished daily peaks in inflow during low-flow periods. During maintenance drawdowns, daily fluctuations would still occur, but at a lower elevation level. For both types of drawdowns, the lake elevation would be lowered slowly, which would not contribute to additional sedimentation.

Reservoir fluctuations were identified during the shoreline reconnaissance survey as a potential source of erosion at 12 sites on Lake Jackson but wave action from wind and watercraft was also observed to be a contributing source at six of the sites. All but one of the sites had stable or moderately stable banks and none exhibited severe erosion or bank failure.

Georgia Power's operations proposal would not adversely affect shoreline conditions in the Lloyd Shoals tailrace area. The potential for shoreline erosion would be moderated by the prevalence of bedrock and boulders, the armoring provided by riprap closer to the dam, and the stream-bank and riparian-zone protection provided by forested vegetation along both sides of the river. Generation releases to the Ocmulgee River downstream would vary between the minimum flow requirement of 400 cfs and the maximum powerhouse hydraulic capacity of 3,720 cfs. Average annual inflow to Lake Jackson is about 1,747 cfs. When inflow falls below 250 cfs, the Project would release a 250-cfs continuous flow to ensure adequate stream flows for aquatic life and other downstream uses. The 250-cfs release would occur at a steady rate without pronounced daily fluctuations. For the period 2001-2020, daily average discharge from the Project to the river downstream exceeded 250 cfs on 99 percent of the days, 400 cfs on 86 percent of the days, and 1,000 cfs on 54 percent of the days.

Sediment Transport and Accumulation within Lake Jackson

Continued operation of the Project as proposed would not significantly affect sediment transport and accumulation within Lake Jackson. The major sources of sediment transport and accumulation in Lake Jackson are the highly developed urban watersheds of metropolitan Atlanta upstream of the Project. Watershed imperviousness is high in much of the upstream Ocmulgee River basin, which increases the volume of stormwater runoff entering streams, which in turn accelerates streamflow velocities and causes stream erosion (widening and down-cutting), loss of riparian vegetative cover, and the transport of sediment downstream. Stormwater runoff from roads and developed urban areas, soil erosion from construction sites, other regulated

stormwater discharges, nonpoint source runoff, and streambank erosion are major sources of erosion and sedimentation upstream of the Project (GEPD 2007, 2017b).

The South River is the largest tributary to Lake Jackson and the most widely impaired by sedimentation. As a result of the historically high sediment load from the upstream watershed, sediment deposition is most evident in the South River embayment of Lake Jackson. The temporal change analysis detected sediment accumulation along points, islands, and sandbars as the South River enters the reservoir and transitions to a lacustrine system. However, the overall shoreline configuration throughout the South River embayment has remained relatively stable due to the prevalence of natural vegetative buffer zone conditions, especially in the upper reaches, and the use of seawalls and/or riprap along residential lots. Implementation of regional water plans and best practices by local governments in the South River watershed upstream of the Project under the existing TMDLs will help to maintain or reduce sediment loads into the South River embayment over time.

Continued implementation of Georgia Power's Small Dredging Permit Program would facilitate property-owner removal of small quantities of accumulated sediment next to seawalls and boat docks. In addition, operation of the Obermeyer gate system, which eliminated the practice of annual drawdowns, would maintain higher water levels year-round, which in turn would maintain more consistent boating access to shallow coves and upstream reaches of the South River/Yellow River, Tussahaw Creek, and Alcovy River embayments.

Continued operation of the Project would not contribute to sediment contamination of Lake Jackson. Legacy PCB and chlordane contamination of sediments in the Lake Jackson, as detected in fish tissue, has been attributed to urban stormwater runoff, nonpoint source pollution, and combined sewer overflows. The use of PCBs and chlordane has been banned in the U.S., loadings have been removed or reduced to zero, and levels are decreasing and will continue to decrease over time. There are no longer fish consumption advisories in effect for PCBs or chlordane in Lake Jackson, reflecting the declining trend. Although fish consumption guidelines remain for Lake Jackson due to mercury, the predominant source of mercury loading to Georgia reservoirs is air deposition, which is also unrelated to project operations.

Construction of Proposed Enhancement Measures

Construction of the proposed recreational enhancements (Section 4.3.6.2) would cause temporary shoreline disturbances in local areas. Georgia Power proposes to perform all construction associated with these enhancements in such a manner as to minimize impacts on shoreline vegetation, bank stability, and water quality. Proper erosion control and restoration practices during and immediately following all construction activities would minimize impacts. Construction of the proposed new boat ramp at the Jane Lofton Access Area would take place during the fall to minimize impacts to littoral-zone habitats and water quality during the spawning seasons of resident fish.

Unavoidable Adverse Impacts

Unavoidable adverse impacts would include temporary effects of shoreline disturbance from construction of proposed recreation enhancements. Impacts would be minimized through the implementation of BMPs for minimizing soil disturbance, controlling erosion, restoring natural contours, and revegetating disturbed areas.

4.3.2 WATER RESOURCES

4.3.2.1 AFFECTED ENVIRONMENT

Water Quantity

USGS divides the Ocmulgee River into three sub-basins with corresponding 8-digit Hydrologic Unit Codes (HUCs). The Lloyd Shoals Project, with an upstream drainage area of 1,400 sq mi, is located within HUC 03070103 (upper Ocmulgee River basin) (Figure 4). The upper Ocmulgee River basin extends from the headwaters in southeastern and eastern metro Atlanta counties downstream through the Piedmont province to the City of Macon at the Fall Line.

Stream Flow

USGS maintains a stream gage on the Ocmulgee River about 1 mile downstream of Lloyd Shoals Dam at the Georgia Hwy 16 bridge (USGS No. 02210500, Ocmulgee River near Jackson, Georgia) (Figure 2). The gage represents a watershed area of 1,420 sq mi. Drainage area accretion between the dam and the USGS gage is small, about 20 sq mi, consisting mainly of one tributary stream (Herds Creek) entering from the east. Monthly minimum, average, and maximum flows at this gage for the 30-year period from January 1989 through December 2018 are listed for each month in Table 3. Average monthly flows ranged from a low of 1,109 cfs in

August to a high of 3,075 cfs in March. The minimum flows usually occurred in late summer/early fall, and high flows tended to occur in winter/early spring. Average annual inflow to Lake Jackson is about 1,747 cfs.

Water Withdrawals

Surface-water withdrawals for public supply comprise the majority of water uses in the Ocmulgee River basin upstream of the Project (Lawrence 2016). Of 19 permitted surface water withdrawals upstream of the Project, the largest withdrawals for consumptive uses are in Henry and Newton Counties (GEPD 2021a). Several water supply reservoirs are in the South, Yellow, and Alcovy River and Tussahaw Creek systems upstream in the river basin (Section 4.1.1). There are no existing permitted withdrawals for public water supply on Lake Jackson.

Butts County et al. WSA operates a public water supply intake on the Ocmulgee River 0.7 mile downstream of Lloyd Shoals Dam, just beyond the project boundary. The permitted monthly average daily withdrawal is 9.7 MGD (GEPD 2021a). Other permitted surface-water withdrawals on the mainstem Ocmulgee River downstream of the Project to Macon include (GEPD 2021a):

- Georgia Power, Plant Scherer – intake about 25 river miles downstream of the Project in Monroe County; permitted monthly average withdrawal of 231 MGD; water is pumped to Lake Juliette for use in a closed-cycle recirculating cooling water system.
- Macon Water Authority (MWA) – public water supply intake about 38 river miles downstream of the Project in Bibb County; permitted monthly average withdrawal of 110 MGD; water is pumped to MWA’s Javors Lucas Lake water storage reservoir.

Water demand in the Metro Water District upstream of the Project is projected to increase by approximately 50 percent by the year 2050 (CH2M and Black & Veatch 2017), while water demand in the Middle Ocmulgee Water Planning District is projected to increase by approximately 35 percent by 2050 (GEPD 2017a). Surface water resources within the project region are considered adequate to meet future water demands (GEPD 2017b).

Treated Wastewater Discharges

Permitted discharges within the Ocmulgee River basin upstream of the Project include 5 water treatment plants, 7 subsurface systems, 17 land application systems, 8 NPDES permitted discharges, 6 mining and processing facilities, 1 general cooling water, and 1 animal feed operation (GEPD 2021a). GEPD’s 2017 assessment for the Middle Ocmulgee Water Planning

District indicates that the current and future (2050) assimilative capacity of waters in the project vicinity is very good (GEPD 2017b).

Water Quality

Water Use Classifications and Attainment Status

GEPD (2018b) classifies the water use of Lake Jackson as Recreation. This area extends from the dam upstream to Georgia Hwy 36 on the South River, Yellow River, and Tussahaw Creek, and upstream to Newton Factory Road bridge on the Alcovy River (Figure 2). The South and Yellow River arms of the reservoir upstream of Georgia 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. In addition to general criteria applicable to all waters, specific criteria apply to these water uses, including numeric criteria for bacteria (fecal coliform, *E. coli*), DO concentration, pH, and temperature (GEPD 2018b). The applicable DO numeric criteria for the project waters, which support warm-water species of fish, are a daily average of at least 5.0 milligrams per liter (mg/L) and no less than 4.0 mg/L at all times.

GEPD (2020) currently lists Lake Jackson as supporting its designated Recreation and Fishing uses. Previously, TMDLs were completed for Lake Jackson due to legacy PCBs (EPA 1998a), chlordane (EPA 1998b), and mercury (EPA 2002) detected in fish tissue (see Section 4.3.1.1). The use of PCBs and chlordane has been banned in the U.S., their levels in water and sediment have been declining, and their detection in fish tissue has been attributed to urban runoff and nonpoint source pollution, not project operations. There are no longer fish consumption guidelines for the main pool of Lake Jackson due to PCBs or chlordane, but there are guidelines for the South River arm of the reservoir at Georgia Hwy 36, which recommend limiting the consumption of Channel Catfish due to PCBs (GDNR 2020).

Fish consumption guidelines remain for Lake Jackson due to mercury for certain size classes of Largemouth Bass (GDNR 2020). However, the predominant source of mercury loading to the reservoir is air deposition (EPA 2002), which is unrelated to project operations. Fish consumption advisories for Largemouth Bass and other sport fishes due to mercury are widespread in Georgia public reservoirs (GDNR 2020).

Numerous tributary streams to Lake Jackson upstream of the Project do not support their designated uses due to one or more parameters, including fecal coliform or *E. coli* bacteria, PCBs

in fish tissue, and impaired biota due to sediment (CH2M and Black & Veatch 2017; GEPD 2020) (see Section 4.3.1.1). The lower reaches of the South River and Yellow River before they enter Lake Jackson are not supporting water quality standards due to fecal coliform bacteria from nonpoint sources and urban runoff (GEPD 2020). The lower reach of the Alcovy River before it enters Lake Jackson is not supporting its Recreation use due to *E. coli* bacteria from nonpoint sources. The lower reach of Tussahaw Creek upstream of the reservoir is not supporting its Fishing use due to fish community impairment from sedimentation.

GEPD (2020) lists the Ocmulgee River downstream of Lloyd Shoals Dam for the first 17 miles, to its confluence with the Towaliga River, as supporting its designated Drinking Water and Fishing uses. The next 10-mile segment of the Ocmulgee River downstream to Georgia Hwy 18 has not been assessed. The 9-mile segment from Hwy 18 downstream to Beaverdam Creek is supporting its Fishing use but data are unavailable to assess its Drinking Water use. The next 10-mile segment of the river downstream to Walnut Creek in Macon is supporting its Drinking Water and Fishing uses.

Water Quality of Lake Jackson

At the normal full-pool elevation of 530 ft PD, Lake Jackson covers 4,750 acres and has 135 miles of shoreline. The full-reservoir gross storage capacity is approximately 107,000 acre-ft. Mean depth is 22.5 ft and the retention time (i.e., residence time of lake water) is 32 days. The 12-ft-high intake openings for the powerhouse have an invert elevation of 495 ft PD, which is approximately 35 ft below the normal full-pool elevation.

Lake Jackson historically exhibited accelerating eutrophication caused by excessive inputs of nutrients, mainly from point-source discharges upstream of the Project (EPA 1975). As major improvements were made to wastewater treatment systems through the 1980s, primarily through phosphorus reduction and diversions of treated wastewater, Lake Jackson water quality made a remarkable recovery (Kamps 1989). However, continued nutrient loading from upstream point and non-point sources led GEPD in 1997 to implement site-specific criteria for chlorophyll-*a*, total nitrogen, and total phosphorus. For chlorophyll-*a*, the average of monthly mid-channel photic zone composite samples taken at a location 2 miles downstream of the confluence of the South and Yellow Rivers is not exceed 20 micrograms per liter ($\mu\text{g/L}$) for April-October more than once in a five-year period (GEPD 2018). Total nitrogen is not to exceed 4.0 mg/L in the

photic zone, and total phosphorus lake loading is not to exceed 5.5 pounds (lbs) per acre-ft of lake volume per year. These site-specific standards have helped to further control nutrient loading and reduce associated seasonal problems with water quality and algal blooms. Subsequent reservoir monitoring results have indicated compliance with the site-specific water quality standards for Lake Jackson (GEPD 2003, 2020).

Georgia Power has monitored the seasonal water quality of Lake Jackson annually since the 1980s (Georgia Power 2018, 2019, 2021a). In recent decades, monitoring typically occurred three or four times per year at up to six representative stations. Stations included the forebay area of the dam, two main-pool stations upstream of the dam, and three stations in the South River/Yellow River, Alcovy River, and Tussahaw Creek embayments. Monitoring included vertical profile measurements of water temperature, DO concentration, pH, specific conductance (conductivity), and turbidity at 1-meter (m) intervals from the surface to the bottom. In addition, surface grab samples were collected at a subset of stations for laboratory analysis of a range of water chemistry parameters, including alkalinity, hardness, nutrients, metals, chlorophyll-*a*, turbidity, and fecal coliform bacteria.

GEPD has collected vertical profile and water chemistry data from forebay and mid-lake stations in Lake Jackson since 2000-2001, typically from April to October (GEPD 2021b). Vertical profile measurements have included water temperature and DO concentration, while water chemistry analyses have included total suspended solids, chlorophyll-*a*, total nitrogen, total phosphorus, fecal coliform, *E. coli*, and other parameters (Georgia Power 2018, 2021a).

The Jackson Lake Homeowners Association has also collected water quality data in the lake since 2014 (Georgia Adopt-A-Stream 2021). Available data include surface water temperature, DO concentration, pH, conductivity, Secchi depth, and *E. coli* density (Georgia Power 2021a).

Analysis of this substantial amount of water quality data indicates that the overall water quality of Lake Jackson is good and that the site-specific criteria for chlorophyll-*a* and total nitrogen are consistently being met (Georgia Power 2018, 2021a). Elevated concentrations of fecal coliform bacteria and chlorophyll-*a* occasionally occur in the reservoir related to nutrient inputs and nonpoint-source runoff from the upstream watershed.

The Lake Jackson forebay exhibits a clear pattern of summertime thermal stratification, with warmer temperatures near the surface, pronounced decline in temperature with increasing depth (thermocline), a sharp decline in DO concentration with increasing depth, and cooler, low-DO water below 10-m depth. Vertical stratification develops from late spring through the summer. Composite vertical profiles of the forebay in the months June-September show average DO values declining below 4.0 mg/L within the intake zone, corresponding with depths 23 to 35 ft below the full-pool surface (495 to 507 ft PD). As the surface water decreases in temperature through the fall and winter, increase in density, and sinks, mixing of the water column occurs, with cooler temperatures and higher DO concentrations becoming more uniformly distributed through the water column. Lake Jackson's seasonal pattern of summertime vertical stratification and fall-winter mixing is typical of southeastern Piedmont reservoirs.

Algal Blooms in Lake Jackson

Algal blooms occur naturally in reservoirs, but their frequency, duration, and intensity can be increased by nutrient enrichment from point and non-point sources, combined with elevated water temperatures, sunlight, and low flows (Pearl et al. 2001; Anderson et al. 2002; EPA 2016). Cyanobacteria (blue-green algae) blooms were reported for Lake Jackson in several years from 2007 to 2018 (Georgia Power 2021a). Blooms assessed by Georgia Power contained the cyanobacterium *Microcystis aeruginosa*, a species that can produce the toxin microcystin. When released into the water and ingested, microcystin can produce adverse effects in humans, pets, livestock, and wildlife, depending on the concentration and individual sensitivities. However, samples assessed from these blooms had cell densities below World Health Organization guidelines. The blooms were associated with drought, prolonged water temperatures above 30°C, low reservoir inflows, and increased retention time.

Georgia Power (2021a) applied a predictive model for blooms of cyanobacterial toxins in the southeastern U.S. (Wilson et al. 2020), which indicated a low overall risk for toxic cyanobacteria blooms in Lake Jackson, although drought conditions during summer likely increase the risk.

Water Quality of Lloyd Shoals Tailrace Area

Georgia Power (2021a) continuously monitored water temperature and DO concentration in the Ocmulgee River below Lloyd Shoals Dam from July 24, 2019 through July 31, 2020 to characterize the effects of continued project operation on tailrace water quality. Measurements

were recorded hourly in the tailrace area. Monthly water chemistry samples also were collected from the tailrace area over the same period and analyzed for 5-day biochemical oxygen demand, ammonia, inorganic nitrogen, total Kjeldahl nitrogen, ortho-phosphate, and total phosphorus.

Throughout the 1-year monitoring period, tailrace DO concentrations met the Georgia instantaneous criterion of no less than 4.0 mg/L 99.84 percent of the hours and met the daily average criterion of 5.0 mg/L 99.2 percent of the days (Georgia Power 2021a). Figure 5 shows the daily averages of water temperature and DO concentration over the monitoring period. The average water temperature was 19.88°C and the average DO concentration was 7.66 mg/L.

Summer tailrace DO values dropped below 4.0 mg/L on two separate days in July 2020 for a total of 13 hours, which represented 0.15 percent of the monitoring period (Georgia Power 2021a). The first excursion occurred on July 27, lasted 10 hours, and reached a low of 3.6 mg/L before recovering (Figure 6). The event began shortly after two non-aerating units and one aerating unit were brought online and added to one aerating unit that was already operating, for a total of two aerating and two non-aerating operating units. Based on examination of similar summertime generating scenarios that occurred during the monitoring period, this excursion could have been avoided by adding two aerating units, which were available at the time, and only one non-aerating unit, for a total of three aerating and one non-aerating units. The second excursion occurred on July 31, lasted only 3 hours, and reached a low of 3.8 mg/L before recovering (Figure 7). The event began a few hours after two aerating units and two non-aerating units were brought online at the same time and added to one aerating unit already operating, for a total of three aerating and two non-aerating units. This shorter event likely was minimized in duration and magnitude by operating all three aerating units.

Each of the July DO excursions was preceded by a combination of elevated surface water temperatures (28.8 to 29.0°C) and a storm event upstream of the Project. As indicated by USGS discharge records, the July 27 excursion followed a storm event on July 26 in the Alcovy River basin (USGS No. 02209000, Alcovy River near Covington, Georgia), and the July 31 excursion followed a storm event on July 30 in the South River basin (USGS No. 02204520, South River at Georgia Hwy 81, at Snapping Shoals, Georgia). The available evidence indicates that naturally occurring runoff from storm events and associated oxygen-demanding constituents, when combined with high water temperature, temporarily depresses DO concentrations as those constituents assimilate in the reservoir. The passing DO depressions are measurable in the

tailrace as the water moves through the system but are mitigated completely, or nearly so, by operation of the draft tube aeration system. The July 31 excursion in particular showed a temporary decline and recovery of DO values during a 3-hour window without any change in dam unit operations while all three aerating units were operating (Figure 7).

Tailrace daily average DO concentrations below 5.0 mg/L occurred on three days during the monitoring period (Figure 5). The daily average DO concentration for October 23, 2019 was 4.95 mg/L. The daily average DO concentrations for June 10 and July 27, 2020, were 4.89 and 4.86 mg/L, respectively, and were likely due to the operation of two of the three aerating units along with two non-aerating units. Preferential operation of a third aerating unit over a second non-aerating may have avoided the excursions.

Overall, the summer continuous DO monitoring in 2019-2020 showed that DO levels were maintained above the applicable criteria nearly 100 percent of the time. This demonstrates the continuing effective performance of the passive draft tube aeration system in improving and maintaining DO levels. The operational patterns surrounding the few excursions of the instantaneous and daily average DO criteria indicate the importance of prioritizing the use of aerating units over non-aerating units when adding units for peaking generation during the summer critical conditions period.

The analysis of monthly water chemistry samples collected in the tailrace area in 2019-2020, and review of other existing water quality data, was also indicative of good overall water quality conditions in the Ocmulgee River downstream of the Project (Georgia Power 2021a).

4.3.2.2 ENVIRONMENTAL IMPACTS AND RECOMMENDATIONS

Project Operations

Georgia Power proposes to continue operating the Lloyd Shoals Project in a modified run-of-river mode for generation during peak power demand hours. The Project would continue to provide a continuous minimum flow release of 400 cfs, or inflow, whichever is less, for the protection and enhancement of downstream fish and wildlife resources. During low-flow periods, when calculated project inflow falls below 250 cfs, the Project would supplement flows downstream by releasing a continuous flow of 250 cfs. The existing passive draft tube aeration system would continue to be operated during the summer critical conditions period of May 15 through September 30 to enhance DO concentrations in downstream releases.

Lake Elevations

For normal operations, Lake Jackson is maintained between elevations 530 ft PD, which is the full pool elevation, and 527 ft PD year-round, excluding planned drawdowns and drought. Georgia Power's operations proposal includes continuing to operate Lake Jackson within a 3.0-ft range to support modified run-of-river operations. Operating within this range enables Georgia Power to temporarily store inflow during hours when the region is not in its peak power demand (off-peak hours) and to release water through the powerhouse turbines to generate power when the service territory enters a peak power demand period. Maintaining this range also allows for water to be stored for short periods over a range of project inflow that varies seasonally. It also allows for consistent access to the reservoir for recreation. The average daily fluctuation of Lake Jackson would continue to be 2.0 ft or less about 99.8 percent of the time.

Since installation of the Obermeyer gate system in 2012, the operators have the ability to incrementally adjust flows released from the spillway, which enhances control over the water levels in the reservoir during and following high-inflow periods. The Obermeyer gates allow the project discharges to be more closely matched with inflows to the Project.

During extended low-flow periods there would be a sustained drawdown of Lake Jackson as Georgia Power supplements river flows downstream; however, there would typically be only minor daily elevation fluctuations because there would be diminished daily peaks in inflow during low-flow periods. During maintenance drawdowns, daily fluctuations would still occur, but at a lower elevation level. For both types of drawdowns, the lake elevation would be lowered slowly.

Once the Obermeyer gate system began operation, the prior practice of conducting annual seasonal drawdowns of Lake Jackson to prevent spilling water during high inflows ended. However, there would continue to be the need for periodic fall drawdowns of the reservoir for homeowner and shoreline maintenance. In the event of a planned, non-emergency drawdown that would reduce the lake elevation below the 3.0-ft normal operating range (elevation 527 ft PD), Georgia Power proposes to consult with GDNR and to report the schedule to FWS, FERC, and FERC's Atlanta Regional Office at least 10 days prior to the non-emergency drawdown. Under emergency operating conditions, the same agencies would be notified within 10 days after the incident.

Downstream Minimum Flow

Georgia Power's proposal to continue operating the Project to provide a continuous minimum flow release of 400 cfs, or inflow, whichever is less, would continue to protect and enhance downstream riverine habitat for fish and freshwater mussels (see Section 4.3.3.2). An instream flow study conducted for the previous Lloyd Shoals relicensing using the Instream Flow Incremental Methodology (IFIM) modeled the relationship between habitat and discharge for representative fish species and life stages in the Ocmulgee River downstream (EA 1990a). The IFIM study results show that a minimum flow of 400 cfs would optimize habitat across multiple species and life stages, providing an estimated 91 percent of the maximum weighted usable area on average. A review of available sources of information and data on river channel stability in the study area detected little change to the river and adjacent floodplains since the IFIM study was conducted and concluded that the habitat-discharge relationships from the study remain applicable today for characterizing the effects of project operations.

In addition, a continuous minimum flow release of 400 cfs would continue to support the operation of the Butts County et al. WSA water supply intake and the MWA water supply intake (in Macon) downstream of the Project.

During low-flow periods when calculated project inflow is less than 250 cfs, Georgia Power's proposal to supplement flows in the river with a 250-cfs continuous release would ensure adequate stream flows for aquatic life and other downstream uses, including the public water supply intakes. In discussions at the scoping meeting, GEPD expressed support for including this supplemental flow release in the new license. The IFIM study results show that a flow of 250 cfs would provide an estimated 87 percent of the maximum weighted usable area on average for the riverine fish community (Section 4.3.3.2). Releases of 250 cfs would be most likely to occur in summer or fall. For the period 2001-2020, daily average discharge from the Project exceeded 250 cfs 99 percent of the days.

Cyanobacteria Blooms in Lake Jackson

During NEPA scoping, the Altamaha Riverkeeper and Ms. Julia Haar expressed concern about harmful blooms of cyanobacteria in Lake Jackson and the potential for adverse effects on the aquatic food chain (FERC 2018b). Analysis of the substantial amount of water quality data available for Lake Jackson indicates that the overall water quality of the reservoir is good and

that the site-specific criteria for chlorophyll-*a* and total nitrogen are consistently being met (Georgia Power 2018, 2021a). Cyanobacteria blooms were reported for Lake Jackson in several years from 2007 to 2018 and blooms assessed by Georgia Power contained the cyanobacterium *Microcystis aeruginosa*, a toxin-producing species. However, the species' presence does not necessarily mean that cyanotoxins are being produced. The samples assessed from these blooms had cell densities below World Health Organization guidelines (Georgia Power 2021a). A predictive model for cyanobacteria blooms applied to Lake Jackson indicated a low overall risk for toxic cyanobacteria blooms, although drought conditions during summer likely increase the risk. Moreover, there is no evidence indicating any adverse effects of harmful algal blooms on the aquatic food chain or the one known Bald Eagle nesting territory at Lake Jackson (Breinlinger et al. 2021).

Continued operation of the Project in a modified run-of-river mode would not contribute directly to increased risk for harmful algal blooms, which are influenced primarily by nutrient inputs from the upstream watershed, low reservoir inflows, prolonged periods of elevated water temperature, and increased retention time, factors which are beyond the control of Georgia Power's project operations.

GEPD initiated a Harmful Algal Blooms Working Group in 2019, which grew out of increasing awareness and reports of potentially harmful algal blooms from on lakes and ponds across the nation and Georgia. As part of this initiative, GEPD is developing a means to better detect blooms, assess whether toxins are present, and better inform the public on this issue, including through education and awareness information on its website (GEPD 2021c).

Water Quality in the Tailrace Area

Georgia Power's proposal to continue operating the passive draft tube aeration system on Units 2-4 from May 15 through September 30 would continue to enhance summer DO concentrations in the tailrace area and benefit downstream water quality, fisheries, aquatic resources, and recreation opportunities by supporting applicable water quality standards. After the draft tube aeration system was installed in 2006, DO monitoring data collected by Georgia Power in 2006 and 2007, and presented in the PAD (Georgia Power 2018), showed the aeration system to be effective in increasing and stabilizing summer DO levels in the tailrace area above 4 mg/L. Georgia Power's continuous DO monitoring of the tailrace area from July 2019 to July 2020

demonstrated the continued effective performance of the draft tube aeration system. The hourly tailrace DO readings for the monitoring period exceeded 4.0 mg/L 99.84 percent of the time and the daily average values exceeded 5.0 mg/L 99.2 percent of the days (Georgia Power 2021a).

Georgia Power's analysis of the operational patterns surrounding two excursions of the instantaneous criterion and three excursions of the daily average DO criterion determined that the excursions likely would have been avoided or minimized had the use of aerating units been prioritized over the use of non-aerating units when adding units for peak generation. Therefore, Georgia Power proposes to prepare and implement an operational procedure for the passive draft tube aeration system that incorporates the following operating rule for the plant operators:

- During the critical summer period (May 15 through September 30), single-unit generation will use an aerating unit. When two to four units are operating, at least half will be aerating units. When five units are operating, all available aerating units will be used before adding non-aerating units.

Georgia Power does not propose to continuously monitor future operation of the draft tube aeration system because its effective performance has been verified to achieve the applicable DO criteria nearly 100 percent of the time, and implementation of the proposed operational procedure would further reduce the likelihood and magnitude of infrequent excursions.

Cumulative Effects

Georgia Power operates the Lloyd Shoals Project as a modified run-of-river facility. Reservoir elevations are maintained within a 3.0-ft range throughout the year and daily reservoir fluctuations are 2.0 ft or less 99.8 percent of the time. By consistently operating Lake Jackson within a relatively narrow and highly predictable range of reservoir elevations, Lloyd Shoals operation also benefits the reservoir's sport fishery and designated Recreational use. Georgia Power's proposal to continue operating the Project with a continuous minimum flow release of 400 cfs, or inflow, whichever is less, would continue to protect and enhance downstream riverine habitat for fish and freshwater mussels, including three state protected aquatic species, and support the operation of public water supply intakes downstream of the project to Macon. In addition, Georgia Power's continued operation of the passive draft tube aeration system would continue to enhance summer DO concentrations in the tailrace area and benefit downstream water quality, fisheries, aquatic resources, and recreation opportunities.

For these reasons, continued operation of the Lloyd Shoals Project would have a highly beneficial cumulative effect on the Ocmulgee River in providing a popular sport fishery and recreation destination, as well as protecting the river's designated uses within the project reservoir and downstream of the Project in the free-flowing Ocmulgee River.

Unavoidable Adverse Impacts

Construction of the proposed recreation enhancements (Section 4.3.6.2) would comply with applicable sediment and erosion control BMPs such that temporary water quality disturbance, if any, would be localized and minimal.

4.3.3 FISH AND AQUATIC RESOURCES

4.3.3.1 AFFECTED ENVIRONMENT

The Lloyd Shoals Project is located in the upper Ocmulgee River basin within the larger Altamaha River basin. The Altamaha River basin drains south and east to the Atlantic Ocean. Lake Jackson and its tributaries are located entirely within the Piedmont physiographic province. The upper Ocmulgee River basin principally supports warm-water fishes. The impounded waters of Lake Jackson dominate aquatic habitats within the project boundary and support reservoir fisheries. Lloyd Shoals Dam discharges into the Ocmulgee River, which supports a riverine fishery downstream of the Project. The project boundary extends downstream of the dam approximately 0.4 mile to encompass Ocmulgee River Park on the east side of the river.

Juliette Dam, located about 19 river miles downstream of the Project, is the first dam encountered by diadromous and highly migratory fish migrating upstream from the Altamaha and lower Ocmulgee Rivers. Juliette Dam poses an impassable barrier to the upstream passage of all fish species except American Eel.

The upper Ocmulgee River basin upstream of Juliette Dam, which includes Lake Jackson, supports a diverse fish fauna consisting of about 60 species in 12 families (Table 4) (Straight et al. 2009). Lake Jackson supports over 30 species of fish. The principal sport fishes inhabiting the reservoir include Largemouth Bass, Spotted Bass, Bluegill, Black Crappie, Striped Bass, White Bass-Striped Bass hybrids (hybrid bass), Channel Catfish, Blue Catfish, and other sunfishes and catfishes (GDNR 2021a; Georgia Power 2020d). The South, Yellow, and Alcovy Rivers and Tussahaw Creek upstream of the Project support a total of about 47 species of fish. At least 60

species of fish are known to inhabit the Ocmulgee River and its tributaries downstream of the Project to Juliette Dam. Additional species occur downstream of Juliette Dam in the Ocmulgee River, including species associated with lower-gradient stream habitats of the Coastal Plain province.

No federally listed threatened or endangered fish species are known to occur within the Lloyd Shoals project boundary, in tributaries to Lake Jackson upstream of the Project, or in the Ocmulgee River downstream of the Project to Juliette Dam. Altamaha Shiner (*Cyprinella xaenura*), a Georgia threatened species, inhabits tributary systems upstream of Lake Jackson and is common in the Ocmulgee River downstream of the Project. The species is endemic to the Piedmont of the upper Altamaha River basin. Robust Redhorse (*Moxostoma robustum*), a Georgia endangered species, occurs in the mainstem Ocmulgee River downstream of the Project, having been stocked in 2002 and 2005 to establish a refugial population (see below).

About 12 fish species believed to be introduced (non-native) to the Ocmulgee River basin have been reported in the project vicinity (Table 4). Nine of these species occur in Lake Jackson and include Blue Catfish and Flathead Catfish, which have become part of the recreational fishery.

Lake Jackson

Lake Jackson covers 4,750 acres and has 135 miles of shoreline (Figure 2). Bottom substrates vary from soft and silty to rocky, and include sand, sand with a top layer of silt, silt, silty mud with sticks and logs, and bedrock/boulders on sand and gravel (GDNR 2019).

Based on a shoreline survey of Lake Jackson conducted in August 2019 (Georgia Power 2020d), the most frequently observed sources of littoral zone fish cover, in descending order, were overhanging vegetation, docks/piers/boatslips, large woody debris, riprap, and bedrock/boulders. On the basis of proportional length, overhanging vegetation was the predominant source of shoreline fish cover, followed by riprap, large woody debris, and docks/piers/boatslips. Riprap was the predominant fish cover type by length in the Mainstem Reservoir, Tussahaw Creek, and Alcovy River sections of Lake Jackson, where residential lots are widespread and riprap is commonly used to stabilize shorelines. Overhanging vegetation was the predominant fish cover by length in the South River section, followed by large woody debris and emergent vegetation.

Lake Jackson supports a popular fishery for Largemouth Bass, Spotted Bass, Striped Bass and hybrid bass, Channel Catfish, Blue Catfish, Black Crappie, and other sunfishes (GDNR 2021a; Georgia Power 2020d). Tournament fishing is popular and primarily targets black bass, both Largemouth Bass and Spotted Bass. For the years 1996 to 2015, the average tournament bass weight ranged from 1.35 to 1.77 lbs (Georgia Bass Chapter Federation 1996-2015). The average largest bass reported in Lake Jackson tournaments ranged from 3.12 to 4.38 lbs.

GDNR annually stocks Striped Bass and hybrid bass into Lake Jackson to provide an additional sportfish option. Current stocking rates are about 9 hybrid bass fingerlings and 5 Striped Bass fingerlings per acre. The annual stockings have produced the potential for a quality fishery. Striped Bass caught in Lake Jackson average about 4 to 5 lbs. Largemouth Bass have also been stocked in the past few years at rates of 8 to 83 fingerlings per acre.

GDNR conducts annual standardized fisheries surveys of Lake Jackson to assess the sport fishery and make management decisions. Georgia Power's analysis of the GDNR fishery database for the years 2000-2019, for the primary sport fish species targeted by the surveys, indicates an overall healthy and balanced sport-fish community typical of southeastern Piedmont reservoirs (Georgia Power 2020d).

Downstream Ocmulgee River

The Ocmulgee River downstream of Lloyd Shoals Dam flows freely for about 19 miles to the pool created by Juliette Dam. Sport fishes in this reach include Largemouth Bass, Shoal Bass, Spotted Bass, Striped Bass, hybrid bass, Channel Catfish, Redbreast Sunfish, Bluegill, and Redear Sunfish (GDNR 2021a). Shoal Bass introduced into the upper Ocmulgee River from the Apalachicola River basin have spread throughout the Piedmont portion of the river. Striped Bass and hybrid bass stocked into Lake Jackson occasionally pass through the Lloyd Shoals turbines and add to the downstream fishery (GDNR 2021a). Introduced Flathead Catfish are also present in the river and pose a risk of direct predation and potentially negative population effects on some native fishes (Bart et al. 1994).

Fisheries investigations for the previous Lloyd Shoals relicensing in 1988 included quarterly backpack and boat electrofishing of the Ocmulgee River at four stations within a 27-mile reach (EA 1990b). Three stations were between Lloyd Shoals Dam and Juliette Dam, and one was downstream of Juliette Dam. The surveys documented the occurrence of 45 species. The top ten

numerically abundant species across all stations, in descending order of abundance, were Redbreast Sunfish, Threadfin Shad, Ocmulgee Shiner, Altamaha Shiner, Bluegill, Spottail Shiner, Snail Bullhead, American Eel, Largemouth Bass, and Blackbanded Darter. These species comprised 86 percent of the total catch. Sport fish made up 43 percent of the total catch by number and 33 percent by weight.

Robust Redhorse, a state endangered, migratory riverine sucker species, also inhabits the Ocmulgee River downstream of Lloyd Shoals Dam. Through the Ocmulgee Candidate Conservation Agreement with Assurances for Robust Redhorse (Ocmulgee CCAA for Robust Redhorse), Georgia Power has participated in a multi-stakeholder partnership to advance conservation of the species in the Ocmulgee River downstream of the Project since 2002 (Georgia Power 2016). Studies funded by Georgia Power have documented the movements and habitat use of hatchery-reared Robust Redhorse stocked downstream of Lloyd Shoals Dam to establish a refugial population. Jennings and Shepard (2003) released and monitored fish via radio telemetry and found that tagged fish moved gradually downstream. Sixty-six percent of the fish remained in the reach upstream of Juliette Dam, while 34 percent moved downstream beyond the dam. Grabowski and Jennings (2009) released radio-tagged fish into the river below Lloyd Shoals Dam in 2006 and monitored their movements over the course of a year. The radio-tagged fish exhibited an initial exploratory pattern of movement, mostly in the downstream direction, and consistently remained in the main channel associated with current, deep water, and woody debris. Two-thirds remained in the reach upstream of Juliette Dam; however, relatively few of the fish seemed to locate suitable spawning habitat and participate in spawning activities.

Surveys conducted in 2010-2011 showed that stocked Robust Redhorse had survived and were participating in spawning activities in the Lloyd Shoals tailrace, but evidence of successful recruitment was not confirmed (Georgia Power 2016). In 2014, GDNR survey efforts in downstream reaches in the Coastal Plain resulted in the capture of a juvenile Robust Redhorse, indicating successful natural recruitment in the river. GDNR collected, tagged, and released four adults from a shoal below Juliette Dam in May 2018 (GDNR 2018a).

Georgia Power is currently working with its partners, FWS Region 4 and GDNR's Wildlife Conservation Section, to renew the Ocmulgee CCAA for Robust Redhorse beyond its current term, which expires at the end of the current FERC license term in December 2023.

Freshwater Mollusks

Mussels

GDNR conducted freshwater mussel surveys in Lake Jackson and the Ocmulgee River downstream to Juliette Dam in fall 2019 and summer 2020 under the Altamaha Mollusk Candidate Conservation Agreement (Altamaha Mollusk CCA)⁸ (GDNR 2019, Rowe 2021). The surveys reported the occurrence of seven native freshwater mussel species and found a relict (dead) shell of an eighth species (Table 5). None of the species are federally listed as threatened or endangered but two of the species detected in Lake Jackson are state threatened in Georgia.

The eight species include, in descending order of overall relative abundance:

- Altamaha Slabshell (*Elliptio hopetonensis*) – widespread and locally abundant in the Altamaha River basin, found in sand/mud and sand substrates (NatureServe 2021).
- Inflated Floater (*Pyganodon gibbosa*) – endemic to the Altamaha River basin, inhabits large rivers, oxbows, and reservoirs in sandy, silty, or muddy substrate (Rowe 2021).
- Paper Pondshell (*Utterbackia imbecillus*) – widely distributed from the Great Lakes and Mississippi River to Gulf Coast and Atlantic Coast; inhabits slow water of creeks, rivers, and reservoirs, usually in mud or sand (Williams et al. 2008).
- Eastern Floater (*Pyganodon cataracta*) – wide ranging in Atlantic Coast drainages from the St. Lawrence River to the Altamaha River; occurs in a wide variety of habitats, usually in sand or mud with little or no current (Williams et al. 2008).
- Variable Spike (*Elliptio icterina*) – ranges along Atlantic Coast from North Carolina to northeast Florida; occurs in lakes, ponds, reservoirs, and streams with slight to moderate current (NatureServe 2021).
- Savannah Lilliput (*Toxolasma pullus*) – Georgia threatened; occurs in Atlantic Coast drainages from Georgia to North Carolina; inhabits very shallow water at the edges of streams, rivers, and lakes in mud or silty sand (Wisniewski 2018a, NatureServe 2021).
- Rayed Pink Fatmucket (*Lampsilis splendida*) – ranges in Atlantic Coast rivers from the Altamaha River north to the Cape Fear River in North Carolina; considered stable in the Altamaha River basin but uncommon in the Ocmulgee River (NatureServe 2021).
- Altamaha Arcmussel (*Alasmidonta arcuala*) – Georgia threatened; range includes the Altamaha, Savannah, and Ogeechee River basins in Georgia; inhabits sloughs, oxbows, or depositional areas of large creeks, rivers, and reservoirs in silt, mud, or sand; primarily known from riverine habitats in the Coastal Plain physiographic province but recently collected in reservoir habitats of Lake Jackson and in the Ocmulgee River and Alcovy River in the Piedmont province (Wisniewski 2018b; Georgia Power 2017b, 2018).

⁸ The Altamaha Mollusk CCA is a collaborative and cooperative agreement between Georgia Power, GDNR WRD, and FWS to implement conservation measures for mollusk species in the Altamaha River basin, which includes the Ocmulgee River basin.

The Lake Jackson surveys yielded live specimens of five native mussel species and one relict shell of Altamaha Arcmussel (Table 5). Altamaha Slabshell, Inflated Floater, and Paper Pondshell comprised 99 percent of all live mussels found. The single live specimen of Savannah Lilliput, a Georgia threatened species, was the first record of the species from Lake Jackson and the upper Ocmulgee River basin (GDNR 2019). Nearly all previous collection records have been from the Coastal Plain (GDNR 2021b). The relict shell of Altamaha Arcmussel was noteworthy in that the species, which was first reported from Lake Jackson in 2012, was not found in previous collection areas, indicating limited suitability of habitat in the reservoir (GDNR 2019, Rowe 2021). The species is primarily known from sandy riverine habitats in the Coastal Plain, farther downstream in the Altamaha River basin (Wisniewski 2018a).

Surveys in the Lloyd Shoals tailrace area yielded live specimens of six native mussel species (Table 5). The four most abundant species comprised 99 percent of all live mussels found; all four also occurred in Lake Jackson. The single specimen of Rayed Pink Fatmucket, relatively uncommon in the Ocmulgee River, was found in the shoal complex downstream of Georgia Hwy 16. Surveys conducted farther downstream of Hwy 16 to Juliette Dam yielded four native species, the same ones that were most abundant in the Lloyd Shoals tailrace area.

Reverse Pebblesnail

The Alcovy River upstream of the Project supports the Reverse Pebblesnail (*Somatogyra alcoviensis*), a rare aquatic snail not currently federally or state protected but under review for federal listing (see Section 4.3.5). The species is restricted to boulders, gravel, and vegetation in rapidly flowing water and is absent from silt substrates (NatureServe 2021). No suitable habitat for the species occurs within the project boundary. Under the Altamaha Mollusk CCA, GDNR's plan to survey for the snail in the Alcovy River upstream of the Project in 2020 was postponed by high water levels during the months considered best for species identification (Rowe 2021). A survey date has yet to be determined.

Migratory Fishes

The Lloyd Shoals Project is about 387 river miles upstream of the Atlantic Ocean and 43 river miles upstream of the Fall Line Hills District. Juliette Dam, located 19 river miles downstream,

and situated above the Fall Line, blocks diadromous⁹ and other migratory riverine fishes, with the exception of American Eel, from migrating upstream into the project area.

Eight highly migratory and/or diadromous species seasonally inhabit portions of the Altamaha River basin, including six anadromous¹⁰ species, one catadromous species¹¹, and one migratory riverine species:

- Shortnose Sturgeon (*Acipenser brevirostrum*) – anadromous; federally endangered;
- Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) – anadromous; federally endangered;
- American Shad (*Alosa sapidissima*) – anadromous;
- Blueback Herring (*Alosa aestivalis*) – anadromous;
- Hickory Shad (*Alosa mediocris*) – anadromous;
- Striped Bass (*Morone saxatilis*) – anadromous or highly migratory;
- American Eel – catadromous; and
- Robust Redhorse – highly migratory riverine.

Striped Bass, Robust Redhorse, and American Eel are the only species presently known to occur within or just downstream of the project boundary. Striped Bass occur in Lake Jackson and in the Ocmulgee River downstream to Juliette Dam as a result of GDNR’s stocking efforts in Lake Jackson. Some stocked fish occasionally pass through the turbines into the downstream river. There is no evidence that Striped Bass successfully reproduce in the project area. Juliette Dam blocks the upstream migration of spawning runs from estuarine/ marine environments.

Robust Redhorse inhabits the Ocmulgee River downstream of the Project as a result of its reintroduction in 2002-2005 under the Ocmulgee CCAA for Robust Redhorse. Surveys in 2010-2011 showed that stocked redhorse had survived and were participating in spawning activities in the Lloyd Shoals tailrace area, but evidence of successful recruitment had not been confirmed in the reach of river upstream of Juliette Dam (Georgia Power 2016). The population extends downstream of Juliette Dam into the lower Ocmulgee River.

⁹ Diadromous species migrate between freshwater and marine/estuarine environments to complete their life cycles.

¹⁰ Anadromous species migrate from marine/estuarine to freshwater environments to spawn.

¹¹ Catadromous species migrate from freshwater to marine environments to spawn.

American Eels presently range upstream in the Ocmulgee River to Lloyd Shoals Dam, and there is also a relatively recent record of the species in Big Cotton Indian Creek, a tributary of the South River upstream of the Project¹² (GDNR 2021b). Young, upstream-migrant eels successfully navigate Juliette Dam. Eels were collected at all three stations between Lloyd Shoals Dam and Juliette Dam during the previous fisheries survey (EA 1990b). Georgia Power (2021b) conducted a study of American Eel Abundance and Upstream Movements in 2019-2021 and documented the continued presence of a healthy, stable population of American Eel in the tailrace area below Lloyd Shoals Dam (see below).

GDNR began experimental stocking of American Shad in Lake Jackson in 2016 as part of basin-wide efforts to help conserve the Altamaha River stock (Atlantic States Marine Fisheries Commission [ASMFC] 2013). Historical evidence suggests the species formerly occurred upstream of the present-day Project (GDNR 2014). Successful natural reproduction of American Shad stocked into Lake Jackson may not be expected to occur upstream of the reservoir. Downstream in the Ocmulgee River, American Shad migrate upstream as far as Juliette Dam and likely spawn in the river downstream of that dam.

The federally endangered Shortnose Sturgeon and Atlantic Sturgeon may seasonally inhabit the lower Ocmulgee River during spawning runs. NMFS designated critical habitat for Atlantic Sturgeon to include the Ocmulgee River upstream to Juliette Dam (National Oceanic and Atmospheric Administration 2017). However, neither sturgeon has been documented in recent years as far upstream as Juliette Dam (GDNR 2021b). A telemetry study of Atlantic Sturgeon movements in the Ocmulgee River documented the maximum extent of upriver migrations to a point about 98 river miles downstream of Juliette Dam (Ingram and Peterson 2016). Shortnose Sturgeon have been reported as occurring no farther upstream than the lower Ocmulgee River in the Coastal Plain, downstream of Macon (Straight et al. 2009).

Blueback Herring has been documented as occurring as far upstream in the Ocmulgee River as Juliette Dam, while Hickory Shad has been documented as migrating upstream no farther than the lower Ocmulgee River in the Coastal Plain (Straight et al. 2009).

¹² It is unlikely that young eels ascend 100-ft-tall Lloyd Shoals Dam, although it is possible some could have followed flashboard leakage up the face of the dam before the Obermeyer gates were installed. Another more plausible explanation may be bait-bucket introduction upstream of the dam, as eels are often purchased or captured by recreational anglers as bait for larger sport fish such as Striped Bass (ASMFC 2017).

State Protected Aquatic Species

Georgia Power (2020d, 2020e) identified and evaluated federally and state protected species, and other species of conservation concern, with known records of occurrence in the project vicinity. No federally protected aquatic species are presently known to occur within the project boundary. Two aquatic species are under review for federal listing (Robust Redhorse [Georgia endangered] and Reverse Pebblesnail), as evaluated in Section 4.3.5 (Threatened and Endangered Species).

Five other Georgia protected aquatic species potentially occur in the project vicinity (Table 6). State protected species in Georgia are listed as endangered, threatened, rare, or unusual, in descending order of rarity. The six species are:

- Altamaha Arcmussel – Georgia threatened;
- Savannah Lilliput – Georgia threatened;
- Chattahoochee Crayfish (*Cambarus howardi*) – Georgia threatened;
- Altamaha Shiner – Georgia threatened; and
- Goldstripe Darter (*Etheostoma parvipinne*) – Georgia rare.

Four of the species – Altamaha Arcmussel, Savannah Lilliput, Altamaha Shiner, and Robust Redhorse – are presently known to occur within the project boundary or in the Ocmulgee River downstream of the Project (Georgia Power 2020d, 2020e).

Altamaha Arcmussel is known to occur in the Ocmulgee River downstream of Lloyd Shoals Dam, in Lake Jackson, and in the Alcovy River upstream of the Project (Wisniewski 2018a; Georgia Power 2017b, 2018). The 2019-2020 mussel surveys in Lake Jackson and the Lloyd Shoals tailrace area did not detect any live individuals of the species.

The reported occurrence of Savannah Lilliput in Lake Jackson in fall 2019 was the first record of the species from Lake Jackson and the upper Ocmulgee River basin in the Piedmont (GDNR 2019). The species' presence in Lake Jackson extends its known range about 235 miles upstream within the Altamaha River basin.

Altamaha Shiner occurs in tributary stream systems upstream of Lake Jackson and in the mainstem Ocmulgee River downstream of the Project (GDNR 2021b). Electrofishing surveys found the shiner to be among the most abundant species in the downstream riverine community,

including the Lloyd Shoals tailrace area (EA 1990b). The species does not tolerate impounded conditions and is not known to reside in Lake Jackson.

Chattahoochee Crayfish and Goldstripe Darter are unlikely to occur within the project boundary (Georgia Power 2020e). Chattahoochee Crayfish is primarily known from the Chattahoochee River basin, where it inhabits clear, swift-flowing riffles in streams ranging in size from small creeks to the mainstem Chattahoochee River. There are no known records of the species in Lake Jackson or the Ocmulgee River downstream of the Project. Goldstripe Darter occupies spring-fed headwater creeks in the Coastal Plain and is not expected to occur within the project boundary.

4.3.3.2 ENVIRONMENTAL IMPACTS AND RECOMMENDATIONS

Project Operations

Georgia Power proposes to continue operating the Lloyd Shoals Project in a modified run-of-river mode for generation during peak power demand hours. The Project would continue to release a continuous minimum flow of 400 cfs, or inflow, whichever is less, for the protection and enhancement of fish and wildlife resources in the downstream Ocmulgee River. During low-flow periods when inflow falls below 250 cfs, the Project would release a continuous flow of 250 cfs to ensure adequate stream flows for aquatic life and other uses.

Lake Jackson

Georgia Power's proposed operation would not adversely affect fish and aquatic resources in Lake Jackson because reservoir elevations would continue to be maintained between 530 and 527 ft PD year-round, excluding planned drawdowns and drought. Since installation of the Obermeyer gate system in 2012, the operators have the ability to incrementally adjust flows released from the spillway, which enhances control over the water levels in the reservoir during and following high-inflows periods by allowing plant discharges to closely match inflows to the Project. Annual GDNR fishery survey data for Lake Jackson indicate an overall healthy and balanced fish community typical of southeastern Piedmont reservoirs, with no evidence of any changes in sport-fish population abundance or growth characteristics that may be related to operation of the Obermeyer gate system. In addition, recent and historic water quality monitoring data show that water temperature and DO concentrations within the upper layer of water (epilimnion) during conditions of summer vertical stratification in deeper areas of the reservoir remain within acceptable ranges for most of the resident sport fish species, as analyzed below.

During low-flow periods there would be a sustained drawdown of Lake Jackson as Georgia Power supplements river flows downstream; however, there would typically be only minor daily elevation fluctuations because there would be diminished daily peaks in inflow during low-flow periods. During maintenance drawdowns, daily fluctuations would still occur, but at a lower elevation level. For both types of drawdowns, the lake elevation would be lowered slowly, which would avoid or minimize stranding of fish in shallow coves. The lowered elevations would occur during the drier months of drought years, usually from mid-summer to fall, after the spring and early summer spawning seasons of many resident sport fishes. The low-flow drawdowns would reduce the area of available littoral-zone habitat for the rearing of young fish. Continued low-flow operations in this manner would not be expected to result in significant adverse effects to fisheries resources in Lake Jackson.

Downstream Riverine Habitat

Operating the Project to provide a continuous minimum flow release of 400 cfs, or inflow, whichever is less, would continue to protect and enhance downstream riverine habitat for fish and freshwater mussels. An instream flow study conducted for the previous Lloyd Shoals relicensing applied an IFIM approach in modeling the relationship between stream flow and area of suitable habitat for fish species and life stages representing a range of riverine habitat use (EA 1990a; Georgia Power 2020d). The study was conducted in consultation with GDNR and FWS. The study area extended from Lloyd Shoals Dam downstream about 17 river miles to the Georgia Hwy 83 bridge. Habitat suitability criteria were developed from site-specific studies of fish habitat use in the upper Ocmulgee River and the Chattooga River (Savannah River basin) for six species and multiple life stages of interest:

- Altamaha Shiner (juveniles and adults);
- Redeye Bass (young-of-year [YOY], juveniles, and adults);
- Shoal Bass (YOY and adults);
- Redbreast Sunfish (spawning and adults);
- Striped Jumprock (juveniles and adults); and
- Silver Redhorse¹³ (adults).

Physical Habitat Simulation (PHABSIM) modeling integrated the results of hydraulic simulations over a range of flows and the habitat suitability criteria to produce discharge versus

¹³ Previously considered a form of Silver Redhorse, this species in the Altamaha River basin now considered to be Notchlip Redhorse (Straight et al. 2009).

weighted usable area relationships for each species and life stage. Figure 8 shows discharge versus average percentage of maximum weighted usable area for all species and life stages combined. A matrix analysis was used to identify a minimum flow that would optimize habitat across multiple species and life stages (Table 7). The IFIM study results showed that a minimum flow of 400 cfs provides an estimated 91 percent of the maximum weighted usable area on average for the spawning and non-spawning seasons combined (EA 1990a).

Available information indicates that the river channel in the IFIM study area 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 exhibited long-term channel stability. In addition, review of habitat mapping for the IFIM study revealed the study reach to be dominated by bedrock and gravel substrates and inspection of aerial imagery spanning 1988-2019 detected little change to the river and adjacent floodplains since the IFIM study was conducted (Georgia Power 2020d). Hence, the habitat-discharge relationships from the IFIM study remain applicable for characterizing the effects of project operations.

Georgia Power's proposal to continue to release a continuous flow of 250 cfs when calculated inflow falls below 250 cfs would provide protection of downstream riverine habitat, and at a level greater than inflow during these periods. The matrix of IFIM study results shows that a flow of 250 cfs provides 87 percent of the maximum weighted usable area on average, while lower flows produce lower average habitat values (Table 7). Releases of 250 cfs would occur during low-flow periods, which would be most likely to occur in summer or fall, after the peak spawning and rearing seasons of most fishes in the Ocmulgee River. For the period 2001-2020, daily average discharge from the Project to the river downstream exceeded 250 cfs on 99 percent of the days.

Draft Tube Aeration System to Enhance Summer DO

Georgia Power's proposed continued operation of the existing passive draft tube aeration system on Units 2, 3, and 4 would continue to enhance summer DO concentrations in the tailrace area and benefit downstream water quality, fisheries, aquatic resources, and recreation opportunities by supporting applicable water quality standards. Habitat in the tailrace area would be enhanced for the fish community, including sport fishes, freshwater mussels, and other aquatic species by

reducing the potential for chronic stress from low DO during the summer critical period, which otherwise could result in avoidance of the tailrace area and/or reduced feeding, growth, and survival. Water temperatures of the project releases would not be affected.

Summer Habitat for Sport Fishes in Lake Jackson

Continued operation of the project in a modified run-or-river mode would not adversely affect summer habitat for sport fishes in Lake Jackson. Georgia Power (2020d) assessed the availability of suitable summer habitat for sport fish species, including Largemouth Bass and Striped Bass, using reservoir water quality data previously collected by Georgia Power, GDNR standardized fisheries survey data for 2007-2019, and water temperature and DO preference criteria reported in the scientific literature. Based on analysis of vertical profile data for the warmest months of the year, most sport-fish species residing in Lake Jackson are capable of tolerating seasonally high water temperatures and occasionally lower DO levels in summer. Analysis of standardized fishery survey data for seven sport fish species and hybrid bass in Lake Jackson, including catch rates, relative condition, length-frequency distribution, and other statistics, indicate the presence of an overall healthy reservoir fishery (Georgia Power 2020d). Recent and historic seasonal vertical profile data show that summer water temperature and DO conditions remain within acceptable ranges for most of the resident sport fish species, with the exception of Striped Bass.

Habitat in Lake Jackson is generally suitable for Striped Bass with regard to water temperature and DO concentration through the fall, winter, and spring. However, during summer, naturally high water temperature in the surface waters and low DO concentrations in deeper waters where temperatures are cooler limit the availability of suitable habitat. Summer water temperatures exceeding 28°C (82°F) begin to exceed the thermal tolerance limit of adult Striped Bass.

Although juvenile Striped Bass have a higher thermal tolerance, up to 32°C (90°F), adult Striped Bass prefer temperatures around 25°C (77°F) or less and begin to experience mortality above 28 or 29°C (82-84°F) (Crance 1984; Coutant 1985, 2013). During summer vertical stratification, deeper portions of the water column (greater than 5-m depth) exhibit naturally lower DO concentrations below 4 mg/L. Summer temperature and DO profiles for Lake Jackson sufficiently explain the limiting nature of habitat suitability for Striped Bass, as reflected in low catch rates and low relative condition of the population (Georgia Power 2020d). Hybrid bass on the other hand, which are stocked in Lake Jackson in larger numbers than Striped Bass, exhibit a

wider tolerance range to temperature. Hybrid bass can tolerate temperatures up to 33C (91°F), although optimal growth is between 25 and 27°C (77-81°F) (Hodson 1989).

State Protected Aquatic Species

Georgia Power's proposed operation would not adversely affect any state protected aquatic species known to occur within the project boundary or downstream Ocmulgee River. Habitat availability for the mussels Savannah Lilliput and Altamaha Arcmussel in Lake Jackson would not be affected because reservoir levels would continue to be maintained between 530 and 527 ft PD year-round and daily fluctuations would continue to be 2.0 ft or less 99.8 percent of the time. Riverine habitats occupied by Altamaha Shiner, Robust Redhorse, and Altamaha Arcmussel downstream of the Project would not be adversely affected because the Project would continue to release a minimum flow of 400 cfs, or inflow, whichever is less, during normal operations. The IFIM study results indicate that a flow of 400 cfs optimizes habitat area for a range of riverine fish species and life stages, which included Altamaha Shiner and a representative sucker species (Figure 8; Table 7). Riverine habitats would also be substantially protected by the proposed continuous release of 250 cfs when inflow falls below 250 cfs.

Fish Passage

Georgia Power's continued operation of the Project as proposed would have little or no additional effect on upstream passage of highly migratory or diadromous fish species. The Project is located 387 river miles upstream of the Atlantic Ocean and 43 miles upstream of the Fall Line. Juliette Dam impedes the upstream migration of highly migratory and diadromous fish species into the project area from the lower Ocmulgee River with the exception of the catadromous American Eel (see below).

Migratory Riverine Species and Anadromous Species

Striped Bass and American Shad stocked into Lake Jackson would continue to occasionally pass downstream through the Lloyd Shoals powerhouse into the Ocmulgee River, and most of these fish would be expected to survive turbine passage (see below). However, there is no evidence that either species can successfully reproduce upstream of the Project or that spawning and rearing habitats are available under present-day conditions. The refugial population of Robust Redhorse in the Ocmulgee River downstream of the Project has persisted since its re-introduction in 2002-2005 but evidence of successful natural recruitment has been lacking

upstream of Juliette Dam. In addition, there is no evidence that suitable main-channel habitat for the species would be available upstream of the Project. Thus, upstream passage at Lloyd Shoals Dam currently is not a factor in the ability of Striped Bass, American Shad, or Robust Redhorse to complete their life cycles in the Altamaha River basin.

Coastal runs of Shortnose Sturgeon, Atlantic Sturgeon, American Shad, Blueback Herring, Hickory Shad, and Striped Bass are all currently limited in the upstream extent of their natural migrations by Juliette Dam. However, even if they could pass upstream of Juliette Dam, there is no evidence that suitable spawning habitat exists for these species upstream of the Project in the more highly developed watersheds of the upper Ocmulgee River basin.

American Eel Abundance and Upstream Movements

Georgia Power (2021b) conducted a two-year study of American Eel Abundance and Upstream Movements in 2019-2021 following the approved Study Plan, as amended, and in consultation with NMFS and FWS. The objectives of the study were to identify the life stage and size range of American Eel migrating to Lloyd Shoals Dam; identify the seasonal timing of upstream movements of eels to Lloyd Shoals Dam and evaluate any correlation with the environmental variables, water temperature, and percent of moon illumination; and calculate indices of abundance of eels migrating to the Project. The study area was the Ocmulgee River from Lloyd Shoals Dam downstream about 1.4 river miles to the shoal complex just downstream of the Georgia Hwy 16 bridge (Figure 2).

Eel sampling was conducted monthly from September 2019 through June 2021, with a few exceptions due to high river flow, COVID-19 restrictions, and vandalism of traps (Georgia Power 2021b). Sampling methods included daytime backpack electrofishing, daytime and nighttime boat electrofishing, overnight trapping using baited traps and a ramp trap, and nighttime flashlight surveys to detect eels migrating to the base of the dam. All captured eels greater than 250 millimeters (mm) total length were implanted with passive integrated responder tags and released to the study area as part of a mark-recapture procedure to estimate the population size of American Eel in the study area.

A total of 259 American Eels were captured or observed by all methods during the study and 109 individuals were tagged (Table 8). Of the 148 American Eels captured during the study, 84 percent were caught via backpack electrofishing, 15 percent via boat electrofishing, and

1 percent via trapping. There were no correlations between eel catch and water temperature, discharge, or moon illumination, although this was likely affected by reduced electrofishing accessibility at higher river flows. The captured eels ranged in length from 127 to 635 mm and included juveniles and adults ranging in age up to 9+ years (Table 9). Based on five recaptures, the Schnabel index yielded a population estimate of 1,398 American Eels in the study area, with upper and lower 95-percent confidence limits of 3,548 and 625, respectively.

The electrofishing catch data indicated that eels were most abundant or active below Lloyd Shoals Dam from April to July (Table 8 and Table 9). Seasonal trends in abundance were similar to the previous relicensing study in 1988 using similar methods (EA 1990b). In both studies, the majority of eels were captured by backpack electrofishing, with catch rates highest in May or June. Backpack electrofishing catch rates, although slightly higher in the previous study, were hampered in spring 2020 by high flows and increased markedly in the second year after the study area was extended downstream to the shoals below Hwy 16. Habitats were more accessible to backpack methods in the shoals, and this was the same area where backpack electrofishing was conducted in the previous study. Boat electrofishing catch rates were slightly higher in the current study.

A total of 38 eels were detected in flashlight surveys in pools at the base of the spillway in the months December and March-July; most were observed in April-June. They were young eels ranging in length from about 130 to 250 mm, and the vast majority were encountered in the eastern-most pools along the base of the spillway.

The results of the American Eel Abundance and Upstream Movements Study demonstrate the continuing presence of a stable and healthy population of American Eel downstream of Lloyd Shoals Dam over decades, as indicated by the similarity in seasonal catch rates and size ranges representing multiple age classes between the 1988 and 2019-2021 studies (Georgia Power 2021b; EA 1990b). American Eel occupies a large range in the Altamaha River basin, with upstream migrant eels having access to 137 miles of the Altamaha River, 250 miles of the Ocmulgee River, and 143 miles of the Oconee River, for a total of 530 miles of mainstem-river migratory pathways. Numerous tributaries to these rivers are inhabited by American Eel based on collections documented within the past two decades by GDNR (2021b), indicating the ongoing success of the population in utilizing a large area of available habitat.

The Altamaha River currently has more watershed area potentially available to American Eels than any other Atlantic Coast river in Georgia and the Carolinas. The watershed area potentially available to American Eels in the Altamaha River basin before the first mainstem barriers to upstream migration (Lloyd Shoals Dam and Sinclair Dam) totals about 10,113 sq mi. This watershed area is over twice the watershed area potentially available to American Eels in any other Georgia coastal river (Figure 9). In addition, this watershed area before the first barrier in the Altamaha River is greater than that in the eight largest coastal rivers in South Carolina and North Carolina, over twice the watershed area in six of these basins.

The vast majority of available potential habitat for American Eels in the Altamaha River basin is located downstream of Lloyd Shoals Dam. The watershed area upstream of Lloyd Shoals Dam represents only 10 percent of the total watershed area of the Altamaha River basin, and many miles of these streams are impaired by fecal coliform bacteria, sediment, and legacy PCBs attributed to urban runoff and nonpoint sources in southeastern metropolitan Atlanta. Within the Metro Water District upstream of the Project, 406 stream miles or 80 percent of the 506 stream miles assessed in the upper Ocmulgee River basin are not supporting their designated uses for one or more parameters (CH2M and Black & Veatch 2017) (see Section 4.3.1).

In summary, the Ocmulgee River downstream of Lloyd Shoals Dam supports a stable and healthy population of American Eel, the currently available watershed area in the Altamaha River basin for the species is substantially larger than most other southeastern coastal rivers, and many miles of streams upstream of the Project are impaired by urban stressors and may not be habitable by American Eels. In addition, there is no indication from available studies or data that the area of habitat available to American Eels downstream of the Project is limiting the growth, survival, maturation, or outmigration (for spawning) of the Altamaha River basin population.

Fish Entrainment and Turbine-Induced Mortality

Fish approaching the powerhouse intake in Lake Jackson during generation may become entrained and subjected to the risks of turbine-induced injury or mortality. Georgia Power (2020d) analyzed the potential for fish entrainment and turbine-induced mortality at the Lloyd Shoals Project using an approved desktop approach, drawing upon the entrainment field studies completed at numerous other hydroelectric projects.

Common trends and data from other studied hydroelectric sites, including several in Atlantic Coast drainages of South Carolina and Georgia, indicate that small and/or young fish likely comprise the majority of fish entrained by the Lloyd Shoals Project. Entrainment is likely to be numerically dominated by species of sunfishes, shads, catfishes, minnows, perch, and suckers (Georgia Power 2020d). Peak entrainment rates likely occur in spring and summer for most species, when young fish are most abundant and tend to be dispersing between habitats. A substantial portion of entrainment likely consists of juvenile sport-fishes, but Largemouth Bass, Striped Bass, and Hybrid Bass probably represent relatively small proportions of entrainment.

The vast majority of entrained fish are small and likely to survive turbine passage. Trends in turbine passage survival at numerous studied hydroelectric sites predict average immediate survival rates at Lloyd Shoals on the order of 86 percent for small fish and 82 percent for moderate-sized and large fish (Georgia Power 2020d). Based on extrapolating monthly entrainment rates from a representative site on an Atlantic Coast river in the Piedmont of South Carolina (Ninety-Nine Islands) to Lloyd Shoals monthly generation data, total annual entrainment at Lloyd Shoals is estimated to be on the order of 130,377 fish, and total annual entrainment mortality is estimated to be about 19,577 fish.

GDNR annually expends resources stocking Striped Bass and hybrid bass fingerlings into Lake Jackson. Fingerlings and small juveniles may be the size classes of Striped Bass and hybrid bass most susceptible to entrainment at Lloyd Shoals because young fish are likely to school in open waters and may exhibit downstream migratory behavior. They become vulnerable to entrainment as they approach the dam; however, because of their small body size, the vast majority would be expected to survive turbine passage into the downstream river. Adult Striped Bass and hybrid bass, while large and potentially subject to higher turbine mortality rates if entrained, are facultative in their downstream migratory behavior and may be less inclined to migrate downstream, as evidenced by low numbers of Striped Bass in entrainment samples at other sites. Moreover, adult Striped Bass have strong swimming capabilities and would be much more capable of escaping intake velocities.

GDNR recently began stocking American Shad in Lake Jackson as part of basin-wide efforts to help conserve the Altamaha River stock. Although successful natural reproduction of American Shad may not occur upstream of Lake Jackson, turbine-passage survival of stocked fish could contribute to the downstream population in the Ocmulgee River. Survival tests with American

Shad at sites with Francis turbines are limited, but the available testing suggests that a majority of American Shad entrained at Lloyd Shoals would survive turbine passage into the downstream river (Georgia Power 2020d).

Overall, Lake Jackson supports a healthy fishery and evidence is lacking to suggest that current levels of fish entrainment and turbine-induced mortality may be adversely affecting the fish community of the Ocmulgee River. Continued operation of the Lloyd Shoals Project is likely to result in only minor impacts to fish populations and recreational fishing opportunities as a result of entrainment and turbine-induced mortality.

Cumulative Effects

Continued operation of the Lloyd Shoals Project would likely contribute to cumulative effects on fisheries and aquatic resources to a relatively small extent due to the Project's location and physical attributes. The project dam is located upstream of the Fall Line Hills District that posed a natural obstacle to the upstream migration of some diadromous and other migratory fishes. The Fall Line area delimits the historic distribution of many species or life stages of fish and mussels preferring either upland Piedmont or lowland Coastal Plain habitats. Juliette Dam would continue to limit upstream fish migration irrespective of the continued operation of the Project.

Georgia Power's proposal to continue providing a continuous minimum flow release of 400 cfs, or inflow, whichever is less, and to supplement flows with a release of 250 cfs when inflow falls below 250 cfs would continue to protect and enhance fish and aquatic resources in the Ocmulgee River downstream, including native species of riverine fish and mussels. The Ocmulgee River downstream supports a refugial population of Georgia endangered Robust Redhorse and also provides habitat for the Georgia threatened Altamaha Shiner and Altamaha Arcmussel.

The cumulative effects of Georgia Power's licensing proposal on diadromous fish migrations would be minor. There are no fish passage facilities at Juliette Dam, although young American Eels are able to ascend the dam. The Ocmulgee River downstream of Lloyd Shoals Dam would continue to support a healthy population of American Eel having access to a large watershed area as potentially suitable habitat downstream in the river basin. The Striped Bass and American Shad stocked in Lake Jackson would continue to support restoration efforts for each species, although neither species would be expected to establish reproducing populations upstream of the Project for lack of sufficient length of free-flowing river upstream for drifting early life stages.

Cumulative entrainment mortality effects for the fish species inhabiting the Ocmulgee River are likely to be relatively minor. Only a small proportion of the fish entrained during generation would likely be killed by turbine passage, and the losses of these mostly small and young fish would be of minor significance to the existing fisheries resources. Moreover, Lake Jackson sustains a healthy and highly popular recreational fishery that would not exist without the Project. In this regard, the Project contributes beneficially to cumulative effects in the Ocmulgee River basin. These benefits far outweigh the mostly minor effects of entrainment mortality.

Unavoidable Adverse Impacts

Unavoidable fish losses resulting from entrainment mortality would continue to occur with continued project operation. These losses, however, would not significantly affect fish populations and recreational fishing opportunities in the Ocmulgee River.

4.3.4 TERRESTRIAL RESOURCES

4.3.4.1 AFFECTED ENVIRONMENT

Georgia Power (2020f) conducted a terrestrial resources study to describe terrestrial wildlife and botanical resources occurring in the project area that use representative upland habitats and to describe floodplain, wetlands, and riparian habitats occurring in the project area. Field reconnaissance surveys were conducted in August 2019 and February and April 2020 to observe representative terrestrial communities and associated wildlife habitat, to characterize wetland, riparian, and littoral habitats, and to search potentially suitable habitat for rare, threatened, and endangered (RTE) species of plants and wildlife. The survey areas included the project recreation facilities.

Terrestrial Vegetative Communities

The dominant terrestrial vegetative community type in the project area¹⁴ is mixed pine-hardwood forest, which covers about 52 percent of the lands within project area (excluding Lake Jackson and other open water) (Georgia Power 2020f). Developed land (anthropogenic disturbances) covers 21 percent of the project area, pine forest/pine plantation covers 9 percent, and deciduous/mesic slope forest covers 9 percent. The remaining terrestrial habitats in the project

¹⁴ For the purposes of the Terrestrial Resources Study, the project area (or study area) was defined to include a zone extending 2,000 ft beyond the project boundary to encompass a conservatively large area for characterizing the existing environment.

area include clear-cut/sparse lands, agriculture/row crop, utility easement, floodplain and riparian forest, dry oak/ pine forest, as well as forested, scrub-shrub, and emergent wetland types.

Developed land (anthropogenic disturbances) is the most common community type within the project boundary, covering about 30 percent of the project lands (excluding Lake Jackson and other open water) (Georgia Power 2020f). These lands include residential areas, project recreation facilities, marinas, and the project works. Many of these areas are landscaped and maintained by mowing and other vegetative control measures. Flora include native canopy species intermixed with horticultural varieties of trees and shrubs, and lawns of common turfgrasses. Invasive species are common in this community type.

Mixed pine-hardwood forest occupies about 27 percent of the lands within the project boundary. This community type is distributed across uplands that are not developed or cleared. The canopy is dominated by Loblolly Pine, Mockernut Hickory and Pignut Hickory, Southern Red Oak, Water Oak, Sweetgum, and Tulip Poplar. Midstory species include Blackgum, Flowering Dogwood, maple species, Persimmon, Eastern Redbud, Eastern Red Cedar, American Holly, hawthorn species, Sparkleberry, Elliott's Blueberry, Wild Indigo, Winged Elm, and Black Cherry. Dominant herbaceous species include Christmas Fern, woodoats species, Partridge Berry, violet species, Pipsissewa, Trumpet Creeper, and greenbriers.

Deciduous/Mesic Slope Forest occurs in scattered locations along steeper slopes above floodplains or riparian corridors and occupies about 21 percent of the lands within the project boundary. Canopy vegetation includes American Beech, Southern Magnolia, Northern Red Oak, Southern Red Oak, White Oak, Shagbark Hickory, Mockernut Hickory, Blackgum, Tulip Poplar, and Sweetgum. Subcanopy species include Southern Sugar Maple, Sourwood, Red Maple, Red Mulberry, Elm, Ironwood, Hop Hornbeam, and American Holly. Herbaceous vegetation is generally sparse but includes Pipsissewa, Poison Ivy, and Muscadine.

Floodplain and riparian forest occur along streams and rivers, occupying about 9 percent of lands within the project boundary. This vegetative community is associated with streams and rivers, with alluvial soils/sediment deposition, periodic flooding, and mesic conditions influencing the species composition. Canopy species include Sweetgum, American Sycamore, Sugarberry, Red Maple, River Birch, Black Willow, Box Elder, Green Ash, and Water Oak, and scattered occurrences of Loblolly Pine and Cherrybark Oak. Midstory species include Ironwood, Hop

Hornbeam, and American Holly. Herbaceous vegetation includes various greenbriers, Christmas Fern, violets, False Nettle, and Butterweed.

Pine plantations and pine forests occupy only 1 percent of the land within the project boundary but occupy 9 percent within 2,000 ft of the project boundary. This community type is dominated by Loblolly Pine in the overstory, with scattered occurrences of Shortleaf Pine, Slash Pine, and Longleaf Pine, and various oaks, hickories, Sweetgum, and Tulip Poplar in the sparse understory. Utility easements, dry oak/pine forest, and agriculture/row crop communities together comprise about 0.5 percent of the land within the project boundary.

Vegetated Wetlands and Aquatic Plants

Forested, herbaceous/emergent, and scrub-shrub wetlands cover approximately 79 acres, or 12 percent, of the lands within the project boundary (Georgia Power 2020f).

Emergent/herbaceous wetlands and forested wetlands are the dominant vegetated wetland types, occupying 35.2 and 33.2 acres, respectively. Scrub-shrub wetlands occupy 10.2 acres.

Emergent/herbaceous wetlands occur in scattered areas around Lake Jackson, particularly in shallow coves and where sediment deposits have formed shallow flats in the upper reaches of tributary embayments. Additional locations include seasonal to permanently flooded wetlands formed from beaver activity. Common vegetation in these areas include Knotweed, Rice Cutgrass, Lizard's Tail, Water Primrose, False Nettle, Joe Pye Weed, Maidencane, Rosemallow, sedges, and Soft Rush.

Forested wetlands are found in poorly drained areas within floodplains, riparian corridors, long the edges of Lake Jackson, and in other locations with sufficient hydrology and hydric soils. Forested wetlands are most common along the rivers and tributaries to Lake Jackson and also occur near confluences of tributaries and the reservoir. Dominant canopy vegetation includes Green Ash, Blackgum, Tupelo, Red Maple, Box Elder, and American Sycamore. Midstory species include Switchcane, Black Willow, Buttonbush, Wax Myrtle, Alder, Virginia Willow, Silky Dogwood, and Ironwood. Herbaceous vegetation includes Nettle Chainfern, Sensitive Fern, Cardinal Flower, Bulrush, and various sedges.

Scrub-shrub wetlands occur in seasonally inundated areas between forested wetlands and emergent wetlands or open water. The majority occur along rivers and large creeks in the

upstream portions of Lake Jackson. Dominant early successional and scrub-shrub vegetation includes Buttonbush, Alder, Silky Dogwood, and Black Willow. Other common species include immature Box Elder, Marshpepper, and Swamp Knotweed, sedges, and rushes.

Georgia Power's field reconnaissance survey of wetland and riparian resources did not identify any significant areas of submergent/submersed aquatic vegetation in Lake Jackson. Aquatic plants previously documented in Lake Jackson have included Alligatorweed, with duckweeds intermixed, and Floating Primrose-willow, primarily along the South and Yellow Rivers in the South River embayment (Georgia Power 2020f; Gaddy 1989). There has been no evidence to date of the occurrence of Hydrilla, a highly invasive exotic aquatic plant species, in the reservoir.

Exotic Invasive Plant Species

Scattered occurrences of terrestrial exotic invasive plant species are present throughout the project boundary (Georgia Power 2020f). Field investigators identified 11 species within the project boundary and 16 within the larger study area. Several of these are introduced species commonly used as landscape plants within established lawns and maintained landscapes on residential lots surrounding Lake Jackson. Most observations were limited to small areas where populations did not exceed 10 percent coverage of a particular area. Three invasive species, Autumn Olive, Chinese Privet, and Japanese Honeysuckle, were observed exceeding 10 percent coverage within project operation and project recreation facilities. Chinese privet and Japanese Honeysuckle occur together in the project operations area between Dam Road and the access road leading to the Tailrace Fishing Pier. An isolated patch of Autumn Olive was observed in Ocmulgee River Park between the boat launch road and the Ocmulgee River.

Mimosa was observed in scattered locations along the shoreline but rarely was found in clusters that dominated the midstory stratum (Georgia Power 2020f). Giant Reed was observed in isolated locations near residential homes (potentially escaped) on shaded slopes within upland coves. Lespedeza was primarily observed near roadsides, such as the road providing access to Lloyd Shoals Park. Although present, this species did not dominate the herbaceous layer where found. Scattered populations of Chinese Privet were observed along the shoreline. Despite this species' tendency to aggressively invade a variety of habitats, only small clusters or single occurrences were observed within the project boundary. Japanese Honeysuckle is also known to

aggressively displace native vegetation; however, observations of this species were limited to occasional individuals in forested areas.

Georgia Power monitors the occurrence of, and periodically treats, invasive terrestrial and aquatic plants within the project boundary. Visual observations are made by shoreline management specialists during their routine reservoir inspections. Depending on the plant species and conditions observed, licensed herbicide specialists have chemically treated small areas within the project boundary to manage nuisance conditions or help prevent further infestation, as warranted. Taxa identified for treatment have included the cyanobacteria *Lyngbya* spp., and the aquatic plants Alligatorweed and Floating Primrose-willow. Alligatorweed can pose serious problems by extensively invading native plant communities and displacing native species (Georgia Exotic Pest Plant Council 2018).

In recent years, herbicide treatments in Lake Jackson have been infrequent and limited in total area from 2.0 to 8.5 acres. Five treatments between 2012 and 2016 targeted invasive species, including Alligatorweed and Floating Primrose-willow. All but one of these treatments were along shorelines and in shallow coves in the South River embayment. One treatment occurred at the head of a small cove on the east side of the reservoir in Jasper County.

Georgia Power administers a shoreline residential aquatic vegetation management program through its Lake Jackson website (<http://georgiapowerlakes.com/lakejackson/>). This program allows property owners to apply for an Individual Aquatic Herbicide Treatment Permit for controlling aquatic nuisance vegetation near their lake lots. If approved by Georgia Power, the permit allows the homeowner to contract the work using a state-certified aquatic pesticide commercial applicator.

Wildlife Resources

The Lloyd Shoals project area provides habitat for a diverse wildlife community. Total species richness observed for wildlife within the study area was 92, with eight mammal species, 70 birds, eight amphibians, and six reptiles (Georgia Power 2020f). The mammals most commonly observed included White-tailed Deer and Eastern Gray Squirrel. Other species included Coyote, Eastern Chipmunk, Nine-banded Armadillo, American Beaver, Raccoon, and Virginia Opossum. Other mammal species not observed but expected to occur in the ecoregion include: Southern Flying Squirrel, Northern River Otter, Least Shrew, Bobcat, Striped Skunk, Woodland Vole,

Long-tailed Weasel, Eastern Woodrat, American Mink, Golden Mouse, Common Muskrat, Marsh Rice Rat, Deermouse, Eastern Harvest Mouse, Eastern Mole, Eastern Fox Squirrel, Hispid Cotton Rat, Southeastern Shrew, Swamp Rabbit, Eastern Cottontail, Gray Fox, Red Fox, and several species of bats.

Amphibian and reptile species were observed during field surveys in a variety of habitats, including mixed pine/ hardwood, floodplain and riparian forests, wetlands, and mesic slope forests (Georgia Power 2020f). Amphibians observed included Bird-voiced Treefrog, Cope's Gray Treefrog, a cricket frog, Green Frog, Southern Leopard Frog, Spring Peeper, Upland Chorus Frog, and an unidentified salamander (Plethodontidae). Reptiles observed included Eastern Box Turtle, Five-linked Skink, Green Anole, Ground Skink, Plain-bellied watersnake, and Yellow-bellied Slider.

A wide variety of birds use diverse wetland, upland, and open-water habitats in the project area, including neotropical migrant songbirds, raptors, waterfowl, and shorebirds (Georgia Power 2018). Field investigators identified 70 bird species during the field surveys (Georgia Power 2020f). Common species included Eastern Phoebe, Carolina Wren, American Crow, Fish Crow, Tufted Titmouse, Turkey Vulture, Eastern Blue Jay, and American Robin. Raptors included Bald Eagle, Osprey, Red-tailed Hawk, Red-shouldered Hawk, and American Kestrel. Although populations are increasing, Bald Eagle remains protected under the Bald and Golden Eagle Protection Act and is considered a high-priority species under the Georgia State Wildlife Action Plan (GDNR 2015). Osprey also depends on large bodies of water and healthy fisheries to flourish and has been observed nesting at Lloyd Shoals Dam.

Waterfowl observed in the Lloyd Shoals project boundary included Mallard, Canada Goose, Wood Duck, and Muscovy Duck (Georgia Power 2020f). Wading bird observations included Great Blue Heron and Black-crowned Night Heron. No wading bird rookeries were observed during the course of the field surveys.

State Protected Plant Species

Georgia Power (2020e, 2020f) identified and evaluated federally and state protected species, and other species of conservation concern, with known records of occurrence in the project vicinity. Four federally threatened and endangered plant species, and one plant species under review for federal listing, potentially occur within the project vicinity, as evaluated in Section 4.3.5

(Threatened and Endangered Species). However, none of the species are presently known to occur within the Lloyd Shoals project boundary.

Four other Georgia protected plant species potentially occur in the project vicinity (Georgia Power 2020e). State protected species in Georgia are listed as endangered, threatened, rare, or unusual, in descending order of rarity. The four species are:

- Oglethorpe Oak (*Quercus oglethorpensis*) – Georgia threatened; grows up to 80 ft tall and inhabits wet, clayey soils, particularly along seepages, stream terraces, and moist hardwood forests (Chafin 2007, 2020a).
- Granite Stonecrop (*Sedum pusillum*) – Georgia threatened; an annual herb with succulent stems that inhabits Piedmont granite outcrops (Chafin 2007, 2020b)
- Mountain Catchfly (*Silene ovata*) – Georgia rare; a tall perennial herb that occurs in rich, deciduous forests over limestone or amphibolite in the Coastal Plain and in Fall Line ravines (Chafin 2007, 2020c).
- Silky Camelia (*Stewartia malacodendron*) – Georgia rare; a shrub or small tree that inhabits rich ravine and slope forests and lower slopes of sandhills above bogs and creek swamps (Chafin 2007, 2020d)

None of these Georgia protected plant species were observed within the project boundary during the field reconnaissance surveys (Georgia Power 2020f) (Table 6). Only marginally suitable habitat was identified for Oglethorpe Oak, no granite outcrops were encountered for Granite Stonecrop, and no potentially suitable habitat was encountered for Mountain Catchfly or Silky Camelia.

State Protected Wildlife Species

One federally endangered terrestrial wildlife species, the Red-cockaded Woodpecker (*Dryobates borealis*, formerly genus *Picoides*), is known to occur in the project vicinity. It is evaluated in Section 4.3.5 (Threatened and Endangered Species).

Two other Georgia protected terrestrial wildlife species occur or potentially occur in the project vicinity (Table 6) (Georgia Power 2020e):

- Bald Eagle (*Haliaeetus leucocephalus*) – Georgia threatened; eagles currently reside year-round within the project area and there is one known nesting territory on Lake Jackson. The original nest site on Georgia Power land within the project boundary was used for several years. In 2020, the eagle pair established a new nest site nearby on the property of another landowner outside of the project boundary. GDNR reported two

eaglets in the nest in March 2020. One eagle was observed in flight over Lake Jackson during the field surveys in 2019 (Georgia Power 2020f).

- Southern Hognose Snake (*Heterodon simus*) – Georgia threatened; primarily found in the Coastal Plain and most often associated with well-drained, xeric, sandy soils where longleaf pine and/or scrub oaks are the characteristic woody vegetation and wiregrass is a significant component of the groundcover (Jensen 2018). Such habitats are fire-maintained. A single specimen from near Lake Jackson represents the only Piedmont record of the species in Georgia; however, this occurrence is historical, and the species may be extirpated from the area (Jensen 2018). The Southern Hognose Snake is unlikely to occur within the Lloyd Shoals project boundary, as no suitable habitat for the species was observed during the field surveys (Georgia Power 2020f).

Avian Protection Program

Georgia Power implements an Avian Protection Program (APP) in accordance with an agreement between the FWS, Edison Electric Institute, and Avian Power Line Interaction Committee. The APP specifies procedures to be followed by all Georgia Power employees to maintain compliance with the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA), and the Endangered Species Act, as it applies to avian species. The APP establishes a company policy of not disturbing wildlife and includes guidance pertaining to: (1) active nests; (2) injured birds; (3) handling live or dead birds or their nests only in accordance with permits issued by FWS; (4) not disturbing live or dead birds, or nests of threatened and endangered avian species; (5) appropriate remedial actions for avian interactions; (6) reporting to Georgia Power Environmental and Natural Resources (ENR) any protected, threatened, endangered, or migratory species (including eggs or chicks) suspected to be in an area that company operations will impact; and (7) reporting immediately to ENR any woodpecker nest cavities found in live pine trees that are subject to company operations.

In addition, Georgia Power's Forestry Policy Manual covers the protection and management of RTE species. With respect to Bald Eagles, Georgia Power forest managers communicate regularly with ENR and GDNR personnel regarding eagle nest locations on Georgia Power lands within and adjacent to the Lloyd Shoals project boundary. Georgia Power conducts an annual mid-winter eagle survey at Lake Jackson each January. GDNR conducts monitoring of Bald Eagles at Lake Jackson every other year as part of its statewide monitoring program. Georgia Power forest managers and ENR biologists document any sightings of new potential Bald Eagle nests and coordinate those through ENR biologists, who check their records and contact GDNR for confirmation as appropriate.

4.3.4.2 ENVIRONMENTAL IMPACTS AND RECOMMENDATIONS

Bald Eagle

Although no longer federally listed as a threatened species, Bald Eagle remains protected under the MBTA and BGEPA. To conserve and protect habitat for bald eagles within the project boundary in compliance with these laws, Georgia Power would continue to implement its existing APP and Forestry Policy Manual. Because nesting Bald Eagles are known to occur within the project boundary, protection and management activities would continue to be focused on land management activities that avoid disturbance to active nest sites. Under the APP, Georgia Power implements current FWS national guidance (FWS 2007) pertaining to prescribed distance buffers, natural or landscape buffers, and activity-specific guidelines where applicable. In addition, Georgia Power natural resource specialists would continue to communicate regularly with GDNR personnel regarding eagle nest locations within and adjacent to the project boundary and cooperate with GDNR's annual monitoring of bald eagles at Lake Jackson.

Exotic Invasive Plant Species

Observed occurrences of invasive plant species were limited across the majority of the study area. Most occurrences were observed in the southern portion of Lake Jackson and associated with residential landscaping. Elsewhere, scattered colonies of bamboo, Chinese Privet, Japanese Honeysuckle, Autumn Olive, and Elephant Ear were noted, particularly in proximity to residential lots around the shoreline. Invasive plant species exceed 10 percent coverage of a particular stratum at two locations at project facilities, including an isolated patch of Autumn Olive (0.01 acre) in mixed pine/hardwood forest at Ocmulgee River Park and an area containing a concentration of Chinese Privet and Japanese Honeysuckle (1.88 acres) in mixed pine/hardwood forest on land next to the project works (Georgia Power 2020f).

Operation and maintenance of the Lloyd Shoals Project has not been a major factor contributing to the occurrence or spread of these species. The occurrence of exotic invasive plant species has resulted mainly from surrounding residential development and anthropogenic disturbance along roadways and in riparian habitats in watersheds upstream of the Project. Exotic invasive species such as Chinese Privet, Japanese Stiltgrass, and Japanese Honeysuckle are now widespread and common throughout Georgia and the eastern and southern U.S., typically in floodplains (Merriam and Feil 2002, Loewenstein and Loewenstein 2005), and irrespective of the location of impoundments.

Public use of the project recreation facilities and lands adjacent to the project works between Dam Road and the access road to the Tailrace Fishing Pier is not being adversely impacted by exotic invasive plant species. Where invasive plant species occur along the shoreline, they often extend onto neighboring lands outside of the project boundary. Control of invasive plant species throughout the project boundary would not be feasible given the adjoining residential lots and other upstream sources of propagules (seeds, rhizomes, etc.). The spread of invasive plants is often linked to urbanization, residential development, and anthropogenic disturbance of riparian habitats (Loewenstein and Loewenstein 2005, Burton et al. 2005). However, Georgia Power will monitor the patch of Autumn Olive at Ocmulgee River Park and the area of Chinese Privet and Japanese Honeysuckle adjacent to the project works, and if necessary, contract the treatment of these areas to reduce spread that could affect public access and recreation.

Georgia Power would continue to monitor invasive aquatic plants within Lake Jackson during routine reservoir inspections. Nuisance invasive aquatic plants would be treated periodically within the project boundary, as warranted, to reduce infestations that could affect public access to the reservoir or hydropower operations. In addition, Georgia Power would continue to administer its existing shoreline residential aquatic vegetation management program through its website. Property owners could apply for an Individual Aquatic Herbicide Treatment Permit, and if approved by Georgia Power, contract the treatment of nuisance aquatic vegetation using a state-certified aquatic pesticide commercial applicator.

Construction of Proposed Enhancement Measures

Construction of the proposed recreation enhancements at Jane Lofton Public Access Area (Section 4.3.6) would permanently remove about 2 acres of mixed pine/hardwood forest next to Dam Road in Butts County. No wetlands or streams would be directly impacted. The known active Bald Eagle nesting territory at the Project is 2 miles away from this site, beyond the distance buffers prescribed by FWS (2007) for avoiding nesting disturbance during construction. Wildlife would be displaced from the construction area and immediately adjacent lands during construction; however, the animals would move into adjacent forest that would remain contiguous to the impact area. Displaced animals would be able to relocate to suitable habitat in surrounding forested areas. Sufficient suitable habitat is expected to be available for assimilation of displaced animals, and therefore, secondary impacts to populations would likely be negligible.

Construction of the proposed new formal recreation access at the Hwy 36 Bridge at Tussahaw Creek would permanently remove about 0.5 acre of mixed pine/hardwood forest just west of the intersection of Hwy 16 and Winding Way in Butts County. No wetlands or streams would be directly impacted, and the known Bald Eagle nesting territory is located over 3.5 miles away. Wildlife would be displaced during construction but would relocate to suitable habitat in the surrounding forest. Secondary impacts to animal populations would be negligible.

Construction of the proposed recreation enhancements at Lloyd Shoals Park and Ocmulgee River Park would occur in previously developed areas of these parks, so disturbance would be minimal. The construction would temporarily disturb upland and riparian vegetation and associated wildlife in the vicinity of the construction sites. However, these disturbances would be short in duration and the sites would be restored, including reseeding as necessary following construction.

Unavoidable Adverse Impacts

Construction of the new recreation facilities at Jane Lofton Public Access Area and the new formal access at the Hwy 36 Bridge at Tussahaw Creek would result in the permanent removal of approximately 2.5 acres of upland, mixed pine/hardwood forest and displacement of associated wildlife to adjacent forested habitats.

Some minor land disturbances would occur in upland and riparian areas during construction of the new and improved recreation facilities. These disturbances would be temporary, and the sites would be revegetated following construction.

4.3.5 THREATENED AND ENDANGERED SPECIES

4.3.5.1 AFFECTED ENVIRONMENT

Georgia Power (2020e) identified and evaluated federally listed species and species under review for federal listing with known records of occurrence in the project vicinity. Five federally protected species of plants and wildlife and four species under federal status review potentially occur in the project vicinity. No federal candidate species for listing presently occur in the project vicinity.

Federally Protected Species

Five species listed as threatened and endangered under the federal Endangered Species Act potentially occur within the project vicinity (Table 6). They include four plant species and one bird species:

- Little Amphianthus (*Gratiola amphiantha*¹⁵) – threatened;
- Black-spored Quillwort (*Isoetes melanospora*) – endangered;
- Michaux’s Sumac (*Rhus michauxii*) – endangered;
- Relict Trillium (*Trillium reliquum*) – endangered; and
- Red-cockaded Woodpecker (*Dryobates borealis*¹⁶) – endangered.

None of these federally protected species are presently known to occur within the Lloyd Shoals project boundary. All five of the species are described below.

Little Amphianthus

Little Amphianthus (or Pool Sprite) is a diminutive, annual herb that occurs in the Piedmont exclusively in shallow, flat bottomed depressions on granite outcrops, where vernal pools form after rainfall (GDNR 2021b, Chafin 2007). The numbers of individual plants in pools range from a dozen to several thousand (FWS 2019a). Little Amphianthus begins flowering in February or March and continues until the habitat becomes desiccated later in the spring. The seeds remain dormant until suitable moisture and light conditions for germination occur in late autumn. Of the 56 known extant populations, 50 occur in Georgia (FWS 2019a). Of the 14 populations considered to be extensive (with 15 or more occupied pools), 13 are in Georgia but none are in counties occupied by the Project. A small population in poor condition occurs in Henry County at the northern border, and two small populations in Butts County are threatened by exotic species, disturbance from a nearby highway, and off-road vehicles. Populations historically known from Newton County have been lost to stone quarrying activities. No granite-outcrop habitats were observed within the project boundary during the field surveys (Georgia Power 2020f), and therefore, no suitable habitat is present for Little Amphianthus.

¹⁵ Formerly referred to as *Amphianthus pusillus*, before being transferred to the genus *Gratiola*.

¹⁶ Formerly referred to as *Picooides borealis*, before being transferred to the genus *Dryobates*.

Black-spored Quillwort

Black-spored Quillwort is an inconspicuous perennial herb that is restricted to shallow, seasonally flooded, flat bottomed pools on granite outcrops (Chafin 2007, Chafin and Brunton 2020). These vernal pools are entirely rock-rimmed, generally occur near the summit, and typically have a depth less than 1 ft. The plants produce spores in early May to June. The species is endemic to the Piedmont of Georgia and South Carolina. Historically known from 16 populations in central Georgia, Black-spored Quillwort currently exists at 11 populations sites in Georgia, including two small populations of unknown condition in Butts County (FWS 2019a). The species co-occurs in pools with Little Amphianthus at all extant populations. No granite outcrops were detected during the field surveys (Georgia Power 2020f), and therefore, no suitable habitat is present.

Michaux's sumac

Michaux's Sumac (or Dwarf Sumac) is a low-growing, colonial shrub that occurs on dry, open rock, or sandy woodlands over bedrock rich in calcium, magnesium, or iron (Chafin 2007). The species requires some form of periodic disturbance, such as fire, to maintain the open quality of its habitat and plants are often found in areas that are artificially disturbed, such as highway and railroad rights-of-way, pine plantations, edges of cultivated fields, and other cleared lands (FWS 1989, NatureServe 2021). Michaux's Sumac flowers from April to June and fruits from August to October. Of the 43 known extant populations in North Carolina, Virginia, and Georgia, 4 are in Georgia, including one in Newton County near the City of Covington and one in Henry County at its northern border (FWS 2014). Field investigators actively looked for this species where open areas occurred in rocky and/or sandy forests having an open canopy or disturbed areas such as roadsides and utility easements (Georgia Power 2020f). While marginal habitat occurs in scattered locations within the project boundary, the species was not detected.

Relict trillium

Relict Trillium is a perennial herb that inhabits mature mesic hardwood forests in deep soils having high organic matter content, typically in rich ravines or on floodplain terraces over calcium-rich bedrock close to creeks or rivers (Chafin 2007, 2020e; NatureServe 2021). The species flowers from mid-March through April and fruits from May to June. Populations vary widely in size from as few as 20 individual plants to tens of thousands of plants. Urbanization and road improvement projects are two factors that destroy or degrade available habitat.

Approximately 40 populations of Relict Trillium are currently known in 18 Georgia counties, including one in Jasper County in Oconee NF with over 100,000 reproductive stems (FWS 2015). Oconee NF occupies 30,120 acres on the east side of the Ocmulgee River beginning one mile downstream of the Project. No Relict Trillium or suitable habitat for the species were observed during the field surveys (Georgia Power 2020f).

Red-cockaded Woodpecker

The Red-cockaded Woodpecker is a small woodpecker endemic to open, mature and old-growth pine ecosystems in the southeastern U.S. (Ozier et al. 2019, FWS 2003). Red-cockaded Woodpeckers excavate roosting and nesting cavities almost exclusively in old, living pines. Cavity trees are usually infected with red-heart disease, which softens the heartwood. The birds typically nest and roost in Longleaf, Slash, or Loblolly Pine trees. Red-cockaded Woodpeckers are cooperative breeders that live in family groups consisting of a breeding pair and often one to three helper male offspring from previous years. Typically, about 150 acres of suitable habitat are required by each family group. Georgia has five remaining population centers. One of these is the Piedmont Recovery Unit, which contains one population on Piedmont NWR and Oconee NF in Jones and Jasper Counties south of the Project (FWS 2003; FS 2011). FWS manages 22,500 acres of upland pine and 3,000 acres of upland hardwood to create conditions suitable for red-cockaded woodpeckers (FWS 2010). The species is not presently known to inhabit pine forests within the Lloyd Shoals project boundary, where stands of large pine trees are relatively small. No Red-cockaded Woodpeckers or potentially suitable nesting habitat for the species were observed during the field surveys (Georgia Power 2020f).

Species Under Review

Four species are currently undergoing status review by FWS to determine if their listing as federally threatened or endangered is warranted (FWS 2011, 2017, 2019b) (Table 6). They include one plant, one snail, one fish, and one bat:

- Small-headed Pipewort (*Eriocaulon koernickianum*) – Georgia endangered;
- Reverse Pebblesnail (*Somatogyus alcoviensis*) – no state or federal protection;
- Robust Redhorse (*Moxostoma robustum*) – Georgia endangered; and
- Tricolored bat (*Perimyotis subflavus*) – no state or federal protection.

Two of the species are presently known to occupy riverine habitats either within the project boundary below Lloyd Shoals Dam (Robust Redhorse) or in larger tributaries to Lake Jackson upstream of the project boundary (Reverse Pebblesnail). Tricolored Bat has a widespread distribution and potentially occurs in the project area. Small-headed Pipewort is unlikely to occur in the project area due to the lack of granite-outcrop habitat to which it is restricted. The following sections provide brief accounts of each species.

Small-headed Pipewort

Small-headed Pipewort (or Dwarf Hatpins), a Georgia endangered species, is an annual or short-lived, diminutive perennial herb that occurs on Piedmont granite outcrops (Chafin 2007, 2020f). The species is found in seepage areas and wet depressions on granite flatrocks. Small-headed Pipewort flowers in late May and June. The number of plants in a population fluctuates annually depending on rainfall and the frequency of disturbance, such as fire, which reduces competition from other plants. Threats to the species include destruction of habitat by quarrying, trash dumping, off-road vehicle use, development, exotic pest plant species, and fire suppression. About 20 populations have been documented in Georgia. No granite outcrops were detected during the field surveys, and therefore, no suitable habitat is present (Georgia Power 2020f).

Reverse Pebblesnail

Reverse Pebblesnail, which has no Georgia or federal protected status, is a freshwater snail species that inhabits shoals with rapidly flowing water. The species is restricted to two known localities on medium-sized rivers in Newton County, one on the Alcovy River and one on the Yellow River (Georgia Power 2017b). Both localities are on tributaries to Lake Jackson upstream of the project boundary. The snail inhabits boulders, gravel, and vegetation growing on rocks in rapidly flowing water but is absent from silty substrates (NatureServe 2021). Under the Altamaha Mollusk CCA, GDNR plans to conduct a survey for this species in 2021 in the Alcovy River upstream of Lake Jackson (Rowe 2021).

Robust Redhorse

Robust Redhorse, a Georgia endangered species, is a migratory riverine sucker species that occurs in large rivers of the Atlantic slope in Georgia, South Carolina, and North Carolina (Freeman and Straight 2009, Rohde et al. 2009). The species occurs in the mainstem Ocmulgee and Oconee Rivers in the Altamaha River basin. Robust Redhorse typically inhabit main-

channel, free-flowing rivers in riffles, runs, and pools. Adults reside in deep waters in moderate to swift current, often on the outside of river bends in association with woody debris. Spawning occurs in rivers over coarse gravel.

As part of the Ocmulgee CCAA for Robust Redhorse, the species was reintroduced to the Ocmulgee River downstream of Lloyd Shoals Dam through stocking in 2002-2005 to establish a refugial population (Jennings and Shepard 2003, Grabowski and Jennings 2009). Georgia Power has been participating in ongoing visual and field-sampling surveys to assess whether successful spawning and recruitment is occurring in the Ocmulgee River population. The population extends many miles downstream of Lloyd Shoals Dam, beyond Juliette Dam, and into the lower Ocmulgee River in the Coastal Plain.

Surveys conducted in 2010-2011 showed that stocked redhorse had survived and were participating in spawning activities in the Lloyd Shoals tailrace, but evidence of successful recruitment was not confirmed (Pruitt 2013, Georgia Power 2016). In 2014, GDNR survey efforts in downstream reaches in the Coastal Plain (near Hawkinsville) resulted in the capture of a juvenile Robust Redhorse, indicating successful natural recruitment in the river.

Georgia Power is currently working on the Ocmulgee CCAA for Robust Redhorse with its partners, FWS Region 4 and GDNR's WRD, to renew the agreement beyond its current term, which expires at the end of the current FERC license term in December 2023.

Tricolored Bat

Tricolored Bat, which has no Georgia or federal protected status, is a small species of bat that occupies a wide range across eastern and central North America (NatureServe 2021). Tricolored Bats can be found anywhere in Georgia and are one of the most commonly encountered cave-dwelling species seen in winter (Ferrall 2019). They inhabit open forests with large trees and woodland edges, roost in tree foliage, and hibernate in caves or mines with high humidity. Despite population declines across the species' range due to white-nose syndrome, Tricolored Bats are the most common cave-dwelling species found during winter surveys in Georgia (Ferrall 2019). Although no targeted surveys were conducted for Tricolored Bat and no individuals or hibernacula were observed within the project area during the field surveys (Georgia Power 2020f), Tricolored Bats are assumed to occur in the project area due to their

wide distribution, use of forested and riparian areas, and occasional use of human-made structures by maternity colonies (NatureServe 2021).

4.3.5.2 ENVIRONMENTAL IMPACTS AND RECOMMENDATIONS

Georgia Power proposes to continue to operate the Lloyd Shoals Project in a modified run-of-river mode for generation during peak power demand hours. Georgia Power is not proposing to make any major modifications to the Project under the new license. Continued project operation as proposed would not be expected to adversely affect any federally or state listed or federal status-review species of plants and wildlife. There is no designated critical habitat for federally protected species within the project boundary or in the 19-mile reach of the Ocmulgee River extending downstream to Juliette Dam.

4.3.6 RECREATION AND LAND USE

4.3.6.1 AFFECTED ENVIRONMENT

Georgia Power (2021c) conducted a Recreation and Land Use Study according to the approved Study Plan, as amended, to characterize existing recreation and land use at the project, evaluate the adequacy of existing recreational facilities to meet current and future recreational demand, and evaluate the adequacy of the existing Shoreline Management Program.

Project Recreation Facilities

Georgia Power owns and operates four project recreation facilities at the Lloyd Shoals Project that provide for a variety of recreational opportunities (Table 10). Two of the facilities are located on Lake Jackson and two facilities are located downstream of Lloyd Shoals Dam in the tailrace area. Amenities at each of these four recreation facilities are summarized below.

Lloyd Shoals Park

Lloyd Shoals Park is a 5-acre facility located on Lake Jackson in Butts County on the western side of the project dam. The park includes a large, paved parking area with space for 50 vehicles with trailers. Amenities at the site include a swimming beach; a picnic/day use area with picnic tables; a pavilion; a playground; one barrier-free fishing pier; a two-lane barrier-free paved boat ramp with courtesy dock; restrooms; and bank fishing areas. The boat ramp at Lloyd Shoals Park provides public boating access to Lake Jackson.

Lloyd Shoals Tailrace Fishing Pier

The Lloyd Shoals Tailrace Fishing Pier is located downstream of Lloyd Shoals Dam on the western bank of the Ocmulgee River in Butts County. The Tailrace Fishing Pier includes a paved parking area with space for 10 vehicles; a barrier-free switchback boardwalk to the fishing pier with seats for fishing and a separate seating area for viewing; and trash cans.

Ocmulgee River Park

Ocmulgee River Park is located downstream of Lloyd Shoals Dam on the eastern bank of the Ocmulgee River in Jasper County. Ocmulgee River Park includes a gravel parking area with space for 15 vehicles with trailers; a 1-lane boat ramp; a paved parking area next to the boat ramp; a picnic/day use area; and bank fishing access along the river.

Jane Lofton Public Access Area

The Jane Lofton Public Access Area opened in 2017 and is located just south of Lloyd Shoals Park at the south end of the auxiliary spillway in Butts County. Jane Lofton Public Access Area provides bank fishing access to Lake Jackson. The recreation area also includes a gravel parking area and a trash can.

Non-Project Recreation Facilities on Lake Jackson

Nine publicly or privately owned and operated, non-project facilities provide recreational access to Lake Jackson (Table 10). All of the facilities except Factory Shoals Park border the project boundary at the shoreline, which is defined by the full pool elevation of 530 ft PD in these areas. Factory Shoals Park is located just upstream of the project boundary.

Six of the facilities are privately operated marinas distributed around the reservoir. They include Martin's Marina northeast of the dam, Reasor's Landing in the Tussahaw Creek embayment, Walker Marina and Sandy's Highway 36 Marina in the South River embayment, and Berry's Boat Dock and Bear Creek Marina in the Alcovy River embayment. The marinas provide boat ramps, fuel, and various other amenities that support fishing, fishing tournaments, bank fishing, boating, water skiing, swimming, picnicking, camping, and other recreation.

Factory Shoals Park is operated by Newton County on about 450 acres immediately upstream of the project boundary next to a shoals complex on the Alcovy River. The park features granite

shoals, a preserved river corridor, and opportunities for kayaking, canoeing, hiking, picnicking, and fishing.

The Georgia FFA-FCCLA Center on the Alcovy River embayment is a 500-acre recreational youth camp and conference center owned by the State of Georgia. Although the majority of recreation occurs on facility lands, the facility fronts over 1.5 miles of Lake Jackson shoreline and canoeing and kayaking take place on the lake.

The Hwy 36 Bridge at Tussahaw Creek is an informal, undeveloped area that the public accesses for bank fishing and other shoreline activities. Georgia Power owns land at the site but does not operate recreational facilities.

Project Recreational Use

Georgia Power (2021c) assessed recreational use at the Project using a combination of existing and new information and data to identify recreational usage trends and recreation demand. Existing recreation use at the project was described based on review of existing information sources; analysis of the most recent recreational use information gathered by Georgia Power (2015b) in 2014 for the 2015 Form 80; and review of available fishing tournament information. In addition, recreation field surveys were conducted on five days in 2019 and 2021. This data was used to supplement and refine the existing recreation use data from the 2015 Form 80.

Recreation surveys were conducted at the four Georgia Power recreation facilities on three days in the summer of 2019 and two days in the spring of 2021, including Lloyd Shoals Park, Jane Lofton Public Access Area, Tailrace Fishing Pier, and Ocmulgee River Park. The purpose of these on-site surveys was to assess recreational user satisfaction and to further characterize user trends, carrying capacity, competing uses, and the adequacy of existing recreation facilities. Roving user counts and recreation surveys also were administered at the informal bank fishing area at the Georgia Hwy 36 Bridge at Tussahaw Creek.

Of the 129 recreation users surveyed at the five access areas, 51 percent were from Lloyd Shoals Park, 14 percent were from Lloyd Shoals Tailrace Fishing Pier, 33 percent were from Ocmulgee River Park, and 2 percent were from the informal recreation area. Although no user surveys were collected at Jane Lofton Public Access Area, bank fishing use was observed there during the surveys. Over 55 percent of those surveyed came from one of the four counties in which the Project is located (Butts, Henry, Jasper, and Newton counties). Of the users surveyed, the highest percentages came from Henry County

(18 percent), Butts County (16 percent), Spalding County (15 percent), Jasper County (12 percent), and Newton County (10 percent). Spalding County borders Henry and Butts counties west of the Project. The most common reasons reported for visiting the Lloyd Shoals Project were bank fishing (24.4 percent) and swimming/wading (17.1 percent). The overall average party size was 2.9 between the five recreation sites with an average length of visit of 2.8 hours. Frequently noted improvements desired included additional/improved restrooms, additional parking, improved access to the shoreline, general cleaning at the parks, additional trash cans, and additional camping opportunities. Other improvements were suggested including additional picnic areas, additional lighting, and additional fishing access.

Bank fishing is a popular activity at Lake Jackson and comprised 24 percent of the primary activity reported during user surveys. Bank fishing is particularly popular at Lloyd Shoals Tailrace Fishing Pier and Ocmulgee River Park, where user surveys indicated bank fishing as the most popular activity at each site. Bank fishing also occurs at informal areas around the lake, including the Hwy 36 Bridge at Tussahaw Creek. Improved access to the shoreline was an improvement requested at Lake Jackson, specifically at Ocmulgee River Park.

The 2019 recreation use estimates were based on the 2014 estimates adjusted to account for data collected during the 2019 and 2021 recreation study¹⁷ and population increases in the Project's four surrounding counties. The 2019 annual use estimate for the Lloyd Shoals Project is 68,393 daytime visits and 1,396 nighttime visits with a peak weekend average of 3,420 daytime visits and 23 nighttime visits (Table 11). The reduction in nighttime visits can be attributed to the closing of Riverside Park in 2017 to address public safety concerns; it accounted for a large portion of the nighttime use numbers in previous estimates¹⁸.

Attendance records from Lloyd Shoals Park show that there were approximately 37,682 visits to the park in 2019, a slight decrease from the previous year's attendance of 39,665. Data collected during user counts at Lloyd Shoals Park in 2019 and 2021 provided an estimate of around 33,579 visits. Lloyd Shoals Park saw approximately 58 percent of all recreation visits to Lake Jackson in 2019.

¹⁷ Data collected during 2021 was used in conjunction with 2019 data when estimating group size and visit duration. This information was used to determine the annual use estimate for 2019.

¹⁸ On November 15, 2016, FERC approved Georgia Power's request to close Riverside Park and to add the Jane Lofton Public Access Area to mitigate the loss of bank fishing access at Riverside Park.

Regional Recreation Opportunities

Lake Jackson is located in central Georgia and is close to two other lakes operated by Georgia Power, including Lake Sinclair and Lake Oconee. Lake Juliette is owned by Georgia Power and most recreation opportunities there are operated by the State of Georgia. In addition, the southern section of the Oconee Ranger District of Oconee NF extends west to the Ocmulgee River, beginning about 1 mile downstream of Lloyd Shoals Dam in Jasper County. These four recreation areas are described in further detail below.

Lake Sinclair

Lake Sinclair is part of Georgia Power's Sinclair Hydroelectric Project (FERC No. 1951) located near Milledgeville, approximately 35 miles east-southeast of Lake Jackson and covers 15,330 acres with 417 miles of shoreline (Georgia Power 2016b). Lake Sinclair is a popular regional destination for fishing, boating, camping, and other recreational activities. The lake offers 20 recreation facilities, including day-use parks, marinas, and campgrounds. While boating and camping are popular activities at these facilities, many other amenities are offered, including fishing piers, fish attractors, hiking trails, swimming beaches, and picnic shelters (Georgia Power 2016b).

Lake Oconee

Lake Oconee is part of Georgia Power's Wallace Dam Hydroelectric Project (FERC No. 2413) located in Hancock, Putnam, Greene, and Morgan counties, approximately 30 miles east-northeast of Lake Jackson and comprises 19,050 acres with 374 miles of shoreline (Georgia Power 2016b). Lake Oconee is a popular regional destination for fishing, boating, camping and other recreational activities. There are many recreation facilities around the lake, including FS recreation areas and commercially operated marinas and boat ramps. Amenities offered around the lake include day-use areas, boat ramps, picnic tables, restrooms, campgrounds, swimming beaches, and shoreline fishing access (Georgia Power 2016b).

Lake Juliette

Lake Juliette¹⁹ is a 3,600-acre reservoir located on a tributary of the Ocmulgee River in Monroe County, approximately 20 miles south of Lake Jackson (Georgia Power 2016b). Recreation opportunities at the lake include fishing, picnicking, boating with 25-hp or less engines, and viewing natural scenery and wildlife (Georgia Power 2016b).

¹⁹ Lake Juliette is an impoundment of Rum Creek and is distinct from Juliette Dam on the Ocmulgee River.

Oconee National Forest

The southern portion of the Oconee Ranger District of Oconee NF extends west to the Ocmulgee River beginning approximately 1 mile south of the dam (Georgia Power 2018). This section of the forest near the river includes the Ocmulgee River Horse, Bike, and Hiking Trail, part of the Ocmulgee Bluff Trail System. The 30-mile trail generally follows the Ocmulgee River and includes numerous horse-back riding, biking, and hiking opportunities (Georgia Power 2018).

Land Use and Relevant Resource Management Plans

FERC-Approved Comprehensive Waterway Plans

Section 10(a)(2)(A) of the Federal Power Act, 16 U.S.C. § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with Federal or State comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the Project. The Commission grants Section 10(a)(2)(A) comprehensive plan status to any Federal or State plan that: (1) is a comprehensive study of one or more of the beneficial uses of a waterway or waterways; (2) specifies the standards, the data, and the methodology used; and (3) is filed with the Secretary of the Commission.

FERC (2021) currently lists 41 comprehensive plans for the state of Georgia. Table 12 lists 23 of those plans potentially relevant to the Lloyd Shoals Project. The most recent and directly relevant comprehensive plan pertaining to recreation is the Georgia SCORP, discussed below.

Statewide Comprehensive Outdoor Recreation Plan

The Georgia SCORP for 2017-2021 (Georgia State Parks 2016) reports on the state of parks and greenspaces and offers guidance to state and local decision-makers and citizens on ways to promote healthy communities, enhance economic vitality, and conserve natural resources. A public parks inventory shows that less-populated Jasper County has about 18 percent of its area available for outdoor recreation (including Oconee NF), while Butts, Henry, and Newton counties have less than 3 percent available. For many recreators, the quality of their experience depends in large part on the quality of the facilities they use. In recognition of this importance, about 60 percent of Land and Water Conservation Fund awards to local governments between 2006 and 2015 were targeted toward the rehabilitation of existing facilities.

A public survey was conducted by telephone to assess demand and preferences for outdoor recreation. About 63 percent of survey respondents self-identified as being outdoor recreators,

enjoying such activities as walking, jogging, running, picnicking, swimming, and observing wildlife and nature. Reasons to recreate included having fun, being with family and friends, relaxing, being healthy and exercising, and enjoying nature. Seventy percent of respondents had visited a park in the past year, and the vast majority of these recreators had visited parks at least several times. About 20 to 30 percent of recreators indicate that physical limitations can be a barrier, indicating the continuing importance of addressing this challenge in the planning, development, and rehabilitation of parks.

ARC Regional Resource Plan

The Atlanta Region's Plan (ARC 2020), applicable to Henry County and counties northwest of the Project, identifies the South River as a "protected river corridor," meaning that planning efforts are to focus on preserving land adjacent to the river to support a diversity of wildlife, recreational interests, and water quality. The Arabia Mountain National Heritage Area, located in DeKalb, Rockdale, and Henry counties, offers a unique combination of natural, cultural, and historic resources. The Heritage Area includes a concentration of granite outcrops, limited to Georgia's Piedmont physiographic province and which provide unique habitats for a variety of native plant species. Unique resources within the Heritage Area include Panola Mountain SP, Davidson-Arabia Mountain Nature Preserve, and the Monastery of the Holy Spirit.

Three Rivers RC Regional Plan 2019-2039

The Three Rivers Regional Plan (TRRC 2019), applicable to Butts County on the west side of the Project, identifies the Ocmulgee River as a RIR due to its environmentally sensitive resources, although it is not among areas identified as requiring special attention. TRRC (2012) has also identified Lake Jackson as a RIR for its boating, fishing, water sports, natural beauty, and wildlife habitat. Regionally important conservation areas within the Ocmulgee River basin include Indian Springs SP and High Falls SP (a portion), located 10 miles and 18 miles southwest of the Project, respectively (TRRC 2019). These parks provide recreational opportunities that include camping, picnicking, a museum, hiking, and scenic views.

Northeast Georgia Regional Plan

The Northeast Georgia Regional Plan and Resource Management Plan (NEGRC 2018a, 2018b) apply to Jasper and Newton counties on the northern and eastern sides of the Project. The following RIRs categorized as natural and recreational resources are located in Newton and Jasper Counties:

- Alcovy River Greenway – the river and floodplain upstream of Lake Jackson providing a recreational resource to hunters, hikers, and campers.
- Factory Shoals Park – a county park on the Alcovy River just upstream of Lake Jackson featuring granite shoals, a preserved river corridor, and opportunities for kayaking, canoeing, hiking, picnicking, and fishing.
- Georgia FFA-FCCLA Center – a 500-acre recreational youth camp on the Alcovy River embayment of Lake Jackson, owned by the State of Georgia, and which has grown into a nationally recognized educational center.
- Big Haynes Creek and Little Haynes Creek – tributaries of the Yellow River upstream of Lake Jackson providing important wildlife habitat and containing wetland and groundwater recharge areas important to drinking water supply.
- South River – the river corridor upstream of Lake Jackson providing natural habitat in a developed area and an important resource for fishing, boating, space for trails, and greenspace.
- Yellow River – the river corridor upstream of Lake Jackson providing natural habitat in a developed area, including habitat for rare plant species found on granite outcrops, and an important resource for fishing, boating, trails, white-water rapids, and greenspace.

4.3.6.2 ENVIRONMENTAL IMPACTS AND RECOMMENDATIONS

Recreation Improvements

Georgia Power identified potential recreation enhancements throughout the relicensing process in agency and stakeholder meetings during scoping, study planning, study results meetings, the PLP meeting, and recreation user surveys at Project recreation areas in 2019 and 2021. Georgia Power proposes to further improve recreational access and facilities by working with GDNR and local stakeholders to implement the following measures, which are illustrated conceptually in Figures 10 through 12:

- Lloyd Shoals Park – relocate the existing boat ramp to the Jane Lofton Public Access Area (additional amenities at Jane Lofton Access Area are described below). The existing boat ramp at Lloyd Shoals Park will be converted to a non-motorized boat (canoe/kayak) step-down ramp. The existing courtesy dock will be replaced with a barrier-free fishing pier that extends approximately 20 ft farther into the reservoir than the existing pier. Existing parking will be restriped to accommodate vehicle-only spaces. New barrier-free parking will be constructed adjacent to the new fishing pier. The existing restroom and bath house will be updated with new facilities.
- Jane Lofton Public Access Area – The proposed boat ramp will be constructed in the cove, southwest of the auxiliary spillway. The existing gravel parking area will be expanded, paved, and delineated to accommodate approximately 20 vehicles with trailers.

Trees will be cleared to accommodate the expanded parking area. A paved turn-around from the boat ramp will be constructed. A proposed wharf-style, barrier-free fishing pier will also be constructed to the west of the proposed boat ramp. Approximately three new barrier-free parking spaces will be constructed to access the new fishing pier. A new concrete-lined vault toilet will be installed. Utilities including electricity, lighting, and water will also be added. A new road will be constructed to access existing lease lots separately from the park. Protection and enhancement measures for the existing cultural site will be installed on the southwest side of the existing gravel parking area. All improvements will be constructed within the existing project boundary.

- Ocmulgee River Park – existing picnic tables will be relocated closer to the existing parking area. The existing parking area will be redefined and paved. One concrete-lined vault toilet will be installed. The existing boat ramp will be rehabilitated. Landscaping with boulders will be installed along the shoreline to discourage parking in this area. All improvements will be constructed within the existing project boundary.
- Tailrace Fishing Pier – no new enhancements are proposed; however, maintenance on the existing pier will be conducted and additional trash cans will be installed.
- Hwy 36 Bridge at Tussahaw Creek – this site will be formalized and named the Hendricks Mill Public Access Area. A new access road and small gravel parking area, to include no more than 10 spaces, will be constructed off of Winding Way, located adjacent to Hwy 36. One picnic table and one trash can will be installed. Georgia Power will work with the Georgia Department of Transportation (GDOT) to close access to the existing informal parking area, which is located in a GDOT right-of-way. A formal path leading to a step-down ramp for paddling access will be constructed at the shoreline west of the Hwy 36 Bridge. Bank fishing access will continue to be available at the site. Existing erosion and high-use impacts will be addressed. Georgia Power land containing the access road, parking, and path will be added to the project boundary. The final acreage proposed for addition will be provided in Exhibit E of the license application.

Reservoir Shoreline Management

Georgia Power proposes to develop a Shoreline Management Plan (SMP) in accordance with its current Shoreline Management Guidelines for Georgia Power Lakes to manage the Lake Jackson shoreline. The proposed SMP would include the Small Dredging Permit Program, as described in Section 4.3.1.1. The proposed SMP would continue to promote the maintenance of vegetative buffers around the reservoir to protect water quality, aquatic habitat, and cultural and aesthetic resources. The SMP would provide guidance to adjacent residents on permitting and constructing shoreline structures in a manner that preserves and enhances the scenic, recreational, and environmental values of the reservoir, as well as maintaining compatibility with overall recreational uses of the reservoir.

The SMP would list specific Lake Jackson requirements and restrictions for constructing seawalls, docks, wharves, boat slips, boat lifts and personal watercraft lifts. The requirements, which are currently included in Georgia Power's Shoreline Management Guidelines for Georgia Power Lakes, minimize shoreline disturbance from tree removal, mechanical clearing, and other activities to protect the 25-ft vegetative buffer surrounding the lake. Georgia Power currently manages and proposes to continue managing the shoreline according to the applicable license articles, U.S. Army Corps of Engineers programmatic general permits, and state and local regulations.

Construction of Proposed Enhancement Measures

Construction of the proposed recreation enhancements and construction of the proposed shoreline stabilization measures (Section 4.3.6.2) could cause temporary disturbances due to noise and limited recreation access at the project recreation facilities; however, to the extent practical, construction would occur during the fall and winter when recreation use is lowest. Georgia Power proposes to perform all construction work in accordance with its proposed SMP, described above, to minimize impacts to environmental resources, including water quality and historic properties, near the construction projects. These minor, temporary disturbances, particularly the infrastructure improvements, installation of new restrooms, and relocation of the boat ramp to the Jane Lofton Public Access Area, could affect existing vegetation and local water quality; however, implementation of proper sedimentation and erosion control BMPs and restoration practices during and immediately following construction would minimize these impacts.

Unavoidable Adverse Impacts

Formalization, including associated construction, of the Hwy 36 Bridge at Tussahaw Creek into the Hendricks Mill Public Access Area would permanently change the use of minor amounts of land within the project boundary and add a small amount of land to the project boundary.

Construction of the new boat ramp and fishing pier at the Jane Lofton Public Access Area would result in permanent clearing of approximately 2 acres of trees in a mixed pine/hardwood forest community. BMPs, consultation with FWS, and consultation with the Georgia State Historic Preservation Officer (SHPO) through the HPMP would minimize impacts to water quality, wildlife habitat, and cultural resources.

4.3.7 AESTHETIC RESOURCES

4.3.7.1 AFFECTED ENVIRONMENT

The Project's public access points offer diverse views of the project impoundment, shorelines, and tailrace areas. Georgia Power's Shoreline Management Guidelines help to protect the vegetative buffer surrounding Lake Jackson and preserve and enhance the aesthetic value of the reservoir.

Generally, the central and southern portions of Lake Jackson downstream of Hwy 36 and Hwy 212 provide the most developed views, including low-density residential, marinas, commercial areas, and various public and private recreation access areas. The shoreline vegetative buffer zone in these parts of the reservoir includes a mix of landscaped, landscaped-natural, and natural conditions. Isolated stretches of undeveloped, forested shoreline occur along Tussahaw Creek and the South and Yellow River embayments. Viewsheds include Lloyd Shoals Dam, low-density residential beyond the shoreline, boat ramps, public marinas, commercial areas, and private and public recreational access areas, and roadway crossings.

The portions of Lake Jackson along Tussahaw Creek and the South and Yellow Rivers upstream of Hwys 36 and 212 provide the most rural and undeveloped views, including significant stretches of undeveloped shoreline. The shoreline vegetative buffer zone in these parts of the reservoir include a mix of landscaped-natural and natural conditions. Viewsheds in these parts include forested, agricultural, silvicultural, and low-density residential land uses beyond the shoreline.

There are various public access points around Lake Jackson that show various degrees of development. Viewsheds from throughout the reservoir show a variety of development from undeveloped at the shoreline to residential areas and public access points such as picnic areas and boat ramps. Viewsheds from various locations around the reservoir are shown in Figures 13 through 15.

4.3.7.2 ENVIRONMENTAL IMPACTS AND RECOMMENDATIONS

Georgia Power's proposed operation and proposed shoreline protection would not adversely affect aesthetic resources within the project boundary. Georgia Power is proposing to modify some existing recreation sites and construct new recreation sites causing short-term, localized impacts

to aesthetic resources. Adverse impacts should only last during the active construction period. Aesthetics will be considered during design and landscaping of new recreation sites.

Unavoidable Adverse Impacts

No unavoidable adverse impacts are anticipated.

4.3.8 CULTURAL RESOURCES

4.3.8.1 AFFECTED ENVIRONMENT

Georgia Power assessed the historic hydro-engineering resources of the Lloyd Shoals Project to document the existing conditions of the hydropower facility and its support buildings (TRC 2020a). The purpose of this assessment was to survey the Project works to evaluate their eligibility for listing on the National Register of Historic Places (NRHP) and assess the potential for effects on them by continued operation under the new license.

The assessment, conducted by TRC through background research and field survey, found that the Project retains good integrity. TRC recommends that the Project is eligible for listing in the NRHP under Criterion A for its significance in the history of hydroelectric development in Georgia and under Criterion C as a distinctive example of an early-twentieth century hydroelectric dam. Georgia Power is not planning any rehabilitations, alterations, or demolitions of structures or buildings within the Lloyd Shoals Hydroelectric Project boundary as part of relicensing. Therefore, TRC found there will be no effect to historic properties as a result of the issuance of a new FERC license for the Project (TRC 2020a).

Georgia Power also conducted an archaeological assessment at six previously recorded sites at the Lloyd Shoals Project (Table 13). All sites are historic and associated with the construction and operation of the Project and were occupied from ca. 1910 to ca. 1967 (TRC 2020b). Four sites are located at the Lloyd Shoals Park on Lake Jackson and two other sites were inundated when Lake Jackson was created. These two sites were inundated when the study was conducted and thus could not be reevaluated. All six sites were recommended eligible for the NRHP in 1989 and are currently being monitored by Georgia Power.

Based on the results of the field work, TRC recommends continuation of preservation and monitoring for Sites 9BS17, 9BS18, and 9BS20. Site 9BS19 has lost integrity and is therefore

recommended as not eligible for the NRHP. The site was documented in 1989 as a construction area of unknown function and was graded down to subsoil prior to the 1989 assessment. The site holds little information potential and is recommended for removal from the Georgia Power monitoring list. Sites 9BS23 and 9JA223 were inundated at the time of survey and are recommended for evaluation during a lake drawdown period (TRC 2020b).

4.3.8.2 ENVIRONMENTAL IMPACTS AND RECOMMENDATIONS

Georgia Power proposes to implement a Historic Properties Management Plan (HPMP) through a Programmatic Agreement to assure the preservation and long-term management of archaeological sites and historic buildings and structures within the project boundary. The HPMP would be implemented through a Programmatic Agreement between FERC, the SHPO, the Advisory Council on Historic Preservation, and the Tribes and would provide specific protocols and procedures for monitoring recorded resources, as well as dealing with any future discoveries on project lands. The HPMP would also provide a list of categorical exclusions for certain safety and maintenance procedures that are a necessary component of operating a power generating facility.

In addition, Georgia Power is proposing to relocate the existing boat ramp at Lloyd Shoals Park to the current Jane Lofton Public Access Area. Several of the NRHP-eligible archaeological sites associated with the construction village are located in this area. Georgia Power will avoid and/or mitigate for any disruption of these sites in accordance with the HPMP developed for the Project. In addition, Georgia Power is proposing to install cultural resources interpretive signage along Dam Road in the vicinity of Lloyd Shoals Park. This signage would provide public education on the Lloyd Shoals Construction and Operator's Village.

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TABLE 1 NAME PLATE GENERATING CAPACITY AND HYDRAULIC CAPACITY OF THE LLOYD SHOALS TURBINE UNITS

Unit	Nameplate Rating of Turbines^a (hp)	Nameplate Capacity of Generators (MW)	Maximum Hydraulic Capacity^b (cfs)	Efficient/Best-Gate Hydraulic Capacity^b (cfs)
1	5,650	3	620	410
2	5,650	4	620	410
3	5,650	3	620	410
4	5,650	3	620	410
5	5,650	3	620	410
6	5,650	3	620	410
Total	33,900	19	3,720	2,460

Source: Southern Company Generation Hydro Services

^a At 96.8 ft net head during unit rating.

^b At estimated 105 ft net head with full pool and normal tailrace conditions.

TABLE 2 TURBINE CHARACTERISTICS OF THE LLOYD SHOALS POWERHOUSE

Unit	Turbine Type	Turbine Arrangement	Unit Hydraulic Capacity (cfs)	Net Head (ft)	Number of Runners	Turbine Operating Speed (rpm)	Runner Diameter (inches)	Number of Blades per Runner	Runner Diameter at Inlet (inches)	Blade Spacing at Inlet (inches)	Runner Diameter at Discharge (inches)	Peripheral Runner Velocity (fps)
1	Francis	Horizontal double runner	600	96.8	2	300	52.38	17	44.82	8.28	50.28	68.62
2	Francis	Horizontal double runner	600	96.8	2	300	52.38	17	44.82	8.28	50.28	68.62
3	Francis	Horizontal double runner	600	96.8	2	300	52.38	17	44.82	8.28	50.28	68.62
4	Francis	Horizontal double runner	600	96.8	2	300	52.38	17	44.82	8.28	50.28	68.62
5	Francis	Horizontal double runner	600	96.8	2	300	54.5	17	49.16	9.09	52.28	71.40
6	Francis	Horizontal double runner	600	96.8	2	300	54.5	17	49.12	9.08	52.28	71.40

Source: Southern Company Generation Hydro Services

TABLE 3 MINIMUM, AVERAGE, AND MAXIMUM MONTHLY FLOWS IN THE OCMULGEE RIVER BELOW LLOYD SHOALS DAM FROM 1999 - 2018

MONTH	MINIMUM FLOW (CFS)	AVERAGE FLOW (CFS)	MAXIMUM FLOW (CFS)
January	888	2,001	5,688
February	951	2,437	4,635
March	944	2,578	5,586
April	632	2,108	4,642
May	443	1,608	7,038
June	275	1,356	3,628
July	339	1,450	6,677
August	321	953	2,925
September	241	1,120	4,899
October	277	953	3,329
November	259	1,481	4,925
December	513	2,291	8,188

Source: USGS (2020)

TABLE 4 FISHES KNOWN TO OCCUR IN THE VICINITY OF THE LLOYD SHOALS PROJECT BASED ON HISTORICAL AND RECENT RECORDS

Family/Scientific Name	Common Name	Lake Jackson	Tributaries to Lake Jackson				Ocmulgee River to Juliette Dam
			South River	Yellow River	Alcovy River	Tusahaw Creek	
GARS:							
<i>Lepisosteus osseus</i>	Longnose Gar	X		X	X	X	X
FRESHWATER EELS:							
<i>Anguilla rostrata</i>	American Eel		X		X	X	X
HERRINGS AND SHADS:							
<i>Alosa sapidissima</i>	American Shad						X
<i>Dorosoma cepedianum</i>	Gizzard Shad	X	X	X	X	X	X
<i>Dorosoma petenense</i>	Threadfin Shad ^a	X	X	X	X	X	X
MINNOWS:							
<i>Campostoma pauciradii</i>	Bluefin Stoneroller						X
<i>Cyprinella callisema</i>	Ocmulgee Shiner		X	X	X	X	X
<i>Cyprinella lutrensis</i>	Red Shiner ^a		X				
<i>Cyprinella xaenura</i>	Altamaha Shiner ^b		X	X	X	X	X
<i>Cyprinus carpio</i>	Common Carp ^a	X	X		X	X	X
<i>Hybognathus regius</i>	Eastern Silvery Minnow						X
<i>Hybopsis rubrifrons</i>	Rosyface Chub		X	X	X	X	X
<i>Nocomis leptcephalus</i>	Bluehead Chub		X	X	X	X	X
<i>Notemigonus crysoleucas</i>	Golden Shiner	X	X	X	X	X	X
<i>Notropis amplamalma</i>	Longjaw Minnow		X		X	X	X
<i>Notropis hudsonius</i>	Spottail Shiner	X	X	X	X	X	X
<i>Notropis longirostrus</i>	Longnose Shiner					X	
<i>Notropis lutipinnis</i>	Yellowfin Shiner		X	X	X	X	X
<i>Notropis petersoni</i>	Coastal Shiner				X		X
<i>Notropis texanus</i>	Weed Shiner					X	
<i>Opsoeodus emiliae</i>	Pugnose Minnow						X

Family/Scientific Name	Common Name	Lake Jackson	Tributaries to Lake Jackson				Ocmulgee River to Juliette Dam
			South River	Yellow River	Alcovy River	Tussehaw Creek	
SUCKERS:							
<i>Carpoides sp. cf. cyprinus</i>	Quillback	X					X
<i>Carpoides sp. cf. vellifer</i>	Highfin Carpsucker						X
<i>Erimyzon oblongus</i>	Creek Chubsucker		X			X	X
<i>Minytrema melanops</i>	Spotted Sucker	X				X	X
<i>Moxostoma collapsum</i>	Notchlip Redhorse		X	X	X	X	X
<i>Moxostoma robustum</i>	Robust Redhorse ^c						X
<i>Moxostoma rupiscartes</i>	Striped Jumprock		X	X	X	X	X
<i>Moxostoma sp. cf. lachneri</i>	Brassy Jumprock		X	X			X
CATFISHES:							
<i>Ameiurus brunneus</i>	Snail Bullhead	X	X	X	X	X	X
<i>Ameiurus catus</i>	White Catfish	X	X	X	X	X	X
<i>Ameiurus natalis</i>	Yellow Bullhead	X	X	X	X	X	X
<i>Ameiurus nebulosus</i>	Brown Bullhead	X	X	X	X	X	X
<i>Ameiurus platycephalus</i>	Flat Bullhead	X					X
<i>Ictalurus furcatus</i>	Blue Catfish ^a	X			X	X	
<i>Ictalurus punctatus</i>	Channel Catfish	X	X	X	X	X	X
<i>Noturus insignis</i>	Margined Madtom		X	X	X	X	X
<i>Noturus leptacanthus</i>	Speckled Madtom		X			X	X
<i>Pylodictus olivaris</i>	Flathead Catfish ^a	X					X
PIKES:							
<i>Esox americanus</i>	Redfin Pickerel					X	X
<i>Esox niger</i>	Chain Pickerel	X	X	X	X	X	X
LIVEBEARERS:							
<i>Gambusia holbrooki</i>	Eastern Mosquitofish	X	X	X	X	X	X
TEMPERATE BASSES:							
<i>Morone chrysops</i>	White Bass ^a	X			X	X	X
<i>Morone saxatilis</i>	Striped Bass	X					X
<i>Morone chrysops</i> x <i>M. saxatilis</i>	hybrid bass	X	X	X	X	X	X

Family/Scientific Name	Common Name	Lake Jackson	Tributaries to Lake Jackson				Ocmulgee River to Juliette Dam
			South River	Yellow River	Alcovy River	Tussahaw Creek	
SILVERSIDES:							
<i>Labidesthes sicculus</i>	Brook Silverside	X					
SUNFISHES:							
<i>Centrarchus macropterus</i>	Flier						X
<i>Lepomis auritus</i>	Redbreast Sunfish	X	X	X	X	X	X
<i>Lepomis cyanellus</i>	Green Sunfish ^a	X	X	X	X	X	X
<i>Lepomis gulosus</i>	Warmouth	X	X	X	X	X	X
<i>Lepomis macrochirus</i>	Bluegill	X	X	X	X	X	X
<i>Lepomis marginatus</i>	Dollar Sunfish	X					X
<i>Lepomis megalotis</i>	Longear Sunfish ^a	X				X	X
<i>Lepomis microlophus</i>	Redear Sunfish	X	X	X	X	X	X
<i>Micropterus cataractae</i>	Shoal Bass ^a						X
<i>Micropterus punctulatus</i>	Spotted Bass ^a	X					X
<i>Micropterus salmoides</i>	Largemouth Bass	X	X	X	X	X	X
<i>Micropterus sp. cf. coosae</i>	Redeye Bass					X	X
<i>Micropterus sp.</i>	Altamaha Bass						X
<i>Pomoxis annularis</i>	White Crappie ^a	X	X	X			X
<i>Pomoxis nigromaculatus</i>	Black Crappie	X	X	X	X	X	X
PERCHES:							
<i>Perca flavescens</i>	Yellow Perch ^a	X	X	X	X	X	X
<i>Percina nigrofasciata</i>	Blackbanded Darter						X
<i>Etheostoma hopkinsi</i>	Christmas Darter						X
<i>Etheostoma inscriptum</i>	Turquoise Darter		X		X	X	X
<i>Etheostoma olmstedi</i>	Tessellated Darter						X
<i>Etheostoma parvipinne</i>	Goldstripe Darter						X
Estimated Number of Taxa		34	37	31	36	43	61

Data sources: EA (1990a, 1990b, 1990c); Straight et al. (2009); GDNR (2018a, 2018b); Bart et al. (1994); Grabowski and Jennings (2009); Nuckols and Roghair (2004); Pruitt (2013); Lee et al. (1980).

^a Introduced, non-native to the Altamaha River basin (GEPD 2003; Bart et al. 1994; Lee et al. 1980).

^b Altamaha Shiner is Georgia state-listed as threatened.

^c Robust Redhorse is Georgia state-listed as endangered and is under review for federal listing.

TABLE 5 SUMMARY OF 2019-2020 FRESHWATER MUSSEL SURVEY RESULTS FOR LAKE JACKSON AND THE OCMULGEE RIVER DOWNSTREAM

Scientific Name	Common Name	Number of Mussels	Relative Abundance (Percent)	Frequency of Occurrence (Percent) ^a
Lake Jackson:				
<i>Elliptio hopetonensis</i>	Altamaha Slabshell	205	45.9	46.7
<i>Pyganodon gibbosa</i>	Inflated Floater	175	39.1	81.8
<i>Utterbackia imbecillus</i>	Paper Pondshell	63	14.1	70.0
<i>Pyganodon cataracta</i>	Eastern Floater	2	0.4	6.7
<i>Toxolasma pullus</i>	Savannah Lilliput ^b	1	0.2	3.3
<i>Alasmidonta arcula</i>	Altamaha Arcmussel ^b	1 ^c	0.2	3.3
		447		
Ocmulgee River, Lloyd Shoals Tailrace Area:				
<i>Elliptio hopetonensis</i>	Altamaha Slabshell	335	63.4	95.0
<i>Pyganodon cataracta</i>	Eastern Floater	96	18.2	75.0
<i>Utterbackia imbecillus</i>	Paper Pondshell	61	11.6	65.0
<i>Pyganodon gibbosa</i>	Inflated Floater	29	5.5	25.0
<i>Elliptio icterina</i>	Variable Spike	6	1.1	20.0
<i>Lampsilis splendida</i>	Rayed Pink Fatmucket	1	0.2	5.0
		528		
Ocmulgee River, Hwy 16 Bridge to Juliette Dam:				
<i>Elliptio hopetonensis</i>	Altamaha Slabshell	398	85.0	100.0
<i>Utterbackia imbecillus</i>	Paper Pondshell	47	10.0	20.0
<i>Elliptio icterina</i>	Variable Spike	12	2.7	30.0
<i>Pyganodon gibbosa</i>	Inflated Floater	11	2.4	20.0
		468		

Sources: GDNR (2019), Rowe (2021)

^a Frequency of occurrence is the proportion of surveyed sites where the species was found.

^b Georgia threatened species.

^c Relict (dead) shell only.

TABLE 6 RARE, THREATENED, AND ENDANGERED SPECIES POTENTIALLY OCCURRING IN THE LLOYDS SHOALS PROJECT VICINITY

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
PLANTS:						
<i>Gratiola amphiantha</i> (= <i>Amphianthus pusillus</i>)	Little Amphianthus (Pool Sprite)	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	Upland seepage swamp openings over Iredell soils; wet meadows.	Jasper
<i>Carex seorsa</i>	Weak Stellate Sedge			G5	Moist depressions in forests and deciduous swamps; water tupelo swamps.	Newton
<i>Cyperus lupulinus</i> ssp. <i>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>	Small-headed Pipewort (Dwarf Hatpins)	UR	E	G2	Seepage areas and wet depressions on Piedmont 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
<i>Gratiola graniticola</i>	Granite Hedge-hyssop			G3	Restricted to ephemeral vernal pools on granite outcrops.	Butts, Newton

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
<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>Ptilimnium costatum</i>	Eastern Bishopweed			G4	Remnant wet prairies, bottomland hardwood forests.	Jasper
<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 (Dwarf 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			G1	Dry woods and barrens; mix of native grasslands and oak savannah).	Jasper
<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

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
<i>Verbesina helianthoides</i>	Hairy Wingstem			G5	Prairies, dry woods.	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
FRESHWATER MUSSELS:						
<i>Alasmidonta arcula</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>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
<i>Toxolasma pullus</i>	Savannah Lilliput		T	G2	Rivers to small creeks, lakes, and backwaters with mud or silty sand, often in very shallow water along banks	Newton
FRESHWATER SNAILS:						
<i>Elimia mutabilis</i>	Oak Elimia			G2Q	Medium-sized rivers on shoals in clear silt-free areas; downstream sides of boulders and outcrops in moderate to swift current.	Henry, Newton
<i>Somatogyrus alcoviensis</i>	Reverse Pebblesnail	UR		G1Q	Medium to small rivers in rapidly flowing water, on surfaces of gravel, cobble, boulder, bedrock, and vegetation.	Newton
CRAYFISH:						
<i>Cambarus howardi</i>	Chattahoochee Crayfish		T	G3Q	Clear, free-flowing waters in riffle habitat in small tributaries to large rivers.	Newton
FISH:						
<i>Cyprinella xaenura</i>	Altamaha Shiner		T	G2G3	Medium-sized streams and rivers in runs or 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

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
<i>Micropterus catarractae</i>	Shoal Bass			G3	Rocky riffles and pools of creeks and small to medium rivers; shoal areas of rivers and creeks.	Butts, Henry, Jasper
<i>Micropterus sp.</i>	Altamaha Bass			GNR	Upland streams, headwaters above Fall Line in Altamaha River basin.	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>Moxostoma sp. 4</i>	Brassy Jumprock			G4	Silty to rocky pools and slow runs of large creeks; small to medium rivers; impoundments.	Butts, Newton
<i>Notropis chalybaeus</i>	Ironcolor Shiner			G4	Coastal Plain streams and floodplain swamps with sandy substrate in clear well-vegetated water.	Jasper
AMPHIBIANS:						
<i>Hemidactylium scutatum</i>	Four-toed Salamander			G5	Under objects or among mosses in swamps, boggy streams, and wet areas near quite 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 rhombomaculata</i>	Mole Kingsnake			G5	Areas of soft soil, including abandoned or cultivated fields; adept burrowers and rarely encountered aboveground.	Henry, Jasper
BIRDS:						
<i>Dryobates borealis</i> (= <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>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

Scientific Name	Common Name	Federal Status ^b	Georgia Status ^c	Global Rank ^d	Habitat	County
<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>	Tricolored Bat	UR		G2G3	Open forests with large trees and woodland edges; roost in tree foliage; hibernate in caves or mines with high humidity.	Jasper

Sources: GDNR (2015, 2021b); FWS (2019); NatureServe (2021).

^a This list is for rare species with known element of occurrence records in Butts, Henry, Newton and Jasper Counties, Georgia; for rare aquatic species, the known element of occurrence records are from the Altamaha River basin within these four counties.

^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.

^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, and abundant; ? = inexact numeric rank; GNR = unranked – global rank not yet assessed.

TABLE 7 PERCENT MAXIMUM WEIGHTED USEABLE AREA BY SPECIES\LIFE-STAGE

Discharge (cfs)	Percent Maximum Weighted Useable Area by Species/Life-Stage												Overall Average
	Altamaha Shiner – YOY	Altamaha Shiner – adult	Redeye Bass – YOY	Redeye Bass – juvenile	Redeye Bass – adult	Redbreast Sunfish – spawn	Redbreast Sunfish – adult	Shoal bass – YOY	Shoal Bass – adult	Striped Jumprock – YOY	Striped Jumprock – adult	Silver Redhorse – adult	
50	52	48	90	65	39	84	67	93	41	98	45	39	63.4
75	65	57	94	70	46	90	74	98	47	99	53	47	70.0
100	71	64	97	73	53	93	77	98	54	99	61	52	74.3
125	77	70	98	77	58	96	82	100	58	100	66	57	78.3
150	81	76	99	80	63	98	84	99	62	99	71	60	81.0
175	84	80	100	83	67	99	87	98	67	98	75	64	83.5
200	86	83	100	84	71	100	89	96	70	96	79	67	85.1
250	91	88	99	87	75	100	92	92	76	90	85	72	87.3
300	95	92	98	90	77	100	93	88	82	84	90	77	88.8
350	97	96	96	94	82	98	95	86	87	81	92	80	90.3
400	99	98	94	95	86	97	97	82	91	75	95	83	91.0
450	100	97	91	96	89	96	98	77	93	69	97	85	90.7
600	97	100	83	100	94	87	100	65	97	54	99	91	88.9
800	93	97	74	100	98	78	100	52	100	39	100	99	85.8
1,000	83	92	66	98	100	69	98	42	97	27	97	99	80.7
1,300	72	82	56	93	96	59	90	31	90	20	91	100	73.3
1,500	64	75	51	87	93	54	85	26	86	17	87	99	68.7
2,000	43	60	40	71	83	45	68	19	74	14	74	89	56.7
2,500	31	49	32	57	74	40	49	15	59	11	62	74	46.1
3,500	20	33	21	34	55	31	29	11	41	8	39	50	31.0

Source: EA 1990a

Note: Highlighting indicates the current Lloyd Shoals minimum flow target of 400 cfs (or inflow whichever is less).

YOY = young-of-year.

TABLE 8 AMERICAN EEL CAPTURE DATA BY SAMPLING EVENT, SEPTEMBER 2019-JUNE 2021

Date	Moon (% visible)	Discharge (cfs)	Water Temp. (°C)	Total Eels Captured or Observed			
				Boat Electrofishing	Backpack Electrofishing	Traps	Flashlight Survey
9/27/2019	1.9	299	27.4	0	0	0 ³	NA
10/25/2019	9.3	493	20.8	1	1	0 ³	NA
11/26/2019	0.1	1,288	13.7	1	0	0 ³	NA
12/17/2019	69.9	2,870	10.2	0	NSF ¹	0 ³	NA
1/21/2020	11	3,565	13.6	7	NSF	0 ³	NA
3/12/2020	89.9	3,020	13.9	1	NSF	0	NA
4/10/2020	81.1	2,230	20.2	NSC ²	NSC	0	NA
5/29/2020	48.4	2,440	22.3	10	NSF	0	NA
6/24/2020	14.5	1,640	26.5	3	NSF	0	3
7/22/2020	5.7	658	28.2	7	26	1	1
8/12/2020	42.4	1,710	28.3	2	NSF	0	0
9/23/2020	49.0	2,640	22.8	2	0	0	0
10/2/2020	99.7	1,040	22.2	3	8	0	0
11/6/2020	71.8	1,070	19.7	NA	6	0	0
12/12/2020	5.9	1,110	14.3	NA	1	0	1
1/23/2021	78.6	1,150	11.8	NA	3	0	0
2/11/2021	0.2	1,930	12.9	3	3	0	0
3/12/2021	0.7	1,490	15.9	NA	3	0	1
4/20/2021	57.6	1,190	17.7	NA	24	0 ³	5
5/12/2021	0.8	2,290	20.3	NA	NA	0	8
5/26/2021	99.9	917	20.8	6	51	1	15
6/16/2021	37.1	783	23.4	NA	47	0	4
Total Eels Captured or Observed				46	173	2	38
Total Eels Captured				22	124	2	0
Recaptures				2	3	0	NA

Sources: Georgia Power (2021b); sampling results for May-June 2021 to be presented in August 2021 study report addendum.

¹NSF = not sampled due to high flows; ²NSC = not sampled due to COVID-19; ³Traps vandalized.

TABLE 9 COMPARISON OF AMERICAN EEL CAPTURE DATA TO PREVIOUS STUDY

Study Year(s)	Catch per Unit Effort (eels per hour)	
	1988 ^a	2019-2021 ^b
Backpack Electrofishing		
Spring	14.6	14.7
Summer	37.4	23.0
Fall	5.4	3.0
Winter	1.4	2.3
Boat Electrofishing		
Spring	--	2.3
Summer	1.4	2.0
Fall	--	0.5
Winter	0.6	1.5
Total Length (mm)		
Minimum	168	127
Maximum	825	635
Mean	343	327
Standard Deviation	95	102
Life Stages Present	Juveniles, adults	Juveniles, adults

^aSource: EA (1990b)

^bSource: Georgia Power (2021b); sampling results for May-June 2021.

TABLE 10 RECREATION FACILITIES PROVIDING ACCESS TO THE LLOYD SHOALS PROJECT

RECREATION SITE	COUNTY	ACREAGE	ADDRESS	AMENITIES
Georgia Power Owned and Operated Facilities (located within the 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, playground, pavilion, barrier-free fishing pier, restrooms, 2-lane barrier-free boat ramp, courtesy dock, 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	Jasper	4 acres	8484 Jackson Lake Rd, Monticello, GA 31064	15 parking spaces, 1-lane boat ramp, picnic/day use area, bank fishing
Jane Lofton Public Access Area ^a	Butts	0.7 acre	Hendricks Road near Dam Road/Power Plant Road, Jackson, GA 30233	Bank fishing, gravel parking area, trash can
Other Publicly or Privately Owned and Operated Facilities:				
Bear Creek Marina	Jasper		60 Bear Creek Marina Rd, Mansfield, GA 30055	50 parking spaces (with trailer slots), boat ramp, swimming, store, and restrooms with full service campground. Privately operated.
Berry's Boat Dock	Newton		330 Waters Bridge Cir, Covington, GA 30014	75 parking spaces (with trailer slots), boat ramp, restrooms, store, marina. Privately operated.
Factory Shoals Park	Newton		450 Newton Factory Bridge Road, Covington, 30014	200 parking spaces (without trailers), Alcovy River access. 450 acres, open area (signage limiting horses, etc.) picnicking, playground,

RECREATION SITE	COUNTY	ACREAGE	ADDRESS	AMENITIES
				swimming, hiking, fishing, restrooms. Operated by Newton County.
Georgia FFA-FCCLA Center	Newton		720 FFA FHA Camp Road, Covington, GA 30014	Canoeing & kayaking, swimming. 500-acre recreational youth camp and conference center owned by State of Georgia.
Martin's Marina (Lakeview Restaurant)	Jasper		8726 Jackson Lake Rd, Monticello, GA 31064	35 parking spaces (with trailer slots), full service campground, restrooms, boat ramps, marina, gas, food, store. Privately operated.
Reasor's Landing	Butts		278 Marina Cir, Jackson, GA 30233	50 estimated parking spaces (with trailer slots), Boat ramp, boat storage, gas, tackle, food, restaurant, restrooms, and mechanic. Privately operated.
Sandy's Highway 36 Marina	Butts		2571 GA-36, Jackson, GA 30233	Boat ramp. Privately operated.
Tussahaw Creek/Highway 36 Bridge	Butts		2088 GA-36, Jackson, GA 30233	Informal bank fishing, public access; undeveloped. Owned by Georgia Power.
Walker Marina	Newton		440 Lang Rd, Covington, GA 30014	Boat ramp, bank fishing. Privately operated.

^a Previously referred to as the Emergency Spillway South End Fishing Access.

TABLE 11 2019 LAKE JACKSON RECREATION USE VISITOR ASSESSMENT

FACILITIES	METHOD	TOTAL VISITORS
Lloyd Shoals Park	User Counts	33,579
Ocmulgee River Park	User Counts	5,982
Lloyd Shoals Tailrace Fishing Pier	User Counts	936
Non-Project Recreation Use	Estimates/Escalation	29,292
Annual Use Total		69,789
Annual Total – Daytime		68,393
Annual Total – Nighttime		1,396
Peak Weekend Average – Daytime		3,420
Peak Weekend Average - Nighttime		23

TABLE 12 FEDERAL OR STATE COMPREHENSIVE PLANS POTENTIALLY APPLICABLE TO PROJECT RECREATION OR LAND USE

COMPREHENSIVE PLAN	POTENTIALLY APPLICABLE (YES OR NO)
Atlantic States Marine Fisheries Commission. 1998. Amendment 1 to the Interstate Fishery Management Plan for Atlantic sturgeon (<i>Acipenser oxyrinchus oxyrinchus</i>). (Report No. 31). July 1998.	Yes
Atlantic States Marine Fisheries Commission. 1998. Interstate fishery management plan for Atlantic striped bass. (Report No. 34). January 1998.	Yes
Atlantic States Marine Fisheries Commission. 1999. Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. (Report No. 35). April 1999.	Yes
Atlantic States Marine Fisheries Commission. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9, 2000.	Yes
Atlantic States Marine Fisheries Commission. 2009. Amendment 2 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. May 2009.	Yes
Atlantic States Marine Fisheries Commission. 2010. Amendment 3 to the Interstate Fishery Management Plan for shad and river herring, Arlington, Virginia. February 2010.	Yes
Atlantic States Marine Fisheries Commission. 2000. Interstate Fishery Management Plan for American eel (<i>Anguilla rostrata</i>). (Report No. 36). April 2000.	Yes
Atlantic States Marine Fisheries Commission. 2008. Amendment 2 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. October 2008.	Yes

COMPREHENSIVE PLAN	POTENTIALLY APPLICABLE (YES OR NO)
Atlantic States Marine Fisheries Commission. 2013. Amendment 3 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. August 2013.	Yes
Atlantic States Marine Fisheries Commission. 2014. Amendment 4 to the Interstate Fishery Management Plan for American eel. Arlington, Virginia. October 2014.	Yes
Department of the Army, Corps of Engineers. Savannah District. 1985. South metropolitan Atlanta region: Georgia water resources management study. Savannah, Georgia. January 1985.	Yes
Department of the Army, Corps of Engineers. Savannah District. 1985. Water resources development by the U.S. Army Corps of Engineers in Georgia. Savannah, Georgia. January 1985.	Yes
Georgia Department of Natural Resources. 1985. Water availability and use - Ocmulgee River Basin. Atlanta, Georgia.	Yes
Georgia Department of Natural Resources. 1986. Water availability and use report - Altamaha River Basin. Atlanta	Yes
Georgia Department of Natural Resources. 2008. Georgia Statewide Comprehensive Outdoor Recreation Plan (SCORP): 2008-2013. Atlanta	Yes
Metropolitan North Georgia Water Planning District. 2003. Water supply and water conservation management plan. Atlanta, Georgia. September 2003.	Yes
Metropolitan North Georgia Water Planning District. 2003. Long-term wastewater management plan. Atlanta, Georgia. September 2003.	Yes
Metropolitan North Georgia Water Planning District. 2003. District-wide watershed management plan. Atlanta, Georgia. September 2003.	Yes
National Marine Fisheries Service. 1998. Final Recovery Plan for the shortnose sturgeon (<i>Acipenser brevirostrum</i>). Prepared by the Shortnose Sturgeon Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. December 1998.	Yes
National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993.	Yes
State of Georgia. Office of the Governor. 1987. Water resources management strategy-summary document. Atlanta, Georgia. January 12, 1987.	Yes
U.S. Fish and Wildlife Service. National Marine Fisheries Service. Georgia Department of Natural Resources. 2013. Priority restoration and management actions for the American Shad in the Altamaha River Basin, Georgia. Athens, Georgia. 2013.	Yes
U.S. Fish and Wildlife Service. No date. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.	Yes

Source: FERC (2021)

TABLE 13 NRHP ELIGIBLE SITES AT THE LLOYD SHOALS PROJECT

SITE	AREA	DESCRIPTION	1989 CONDITION	2019 CONDITION
9BS17	Lloyd Shoals Construction and Operator's Village	African American Housing area	Disturbed, foundations may be present	Little change in condition from 1989
9BS18	Lloyd Shoals Construction and Operator's Village	Construction Village, Numerous Features	Disturbed, foundations may be present	Little change in condition from 1989
9BS19 ^a	Lloyd Shoals Construction and Operator's Village	Landscape Feature, Construction Staging Pad	Disturbed to subsurface	Area covered by parking lot
9BS20	Lloyd Shoals Construction and Operator's Village	Plant Supervisor's Home Site	Disturbed, foundations may be present	Little change in condition from 1989
9BS23	Hendrick's Mill	Circa 1830-1910 Grist Mill	Partially submerged	Unknown
9JA223	Dempsey Ferry	Circa 1859 River Ferry	Submerged	Unknown

^a The cultural study recommended that this site be discontinued from Georgia Power monitoring (TRC 2020b).
Source: TRC 2020b

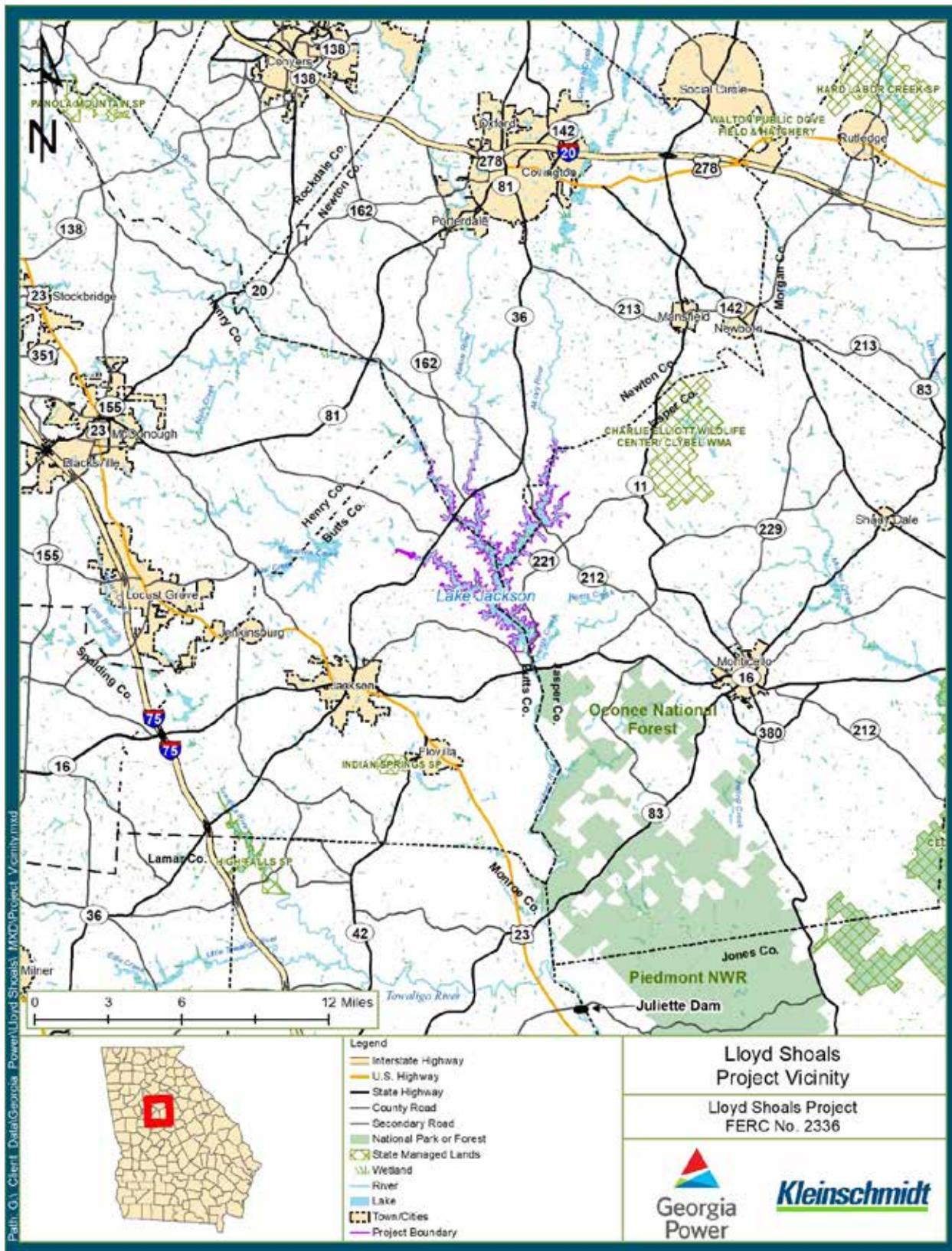


FIGURE 1 LLOYD SHOALS PROJECT VICINITY

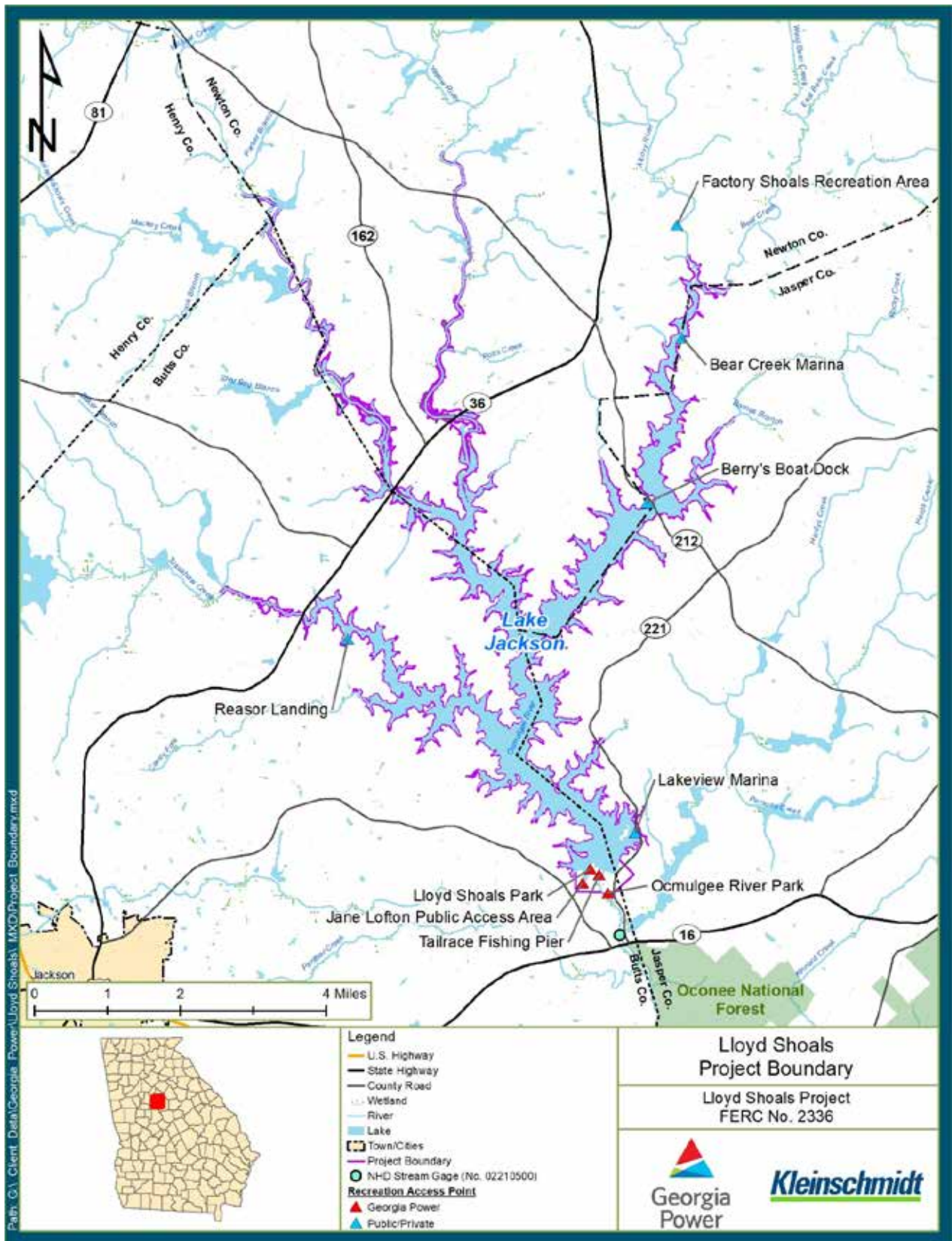


FIGURE 2 LLOYD SHOALS PROJECT BOUNDARY



FIGURE 3 LLOYD SHOALS PROJECT FACILITIES

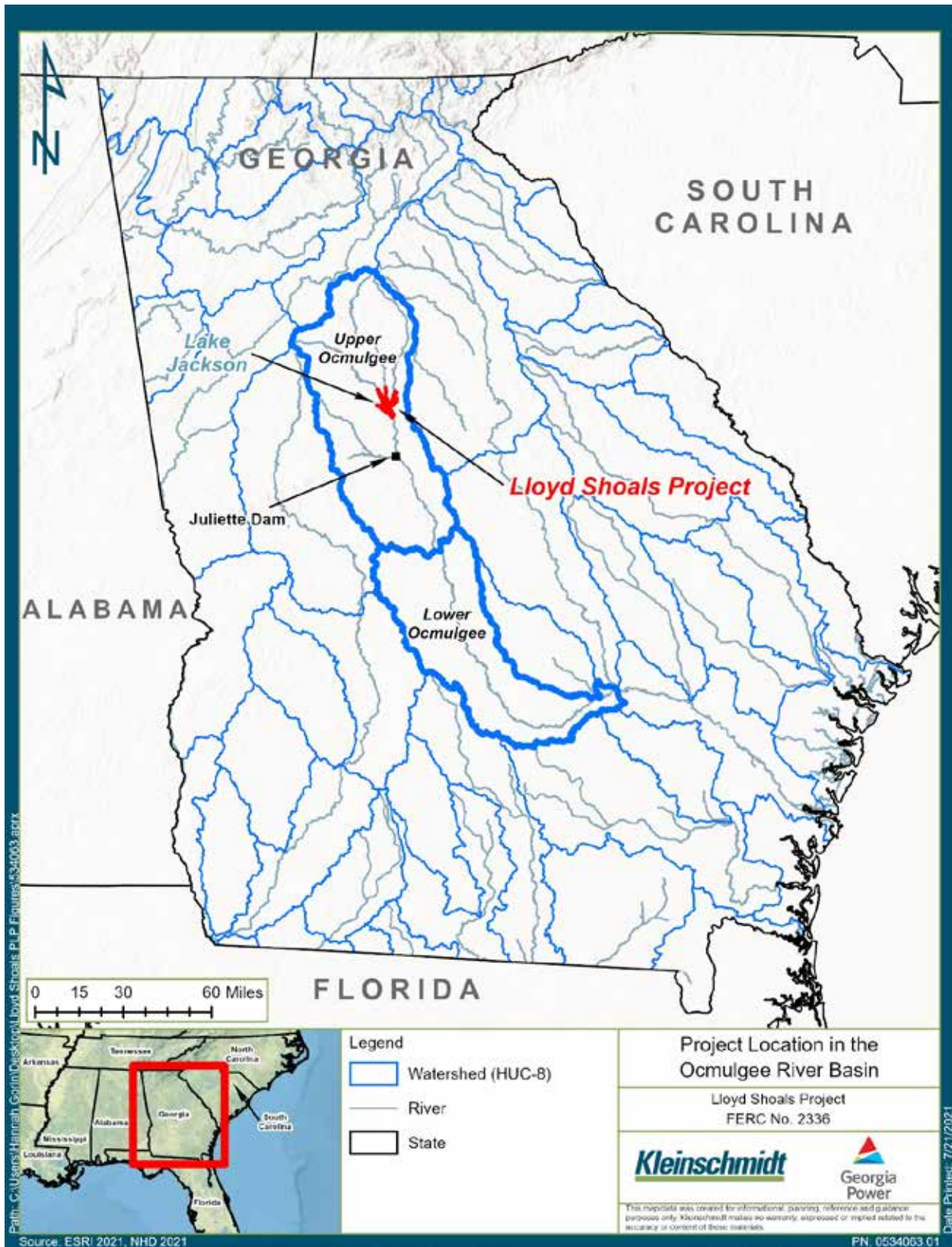
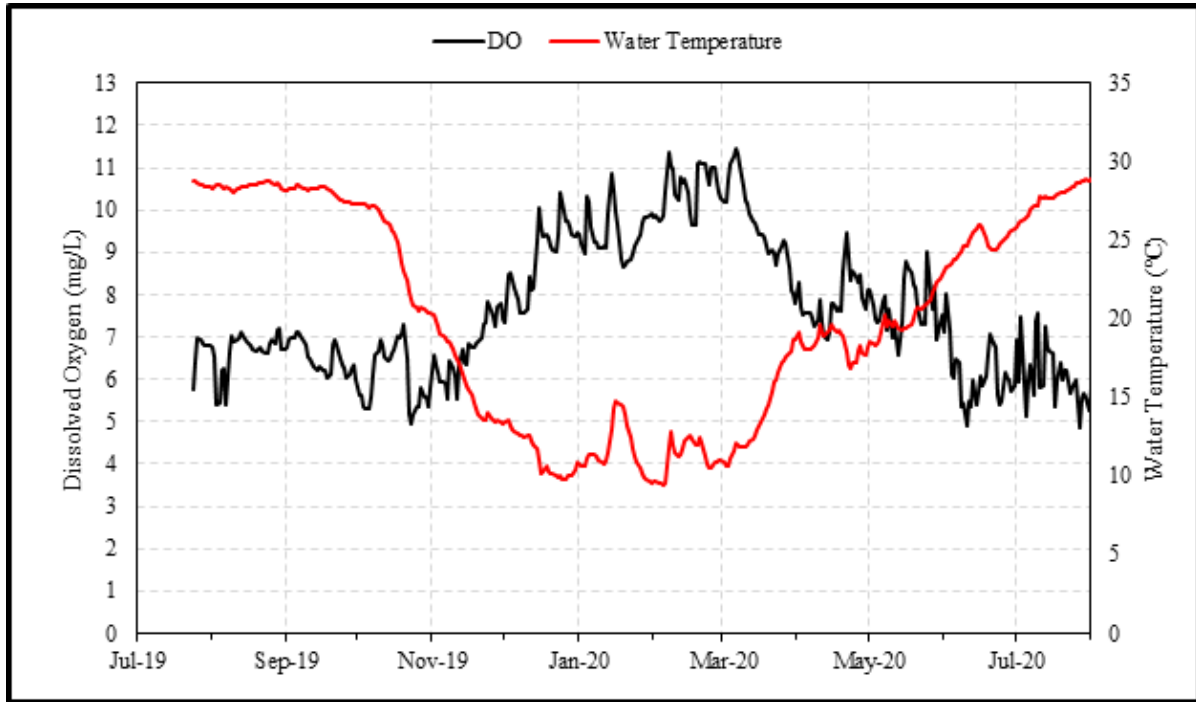
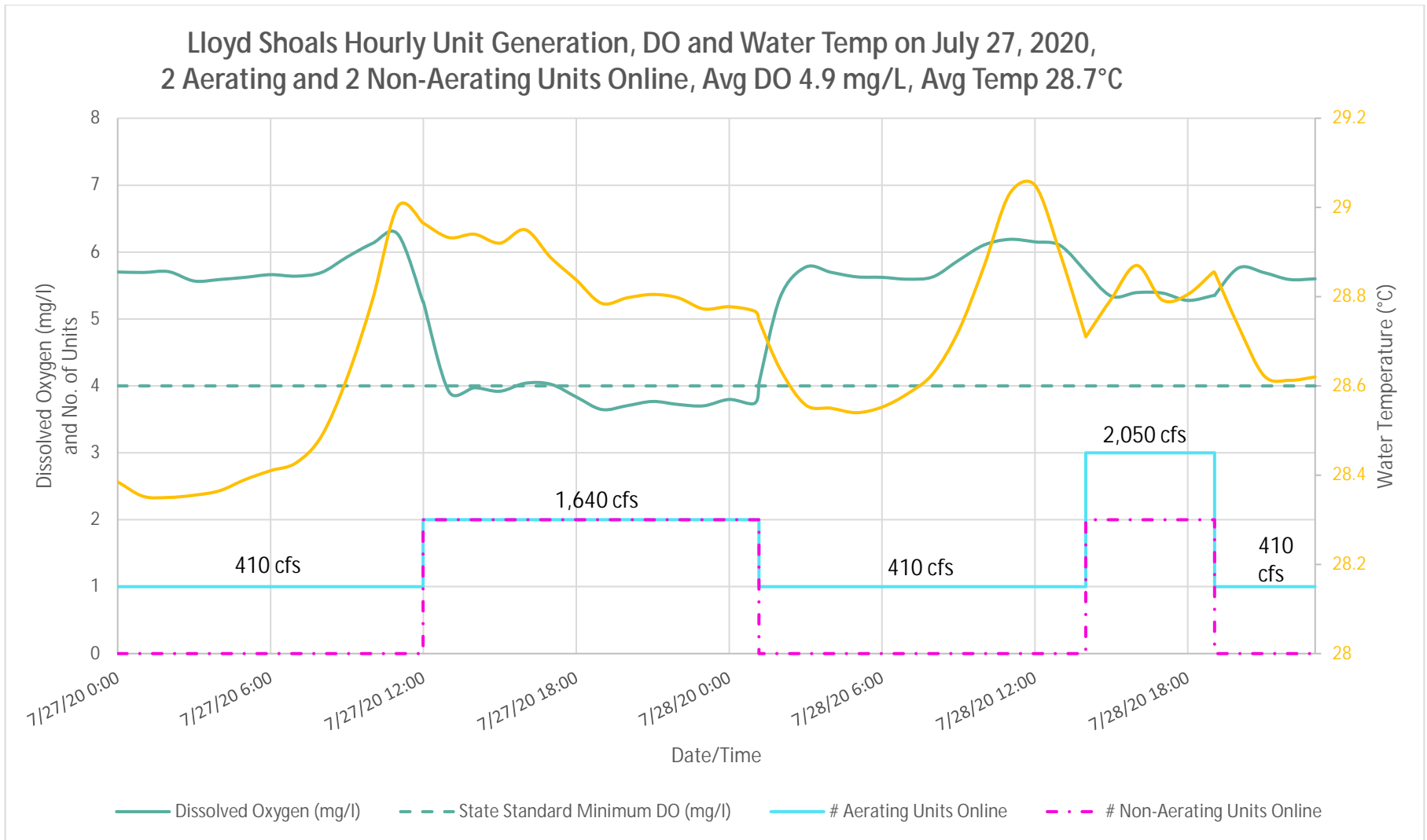


FIGURE 4 PROJECT LOCATION IN THE OCMULGEE RIVER BASIN



Source: Georgia Power

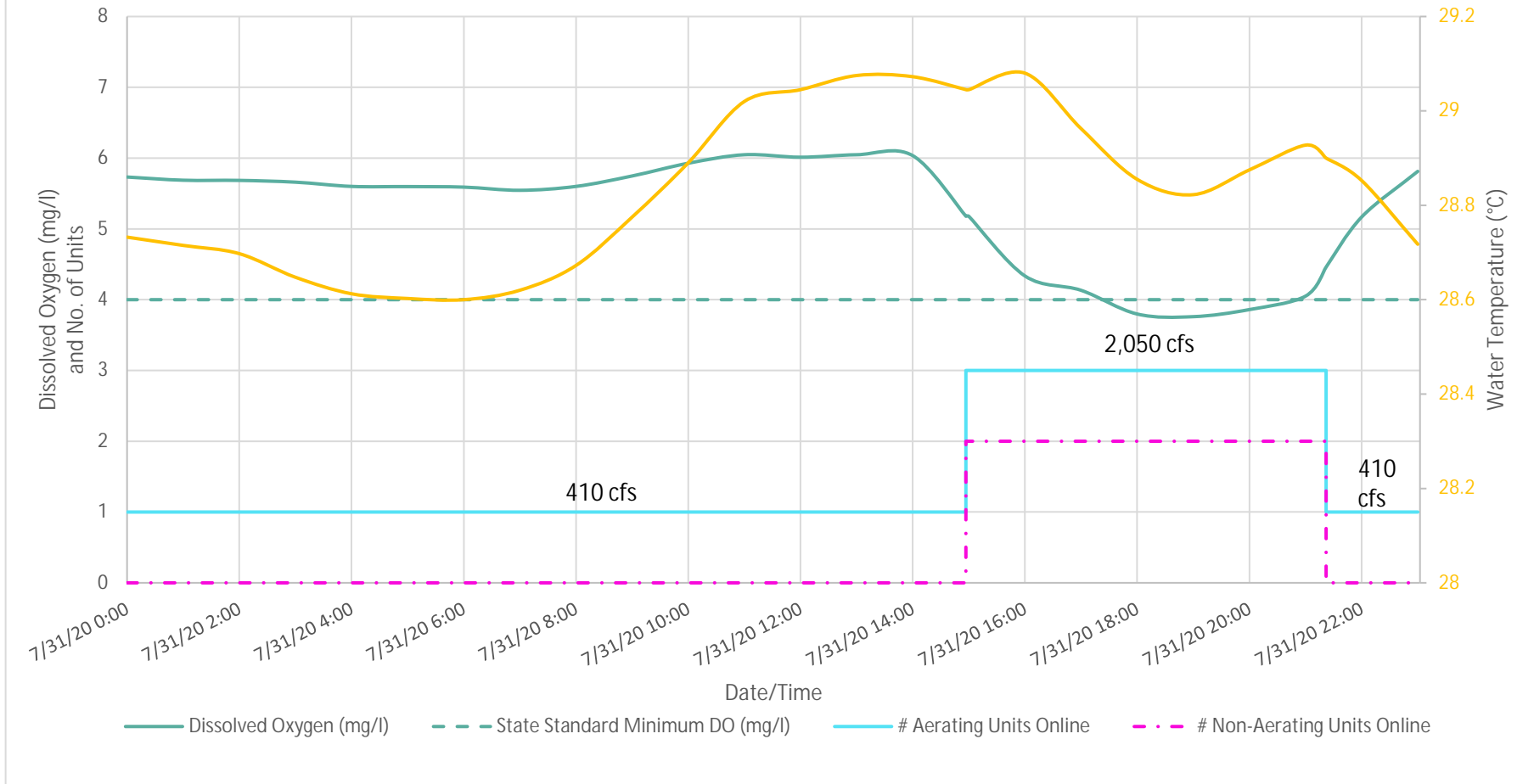
FIGURE 5 LINE PLOT OF DAILY AVERAGE DO AND WATER TEMPERATURE FROM TAILRACE MONITOR



Note: The flows on the graph are the best gate/full pool hydraulic capacities of the generating scenario and not measured flows.

FIGURE 6 CONDITIONS OF TAILRACE INSTANTANEOUS DISSOLVED OXYGEN EXCURSION ON JULY 27, 2020

Lloyd Shoals Hourly Unit Generation, DO and Water Temp on July 31, 2020,
3 Aerating and 2 Non-Aerating Units Online, Avg DO 5.3 mg/L, Avg Temp 28.8°C



Note: The flows on the graph are the best gate/full pool hydraulic capacities of the generating scenario and not measured flows.

FIGURE 7 CONDITIONS OF TAILRACE INSTANTANEOUS DISSOLVED OXYGEN EXCURSION ON JULY 31, 2020

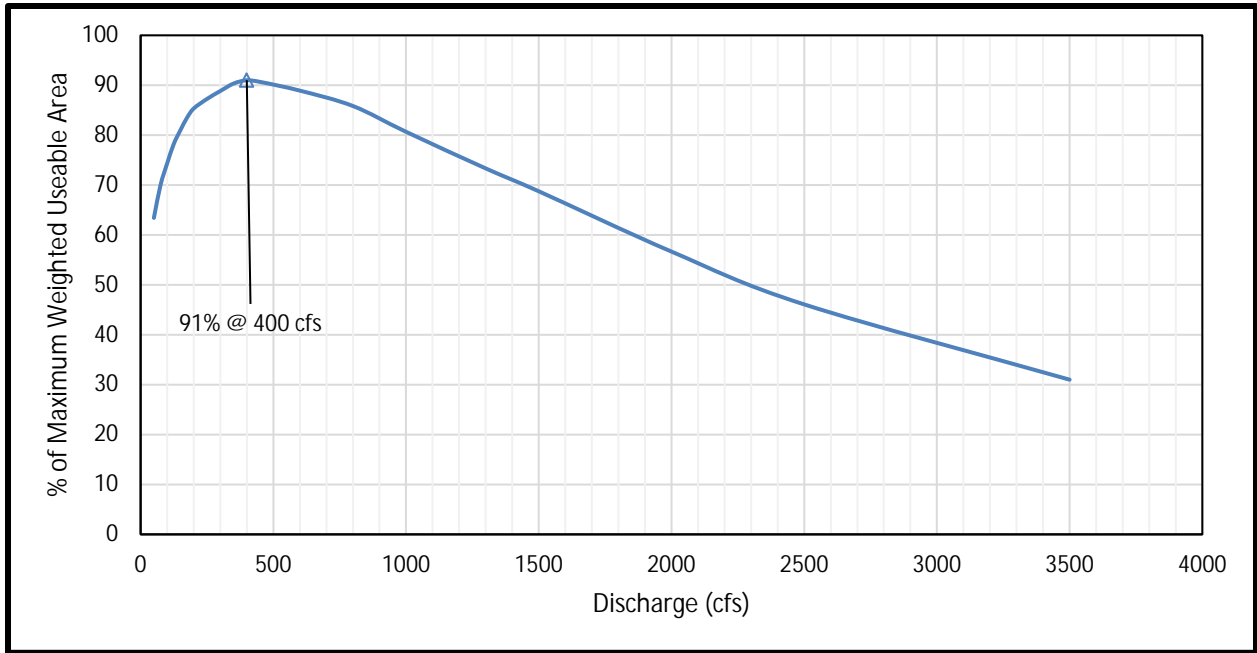


FIGURE 8 DISCHARGE AND PERCENTAGE OF MAXIMUM WEIGHTED USABLE AREA

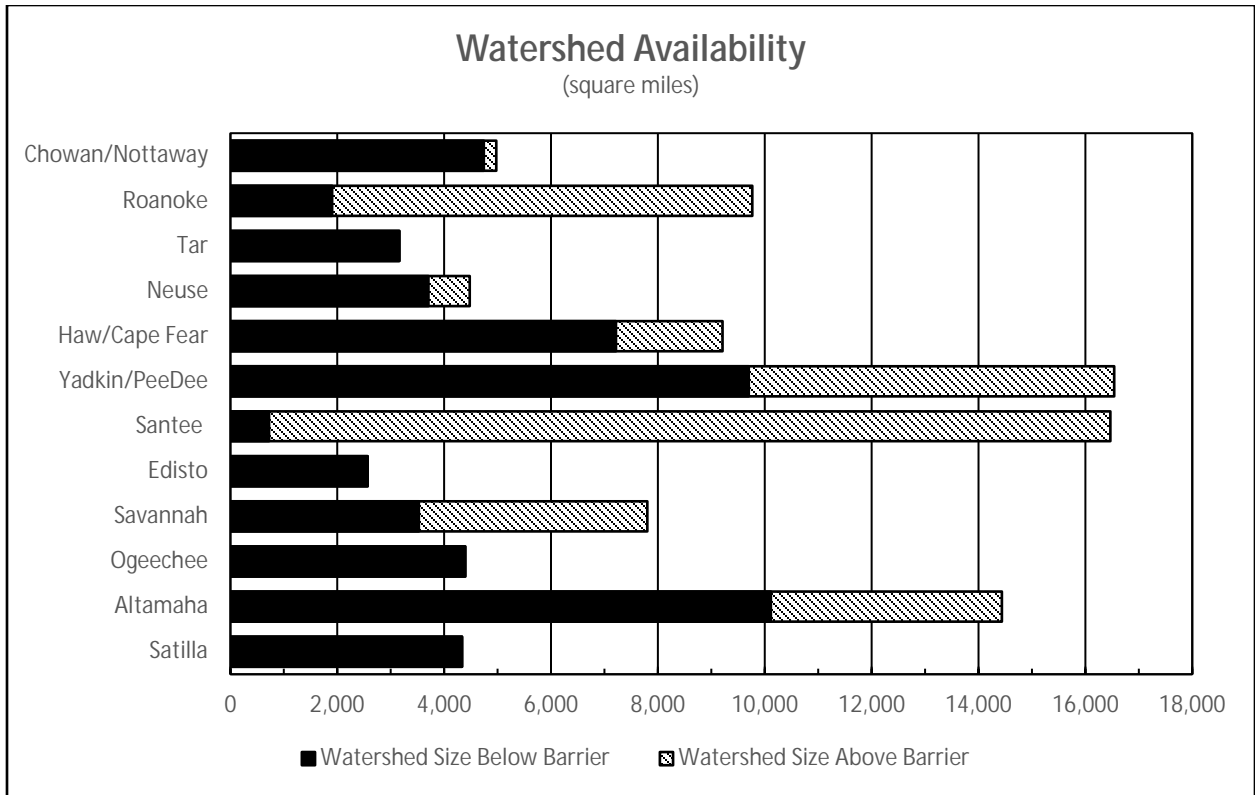


FIGURE 9 ESTIMATED WATERSHED AREA BEFORE THE FIRST UPSTREAM BARRIER IN ATLANTIC COAST RIVERS OF GEORGIA AND THE CAROLINAS

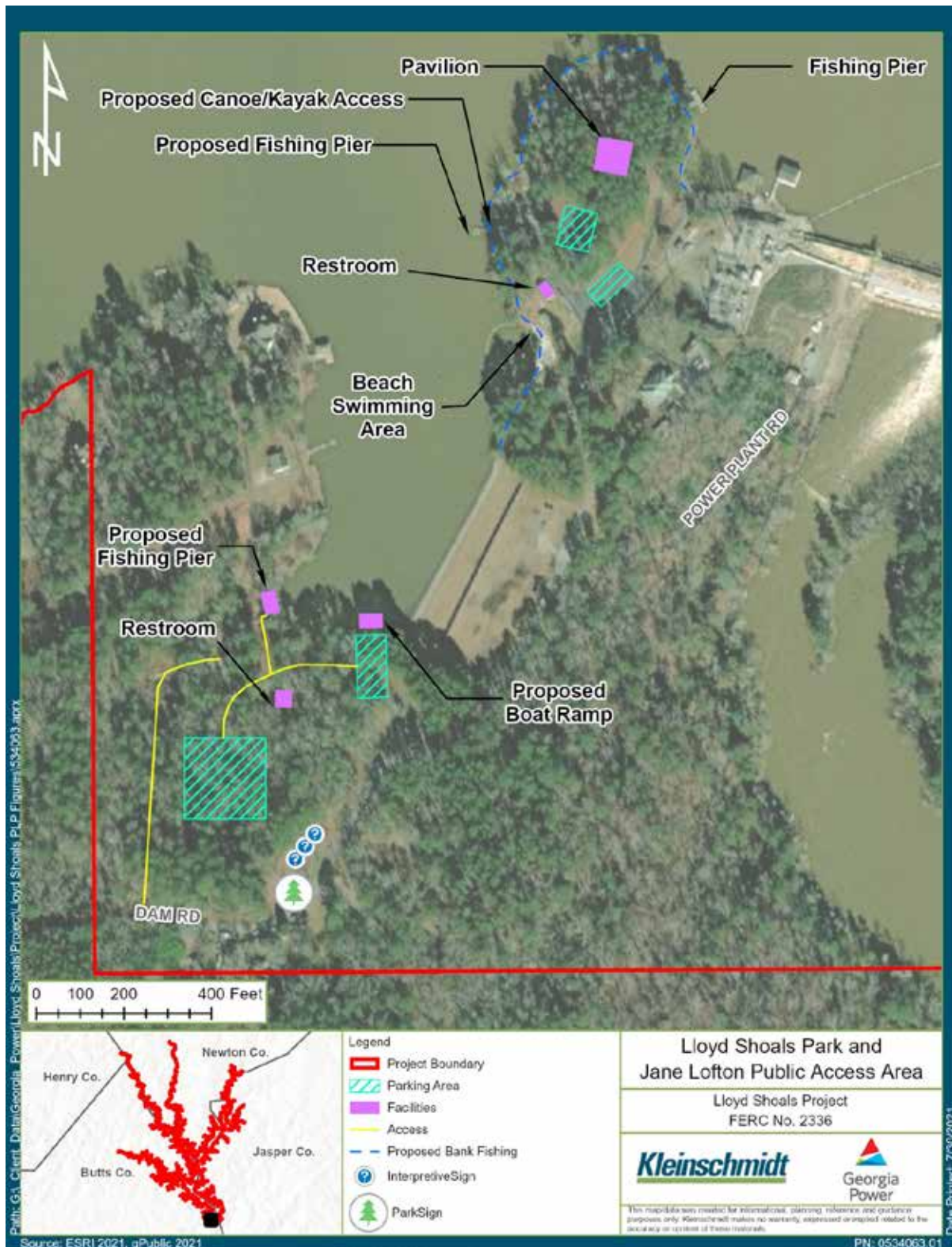


FIGURE 10 CONCEPTUAL DRAWING OF LLOYD SHOALS PARK AND JANE LOFTON PUBLIC ACCESS AREA RECREATION PROPOSAL

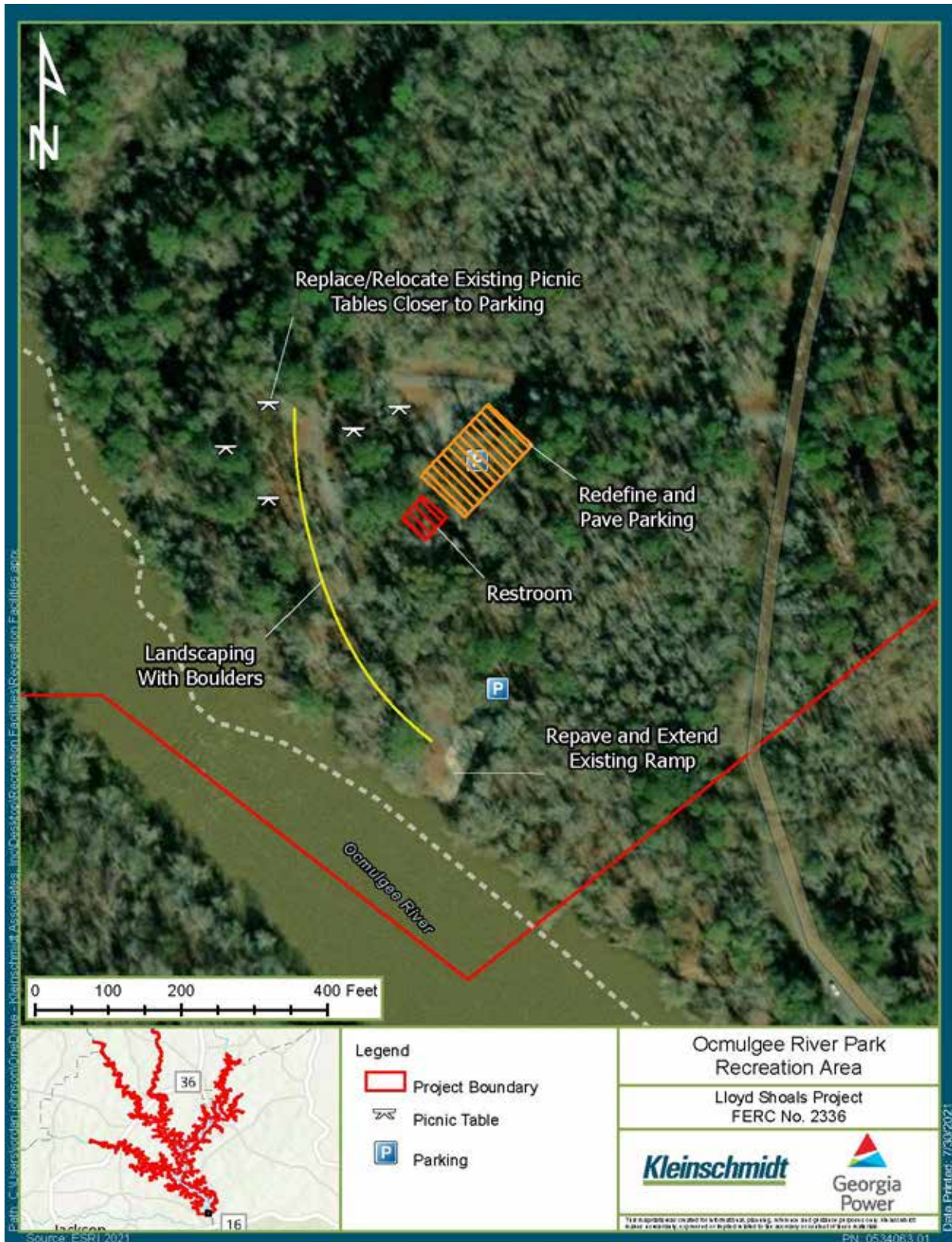


FIGURE 11 CONCEPTUAL DRAWING OF OCMULGEE RIVER PARK RECREATION PROPOSAL

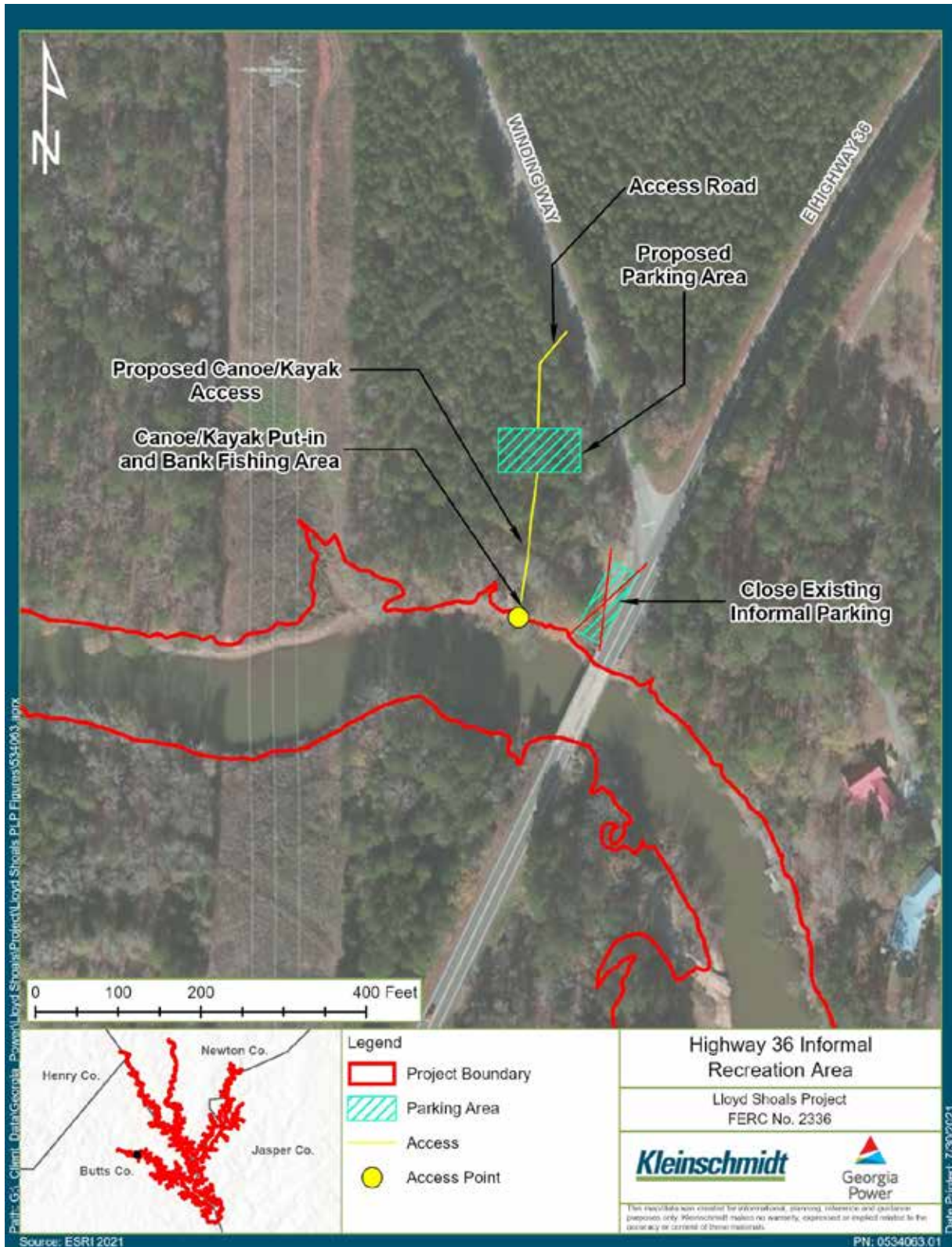


FIGURE 12 CONCEPTUAL DRAWING OF HIGHWAY 36 BRIDGE AT TUSSAHAW CREEK RECREATION PROPOSAL

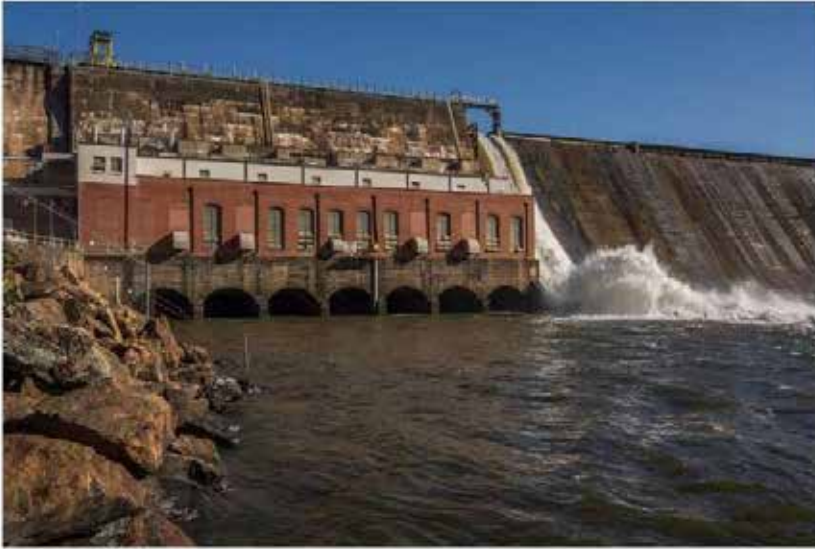


FIGURE 13 LLOYD SHOALS TAILRACE AREA PUBLIC ACCESS VIEWSHEDS



FIGURE 14 OCMULGEE RIVER PARK PUBLIC ACCESS VIEWSHEDS



FIGURE 15 LLOYD SHOALS PARK PUBLIC ACCESS VIEWSHEDS