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June 29, 2021

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Preliminary Licensing Proposal

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

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC or Commission) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628-065). The existing Project license will expire on November 30, 2023, and Alabama Power is utilizing the Integrated Licensing Process (ILP) to relicense the Harris Project.

Pursuant to the Commission's ILP and 18 CFR § 5.16, Alabama Power is filing the Harris Project Preliminary Licensing Proposal (PLP). The attached PLP includes Alabama Power's proposed operations and protection, mitigation, and enhancement (PM&E) measures, a summary of the existing environment, and an environmental analysis of the proposed actions' effects on the Harris Project resources. Stakeholders may file comments on the PLP within 90 days of this filing. The PLP and the individual study reports are available on FERC's website (http://www.ferc.gov) by going to the "eLibrary" link and entering the docket number (P-2628). The PLP is also available on the Project relicensing website at https://harrisrelicensing.com.

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg
Harris Relicensing Project Manager

Attachment – Preliminary Licensing Proposal (PLP)

cc: Harris Action Teams Stakeholder List

Attachment
Preliminary Licensing Proposal (PLP)

PRELIMINARY LICENSING PROPOSAL

R.L. HARRIS HYDROELECTRIC PROJECT

FERC NO. 2628

Prepared for:

Alabama Power Company

Prepared by:

Kleinschmidt Associates

June 2021

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1 PRELIMINARY LICENSING PROPOSAL OVERVIEW

The purpose of this Preliminary Licensing Proposal (PLP) is to summarize Alabama Power Company's (Alabama Power) proposed operations and protection, mitigation, and enhancement (PME) measures for relicensing the R. L. Harris Hydroelectric Project (Harris Project), Federal Energy Regulatory Commission (FERC) No. 2628.

Alabama Power prepared this PLP in accordance with 18 Code of Federal Regulations (C.F.R.) Section 5.16, to include the following:

- A description of the existing and proposed Harris Project facilities, as applicable, including Project lands and waters;
- A description, as applicable, of Alabama Power's existing and proposed project operation and maintenance plan, to include PME measures with respect to each resource affected by the project proposal; and
- A draft environmental analysis by resource area of the continuing and incremental impacts, if any, of Alabama Power's preliminary licensing proposal, including the results of its studies conducted under the approved Study Plan[1].

Alabama Power used existing information and the results of the relicensing studies to describe existing resources and analyze the effect of the proposal on Project resources. The results of studies completed during relicensing are included in the following draft and final reports in chronological order:

- *Inadvertent Discovery Plan on April 10, 2020*[2]
- *Traditional Cultural Properties Identification Plan on April 10, 2020*[3]
- **Final** *Area of Potential Effects Report* on June 29, 2020[4]
- **Final** *Downstream Release Alternatives Phase 1 Study Report* on July 27, 2020[5]
- **Final** *Operating Curve Change Feasibility Analysis Phase 1 Study Report* on August 31, 2020[6]

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[1] Accession No. 20190412-3000
[2] Accession No. 20200410-5068
[3] Accession No. 20200410-5068
[4] Accession No. 20200629-5328
[5] Accession No. 20200727-5088
[6] Accession No. 20200831-5339

- **Final** *Phase 1 Project Lands Evaluation Study Report* on October 2, 2020[7]
- **Final** *Recreation Evaluation Study Report* on November 24, 2020[8]
- **Final** *Threatened and Endangered Species Study Report* on January 29, 2021[9]
- **Draft** *Downstream Release Alternatives Phase 2 Study Report* on April 12, 2021[10]
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report* on April 12, 2021[11]
- **Final** *Aquatic Resources Study Report* on April 12, 2021[12]
- **Final** *Downstream Aquatic Habitat Study Report* on April 12, 2021[13]
- **Final** *Erosion and Sedimentation Study Report* on April 12, 2021[14]
- **Final** *Water Quality Study Report* on April 12, 2021[15]
- *A Botanical Inventory of a 35-Acre Parcel at Flat Rock Park, Blake's Ferry, Alabama* on April 12, 2021[16]
- **Draft** *Battery Energy Storage System at R.L. Harris Project Report* on April 12, 2021[17]

Each section of the PLP is summarized below:

- Section 1 – Overview of the PLP – refers to FERC regulations that provide content requirements of the PLP and establishes the location of information in the PLP.
- Section 2 – Project Description - describes the Harris Project Boundary, Tennessee River and Tallapoosa River Basins, and information on the major land and water uses, tributaries, and climate.
- Section 3 – Project Operations – describes normal, flood control, and drought operations at the Harris Project; includes information on navigation, minimum flow requirements, and the existing Green Plan operations and existing PME measures.
- Section 4 – Prefiling Consultation – describes the FERC scoping process, development of Harris Action Teams (HATs), Study Plan development and

[7] Accession No. 20201002-5139
[8] Accession No. 20201124-5182
[9] Accession No. 20210129-5393
[10] Accession No. 20210412-5748
[11] Accession No. 20210412-5750
[12] Accession No. 20210412-5745
[13] Accession No. 20210412-5785
[14] Accession No. 20210412-5752
[15] Accession No. 20210412-5760
[16] Accession No. 20210412-5746
[17] Accession No. 20210412-5747

implementation, and provides reference to the appendix summarizing stakeholder meetings.

- Section 5 – Proposed Action – describes the No Action Alternative, Alternatives Considered but Eliminated from Further Consideration, and the Proposed Action (Alabama Power's relicensing proposal); summarizes the presentation of effects described in Sections 6 through 13 and discusses the geographic scope of analysis.
- Sections 6 through 13 – Affected Environment and Environmental Analysis - describes the existing environment as well as the effects of Alabama Power's proposal by resource at Skyline, Lake Harris, and the Tallapoosa River below R.L. Harris Dam (Harris Dam) through Horseshoe Bend National Military Park (Horseshoe Bend).
- Section 14 – References – provides all references used in the PLP.

Appendix A includes a list of commonly used abbreviations and acronyms for the Harris Project.

2 PROJECT DESCRIPTION

Alabama Power owns and operates the Harris Project, licensed by FERC, Project No. 2628. Alabama Power is relicensing the 135-megawatt (MW) Harris Project, and the existing license expires in 2023. The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the Harris Project and enhancement, mitigation, and protection of environmental resources. These structures, lands, and waters are enclosed within the FERC Project Boundary. Under the existing Harris Project license, the FERC Project Boundary encloses two distinct geographic areas, described below.

Harris Reservoir is the 9,870-acre reservoir created by the Harris Dam. Harris Reservoir is located on the Tallapoosa River, near Lineville, Alabama. The lands adjoining the reservoir total approximately 7,392 acres and are included in the FERC Project Boundary. This includes land to 795.0-feet mean sea level (msl)[18], as well as natural undeveloped areas, hunting lands, prohibited access areas, recreational areas, and all islands.

The Harris Project also contains 15,063 acres of land within the James D. Martin-Skyline Wildlife Management Area (Skyline WMA)[19] located in Jackson County, Alabama. These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigation Plan[20]. These lands are leased to, and managed by, the state of Alabama for wildlife management and public hunting and are part of the Skyline WMA as outlined in the Skyline Wildlife Management Plan (WMP) [21].

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[18] Includes a scenic easement to 800-feet msl or 50-horizontal feet from 793-feet msl, whichever is less, but never less than 795-feet msl.

[19] James D. Martin-Skyline Wildlife Management Area (Skyline WMA) is a wildlife management area managed by the Alabama Department of Conservation and Natural Resources (ADCNR) currently totaling approximately 60,000 acres.

[20] The Harris Project Wildlife Mitigation Plan was developed as part of the original license and was approved by FERC on July 29, 1988; See Accession No. 20181113-4002.

[21] The Harris Project Wildlife Mitigation Plan was developed as part of the original license and was approved by FERC on July 29, 1988; the Skyline WMP was approved by FERC on June 29, 1990. See Accession No. 20181113-4002.

The following Project references have been applied throughout this document:

- Lake Harris refers to the 9,870-acre reservoir, the adjacent 7,392 acres of Harris Project land, and the dam, spillway, and powerhouse. This area is also called the Lake Harris Project Boundary.
- Skyline refers to the 15,063 acres of Project land within the Skyline WMA in Jackson County. This area is referred to as Skyline or Skyline Project Boundary.
- Harris Project refers to all the lands, waters, and structures enclosed within the FERC Project Boundary, which includes both Lake Harris and Skyline.
- Harris Reservoir refers to the 9,870-acre reservoir only.
- Harris Dam refers to the dam, spillway, and powerhouse.
- The Project Area refers to the land and water in the Project Boundary and the immediate geographic area adjacent to the Project Boundary.
- The Project occupies 4.90 acres of land administered by the Bureau of Land Management (BLM).

2.1 Harris Project Facilities

FERC issued a preliminary permit to Alabama Power for the Harris Project on July 7, 1967, and on November 1, 1968, Alabama Power submitted to FERC an application for an original license. FERC granted an Order Issuing a Major License for the Harris Project on December 27, 1973, for a 50-year period, effective December 1, 1973[22]. Alabama Power began construction on the Harris Project in 1974; however, for various reasons, construction was delayed (Alabama Power and Kleinschmidt 2018).

Alabama Power began service at the Harris Project on April 20, 1983. The Harris Project works consist of:

- A 29-mile-long reservoir with a surface area of 9,870 acres at normal full pool elevation of 793.0-feet msl.
- A concrete gravity dam, including a gated spillway, a powerhouse integral with the dam, and non-overflow sections.

[22] The preliminary permit was issued by the Federal Power Commission, which was established in 1920 and became the Federal Energy Regulatory Commission in 1977. In addition, the R.L. Harris Project, which was originally named the Crooked Creek Project, became the official project name on November 6, 1974.

- Earth embankments extending from each abutment of the dam.
- Transmission lines and appurtenant facilities.

Harris Reservoir extends up the Tallapoosa River approximately 29 river miles (RM) from Harris Dam. With an approximate 367 miles of shoreline, the Harris Reservoir surface area is approximately 9,870 acres at normal full pool elevation of 793.0-feet msl with a mandatory 8-foot drawdown to 785.0-feet msl from December to April. The gross storage capacity of Harris Reservoir is approximately 425,721 acre-feet, and the usable storage capacity is approximately 207,317 acre-feet.

Harris Dam is located 139.1 RMs upstream of the mouth of the Tallapoosa River, as well as approximately 78 RMs upstream from the Martin Dam, 86 RMs upstream from the Yates Dam, and 89 RMs from the Thurlow Dam (Alabama Power and Kleinschmidt 2018). Water retaining structures total approximately 3,243 feet with a maximum height of 163 feet and consist of:

- 310-foot-long, 163-foot-high gated concrete gravity spillway, which has six radial gates 40.5-feet-high by 40-feet-wide for passing floodwaters in excess of turbine capacity, one of which serves a dual role as a trash gate
- 186-foot-long, 150-foot-high concrete gravity powerhouse integral with the dam
- 400-foot-long and 95-foot-high west embankment
- 600-foot-long and 95-foot-high east embankment
- 331-foot-long, 112-foot-high concrete gravity west non-overflow section
- 315.5-foot-long, 150-foot-high concrete gravity east non-overflow section
- Earth embankments in topographic saddles east of the river, including:
  - 800-foot-long, 40-foot-high west saddle dike
  - 300-foot-long, 30-foot, high east saddle dike

The Harris Project powerhouse is a 186-foot-long, 150-foot-high, 95-foot-wide concrete structure integral with the dam that houses two vertical flow units totaling 135 MW. There are two vertical generators each rated at 71,740 kilovolt-amps (kVA) and two vertical Francis turbines each rated at 95,000 horsepower (hp) under a net head of 121 feet and each with a maximum hydraulic capacity of 8,000 cubic feet per second (cfs). The normal tailwater elevation with only one unit operating is 664.9-feet msl; with two units operating it is 667.7-feet msl. The Harris Project intake structure consists of six intake gates, each equipped with trash racks, and a penstock. The invert elevation of the intake structure is located at 746.0-feet msl. The intake is equipped with a skimmer weir that can incrementally raise the effective intake elevation approximately 18 feet to a maximum of approximately 764.0-feet msl, thus pulling water from higher in the water column. In other words, the invert elevation of the intake structure is located at 746.0-feet msl when the skimmer weir is fully lowered, and it is at 764.0-feet msl when it is fully raised. The intake structures are 47 feet below full pool elevation and 39 feet below the winter pool elevation (Alabama Power and Kleinschmidt 2018).

Alabama Power supplies electric power throughout a large part of Alabama and exchanges electric power with other operating subsidiaries of Southern Company, and with the Tennessee Valley Authority (TVA) by means of physical connections of the transmission systems. The Harris Project includes two - 115 kilovolt (kV) transmission lines that extend parallel to one another for approximately 1.5 miles to the northwest from Harris Dam to the Crooked Creek Transmission Substation[23] (Alabama Power and Kleinschmidt 2018).

2.2 Project Lands and Waters

FERC defines a project boundary as the area enclosing the land and waters necessary to operate a FERC-licensed hydroelectric project. Alabama Power is responsible for managing only those activities within the FERC Harris Project Boundary (Figure 2-1 and Figure 2-2). Due to the influence of Project operations, the geographic scope of some of the Harris Project studies includes approximately 44 RMs of the Tallapoosa River downstream of Harris Dam through Horseshoe Bend. This geographic scope was developed for study purposes and associated analyses only; this area is not included in the Project Boundary.

Skyline, Lake Harris, and the Tallapoosa River downstream of Harris Dam are located in two river basins: Skyline is in the Tennessee River Basin, and Lake Harris and the Tallapoosa River downstream of Harris Dam are in the Tallapoosa River Basin. Only parts of the Tallapoosa River Basin are managed by Alabama Power as part of its FERC license for the Harris Project.

[23] The Crooked Creek transmission substation is the point at which electrical power from the Project is distributed to the grid. Therefore, the Crooked Creek transmission substation is not a Project facility.

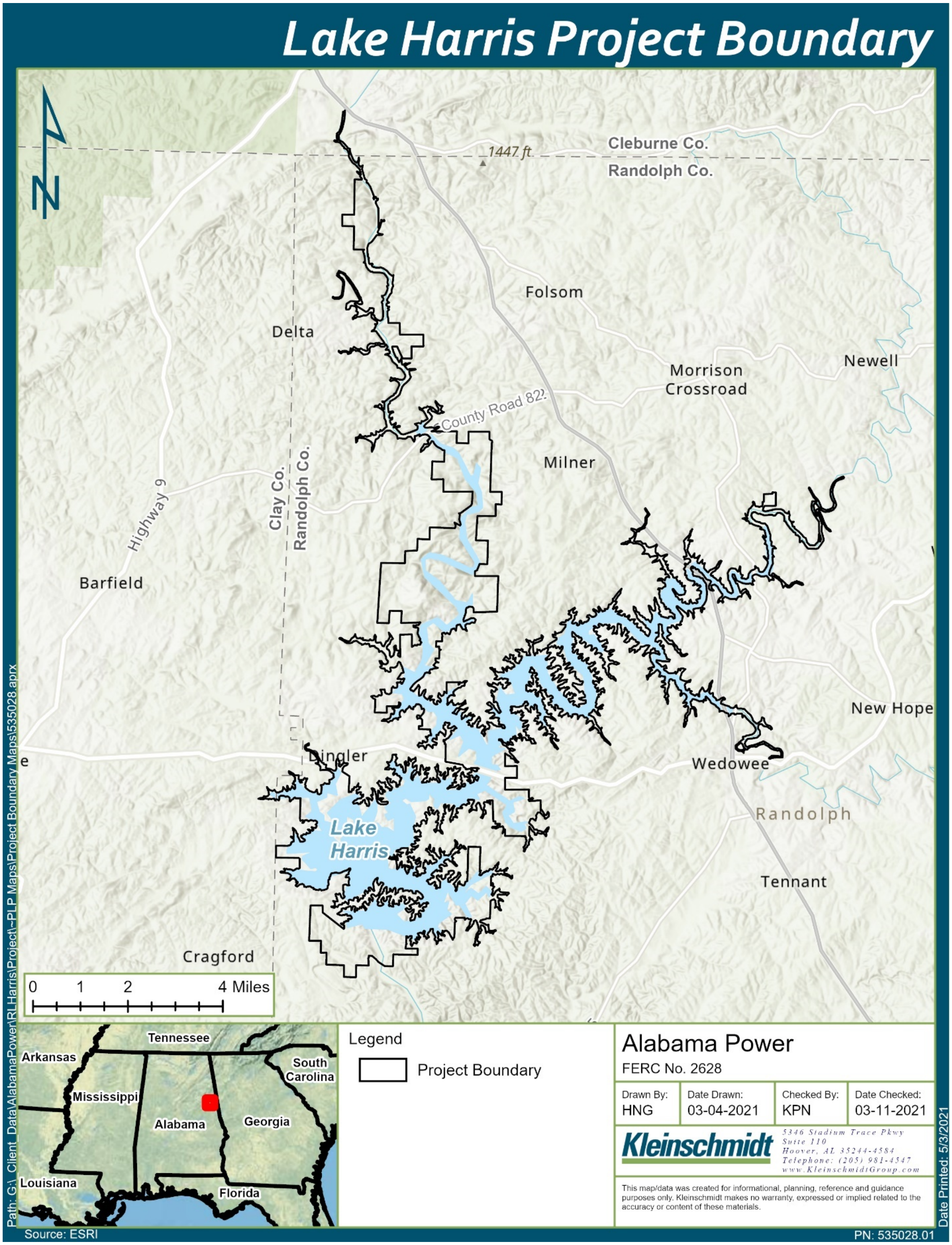


Figure 2-1 Lake Harris Project Boundary

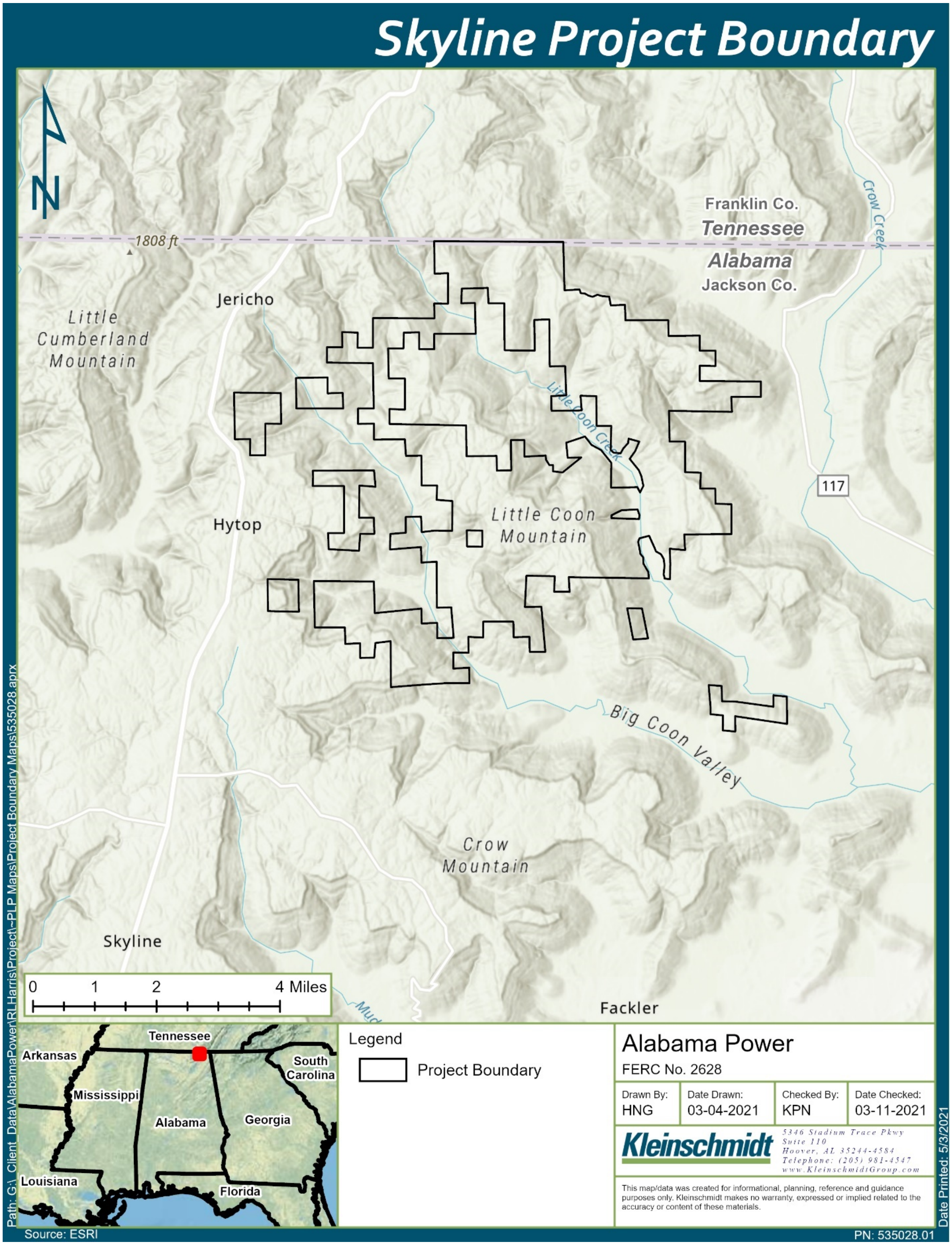


Figure 2-2 Skyline Project Boundary

2.3 Tennessee River Basin

Skyline is located near Scottsboro, Alabama, in the Tennessee River Basin (Figure 2-3). The Tennessee River flows 652 miles from the confluence of the French Broad and Holston rivers in Knoxville, Tennessee. The Tennessee River Basin is a sub-basin of the Ohio River Basin that begins in Pittsburgh, Pennsylvania and flows westward to Cairo, Illinois (Alabama Power and Kleinschmidt 2018).

The headwaters of the Tennessee River begin at RM 652 where the French Broad River meets the Holston River in the Tennessee county of Knox, east of Knoxville, Tennessee, at an approximate source elevation of 813.0-feet msl (USGS 1955 as cited in Alabama Power and Kleinschmidt 2018). The Tennessee River enters Alabama in Jackson County northeast of Bridgeport, Alabama, passing Skyline on the east. From this point, the Tennessee River meanders southwesterly to Guntersville, Alabama, and then proceeds northwesterly through Decatur to Florence, Alabama (Alabama Power and Kleinschmidt 2018). The Tennessee River hosts 29 power-generating dams that power the TVA's hydroelectric fleet before ending at the Ohio River in Livingston/McCracken counties near Paducah, Kentucky, at an approximate source elevation of 302.0-feet msl (USDOI 1968 as cited in Alabama Power and Kleinschmidt 2018). The portion of the Tennessee River Basin in Alabama drains approximately 6,826 square miles, which represents 13 percent of the land area in northern Alabama (Clean Water Partnership 2003 as cited in Alabama Power and Kleinschmidt 2018). The drainage area covers all 15 of the northern counties in Alabama.

The largest cities in northern Alabama within the Tennessee River Basin include Decatur, Florence, and Huntsville, each having a population of more than 40,000 residents. The closest large city to Skyline is Huntsville, which lies approximately 37 miles west, with an estimated population of 200,574. Huntsville is the largest city within the Tennessee River Basin in Alabama (U.S. Census Bureau 2019a). Decatur, Alabama is approximately 60 miles west of Skyline; Florence, Alabama is approximately 95 miles west of Skyline (Alabama Power and Kleinschmidt 2018).

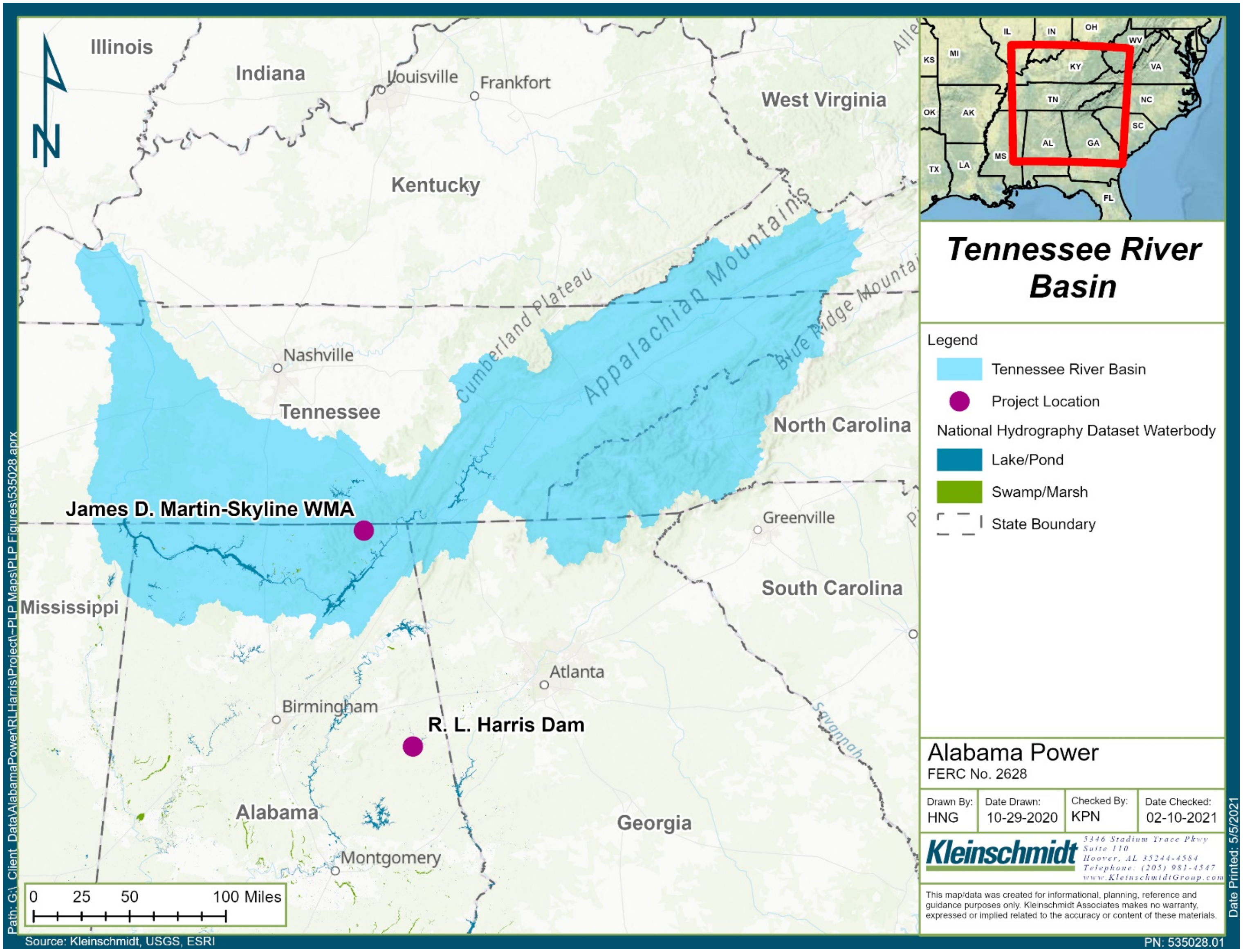


Figure 2-3 Tennessee River Basin

2.3.1 Dams

The main stem of the Tennessee River is highly regulated with few free-flowing stream reaches (USGS 1998 as cited in Alabama Power and Kleinschmidt 2018). There are 30 dams, 29 hydroelectric and 1 non-power dam on the Tennessee River: Appalachia, Blue Ridge, Boone, Chatuge, Cherokee, Chickamauga, Douglas, Fontana, Fort Loudoun, Fort Patrick Henry, Great Falls, Guntersville, Hiwassee, Kentucky, Melton Hill, Nickajack, Norris, Nottely, Ocoee Dam 1, Ocoee Dam 2, Ocoee Dam 3, Pickwick Landing, Raccoon Mountain, South Holston, Tims Ford, Watauga, Watts Bar, General Joe Wheeler, Wilbur, and Wilson. All 29 of these hydroelectric generating dams are owned and operated by TVA (Alabama Power and Kleinschmidt 2018). Of these 29 dams, 3 are located in Alabama: Guntersville (RM 349.0), General Joe Wheeler (RM 274.9), and Wilson (RM 259.4) dams (USACE 2013a as cited in Alabama Power and Kleinschmidt 2018).

2.3.2 Major Land and Water Uses

The Tennessee River Basin is predominantly woodland and agricultural land. Urban/suburban and bare areas used as mine lands and construction are common (Clean Water Partnership 2003 as cited in Alabama Power and Kleinschmidt 2018). The closest rural towns to Skyline are Hytop and Stevenson, Alabama and Sherwood, Tennessee, with an estimated combined total population of approximately 2,931 residents (City-Data 2007; U.S. Census Bureau 2019b, 2019c).

Current uses of the Tennessee River Basin include surface water withdrawals for all purposes (domestic, industrial, agricultural). Approximately 87 percent of water withdrawn annually is used for agricultural (irrigation) purposes; 8 percent for industrial use; and the remaining 5 percent for domestic use (Alabama Power and Kleinschmidt 2018).

Water demands include consumptive and non-consumptive uses. Consumptive uses or "out-of-stream" uses are water withdrawals that return only a portion or none of the withdrawn water back to the Tennessee River Basin. Consumptive uses include municipal, industrial, and agricultural water supplies. Municipal and industrial (M&I) water demands are both publicly supplied and self-supplied and include residential, commercial, governmental/institutional, industrial, manufacturing, and other demands such as unaccounted-for water use (system losses and firefighting) (CH2MHILL 2005 as cited in Alabama Power and Kleinschmidt 2018). Estimated water withdrawals in the Tennessee River Basin during 2005 averaged approximately 12,437 million gallons per day (mgd) of freshwater for out-of-stream uses and is projected to decrease to 11,551 mgd by 2030 (TVA 2008). The reuse potential of water from the Tennessee River is high because most of the water withdrawn for out-of-stream use is returned to the river system (Huston et al. 2004 as cited in Alabama Power and Kleinschmidt 2018). Non-consumptive water demands in the Tennessee River Basin include hydroelectric generation and boating and /or fishing where the water is available for other uses at the same site (Alabama Power and Kleinschmidt 2018).

Four major reservoirs are located on the Tennessee River and are operated and managed by the TVA for a variety of purposes that include flood control, navigation, water supply, recreation, hydroelectric power, and economic development. Recreational use of the reservoirs includes fishing and swimming (Clean Water Partnership 2003 as cited in Alabama Power and Kleinschmidt 2018). Peak water demands are during the summer months when TVA's generating load increases (USGS 2004 as cited in Alabama Power and Kleinschmidt 2018).

2.3.3 Tributaries

The principal tributary streams are the Holston River and the French Broad River, both of which are in Tennessee. The French Broad River has a drainage area of 5,124 square miles in North Carolina and Tennessee. The Holston River has a drainage area of 3,776 square miles in Virginia and Tennessee (USGS 2000 as cited in Alabama Power and Kleinschmidt 2018).

2.3.4 Climate

The Lower Tennessee River Basin is approximately 19,500 square miles, of which 57 percent is in Tennessee, 35 percent in Alabama, and 1 percent in Georgia. This area consists of three physiographic regions: Coastal Plain Province, Cumberland Plateau Section of the Appalachian Plateaus Province, and Interior Low Plateaus. Annual precipitation varies from 47 inches in the Coastal Plain to 63 inches in the Cumberland Plateau. The general area has a temperate climate with an average annual temperature of approximately 58 degrees Fahrenheit (°F) (USGS 1998 as cited in Alabama Power and Kleinschmidt 2018). Skyline is located within the Cumberland Plateau section of the Appalachian Plateaus Province in the northeastern corner of Alabama. Rainfall in the drainage area varies annually with much of the rainfall occurring in the mountainous areas along the headwaters of the tributaries where mean annual rainfall can be as high as 90 inches (USGS 2004 as cited in Alabama Power and Kleinschmidt 2018). The Tennessee River Basin is conducive to agriculture, outdoor leisure and recreation activities, and industries that require year-round outdoor work (Alabama Power and Kleinschmidt 2018).

2.4 Tallapoosa River Basin

Harris Reservoir is located on the Tallapoosa River, near the towns of Lineville and Wedowee in east central Alabama. The Tallapoosa River flows 265 miles from the southern end of the Appalachian Mountains in Georgia, southward and westward into Alabama and is formed by the confluence of McClendon and Mud creeks in Paulding County, Georgia. The Tallapoosa River Basin is a sub-basin of the Mobile River Basin that begins in western Georgia and flows southwesterly through east central Alabama. The Tallapoosa River Basin is approximately 4,687 square miles with approximately 15 percent of this basin's drainage area in Georgia (CH2MHILL 2005 as cited in Alabama Power and Kleinschmidt 2018).

The headwaters of the Tallapoosa River and the Little Tallapoosa River begin in the Georgia counties of Paulding and Carroll, respectively, and converge in Randolph County, Alabama, to form the main stem of the Tallapoosa River. From this point, the Tallapoosa River meanders southwesterly through four Alabama Power hydroelectric developments (Harris Dam, Martin Dam, Yates Dam, and Thurlow Dam) before joining the Coosa River to create the Alabama River (Figure 2-4) (Alabama Power and Kleinschmidt 2018).

Harris Reservoir is located in Clay, Cleburne, and Randolph counties, on the Tallapoosa River and has approximately 367 miles of shoreline. Figure 2-5 provides the location of the Harris Reservoir within the Tallapoosa River Basin; two smaller creeks (Wedowee and Ketchepedrakee) serve as main tributaries of Harris Reservoir, and the city of Wedowee flanks the eastern and southeastern shores of Harris Reservoir. The city of Heflin, the largest city in Cleburne County, is roughly 30 miles north of Harris Reservoir, while the city of Lineville in Clay County is approximately 10 miles west of the reservoir. Although Heflin and Lineville are the only cities with populations of 1,000 or more, the watershed is located just south of Interstate 20 (I-20) and is only 65 miles east of downtown Birmingham, Alabama, and 65 miles west of downtown Atlanta, Georgia. Anniston, Alabama is located approximately 42 miles from Harris Reservoir, and Montgomery and Auburn, Alabama are located within 100 miles of Harris Reservoir (Alabama Power and Kleinschmidt 2018).

2.4.1 Dams

All four hydroelectric generating dams on the Tallapoosa River are owned and operated by Alabama Power and include Harris Dam located at RM 139.1; Martin Dam at RM 60.6; Yates Dam at RM 52.7; and Thurlow Dam at RM 49.7.

2.4.2 Major Land and Water Uses

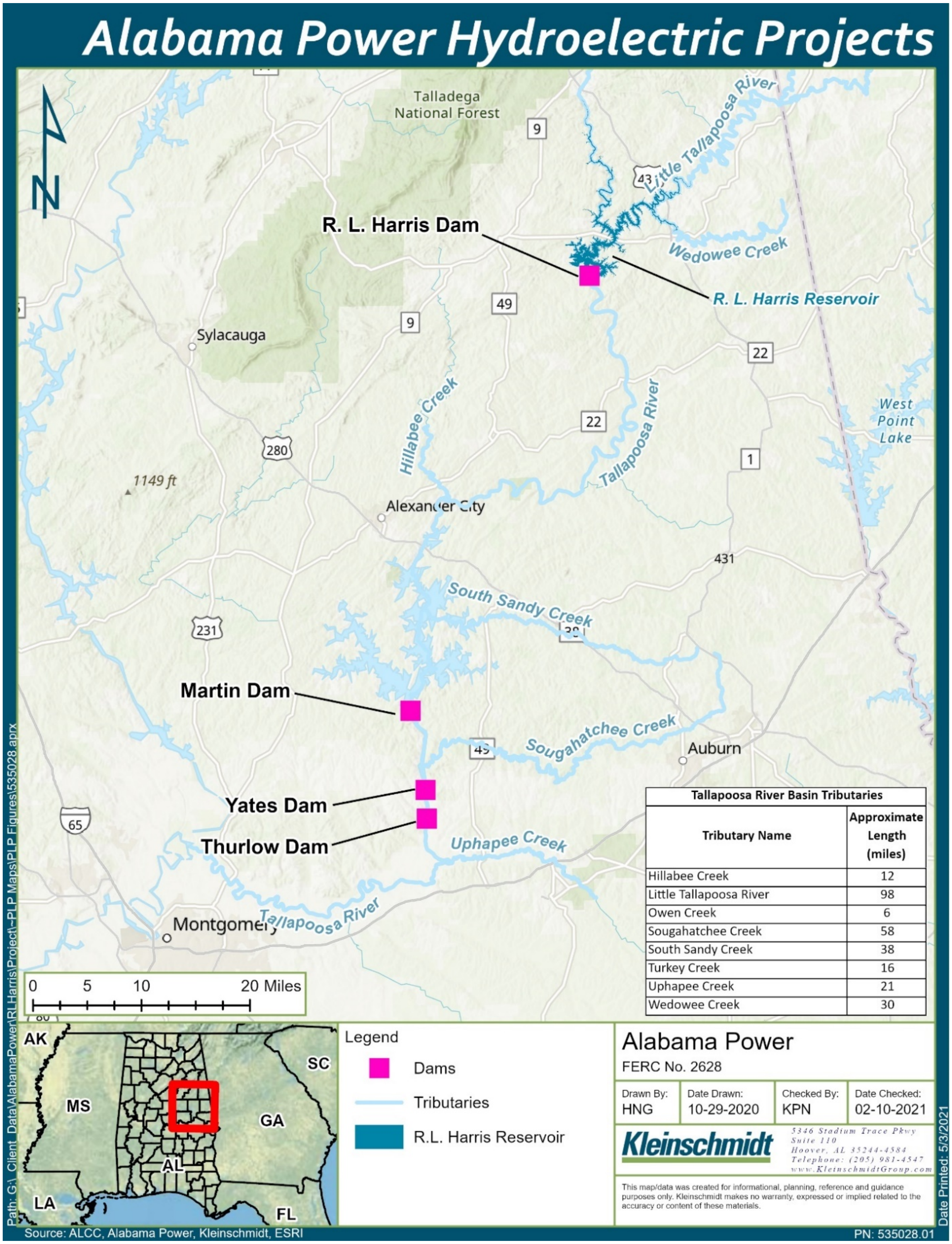
Most of the land in the Tallapoosa River Basin is undeveloped. Approximately 84 percent of the basin is forested, and 13 percent is agricultural. Less than 1 percent of the Tallapoosa River Basin is urban (CH2MHILL 2005 as cited in Alabama Power and Kleinschmidt 2018). The closest population centers to Lake Harris are Wedowee, Lineville, and Wadley, with populations of 794; 2,249; and 714 respectively (U.S. Census Bureau 2019a).

Riparian water doctrine serves as the legal basis for water use in the eastern United States and is the foundation for the state's water resources management policy. Current uses include water supply for M&I, agricultural, hydropower, navigation (downstream flow augmentation for the Alabama River), water quality (e.g., assimilative capacity for wastewater discharges), flood control, fish and wildlife habitat, and recreation (CH2MHILL 2005 as cited in Alabama Power and Kleinschmidt 2018).

Water use generally follows a seasonal pattern. Peak water demands are from June through September, when irrigation and residential water demand peaks with the warm temperatures (David et al. 1996 as cited in Alabama Power and Kleinschmidt 2018). Seasonal demands on surface water affect management of Alabama Power's hydroelectric operations in the Tallapoosa River Basin (Alabama Power and Kleinschmidt 2018).

Nearly half of the surface water withdrawals in the Tallapoosa River Basin are from reservoirs, with Lake Martin, downstream of Lake Harris, being the main source. Drinking water supplies for livestock, irrigation of crops and orchards, and aquaculture account for most of the agricultural water demand in the Tallapoosa River Basin (CH2MHILL 2005 as cited in Alabama Power and Kleinschmidt 2018).

Although the downstream Alabama River provides for navigation for commercial barge traffic, the Tallapoosa River does not contain any locks. There are no large metropolitan centers within the Tallapoosa River Basin; however, Birmingham is located 65 miles west of Harris Reservoir. The Upper, Middle, and Lower Tallapoosa River areas are dominated by forest/woodland, at 83.8 percent, 84.4 percent, and 64.1 percent, respectively, and agriculture, at 13.1 percent, 8.4 percent, and 19.6 percent, respectively (CH2MHILL 2005 as cited in Alabama Power and Kleinschmidt 2018).



Tallapoosa River Basin Tributaries

Tributary Name	Approximate Length (miles)
Hillabee Creek	12
Little Tallapoosa River	98
Owen Creek	6
Sougahatchee Creek	58
South Sandy Creek	38
Turkey Creek	16
Uphapee Creek	21
Wedowee Creek	30

Figure 2-4 Alabama Power Tallapoosa River Hydroelectric Projects

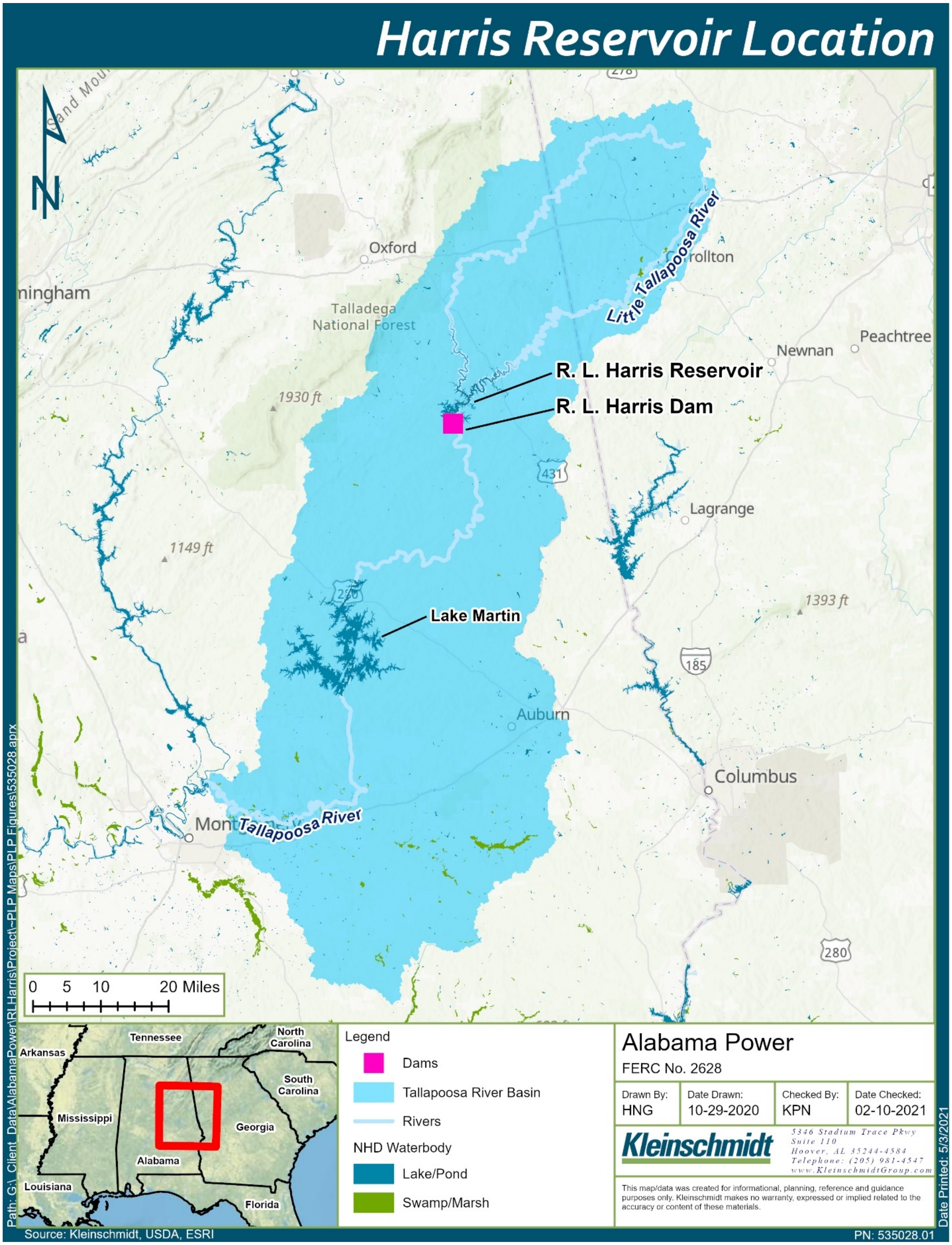


Figure 2-5 Location of Harris Reservoir in the Tallapoosa River Basin

2.4.3 Tributaries

The principal tributary streams in the Tallapoosa River Basin are the Little Tallapoosa River, which has a drainage area of 464.7 square miles in Georgia and Alabama, and the Sougahatchee, South Sandy, Uphapee, and Hillabee creeks in Alabama. Other tributaries include the Wedowee, Owen, and Turkey creeks (ADEM 2017).

2.4.4 Climate

The general climate in the Tallapoosa River Basin is conducive to agriculture, outdoor leisure and recreation activities, and industries that require year-round outdoor work. This basin generally has a moist yet temperate climate. Precipitation is usually in the form of rain with rare snowfalls. Rainfall is not evenly distributed throughout the Tallapoosa River Basin. Annual rainfall amounts typically range from 46 to 64 inches, with the higher amounts occurring in the Upper and Lower Tallapoosa River Basin segments, respectively. Insufficient rainfall may occur every 10 to 15 years.

Average normal daily temperatures range from a high of 58 °F to a low of 35 °F in January. During the month of July, temperatures vary from 92 °F to 67 °F. Although the monthly average highs in June, July, and August exceed 90 °F, this temperature range generally occurs, on average, only 87 days per year. Historic records show that freezing temperatures occur an average of only 51 days per year (Alabama Power and Kleinschmidt 2018).

3 PROJECT OPERATIONS

Before describing the Harris Project operations, it is important to discuss the relationship between Alabama Power and U.S. Army Corps of Engineers (USACE) in the Alabama-Coosa-Tallapoosa (ACT) River Basin. The ACT basin originates just north of the Tennessee-Georgia border, extends into central north Georgia, crosses the Georgia-Alabama state line into north Alabama, and continues across central and southern Alabama before terminating in Mobile Bay (USACE 2011 as cited in Alabama Power and Kleinschmidt 2018). The basin covers 32 counties in Alabama, 18 counties in Georgia, and 2 counties in Tennessee. The basin drains 22,800 square miles, extending approximately 320 miles. The USACE owns and maintains five projects in the ACT basin, and Alabama Power owns and maintains 11 developments (Figure 3-1) (Alabama Power and Kleinschmidt 2018).

The USACE Master Water Control Manual (WCM) provides a general reference for day-to-day, real-time water management decision making for the five federal projects operated by USACE and the 11 non-federal developments operated by Alabama Power in the ACT basin. Projects in the ACT basin are operated in a coordinated manner to manage the often competing uses, meet all authorized uses, ensure that enough water is available to minimally satisfy project purposes during droughts, and to maintain a balanced use of storage (USACE 2013b as cited in Alabama Power and Kleinschmidt 2018). The Master WCM contains nine appendices that describe specific regulations for individual projects in the ACT basin.

Alabama Power operates Harris Reservoir for flood control and navigation support in accordance with Appendix I of the Master WCM issued October 2014 (Appendix B). This Harris Water Control Manual (Harris WCM) describes flood management regulations, navigation support plans, and drought contingency operations for the Harris Project (USACE 2014a in Alabama Power and Kleinschmidt 2018).

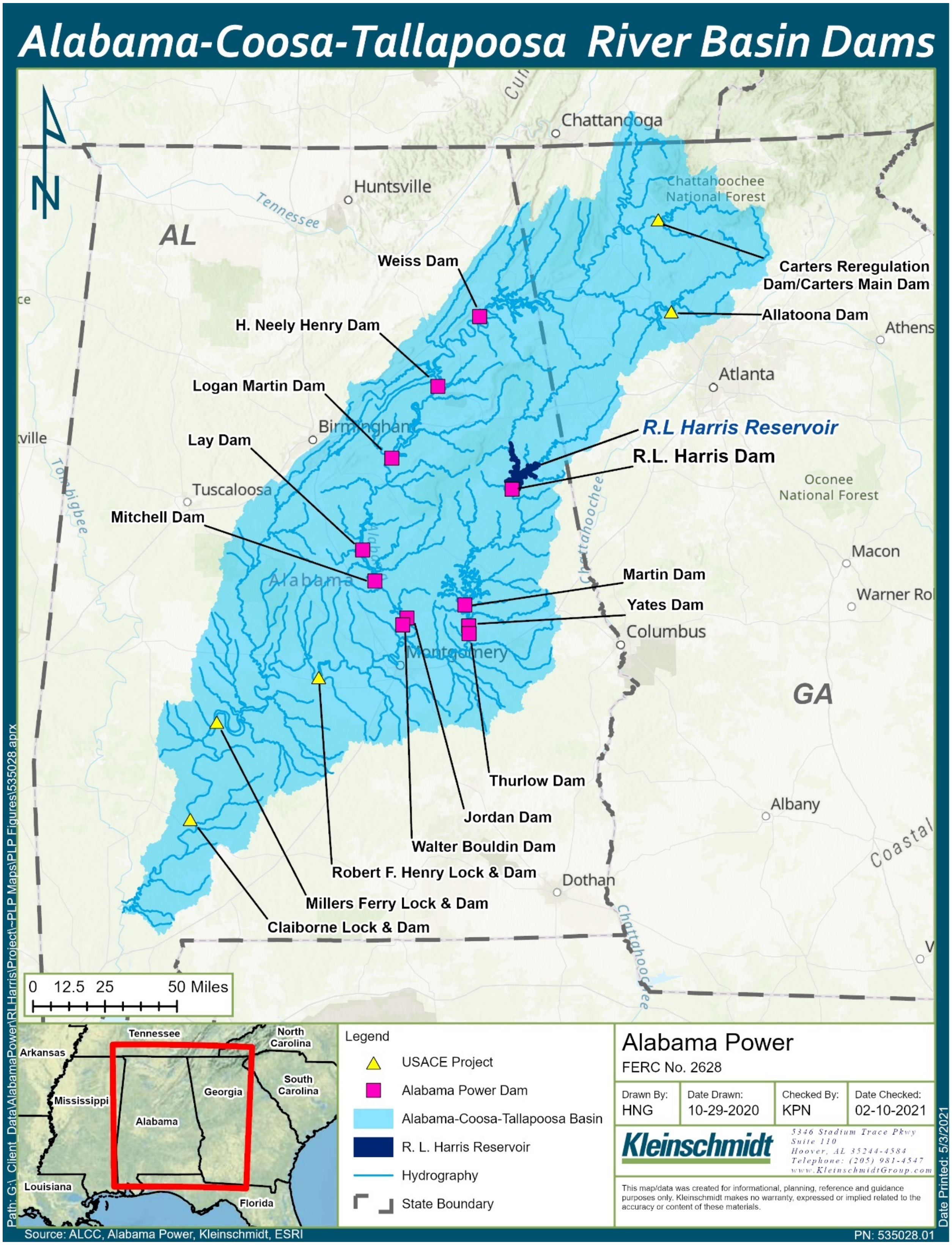
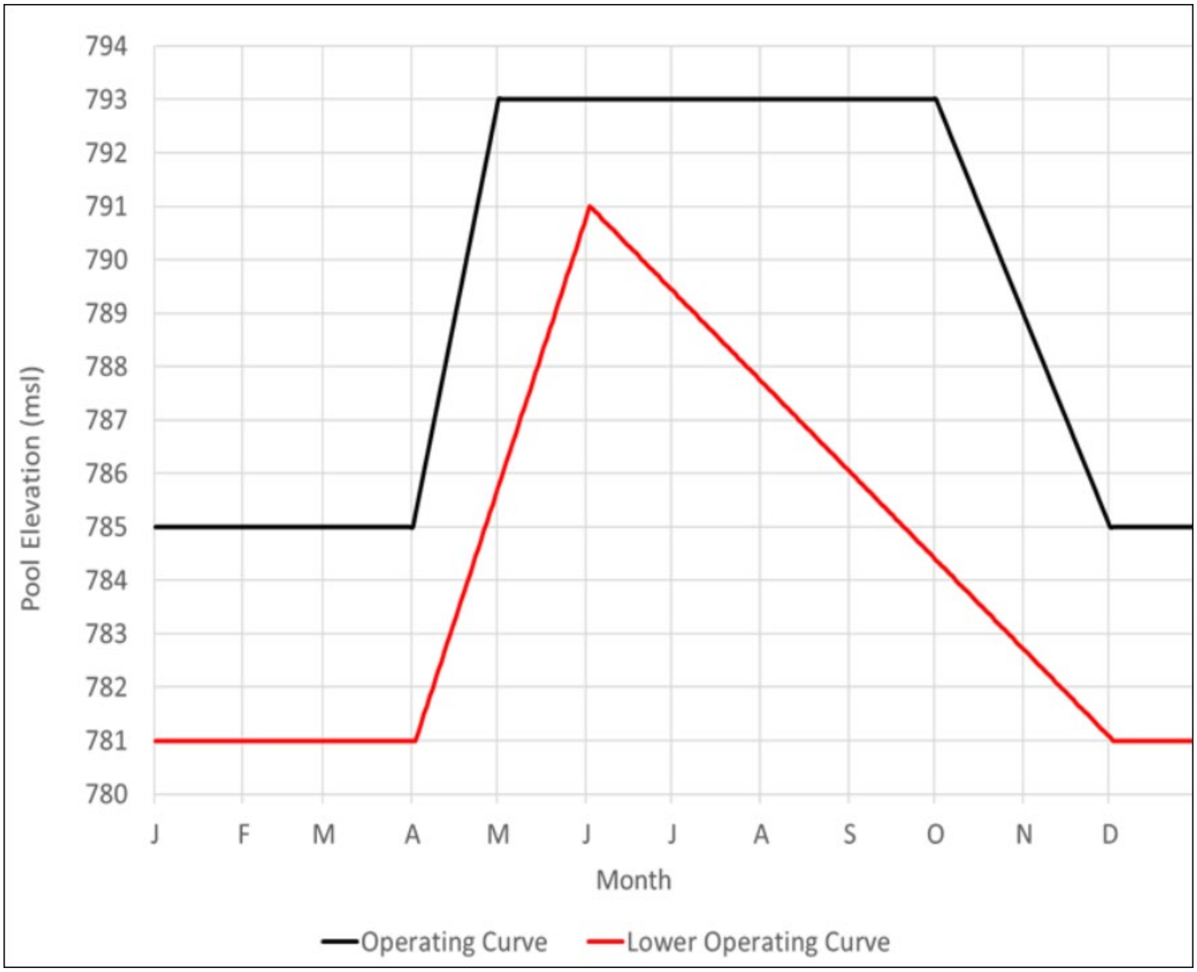


Figure 3-1 ACT River Basin Dams

3.1 Normal Operations

Harris Reservoir is a multi-purpose storage reservoir with water levels that fluctuate seasonally. The Harris Project was built to support various upstream and downstream uses and hydroelectric power, directly affecting many people throughout the state. The Harris Project also provides flood control and navigation support. Harris Reservoir waters are used for public water supply, fish and wildlife habitat, recreational fishing and boating, and various other outdoor recreation activities. Under normal conditions, Alabama Power operates the Harris Project during daily peak-load periods to maintain reservoir levels according to the operating curve (Alabama Power and Kleinschmidt 2018).

The Harris Operating Curve, depicted as the black line in Figure 3-2, depicts the targeted normal daily lake levels. Harris Reservoir is maintained at or below the elevations specified by the Harris Operating Curve except when storing floodwater. From May 1 through October 1, Harris Reservoir is maintained at or below elevation 793.0-feet msl, depending on inflow conditions. Between October 1 and December 1, the operating curve elevation drops to elevation 785.0-feet msl. The pool level remains at or below elevation 785.0-feet msl until April 1. From April 1 to May 1, the operating curve elevation rises to full pool at elevation 793.0-feet msl. During high flow conditions, USACE-approved flood control procedures in the Harris WCM are implemented. During low flow conditions, the drought contingency curve (the red line in Figure 3-2) is intended to be used as one of several factors in evaluating drought reservoir operations consistent with approved drought plans (Alabama Power and Kleinschmidt 2018).



Source: Alabama Power and Kleinschmidt 2018

Figure 3-2 Harris Operating Curve

3.2 Flood Control Operations

The objective of flood control at Harris Dam is to minimize impacts downstream of Harris Dam by storing excess water during high flow events. The Harris WCM provides procedures used by Alabama Power to execute the operation of the Harris Project during floods (Alabama Power and Kleinschmidt 2018).

During floods, the Harris Project will operate to pass the inflow up to approximately 16,000 cfs by releasing water through the powerhouse to maintain the reservoir near the operating curve (USACE 2014a as cited in Alabama Power and Kleinschmidt 2018). If the reservoir rises above the operating curve but is below elevation 790-feet msl, the Harris Project will operate to discharge 13,000 cfs or an amount that will not cause the U.S. Geological Survey (USGS) stream gage at Wadley, Alabama (gage No. 02414500), to exceed a stage of 13.0 feet, unless greater discharge amounts are required by the induced surcharge curves. When the reservoir rises above elevation 790-feet msl, the powerhouse discharge will be increased to the larger of approximately 16,000 cfs or the amount indicated by the induced surcharge curves. Once the reservoir level begins to fall, all spillway gate openings and the powerhouse discharge will be maintained at those settings until the Harris Reservoir level returns to the operating guide curve. If a second flood enters the reservoir prior to the complete evacuation of the stored flood waters, the release will be as directed by the induced surcharge curve operation plan outlined in the Harris WCM (USACE 2014a as cited in Alabama Power and Kleinschmidt 2018) (Appendix B).

The spillway gates at Harris Dam are generally operated in accordance with the gate opening schedule described in the Harris WCM (USACE 2014a as cited in Alabama Power and Kleinschmidt 2018). The schedule specifies the gate step and gate position based on the induced surcharge curve (Alabama Power and Kleinschmidt 2018).

3.3 Navigation

Alabama Power operates the Harris Project, along with other hydroelectric projects on the Coosa and Tallapoosa rivers, to support a predictable minimum navigable channel (i.e., a minimum water depth) in the Alabama River. As outlined in the Master WCM for the ACT basin, Alabama Power's Coosa River and Tallapoosa River projects are operated to provide a minimum 7-day average flow of 4,640 cfs (32,480 day-second-feet [dsf]/7 day) to the Alabama River at Montgomery. This flow is subject to being increased for navigation or decreased due to insufficient inflow or drought conditions, generally described as follows:

> The ACT Master WCM includes a template for Alabama River navigation support, subject to development of a "navigational Memorandum of Understanding [MOU]," or navigation memorandum of understanding, between Alabama Power and the USACE. This template provides for the use of specified amounts of storage from Alabama Power's reservoirs to support navigation during the June-December period, under certain conditions, including adequate basin inflow. Navigation is not supported during drought conditions, as defined by the ACT Basin Drought Contingency Plan (USACE 2014a as cited in Alabama Power and Kleinschmidt 2018).

3.4 Drought Operations

Droughts vary in duration, magnitude, degree of severity, and geographical extent, and, as a result, are difficult to predict and manage. Significant impacts to hydroelectric projects may occur despite Alabama Power's efforts to conserve water during periods of low rainfall. Effects of drought on hydroelectric operations can be classified into three broad categories: ecological impacts (e.g., changes to water quality and minimum flows), reduced electric generating capacity, and reduced recreational opportunities (Alabama Power and Kleinschmidt 2018). In addition, navigation flows described in Section 3.3 may also be affected by drought.

The Alabama-ACT Drought Response Operations Plan (ADROP) describes the management of Alabama Power's reservoirs within the ACT basin during drought conditions. It was developed by Alabama Power, stakeholders, and state and federal agencies in response to the 2007 drought, which is the drought of record for the ACT basin (Alabama Power 2013a as cited in Alabama Power and Kleinschmidt 2018). ADROP defines three drought triggers: (1) low basin inflow; (2) low composite conservation storage; and (3) low state line flow. If any one of these triggers is met, navigation support is suspended, and the 4,640 cfs Alabama River flow at Montgomery may be reduced consistent with the plan, depending on the severity of the drought conditions. Under ADROP, the drought triggers are used to define three incremental Drought Intensity Level (DIL) responses. The DIL responses describe a range of operations for the hydroelectric projects within the ACT basin as a function of the DIL and month. Alabama Power, Alabama Office of Water Resources (OWR), and other relevant state and federal agencies monitor specific precipitation and stream flow indicators within the ACT basin. The precipitation indicator is based on the average of normal monthly rainfall at the following airport rain gages: Rome, Anniston, Shelby County, and Montgomery. The stream flow indicator is based on specific percentile ranges of stream flow from 11 USGS gages in the Coosa River Basin and seven gages in the Tallapoosa River Basin (Alabama Power 2013a as cited in Alabama Power and Kleinschmidt 2018). Alabama Power evaluates the DIL using the ADROP Decision Tool that was developed by Alabama Power and the USACE Mobile District to implement portions of the Master WCM in real time operations. ADROP was incorporated into the Master WCM and ACT Basin Drought Contingency Plan. A full description of ADROP and associated operational responses for its projects on the Coosa and Tallapoosa rivers during periods of drought is included in Appendix B (Alabama Power and Kleinschmidt 2018).

3.5 Minimum Flow

To protect and develop the downstream aquatic habitat, Article 13 of the existing Harris Project FERC license requires Alabama Power to meet a minimum flow requirement of 45 cfs, as measured at the downstream Wadley gage near Wadley, Alabama (FERC 1973 as cited in Alabama Power and Kleinschmidt 2018).

3.6 Green Plan Operations

In the 1990s, resource agencies and other stakeholders expressed concern about impacts to aquatic resources associated with peaking operations and minimum flows at Harris Dam. Alabama Power worked with stakeholders including, among others, ADCNR, U.S. Fish and Wildlife Service (USFWS), FERC, and the Alabama Cooperative Fish and Wildlife Research Unit (ACFWRU) at Auburn University to address those concerns. Following a 2003 adaptive management workshop, a core group of stakeholders worked with Alabama Power to explore potential solutions that maximized benefits to biological, economic, and recreation resources.

Alabama Power evaluated several methods to provide continuous flows or re-regulation of peaking flows from Harris Dam, including geotubes, a re-regulation dam, and structural modification to Harris Dam. Alabama Power performed numerous hydraulic modeling runs of various flow scenarios in evaluating potential re-regulation structures. Many of the methods evaluated were deemed unfeasible at that time due to engineering (structural), cost, and/or ecological considerations.

After eliminating potential physical modifications to the dam and river downstream, the stakeholder group and Alabama Power devised a plan for specific pulsing releases from Harris Dam, which was deemed the “Green Plan” (Green Plan or GP) (Appendix B). Generally, the Green Plan specifies short (10 to 30 minute) pulses from Harris Dam, with the pulse duration determined by conditions at a gage on an unregulated section of the Tallapoosa River upstream of Harris Reservoir. The Green Plan outlines specific daily and hourly release schedules from Harris Dam based on the previous day’s flow at the USGS’s gage near Heflin (Station. No. 02412000). The daily volume releases are suspended during flood operations, and specific drought release criteria are also outlined.

In 2005, Alabama Power began implementing the Green Plan. Although Green Plan operations are not required by the existing license, Alabama Power has operated Harris Dam according to the Green Plan release criteria since 2005, and, along with ADCNR, began funding research by ACFWRU to determine the response of the aquatic community in the Tallapoosa River downstream of Harris Dam. Alabama Power continued to support those research efforts through 2017. In 2018, to support the relicensing process and provide baseline information for the Pre-Application Document (PAD), the history of the development of the Green Plan and the research conducted from 2005-2017 as part of monitoring efforts in the Tallapoosa River below Harris Dam were summarized in a report entitled "*Summary of R.L. Harris Downstream Flow Adaptive Management History and Research*". A full description of the Harris Adaptive Management Plan (AMP) Process and Green Plan operations is provided in Appendix B.

3.7 Existing PME Measures

In addition to the existing operations, Alabama Power also implements PME measures, as required in the license, or voluntarily. Table 3-1 summarizes the PME measures implemented at the Project during the current license term.

Table 3-1 Existing PME Measures

PME MEASURES (PMEs) AT HARRIS PROJECT			
	Voluntary PMEs	**Completed PMEs**	**On-Going PMEs**
In the interest of protecting and developing the downstream aquatic habitat, release water from the Project to provide a minimum flow of 45 cfs, as measured at the Wadley gage.			✓
In the interest of recreation, flood control and other public uses, and consistent with power needs, maintain the Harris Reservoir as reasonably as possible at normal full pool elevation of 793 feet from May 1 to September 30 of each year and maintain the reservoir from October 1 to April 30, of each year at elevations as high as is consistent with flood control and system power needs and in no event lower than elevations of 768 feet.			✓
Operate the reservoir for flood control in accordance with the agreement between USACE and Alabama Power.			✓
Operate Harris Dam according to Green Plan release criteria (since 2005).	✓		✓
When conditions exist, and upon request from ADCNR, hold Harris Reservoir water levels constant or slightly increasing for a 14-day period for spring spawning.	✓		✓

PME Measures (PMEs) at Harris Project			
Consistent with the 1972 Alabama Water Improvement Commission (predecessor to ADEM) certificate pursuant to Section 21(b) of the Federal Water Pollution Control Act and the Revised Exhibit S (approved on September 21, 1984), operate the skimmer weir and turbine aeration system in order to maintain state water quality standards.			✓
Perform vector control, as necessary.			✓
Implement a Wildlife Mitigation Plan in consultation with ADCNR and USFWS (approved by FERC in 1988).			✓
• Waterfowl – Wood Duck			
o Identify suitable Wood Duck habitat		✓	
o Install Wood Duck boxes		✓	
o Inspect boxes annually and perform necessary maintenance as needed			✓
• Waterfowl – Canada Goose - Develop and implement a Canada Goose restoration project including releasing Canada geese around Lake Harris		✓	
o Initial release of birds		✓	
o Place floating nests in sheltered coves		✓	
o Clear and strip-crop feeding areas		✓	
• Install Osprey nesting platforms		✓	
• Land Acquisition – Lake Harris - Acquire 779.5 acres of land		✓	
• Timber Management – Lake Harris			✓
• Managed Openings - Lake Harris			
o Establish and manage105 acres of permanent openings			✓
o Manage 180 acres of right-of-way on project lands			✓
• Additional artificial Nesting Structures – Lake Harris - construct and install			
o 300 large animal and cavity-nesting bird structures		✓	
o 300 small animal and cavity-nesting bird structures		✓	
Implement the Skyline Management Plan in (approved by FERC in 1990).			✓
• Purchase and lease to ADCNR, approximately 15,000 acres of land in the Skyline Wildlife Management Area.		✓	
• Fund ADCNR to provide wildlife management			✓
• Conduct clearing, construct firebreaks, construct waterholes, add additional campsites as needed			✓
• Conduct annual boundary maintenance, upgrade roads to all-weather status and maintain annually; install and maintain gates; maintain campsites; erect and maintain nest structures			✓
• Develop and maintain herbaceous and shrub plantings; manage wildlife openings; conduct timber management			✓
Encourage the use of alternative bank stabilization techniques other than seawalls.	✓		✓
Implement the Dredge Permit Program.			✓

PME Measures (PMEs) at Harris Project			
Implement the Water Withdrawal Policy.	✓		✓
Incorporate a scenic easement for the purpose of protecting scenic and environmental values.			✓
Use of a "sensitive resources" designation on Project lands managed for the protection and enhancement of cultural resources, wetlands, and threatened and endangered species.	✓		✓
Implement a shoreline compliance program and shoreline permitting program.			✓
Encourage the adoption of shoreline best management plans (BMPs), including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation.	✓		✓
Operate and maintain Project recreation sites.			✓
Identification of historical structures: cooperate with the appropriate State and local agencies in the identification of historical structures, if any, within the project area and, if necessary, cooperate in developing a plan for protection or relocation of such structures.		✓	
Archaeological Consultation: prior to commencement of construction, Alabama Power will consult with the University of Alabama to determine the extent of any archeological survey and salvage excavations that may be necessary prior to any construction activities and provide funds in a reasonable amount for any needed surveys or salvage excavations to be conducted and completed prior to construction and/or flooding, whichever is applicable.		✓	
SHPO Consultation: Licensee shall, prior to commencement of any future construction at the project, consult with the Alabama State Historic Preservation Officer (SHPO) about the need for any cultural resource survey and salvage work.			✓

4 PREFILING CONSULTATION SUMMARY

4.1 Stakeholder Consultation

Alabama Power implemented a document control and communication plan to track and manage Harris Project relicensing communications. The communication plan included a stakeholder database and relicensing website. Alabama Power's stakeholder database includes federal, state, and local agencies, applicable tribes[24], and non-governmental organizations (NGOs). Alabama Power's relicensing website for the Harris Project is located at www.harrisrelicensing.com and contains a summary of the Harris Project and Integrated Licensing Process (ILP), meeting notices and schedules, final meeting summaries, and relicensing documents.

4.2 Scoping Process

Alabama Power filed the Harris Project PAD (18 C.F.R. §5.6 (c) and (d)) with FERC on June 1, 2018[25]. The PAD included a compilation of existing information regarding the Harris Project and its associated environmental, recreation, land use, cultural, and socioeconomic resources (Alabama Power and Kleinschmidt 2018).

In accordance with 18 C.F.R. §5.8, FERC issued a National Environmental Policy Act (NEPA) Scoping Document 1 (SD1)[26] on July 31, 2018, to federal, state, and local agencies, applicable tribes, NGOs, and the public. On August 28 and 29, 2018, FERC held Harris Project Scoping Meetings[27] to provide additional opportunities for stakeholders and the public to present and discuss any issues related to the Harris Project relicensing. FERC issued Scoping Document 2 (SD2)[28] on November 16, 2018, after incorporating the written comments filed during the scoping comment period.

[24] As of March 2021, the applicable tribes consisted of the following: Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians in Oklahoma, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town, Coushatta Tribe of Louisiana, Kialegee Tribal Town, Muscogee (Creek) Nation, Poarch Band of Creek Indians, and Thlopthlocco Tribal Town.
[25] Accession No. 20180601-5126
[26] Accession No. 20180731-3035
[27] Accession Nos. 20181010-4002 and 20181010-4003
[28] Accession No. 20181116-3065

4.3 Study Plan Development

On November 13, 2018, Alabama Power filed ten Proposed Study Plans [29] for the Harris Project: Operating Curve Change Feasibility Analysis Study; Downstream Release Alternatives Study; Erosion and Sedimentation Study; Water Quality Study; Aquatic Resources Study; Downstream Aquatic Habitat Study; Threatened and Endangered (T&E) Species Study; Project Lands Evaluation Study; Recreation Evaluation Study; and Cultural Resources Programmatic Agreement (PA) and Historic Properties Management Plan (HPMP).

Alabama Power held a Study Plan Meeting on December 13, 2018, with stakeholders to discuss the Proposed Study Plans. Based on comments filed by stakeholders, Alabama Power filed a Revised Study Plan on March 13, 2019[30].

On April 12, 2019, FERC issued its Study Plan Determination (SPD)[31] for the Harris Project, approving Alabama Power's ten relicensing studies with FERC modifications. On May 13, 2019, Alabama Power filed Final Study Plans[32] to incorporate FERC's modifications and posted the Final Study Plans on the Harris Project relicensing website at www.harrisrelicensing.com. In the Final Study Plans, Alabama Power proposed a schedule for each study that included filing voluntary Progress Updates in October 2019 and October 2020 to ensure that stakeholders could review the progress to date and plan for future reports, meetings, and overall relicensing activities.

4.4 Resource Study Reports

Alabama Power conducted the first season of studies from May 2019 to April 2020, and filed the first voluntary Progress Update on October 30, 2019[33]. After completing the first season of studies, Alabama Power filed an Initial Study Report (ISR)[34] on April 10, 2020, describing Alabama Power's overall progress in implementing the Study Plans, schedules, a summary of the data, and any variances from the Study Plans or schedules. Concurrently with the ISR filing, Alabama Power filed six study reports and two cultural resources

[29] Accession No. 20181113-5213
[30] Accession No. 20190313-5060
[31] Accession No. 20190412-3000
[32] Accession No. 20190513-5093
[33] Accession No. 20191030-5053
[34] Accession No. 20200410-5084

documents, including the consultation record for each of these six reports and cultural resource documents from May 2019 through March 2020.

Alabama Power held the ISR meeting on April 28, 2020, and filed the meeting summary on May 12, 2020[35]. Stakeholders and FERC provided comments on the ISR and ISR Meeting Summary on or before June 10, 2020. Alabama Power filed the Response to ISR Disputes or Requests for Modifications of Study Plan on July 10, 2020[36].

In the August 10, 2020, FERC Determination on Requests for Study Modifications for the Harris Project[37], FERC recommended that Alabama Power conduct a new study titled Battery Energy Storage System (BESS) to include two new release alternatives: (a) a 50 percent reduction in peak releases associated with installing one 60-MW battery unit, and (b) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10, or 20 MW battery). FERC further recommended that Alabama Power include in its cost estimates for installation of a BESS, any specific structural changes, any changes in turbine-generator units, and costs needed to implement each battery storage type. Finally, FERC recommended that, consistent with the Downstream Release Alternatives Study Plan, Alabama Power evaluate how each of the release alternatives (i.e., items [a] and [b] above) would affect recreation and aquatic resources in the Harris Project reservoir and downstream of Harris Dam.

In their August 10, 2020 letter, FERC also recommended that as part of the Downstream Release Alternatives Study Plan, Alabama Power model additional downstream releases including: the continuous minimum flows with the Green Plan releases (i.e., 150 cfs + Green Plan, 300 cfs + Green Plan, 600 cfs + Green Plan, and 800 cfs + Green Plan). FERC also required Alabama Power to model a variation of the existing Green Plan where the daily volume of Harris Dam releases are 100 percent of the prior day's flow at the USGS Heflin stream gage. As explained in a HAT 3 meeting on November 5, 2020, Alabama Power releases approximately 100 percent of the prior day's flow at the USGS Heflin stream gage under the current Green Plan operations. The Green Plan criteria states that Harris Dam release at least 75 percent of the prior day's flow at Heflin. Translating that minimum requirement into the 10, 15, and 30 minute pulsing operations results in releases well above 75 percent of the prior day's Heflin flow. Therefore, there was no need

[35] Accession No. 20200512-5083
[36] Accession No. 20200710-5122
[37] Accession No. 20200810-3007

to further evaluate this alternative, as there was no discernible difference between 75 percent and 100 percent (Alabama Power and Kleinschmidt 2021b).

Beginning June 2020 to March 2021, Alabama Power conducted the Operating Curve Change and Downstream Release Alternatives Phase 2 analyses. Alabama Power also filed the second voluntary Progress Update[38] on October 30, 2020. During the Phase 2 operations analyses, Alabama Power used modeling results from Phase 1 studies along with results from other FERC-approved studies to perform quantitative and qualitative evaluations of potential resource effects.

On April 12, 2021, Alabama Power filed an Updated Study Report (USR)[39] describing Alabama Power's overall progress in implementing the Study Plans, schedules, summary of the data, and any variances from the Study Plan or schedules. Concurrently with the USR filing, Alabama Power filed the *Draft Operating Curve Change Feasibility Analysis Phase 2 Study Report*, *Draft Downstream Release Alternatives Phase 2 Study Report*, and *Draft Battery Energy Storage System Report*, including the consultation record for each of these draft reports. In addition, Alabama Power filed several final study reports (see Section 1). Alabama Power held the USR meeting on April 27, 2021, and filed the USR Meeting Summary on May 12, 2021[40]. Stakeholder comments on the USR Meeting Summary were filed on or before June 11, 2021.

4.5 Stakeholder Meetings

Alabama Power began the relicensing consultation process in 2017 by meeting with federal, state, and local agencies and other interested groups to discuss potential Project issues and gather available information. Alabama Power prepared a Preliminary Information Document (PID) in September 2017 to educate stakeholders on the current operation of the Harris Project and held an Issue Identification Workshop on October 19, 2017.

Alabama Power hosted an informational meeting on January 31, 2018, to address questions regarding Harris Project operations and to provide a history of the Adaptive Management Process and Green Plan flows (see Appendix B). At this meeting, Alabama Power introduced the concept of relicensing teams, called HATs, which are comprised of

[38] Accession No. 20201030-5215
[39] Accession No. 20210412-5737
[40] Accession No. 20210512-5067

a smaller group of interested stakeholders organized around specific resource issues, as follows:

- HAT 1 – Project Operations
- HAT 2 – Water Quality and Use
- HAT 3 – Fish and Wildlife
- HAT 4 – Project Lands
- HAT 5 – Recreation
- HAT 6 – Cultural Resources

The formal relicensing process began in June 2018 with the filing of the PAD and Notice of Intent (NOI). The HATs met from 2019-2021 to discuss issues and PME measures. All HAT meetings from April 2020 to present were held virtually due to Coronavirus Disease 2019 (COVID-19) and related travel and public gathering restrictions. A summary of the stakeholder and HAT meetings is presented in Appendix C[41].

Copies of formal comment letters and a transcript of the FERC Scoping Meeting are available on FERC's e-library (http://www.ferc.gov/docs-filing/elibrary.asp) under FERC Project No. 2628. Copies of final meeting summaries are available on the Harris Project relicensing website (www.harrisrelicensing.com). The consultation record for each study is included as an attachment to the study report filings. A complete stakeholder consultation record will be filed with the FLA.

4.6 Tribal Consultation

On July 31, 2018, FERC issued Notice of Commencement of Proceeding[42] and SD1[43], designating Alabama Power as the non-federal representative for informal Section 106 Consultation. As noted in Section 4.5, Alabama Power formed HAT 6 to address the Harris Project cultural resources.

[41] This consultation summary consists of milestone meetings to date and consultation is on-going; therefore, the full consultation record will be included with the Final License Application.
[42] Accession No. 20180731-3029
[43] Accession No. 20180731-3035

5 PROPOSED ACTION AND ACTION ALTERNATIVES

This section describes Alabama Power's proposal, or the "Proposed Action", including changes to the Harris Project operations, and PME measures proposed by Alabama Power for the term of the new license. This section also defines and describes the No Action Alternative and alternatives considered but eliminated from further analysis.

5.1 No Action Alternative

Under the No Action Alternative, the Harris Project would continue to operate under the terms and conditions of the existing license, and no new PME measures would be implemented. The No Action Alternative serves as the baseline environmental condition for comparison with other alternatives. Existing operations include: 1) the normal, flood, and drought operations described in Sections 3.1 through 3.4; and 2) the Green Plan operations described in Section 3.6. As noted in Section 3.6, the Green Plan is not a license requirement, but a voluntary operations procedure that Alabama Power began implementing in 2005 following consultation with FERC, agencies, and stakeholders to address concern about impacts to aquatic resources associated with peaking operations and minimum flows at Harris Dam and to potentially maximize benefits to biological, economic, and recreation resources. Reference to the Green Plan is synonymous with "baseline," with regard to operations, and is presented hereinafter as "Green Plan (baseline)."

5.2 Alternatives Considered but Eliminated

The relicensing studies presented in Section 1.0 describe the baseline conditions and effects of evaluated operational changes on all resource areas. Operational alternatives that were considered but eliminated from further analysis and the reason for their elimination are summarized in Table 5-1.

Table 5-1 Summary of Alternatives Considered but Eliminated and Rationale

DESCRIPTION OF ALTERNATIVE	REASON FOR ELIMINATING FROM FURTHER ANALYSIS
Raising the winter operating curve on Lake Harris from 785-ft msl to 786, 787, 788, or 789-ft msl	• Any increase in the winter operating curve would result in an increase in downstream flooding, including both an increase in downstream acres inundated and an increase in downstream flood depth. Alabama Power determined from the modeled 100-Year Design Flood that increases in downstream flooding were not reasonable; therefore, Alabama Power eliminated these operating alternatives from further consideration. A comprehensive analysis of effects is presented in the *Operating Curve Change Feasibility Analysis Phase 1 and Phase 2 Study Reports*.
PreGP or PGP - Pre-Green Plan (peaking only; no pulsing or continuous minimum flow)	• Alabama Power determined that returning to peaking-only operations could potentially eliminate any beneficial effect on aquatic resources from the Green Plan (baseline); therefore, Alabama Power eliminated this alternative from further consideration. A comprehensive analysis of effects is presented in the *Downstream Release Alternatives Phase 1 and Phase 2 Reports*.
ModGP - Modified Green Plan (changing the timing of the Green Plan pulses to 2AM, 10 AM, and 6 PM)	• The ModGP alternative may have minor beneficial environmental effects but was overall less beneficial compared to other downstream release alternatives; therefore, Alabama Power eliminated this alternative from further consideration. A comprehensive analysis of effects is presented in the *Downstream Release Alternatives Phase 1 and Phase 2 Reports*.
600CMF - 600 cfs continuous minimum flow	• The 600CMF alternative would adversely affect the summer reservoir elevations of Lake Harris and, consequently, lake recreation access. This alternative would result in average reservoir elevations approximately 0.5 feet lower than the Green Plan (baseline) from May to September, and then approximately 1-foot lower during September; therefore, Alabama Power eliminated this alternative from further consideration. A comprehensive analysis of effects is presented in the *Downstream Release Alternatives Phase 1 and Phase 2 Reports*.
800CMF - 800 cfs continuous minimum flow	• The 800CMF alternative would adversely affect the summer reservoir elevations of Lake Harris and, consequently, lake recreation access. This alternative would result in average reservoir elevations approximately 1 foot lower than the Green Plan (baseline) during May and June, increasing to approximately 4 feet lower during September; therefore, Alabama Power eliminated this alternative from further consideration. A comprehensive analysis of effects is presented in the *Downstream Release Alternatives Phase 1 and Phase 2 Reports*.

DESCRIPTION OF ALTERNATIVE	REASON FOR ELIMINATING FROM FURTHER ANALYSIS
150CMF+GP - 150 cfs continuous minimum flow + GP (a hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing described in the existing Green Plan release criteria)	• The 150CMF+GP alternative showed no significant increase in benefits by adding the Green Plan pulsing to a 150 cfs continuous minimum flow. Additionally, pulsing could adversely affect recreation as it creates more unpredictable conditions for recreation users in the Tallapoosa River near Harris Dam. Therefore, Alabama Power eliminated this alternative from further consideration. A comprehensive analysis of effects is presented in the *Downstream Release Alternatives Phase 1 and Phase 2 Reports*.
300CMF+GP - 300 cfs continuous minimum flow + GP (a hybrid Green Plan that incorporates both a base minimum flow of 300 cfs and the pulsing described in the existing Green Plan release criteria)	• The 300CMF+GP alternative showed little to no significant increase in benefits over the 300 CMF by adding the Green Plan pulsing. In addition, 300 continuous minimum flow +GP results in lower average reservoir elevations in the summer months from May – October and during periods of low inflow. A comparison of minimum elevations over the period of record under this alternative to Green Plan (baseline) minimum elevations shows that the reservoir would be 4 feet lower from April through October. Additionally, pulsing could adversely affect recreation as it creates more unpredictable conditions for recreation users in the Tallapoosa River near Harris Dam. Therefore, Alabama Power eliminated this alternative from further consideration. A comprehensive analysis of effects is presented in the *Downstream Release Alternatives Phase 1 and Phase 2 Reports*.
600CMF+GP - 600 continuous minimum flow + GP (a hybrid Green Plan that incorporates both a base minimum flow of 600 cfs and the pulsing described in the existing Green Plan release criteria)	• The 600CMF+GP would adversely affect the summer reservoir elevations of Lake Harris and, consequently, lake recreation access. This alternative would result in average reservoir elevations approximately 2 feet lower than the Green Plan (baseline) for May and June, increasing to approximately 4 feet lower during September; therefore, Alabama Power eliminated this alternative from further consideration. Additionally, pulsing could also adversely affect recreation as it creates more unpredictable conditions for recreation users in the Tallapoosa River near Harris Dam. A comprehensive analysis of effects is presented in the *Downstream Release Alternatives Phase 1 and Phase 2 Reports*.
800CMF+GP - 800 continuous minimum flow + GP (a hybrid Green Plan that incorporates both a base minimum flow of 800 cfs and the pulsing described in the existing Green Plan release criteria)	• The 800CMF+GP alternative would adversely affect the summer reservoir elevations of Lake Harris and, consequently, lake recreation access. This alternative would result in average reservoir elevations approximately 4 feet lower than the Green Plan (baseline) during May and June, which increases to approximately 12 feet during September. Additionally, pulsing could adversely affect recreation as it creates more unpredictable conditions for recreation users in the Tallapoosa River near Harris Dam. Therefore, Alabama Power eliminated this alternative from further consideration. A comprehensive analysis of effects is presented in the *Downstream Release Alternatives Phase 1 and Phase 2 Reports*.

DESCRIPTION OF ALTERNATIVE	REASON FOR ELIMINATING FROM FURTHER ANALYSIS
Battery Energy Storage System	• Alabama Power evaluated two alternatives: ❖ **Option A** is a 60 MW battery with 240 MWh capacity that can provide the equivalent generation of one unit at best gate for 4 hours per day/every day. ❖ **Option B** is a 20 MW battery with 80 MWh capacity that can provide the equivalent generation of one-third of one unit at best gate for 4 hours per day/every day. The remaining 40 MW needed for 1-unit peaking generation would be produced by a new, upgraded unit. • The cost of integrating a BESS at Harris is substantial, and, therefore, not economical in comparison to potential limited environmental benefits (see the *Battery Energy Storage System Report* for details). • Key considerations include the need to charge the BESS from the grid due to insufficient inflows as well the need for greater production of energy to overcome the efficiency losses through the BESS. Moreover, additional costs will be incurred for interconnection, as well as costs associated with replacing an existing hydroelectric unit. • Neither Option A nor Option B retain full system peaking capabilities. Therefore, there would be times throughout the year when higher, peaking flows would continue to be released for both Option A and Option B. • Alabama Power does not consider the integration of a BESS as a reasonable alternative and, therefore, eliminated it from further consideration. A comprehensive analysis is provided in the *Battery Energy Storage System Report*.

5.3 Proposed Operations

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods to maintain reservoir levels according to the existing operating curve as described in Section 3.1. Alabama Power will continue operating in high flow conditions according to the USACE-approved flood control procedures in the Harris WCM and will operate in low flow periods according to ADROP, which has been incorporated into the Master WCM and ACT Basin Drought Contingency Plan.

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow[44] (CMF) between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. Based on conceptual design, there are two factors affecting the location and size of the minimum flow unit. First, the only suitable location that would accommodate an additional unit is on the outside of the Unit 1 side of the powerhouse. The minimum flow unit would require an addition to the east side of the powerhouse and would connect to the Unit 1 penstock (Figure 5-1). Second, the conceptual design indicates that the unit size would be limited by the space available; therefore, the amount of flow through the unit would also be limited. Details from the preliminary engineering design will be filed with the FLA and final engineering design may be modified based on future information. Any engineering design will take into account the ability to provide a reliable flow, dam safety, and unit accessibility for operation and maintenance. Note that Alabama Power will continue to operate in accordance with the Green Plan (baseline) until the minimum flow unit is installed and operational.

[44] Note that continuous minimum flow is used in the text and "CMF" acronym is used in tables and figures.

Figure 5-1 Approximate Location of the Proposed New Minimum Flow Unit

5.4 Proposed Environmental Measures

In addition to the proposed operations, Alabama Power proposes various PME measures to protect and enhance environmental, recreational, and cultural resources. Table 5-2 summarizes the operational and PME measures.

Table 5-2 Proposed Operations and PME Measures for the Harris Project

Proposed Operational and PME Measures
• Continue operating the Harris Project according to the existing operating curve and flood control procedures • Continue daily peak-load operations • Continue operating in accordance with ADROP to address drought management
• Design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. Based on conceptual design, the continuous minimum flow unit would require an addition to the east side of the powerhouse and connect to the Unit 1 penstock; therefore, the unit size would be limited by the space available. ❖ File details of the preliminary engineering design in the FLA ❖ Develop minimum flow operations during drought and unit outages
• Develop and implement a Project Operations and Flow Monitoring Plan to monitor compliance with: (1) Project Operation and Water Level Management; (2) flood control operations (3) drought management; and (4) flow releases from the Harris Dam
• Develop and implement an Aquatic Resources Monitoring Plan following implementation of the CMF
• Develop and implement a Water Quality Monitoring Plan consistent with the 401 Water Quality Certification • Continue operating the existing aeration system • Continue to maintain the skimmer weir at the highest setting
• When conditions exist, and upon request from ADCNR, hold Harris Reservoir water levels constant or slightly increasing for a 14-day period for spring spawning
• Provide fish habitat improvements by adding habitat enhancements to Harris Reservoir
• Develop and implement a Nuisance Aquatic Vegetation and Vector Control Program ❖ File Program with FLA
• Implement a Wildlife Management Plan (WMP) for Lake Harris and Skyline ❖ Follow current guidelines and consult with USFWS to develop measures protective of federally listed bats ❖ Incorporate timber management into the WMP ❖ Continue to provide hunting opportunities to the public ❖ File WMP with FLA

Proposed Operational and PME Measures
• Develop and implement a Shoreline Management Plan (SMP) for Lake Harris ❖ Incorporate proposed changes in land use classifications (including reclassifying the botanical area at Flat Rock Park from recreation to natural/undeveloped) ❖ Continue to encourage the use of alternative bank stabilization techniques other than seawalls ❖ Continue implementing the Dredge Permit Program ❖ Continue implementing the Water Withdrawal Policy ❖ Continue implementing a shoreline classification system to guide management and permitting activities ❖ Continue the requirements of a scenic easement for the purpose of protecting scenic and environmental values ❖ Continue the use of a "sensitive resources" designation in conjunction with shoreline classifications on Project lands managed for the protection and enhancement of cultural resources, wetlands, and threatened and endangered species ❖ Continue implementing a shoreline compliance program and shoreline permitting program ❖ Continue to encourage the adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation ❖ Provide an update to the SMP every 10 years ❖ File SMP with the FLA
• Implement proposed land additions to the Project Boundary and incorporate into Exhibit G
• Implement proposed land removals from the Project Boundary and incorporate into the Exhibit G
• Develop and implement a Recreation Plan ❖ Continue to operate and maintain 11 Project recreation sites ❖ Remove Wedowee Marine South as a Project recreation site and request approval of entire facility as Non-Project Use ❖ Install and maintain recreation (canoe/kayak) access below Harris Dam within the Project Boundary ❖ Provide an additional recreation site on Lake Harris to include a day use park (swimming, picnicking, and boat ramp) ❖ Implement Barrier-Free Evaluation Program at existing recreation sites ❖ Provide a Recreation Plan update to FERC every 10 years
• Finalize and implement a Historic Properties Management Plan (HPMP) ❖ Include aspects of the Traditional Cultural Properties (TCP) Identification Plan and the Inadvertent Discovery Plan (IDP) ❖ Provisions for training with appropriate Alabama Power personnel on looting. In addition, Alabama Power will explore options for training for indications of looting beyond Alabama Power personnel and/or its contactors. ❖ Include strategies for mitigation for potential adverse effects to historic properties within the Project Area of Potential Effects (APE) ❖ Provisions for the National Register of Historic Places (NRHP) eligibility evaluation of Harris Dam facilities in 2033 ❖ Develop a best management practices brochure (printed and online editions) for managing cultural resources on private lands ❖ Develop mitigation procedures for any adverse effects of Project operations on the Miller Covered Bridge piers, as necessary, after consultation with SHPO and NPS ❖ File Final HPMP with FLA

5.5 Presentation of Effects

In accordance with FERC regulations at 18 C.F.R. Section 5.5, the sections that follow describe by resource area, the: 1) affected environment, which serves as the baseline to compare Project alternatives, 2) environmental analysis, and 3) unavoidable adverse impacts. Use of "effects" or "impacts" should be considered synonymous; and effects/impacts are described as "beneficial", "adverse", or "no effect", in accordance with guidance from the Council on Environmental Quality (CEQ) implementing the NEPA.[45] The affected environment and environmental analysis are organized and presented by the Harris Project's three geographic areas: Skyline, Lake Harris, and the Tallapoosa River Downstream of Harris Dam, respectively. Unavoidable adverse impacts[46] are those impacts that cannot be avoided if the proposed action were implemented despite proposed protection, mitigation and enhancement measures. Unavoidable adverse impacts may include impacts caused by activities outside of the Project Boundary and therefore, outside of FERC's jurisdiction.

Alabama Power does not own any water or hydroelectric infrastructure at Skyline; therefore, this PLP does not contain any analysis of the proposed operations for Skyline.

5.6 Cumulative Effects

The CEQ issued a final rule on July 15, 2020, revising the regulations under 40 C.F.R. Parts 1500 – 1518 that federal agencies use to implement NEPA (see Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act, 85 Fed. Reg. 43,304). The Final Rule became effective on September 14, 2020 and applies to any NEPA process that begins after September 14, 2020.

FERC may apply the regulations to ongoing activities and environmental documents that began before September 14, 2020, which includes the Harris Project; therefore, FERC may conduct its NEPA review in accordance with CEQ's new regulations. As part of the new regulations, the CEQ changed the way cumulative effects are to be addressed in NEPA documents. Under the new regulations, NEPA documents will no longer differentiate between direct, indirect, and cumulative effects of a proposed action.

[45] Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act; Federal Register / Vol. 85, No. 137 / Thursday, July 16, 2020 /.
[46] Unavoidable Adverse Impacts are required by 40 C.F.R. Section 1502.14

In FERC's SD 1[47] and SD 2[48], geology and soils (erosion and sedimentation), water quantity, water quality, and fishery resources were identified as resources that could be cumulatively affected by the proposed continued operations and maintenance of the Harris Project, in combination with other hydroelectric projects and other activities in the Tallapoosa River Basin (FERC 2018a; 2018b). Based on the July 15, 2020 CEQ regulations, this PLP does not include a cumulative effects analysis for the resources noted above.

[47] Accession No. 20180731-3035

[48] Accession No. 20181116-3065

6 GEOLOGY AND SOILS

6.1 Affected Environment

6.1.1 Skyline

Skyline falls within the Jackson County Mountains District of the Cumberland Plateau. The Jackson County Mountains District is characterized by a highly irregular surface consisting of isolated, flat-topped remnants of the former plateau cut by steep-sided valleys (Neilson 2013). Skyline is underlain by Paleozoic sedimentary rocks that range from Mississippian to Pennsylvanian. Figure 6-1 shows the surficial geology of the lands in the Skyline Project Area. A detailed summary of physiographic regions, including physiographic sections, dominant structural features, and mineral resources is presented in Appendix D.

Figure 6-2 provides the soil types in the Skyline Project Area, including those soils within the Skyline Project Boundary. For additional tables and figures see Appendix D.

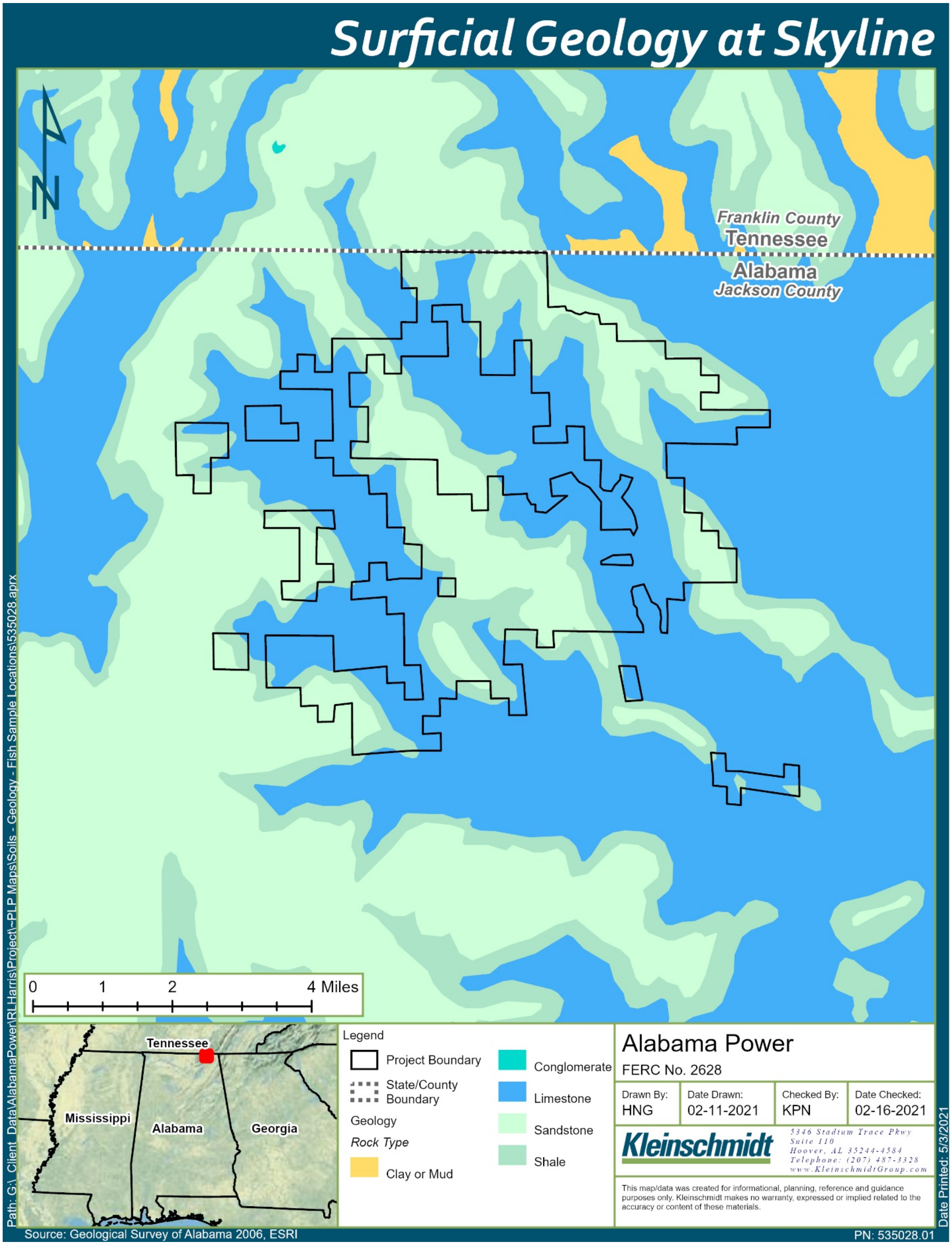


Figure 6-1 Surficial Geology at Skyline

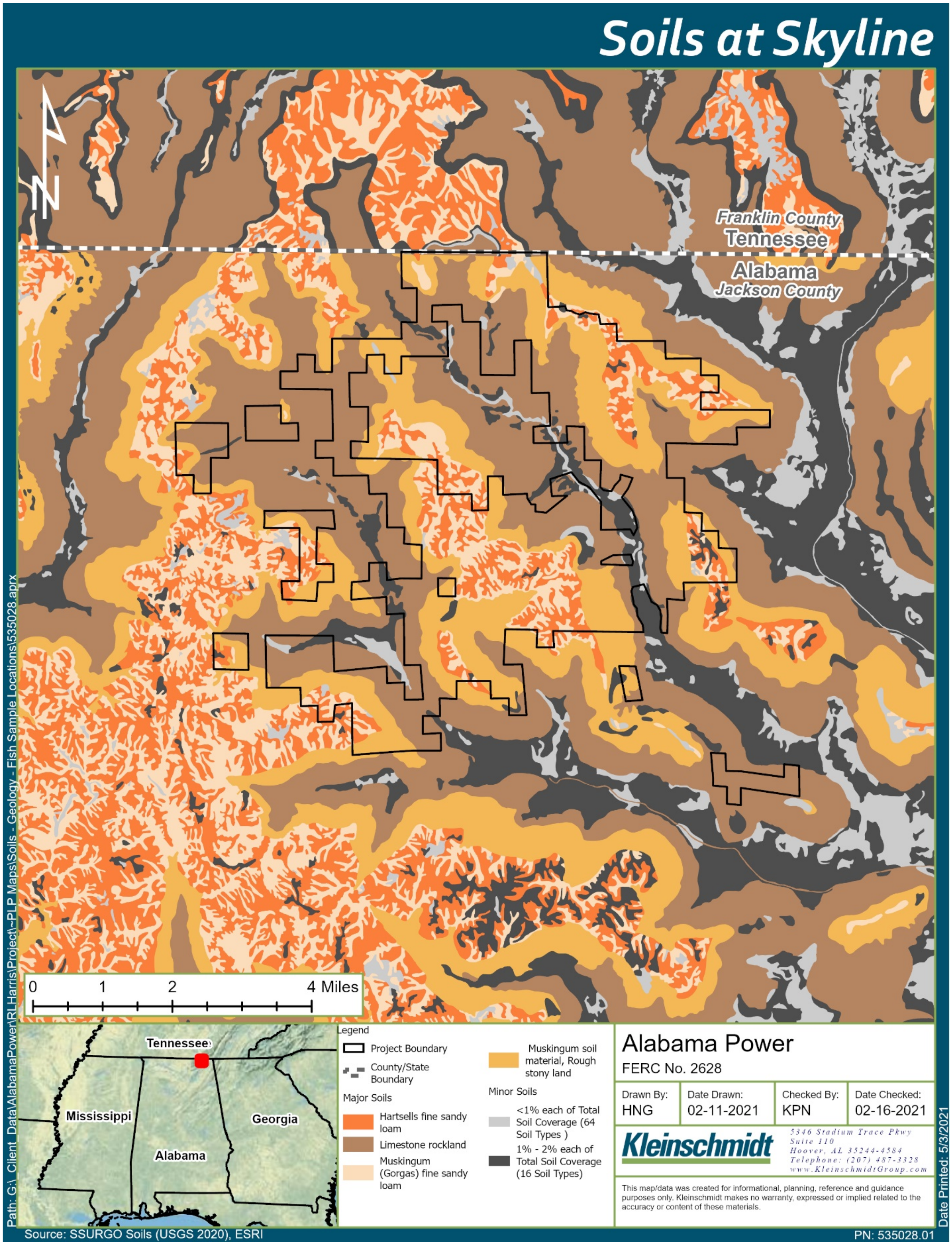


Figure 6-2 Soils at Skyline

6.1.1.1 Existing Erosion and Sedimentation

As part of the Erosion and Sedimentation Study, a geographic information system (GIS) analysis of land use classifications was conducted to assess the impact of agriculture on Little Coon Creek. Little Coon Creek is currently included in Alabama's 303(d) Impaired Waters List due to siltation. All states are required to develop a list of waterbodies that do not meet water quality standards. This requirement comes from Section 303 (d) of the Clean Water Act (CWA). Sources of this impairment include non-irrigated crop production and pasture grazing (ADEM 2020). This analysis shows 8.8 percent of land within the watershed is used for agriculture, a 0.8 percent increase from 2001 to 2016. The proximity of these areas to Little Coon Creek more easily allows for soils loosened due to tilling or other agricultural practices to be washed into the creek, resulting in sedimentation of the creek bottom. Additional information is included in the *Final Erosion and Sedimentation Study Report* (Kleinschmidt 2021a).

6.1.2 Lake Harris

Harris Reservoir and surrounding lands are located within the Piedmont Upland Physiographic Section, which consists of the Northern and Southern Piedmont Upland districts. The Brevard Fault Zone, a narrow zone of intensely sheared rocks, separates the Northern and Southern Piedmont Upland districts. Well-dissected uplands developed over metamorphic and igneous rocks characterize the Northern Piedmont Upland district. In the northern portion, elevations generally range from 500 to 1,100-feet msl. Cheaha Mountain, Alabama's highest elevation, 2,407-feet msl, is located on the northeastern end of a prominent northeast-trending ridge that occurs in this district. Tributaries of the Tallapoosa River incise the upland surfaces (Sapp and Emplaincourt 1975 as cited in Alabama Power and Kleinschmidt 2018; Neilson 2013b as cited in Alabama Power and Kleinschmidt 2018). The counties in the Lake Harris Project Area are underlain by igneous and metamorphosed rocks of Precambrian to Paleozoic age (Alabama Power and Kleinschmidt 2018). Figure 6-3 shows the surficial geology of the lands in the Lake Harris Project Area. A detailed summary of physiographic regions, including physiographic sections, dominant structural features, and mineral resources is presented in Appendix D.

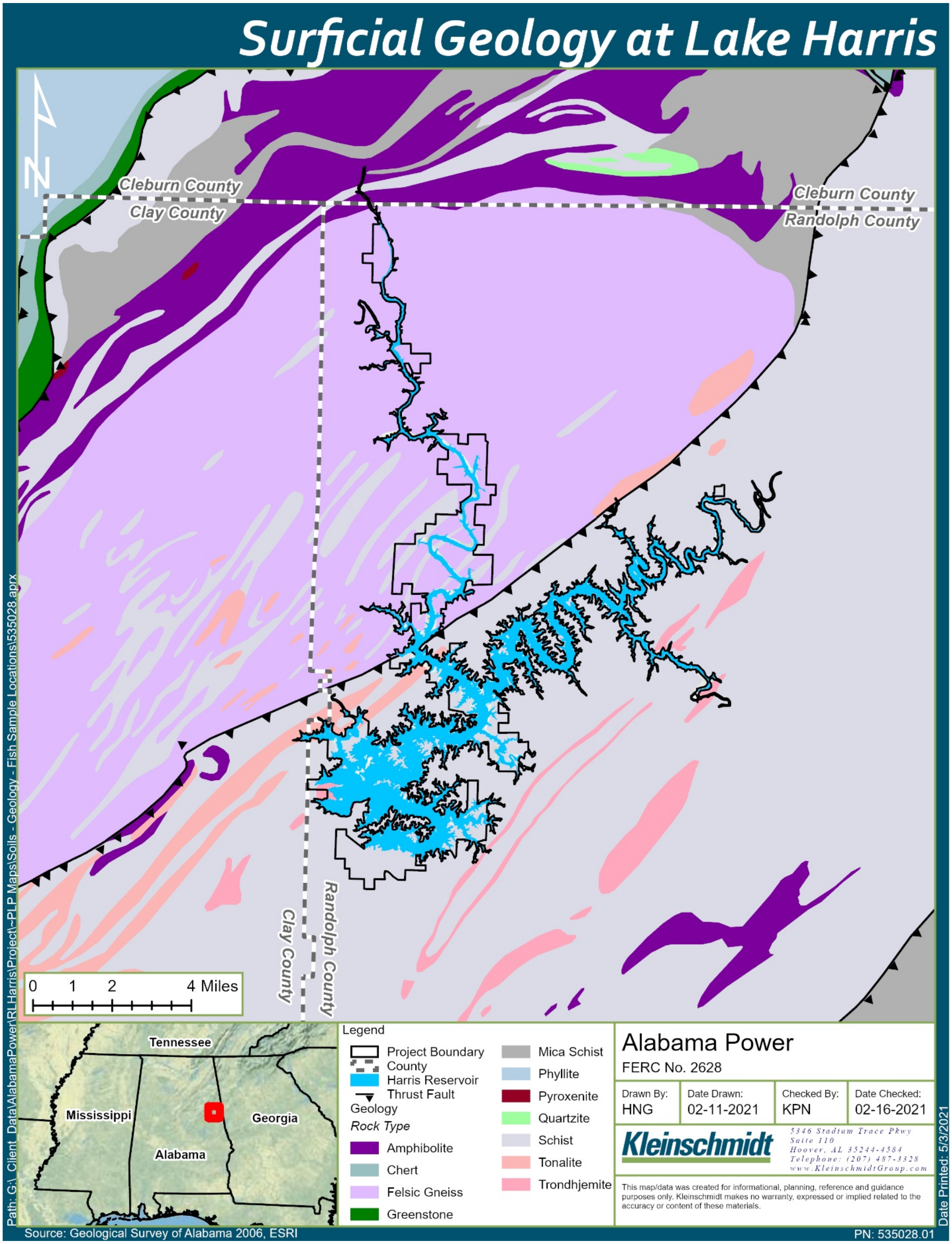


Figure 6-3 Surficial Geology at Lake Harris

Soils in the Lake Harris Project Area were derived from metamorphic, sedimentary, and igneous rock. Soil productivity has greatly decreased over much of the area due to poor farming practices in the 1800s and early 1900s. Many areas of depleted soils have reverted to forest, but productivity is often low. Figure 6-4 provides the soil types in the Lake Harris Project Area, including those soils within the Lake Harris Project Boundary. For additional tables and figures see Appendix D.

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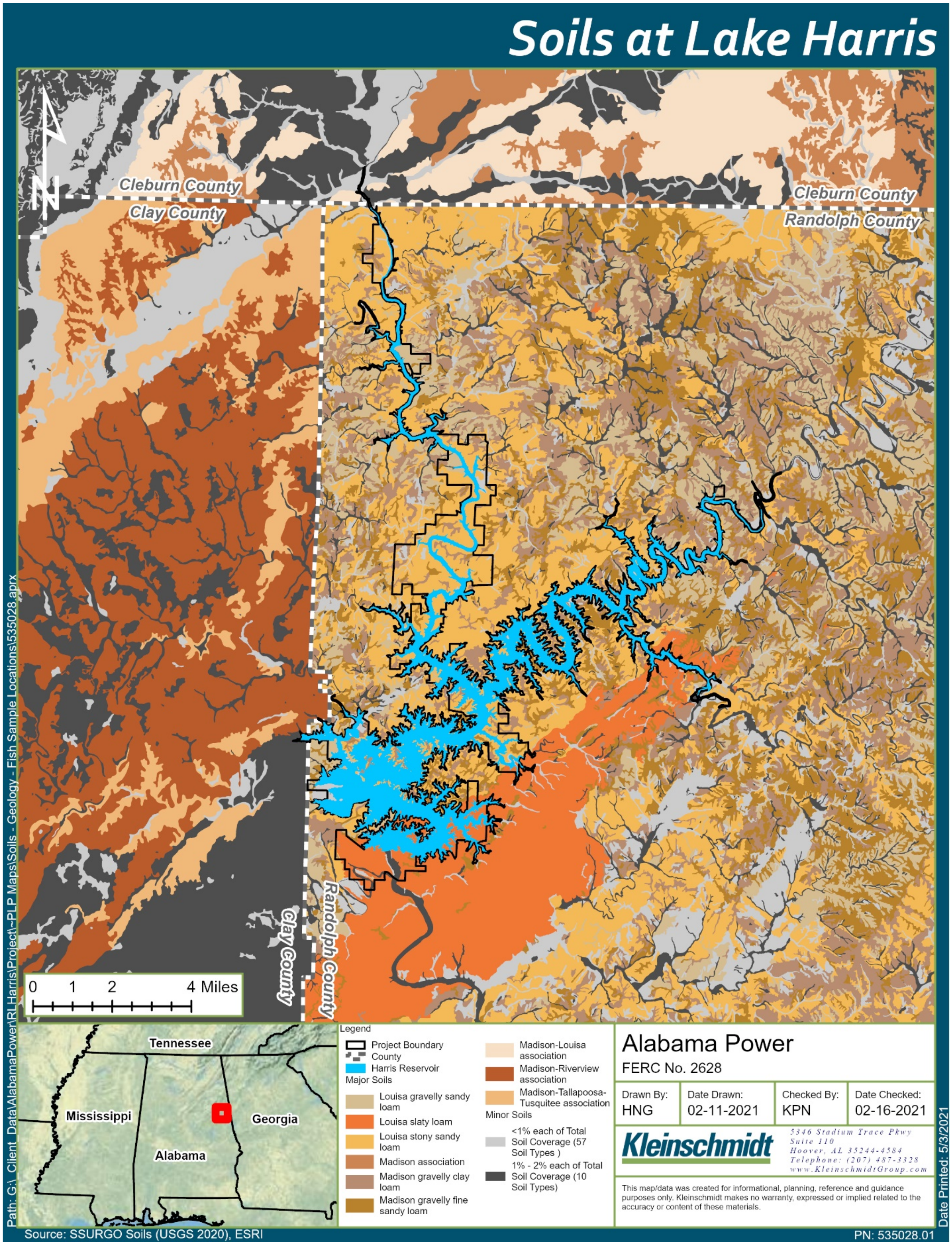

Figure 6-4 Soils at Lake Harris

6.1.2.1 Existing Erosion Sites

As part of the Erosion and Sedimentation Study, erosion sites were identified by stakeholders and investigated in 2019 (Kleinschmidt 2021a). Twenty-four erosion sites (22 on the lake and 2 downstream) were identified for field assessment (Table 6-1). Potential causes of erosion were assessed visually by the inspection team, including a qualified Erosion and Sediment Control Professional, as well as a soil scientist. To determine potential causes, the inspection team considered the geographic and geomorphic location of the identified location area and compared the area to surrounding banks. In addition, shape and depth of the erosion feature were assessed to help discern potential Project induced or wave action induced erosion. Erosion areas in upper portions of the reservoir were analyzed to determine if predominant erosion patterns were consistent with natural processes observed in those areas.

Table 6-1 Summary of Lake Harris Erosion Site Assessment

Erosion Site	Latitude	Longitude	Potential Cause(s) of Erosion/ Sedimentation	Length (ft)	Width (ft)	Description of Exposed Soils	Adjacent Land Use
E1	33.39649	-85.44412	Natural Factor Independent of Operations, Land Use	100	20	Oc, Ochlockonee fine sandy loam	Agricultural, Exposed Roots or Root Undercutting, Leaning or Fallen Trees
E2	33.39618	-85.44512	Natural Factor Independent of Operations, Land Use	150	20	Oc, Ochlockonee fine sandy loam	Agricultural
E3	33.39448	-85.44763	Land Use	50	30	Oc, Ochlockonee fine sandy loam	Agricultural
E4	33.39253	-85.44797	Land Use	varying	N/A	Oc, Ochlockonee fine sandy loam	Early Successional Vegetation, Developed, Residential
E5	33.38870	-85.44677	Anthropogenic	100	10	Oc, Ochlockonee fine sandy loam	Unvegetated, Exposed Roots or Root Undercutting, Leaning or Fallen Trees, Residential
E6	33.38817	-85.45264	No active erosion	N/A	N/A	Oc, Ochlockonee fine sandy loam	N/A
E7	33.38399	-85.45285	Natural Factor Independent of Operations, Land Use	75	5	Bu, Buncombe loamy sand	Undeveloped Wooded, Exposed Roots or Root Undercutting, Leaning or Fallen Trees
E8	33.37972	-85.45260	Natural Factor Independent of Operations, Land Use	100	10	Bu, Buncombe loamy sand	Undeveloped Grassy
E9	33.37732	-85.45879	Natural Factor Independent of Operations, Land Use	450	5	LtE, Louisa stony sandy loam	Early Successional Vegetation, Exposed Roots or Root Undercutting, Leaning or Fallen Trees, Residential
E10	33.37785	-85.45851	Natural Factor Independent of Operations, Land Use	150	5	Oc, Ochlockonee fine sandy loam	Early Successional Vegetation, Exposed Roots or Root Undercutting, Leaning or Fallen Trees, Residential
E11	33.38727	-85.47761	No active erosion	N/A	N/A	Mantachie fine sandy loam	N/A
E12	33.36759	-85.47331	No active erosion	N/A	N/A	Oc, Ochlockonee fine sandy loam	Developed
E13	33.36509	-85.47680	No active erosion	N/A	N/A	MaD3, Madison gravelly clay loam	Undeveloped Grassy, Roadway Embankment
E14	33.36407	-85.47728	Natural Factor Independent of Operations, Anthropogenic	N/A	N/A	Oc, Ochlockonee fine sandy loam	Undeveloped Wooded, Roadway Embankment
E15	33.37197	-85.49914	No active erosion	N/A	N/A	LgE, Louisa gravelly sandy loam	Developed, Wooded and Grassy, Residential

Erosion Site	Latitude	Longitude	Potential Cause(s) of Erosion/ Sedimentation	Length (ft)	Width (ft)	Description of Exposed Soils	Adjacent Land Use
E16	33.37216	-85.50173	No active erosion	N/A	N/A	LtE, Louisa stony sandy loam	Undeveloped Grassy
E17	33.37371	-85.50122	No active erosion	N/A	N/A	Mt, Mantachie fine sandy loam	Undeveloped Grassy, Exposed Roots or Root Undercutting, Power Line Crossing
E18	33.35833	-85.49693	Land Use, Anthropogenic	300	5	LtE, Louisa stony sandy loam	Developed, Grassy
E19	33.35334	-85.50611	Land Use, Anthropogenic	150	3	LtE, Louisa stony sandy loam	Early Successional Vegetation, Exposed Roots or Root Undercutting, Developed Grassy
E20	33.35544	-85.51280	No active erosion			LtE, Louisa stony sandy loam	Undeveloped Grassy
E21	33.33941	-85.55814	Anthropogenic	100	2	MdC2, Madison gravelly fine sandy loam	Exposed Roots or Root Undercutting, Residential Grass Cutting
E22	33.19603	-85.57649	Natural Factor Independent of Operations, Land Use	30	4	Oc, Ochlockonee fine sandy loam	Developed, Grassy, Early Successional Vegetation, Exposed Roots or Root Undercutting, Leaning or Fallen Trees
E23	33.18490	-85.58503	Land Use	400	10	Oc, Ochlockonee fine sandy loam	Agricultural, Grassy, Early Successional Vegetation, Exposed Roots or Root Undercutting, Leaning or Fallen Trees
E24	33.34779	-85.51483	Anthropogenic	30	5	DaD3, Davidson gravelly clay loam	Undeveloped Wooded, Exposed Roots or Root Undercutting, Leaning or Fallen Trees

Source: Kleinschmidt Associates 2021a

6.1.2.2 Existing Sedimentation Sites

As part of the Erosion and Sedimentation Study, nine sedimentation areas (Table 6-2) were identified by stakeholders and by examining available satellite imagery/aerial photography and light detection and ranging (LiDAR) data. The LiDAR and historical satellite/aerial imagery data were analyzed using GIS to identify elevation or contour changes around the reservoir and thus identify areas of sediment accumulation. The identified sedimentation areas were limited to areas exposed during the winter pool drawdown due to limitations of LiDAR in measuring below water surfaces. Therefore, approximate surface area for each of the identified sedimentation areas was measured using contours 793-feet and 785-feet msl established in a 2015 LiDAR survey of the reservoir during winter drawdown.

The GIS analysis was supported by field observations to verify sedimentation areas. Each of these sedimentation areas was also surveyed for nuisance aquatic vegetation during the 2020 growing season (Kleinschmidt Associates 2021a).

Table 6-2 Sedimentation Areas and Approximate Size (Elevation 793-FT – 785-FT MSL)

Site Name	Latitude	Longitude	Acreage
S1	33.37625	-85.4717	23.83
S2	33.3672	-85.4775	4.96
S3	33.3659	-85.4821	10.51
S4	33.36622	-85.485	5.49
S5	33.36051	-85.4856	6.68
S6	33.37432	-85.5138	13.55
S7	33.32641	-85.4885	26.14
S8	33.45383	-85.6098	10.59
S9	33.30647	-85.6286	18.25

Source: Kleinschmidt Associates 2021a

To assess the change in sedimentation areas over time, LiDAR data collected during 2007 was compared to more recent LiDAR collected in 2015. Surface areas, in acres, were calculated for the regions between the 786-feet and 793-feet msl elevation contours. Because the 785-feet msl contour was not available from the 2007 dataset, sedimentation surface area from 2015 was calculated again using the 786-feet and 793-feet msl contours to allow for a like comparison. All but one of the lake sedimentation sites were larger in 2015 compared to 2007.

Nuisance aquatic vegetation was also surveyed at the nine identified sedimentation areas. American Water-willow (*Justicia americana*), Pickerel Weed (*Pontederia cordata*), Alligator Weed (*Alternathera philoxeroides*), and juncus grass (*Juncus spp.*) were observed. No submerged vegetation species were found at any of the sites. The only non-native species identified was Alligator Weed (Kleinschmidt 2021a).

6.1.3 Tallapoosa River Downstream of Harris Dam

General characterization of geology and soils surrounding the Tallapoosa River downstream of Harris Dam is the same as described for Lake Harris in Section 6.1.2.

6.1.3.1 Existing Erosion Sites

As part of the Erosion and Sedimentation Study, a downstream streambank assessment was conducted by Trutta Environmental Solutions (Trutta). Trutta used two boat High Definition Stream Survey (HDSS) systems to collect geo-referenced video (forward, left, and right), water depth, side-scan sonar, and high-resolution global positioning system (GPS) information on 44 RMs of the Tallapoosa River between Harris Dam and Peters Island, located just downstream of Horseshoe Bend before the headwaters of Lake Martin. All data were collected, organized, and classified for analysis by creating GIS layers for depth, and left and right streambank condition. Left and right bank condition was visually assessed using the high-definition video. The Bank Condition score consisted of five bank condition levels ranging from Fully Functional (1) to Non-functional (5) and were continuously assessed for the entire sampling area (Table 6-3) (Trutta 2019 in Kleinschmidt 2021a).

Table 6-3 Bank Condition Score

Bank Condition Score	Bank Condition Class	Description	Erosion Potential	Human Impact
1	Fully Functional	Banks with low erosion potential, such as, bedrock outcroppings, heavily wooded areas with low slopes and good access to flood plain.	Low to High	Low to High
2	Functional	Banks in good condition with minor impacts present, such as, forested with moderate bank angles and adequate access to flood plains.		
3	Slightly Impaired	Banks showing moderate erosion impact or some impact from human development.		
4	Impaired	Surrounding area consists of more than 50% exposed soil with low riparian diversity or surface protection. Obvious impacts from cattle, agriculture, industry, and poorly protected streambanks.		
5	Non-functional	Surrounding area consists of short grass or bare soil and steep bank angles. Evidence of active bank failure with very little stabilization from vegetation. Contribution of sediment likely to be very high in these areas.		

Source: Trutta 2019 in Kleinschmidt 2021a

Streambank condition point data collected during the Trutta survey were averaged into 0.1-mile segments to help facilitate the assessment of bank stability and erosion susceptibility (RM downstream of Harris Dam illustrated in Figure 6-5). Using these data, Trutta developed a ranking system to understand specific areas of failing streambanks on the Tallapoosa River (Table 6-4). Of the 875 0.1-mile segments downstream of Harris Dam, only fifteen segments (1.7 percent) had bank condition scores greater than three, i.e., slightly impaired or worse. Notably, only one segment scored as impaired to non-functional. This area was located on the right bank at RM 16.7 (Table 6-4).

Table 6-4 Tallapoosa River Downstream of Harris Dam: 15 Most Impaired Streambank Areas from Harris Dam through Horseshoe Bend

Bank[1]	River Mile Segment Downstream of Harris Dam	Condition Score[2]	Latitude	Longitude
Right Bank	7.7	3.57	33.1919	-85.5791
Left Bank	10	3.22	33.1625	-85.5843
Right Bank	16.3	3.35	33.0859	-85.5483
Right Bank	16.4	3.18	33.0848	-85.5486
Right Bank	16.5	3.55	33.084	-85.5494
Right Bank	16.6	3.96	33.0836	-85.5509
Right Bank	16.7	4.45	33.0833	-85.5526
Right Bank	16.9	3.2	33.0826	-85.5561
Left Bank	17.9	3.09	33.0707	-85.5648
Left Bank	19.2	3.11	33.0612	-85.5551
Left Bank	20.6	3.05	33.0503	-85.5547
Right Bank	34.4	3.07	32.9716	-85.6631
Left Bank	36.5	3.05	32.9568	-85.6914
Left Bank	36.6	3.04	32.956	-85.6928
Right Bank	43.8	3.17	32.9845	-85.7515

Source: Trutta 2019 in Kleinschmidt 2021a

[1] Left bank or right bank is a reference to the side of the river when looking downstream.

Erosion sites 22 and 23 (approximately 16 miles below Harris Dam) were assessed twice: once using the same criteria as the erosion sites located within Lake Harris (see Section 6.1.2.1) and again using the downstream assessment methods by Trutta as described above. Using methods from the reservoir erosion assessment, both sites were confirmed to have areas of erosion potentially caused by adjacent land use/clearing and riverine processes. The downstream assessment methods found the streambank condition class for both areas was "slightly impaired", and confidence (i.e., clarity of the areas in the HDSS video used to assess streambank condition) was classified as "Good Visibility."

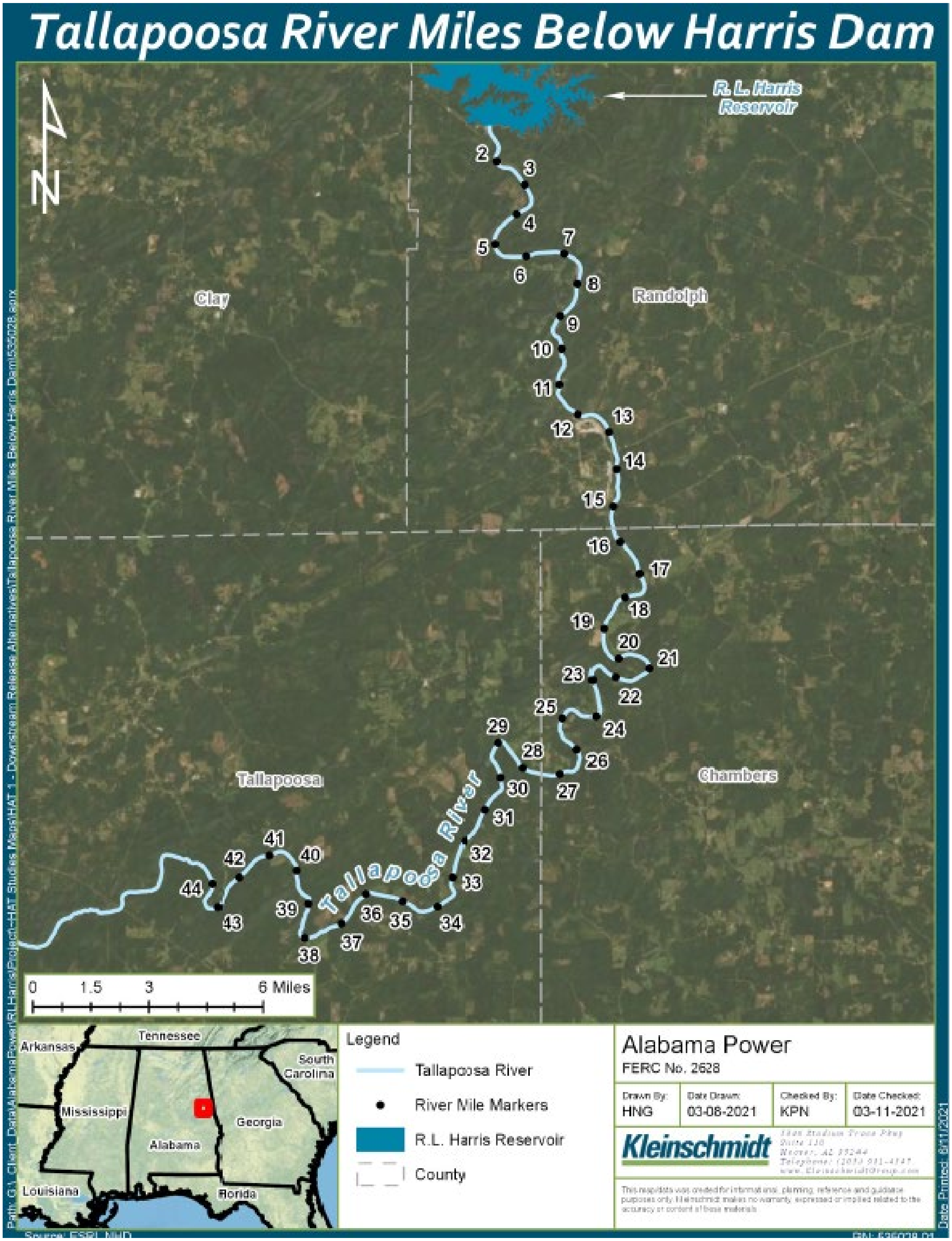

Figure 6-5 Delineation of Miles of the Tallapoosa River Downstream of Harris Dam

6.2 Environmental Analysis

Alabama Power conducted relicensing studies and associated analyses that pertain to effects on geology and soils. Those analyses are presented in the following reports:

- **Final** *Phase 1 Project Lands Evaluation Study Report*
- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*
- **Final** *Erosion and Sedimentation Study Report*

Table 6-5 includes the proposed operations and PME measures that may affect geology and soil resources at Skyline, Lake Harris, and the Tallapoosa River Downstream of Harris Dam. Not all operations or PME measures apply to each geographic area of the Harris Project; therefore, the analysis of beneficial and adverse effects will be presented accordingly. A complete list of Alabama Power's operations and PME measures is located in Table 5-2.

Table 6-5 Proposed Operations and PME Measures That May Affect Geology and Soils

PROPOSED OPERATIONS AND PME MEASURES THAT MAY AFFECT GEOLOGY AND SOILS
• Continue operating the Harris Project according to the existing operating curve and flood control procedures • Continue daily peak-load operations • Continue operating in accordance with ADROP to address drought management
• Design, install, operate, and maintain a minimum flow unit to provide a CMF between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam
• Implement a WMP for Lake Harris and Skyline ❖ Incorporate timber management into the WMP
• Develop and implement a SMP for Lake Harris ❖ Continue to encourage the use of alternative bank stabilization techniques other than seawalls ❖ Continue implementing the Dredge Permit Program ❖ Continue implementing a shoreline classification system to guide management and permitting activities ❖ Continue the requirements of a scenic easement for the purpose of protecting scenic and environmental values ❖ Continue implementing a shoreline compliance program and shoreline permitting program ❖ Continue to encourage the adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation
• Develop and implement a Recreation Plan ❖ Install and maintain recreation (canoe/kayak) access below Harris Dam within the Project Boundary ❖ Provide an additional recreation site on Lake Harris to include a day use park (swimming, picnicking, and boat ramp)

6.2.1 Skyline

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions and best management practices (BMPs) that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies within Skyline.

Little Coon Creek, which flows through portions of the Skyline Project Boundary, is currently listed as impaired due to siltation (see Section 6.1.1). The sources of this impairment include non-irrigated crop production and pasture grazing (ADEM 2020). Timber management benefits soils by avoiding large or total acreages of clear cutting, which maintains the overall soil stability in the adjacent forested areas of Little Coon Creek.

6.2.2 Lake Harris

Project Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. As part of the Erosion and Sedimentation Study, Alabama Power evaluated potential causes of erosion at existing erosion sites identified by stakeholders around Lake Harris. Potential causes of erosion were classified into several categories during the assessment. These categories included: Harris Project Operations (water level fluctuations, maintenance/construction activities), Natural Factors independent of operations (e.g., seasonal flooding, riverine processes), Land Use (e.g., farming, ranching, mining, development), Anthropogenic (foot/bike paths, vehicle traffic, boat waves), or "Other" noted causes identified during the survey. Of the 22 erosion sites identified on Lake Harris, 8 sites were confirmed to have no significant signs of active erosion. The remaining 14 sites did show signs of active erosion; however, the erosion at these sites is occurring at or above normal reservoir elevation and were likely the result of anthropogenic and/or natural processes/factors independent of existing Project operations. Anthropogenic factors included wave action due to boating activity, land clearing and landscaping, and other construction activities affecting runoff towards the reservoir (MSU 2020 as cited in Kleinschmidt Associates 2021a). Natural erosion processes observed included wind and boat generated wave action and bank scour due to channelized flows at the toe of banks. These processes would occur independently of any Project operations, and therefore, Alabama Power's proposal to continue operations on Lake Harris according to the existing operating curve, flood control procedures, and ADROP would have no adverse effect on erosion at Lake Harris.

Sedimentation in Lake Harris is most pronounced in the Little Tallapoosa River arm where sediment transported from upstream settles out of the water column as water velocities decrease upon entering the reservoir. Land uses in the basin upstream of Lake Harris and adjacent to the river contribute sediment load to the upper reaches of Lake Harris. This is illustrated in the growth of all but one of the sedimentation areas identified on Lake Harris. Sedimentation rates on the reservoir would likely remain consistent with rates under the existing operations, assuming upstream influences remain consistent (Alabama Power and Kleinschmidt 2021a). Drawdown periods occur under normal winter operating conditions and expose areas of accumulated sediment, allowing for winter and early spring rains to flush sediment to deeper depths, reducing the overall areas of sedimentation. Risk of establishment of submerged aquatic vegetation populations is higher because of improved growing conditions in the sedimentation areas. Continued exposure of the sedimentation areas during winter pool drawdown would help manage any submerged aquatic vegetation by killing seeds and vegetation due to freezing, drying, or soil compaction (Alabama Power and Kleinschmidt 2021a).

Continuous Minimum Flow

As part of the Downstream Release Alternatives Phase 2 Study, Alabama Power evaluated the effects of a continuous minimum flow of 150 cfs and 300 cfs on erosion in Harris Reservoir. The proposed downstream release would not affect identified erosion areas on Harris Reservoir (Alabama Power and Kleinschmidt 2021b). The identified erosion areas on Harris Reservoir exist at or above the existing full pool elevation, and the proposed minimum flow does not affect summer or winter pool elevations.

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies at Lake Harris. Alabama Power will continue to manage Project forest lands in consultation with USFWS and ADCNR on use of herbicides, timber harvest cycles and selective cutting, use of forest rotation practices, and use of natural regeneration and/or stand planting.

Shoreline Management Plan

Table 6-5 contains the primary elements of the Shoreline Management Plan (SMP) that may affect soils and geology.

Alabama Power encourages the use of alternative bank stabilization techniques other than seawalls. Such alternatives include, but are not limited to, riprap, bioengineering techniques, natural vegetation with riprap, and gabions. Alabama Power requires, as a condition of a permit, that any future seawall proposals include the placement of riprap, for fish and other semi-aquatic species habitat and increased stability, in front of the seawall. Alternative bank stabilization techniques are preferred methods of erosion control and would likely minimize adverse effects of erosion at Lake Harris.

Alabama Power's continued implementation of the Dredge Permit Program, developed in consultation with the USACE and other agencies, establishes the processes and procedures for permittees seeking to obtain direct authorization from Alabama Power for dredging activities up to 500 cubic yards (CY) of material (below the full pool elevation). The Dredge Permit Program is not intended to cover applications for dredging on lands determined to be "sensitive". The Dredge Permit Program streamlines the process for allowing dredging under 500 cubic yards thus providing opportunity for homeowners to remove sediments that may restrict access. Continuing the Dredge Permit Program would have a beneficial effect on sedimentation in Lake Harris.

Implementing a shoreline classification system would allow for management and permitting activities that are specific to the designated uses in those areas around the reservoir. For example, areas or shorelines designated as natural/undeveloped would be managed and protected to prohibit or limit certain construction activities often associated with residential development. Those shorelines in the natural/undeveloped areas would be less likely to need shoreline stabilization if naturally vegetated shorelines are preserved. Continuing the requirements of the "scenic easement" on Harris would also protect currently vegetated areas that could be subject to future development. A scenic easement would ensure no clearcutting of natural vegetation to the water's edge, which frequently results in soil destabilization and the need for formal shoreline stabilization (i.e., seawalls or riprap).

Continued implementation of the shoreline compliance and shoreline permitting programs, along with shoreline BMP education, would ensure that Alabama Power implements its permitting program consistently at Harris across all land use designations. Adjacent land-use and anthropogenic disturbance is a common cause for erosive and destabilized banks around Lake Harris (Kleinschmidt 2021a). Providing homeowner education on shoreline BMPs may have a beneficial effect on the long-term stability of the Lake Harris shoreline as homeowners choose to keep vegetated shorelines that stabilize soils.

<u>Recreation Plan</u>

Alabama Power proposes to develop and implement a Recreation Plan that will incorporate the continued operation and maintenance of 11 existing recreation sites and the construction of new recreation sites at Lake Harris. Alabama Power's proposal to construct new recreation access and facilities including the proposed day use park on Lake Harris would require land disturbing activity that could adversely affect soils and may result in localized erosion and sedimentation. The Recreation Plan would include provisions for soil erosion and sedimentation control BMPs to reduce or eliminate the temporary effects of construction. Adding boat ramps on Lake Harris may result in an increase in recreational boating, and should boat wave action increase, the Harris Reservoir banks could be exposed to an increase in these erosive forces. Implementation of the SMP shoreline stabilization techniques along with the erosion and sedimentation controls that are always included in construction plans would mitigate these potential adverse effects.

6.2.3 Tallapoosa River Downstream of Harris Dam

Project Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. No effects over Green Plan (baseline) on erosion sites identified on the Tallapoosa River downstream of Harris Dam is expected to occur from this proposal.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. During the Downstream Release Alternatives Study, Alabama Power used the results of the Erosion and Sedimentation Study (Kleinschmidt 2021a) and outputs from the Hydrologic Engineering Center-River Analysis System (HEC-RAS) model to assess the effects of downstream release alternatives quantitatively and qualitatively on erosion in the Tallapoosa River downstream of Harris Dam. HEC-RAS model results were used to produce daily average water surface fluctuations for the study area (Harris Dam through Horseshoe Bend). The HEC-RAS model results were further analyzed to produce fluctuation exceedance curves at representative locations downstream of Harris Dam. Daily fluctuations were calculated for each day of the year for each downstream release alternative. Daily fluctuations were calculated by determining the difference between the daily maximum and minimum water surface elevations. The values were then ranked from greatest to least and assigned an exceedance probability. These factors were weighed against bank and soils conditions to qualitatively assess potential for bank degradation or erosion.

Results of the HEC-RAS model of water surface elevation fluctuations downstream of Harris Dam and the delineation of miles downstream of Harris Dam are provided in the Draft *Downstream Release Alternatives Phase 2 Report* (Alabama Power and Kleinschmidt 2021b). Generally, results show that daily water surface elevation fluctuations are lower with increasing continuous minimum flows (Table 6-6). Although the Erosion and Sedimentation Study found that existing erosion sites in the Tallapoosa River downstream of Harris Dam are primarily attributed to adjacent land use/clearing and riverine processes and not the direct result of Project operations, the addition of a continuous minimum flow release downstream of Harris Dam would slightly reduce river fluctuations over Green Plan (baseline), having a potential minor benefit to areas of downstream erosion. Therefore, Alabama Power's proposal to implement a continuous minimum flow in the Tallapoosa River below Harris Dam between 150 cfs and 300 cfs would not adversely affect geology and soils.

Table 6-6 shows that river fluctuations are higher in areas closer to the dam and dissipate as flows attenuate downstream. The greatest benefit to decreased fluctuations would be seen in the first seven miles below Harris Dam where fluctuations are greatest due to proximity to the Project.

Table 6-6 Daily Average Water Surface Elevation Fluctuations (in Feet) in the Tallapoosa River Downstream of Harris Dam Based on HEC-RAS Model of GP (Baseline), 150CMF and 300CMF

Alternative	Miles Below Harris Dam										
	0.4	1	2	4	7	10	14	19	23	38	43
GP (Baseline)	4.62	4.24	3.99	4.22	3.20	2.56	3.60	3.01	2.01	0.92	1.79
150CMF	4.10	3.94	3.81	4.07	3.15	2.56	3.63	3.02	2.01	0.93	1.80
300CMF	3.59	3.51	3.44	3.72	2.96	2.34	3.54	2.99	1.99	0.92	1.74

Source: Alabama Power and Kleinschmidt 2021b

<u>Recreation Plan</u>

Alabama Power proposes to develop and implement a Recreation Plan that will provide for the construction of canoe/kayak access in the tailrace below Harris Dam. Alabama Power's proposal to design and install public access and recreation facilities downstream of Harris Dam would require land disturbing activity that may adversely affect soils in the proposed area. The Recreation Plan would include provisions for soil erosion and sedimentation control BMPs to reduce or eliminate the temporary effects of construction. Implementation of BMPs and shoreline stabilization in the canoe/kayak recreation area could mitigate potential adverse effects of increased human traffic at the recreation site owned and operated by Alabama Power.

6.3 Unavoidable Adverse Impacts

6.3.1 Skyline

Local and basin land disturbing activities (construction, farming/agriculture practices, private timber harvesting) may occur and cause short-term adverse impacts on soils at Skyline, including soil destabilization, runoff, and erosion and sedimentation.

6.3.2 Lake Harris

Local and basin land disturbing activities (construction, farming/agriculture practices, private timber harvesting) may occur resulting in continued sedimentation and erosion on Lake Harris. Wind and wave induced erosive forces would also continue to have some effect on the soil resources at Lake Harris. Alabama Power's proposal to provide BMP education to property owners and customers through the Alabama Power website[49] may reduce this unavoidable impact.

6.3.3 Tallapoosa River Downstream of Harris Dam

Local and basin land disturbing activities (construction, farming/agriculture practices, private timber harvesting) may occur resulting in continued erosion downstream of Harris Dam. Alabama Power's proposal to provide BMP education through their website to property owners and customers may reduce this unavoidable impact.

Development of recreation sites may result in short-term localized areas of erosion. Use of BMPs during these activities would minimize these impacts.

High flow events would continue to occur and may continue to impact existing erosion sites downstream of Harris Dam. By continuing to encourage the adoption of shoreline BMPs, landowners adjacent to the Tallapoosa River may reduce the overall impact to existing eroded sites and minimize future erosion.

[49] Alabama Power website includes a link to the Smart Lakes APP and *Shorelines*.

7 WATER RESOURCES (QUALITY AND QUANTITY)

7.1 Affected Environment

7.1.1 Skyline

7.1.1.1 Water Quality

Alabama's water quality standards consist of three components: designated uses, numeric and narrative criteria, and an antidegradation policy. Designated use is a classification system designed to identify the best uses of individual waterways. Alabama Department of Environmental Management (ADEM) Administrative Code r. 335-6-11 outlines seven designated uses, as follows (ADEM 2016a as cited in Alabama Power and Kleinschmidt 2018):

- Outstanding Alabama Water (OAW)
- Public Water Supply (PWS)
- Shellfish Harvesting (SH)
- Swimming and Other Whole-Body Water-Contact Sports (S)
- Fish and Wildlife (F&W)
- Limited Warmwater Fishery (LWF)
- Agricultural and Industrial Water Supply (A&I)

Skyline is located within two watersheds: Coon Creek watershed includes Coon Creek, Big Coon Creek, and Little Coon Creek streams and Crow Creek watershed includes Crow Creek and Little Crow Creek (Figure 7-1).

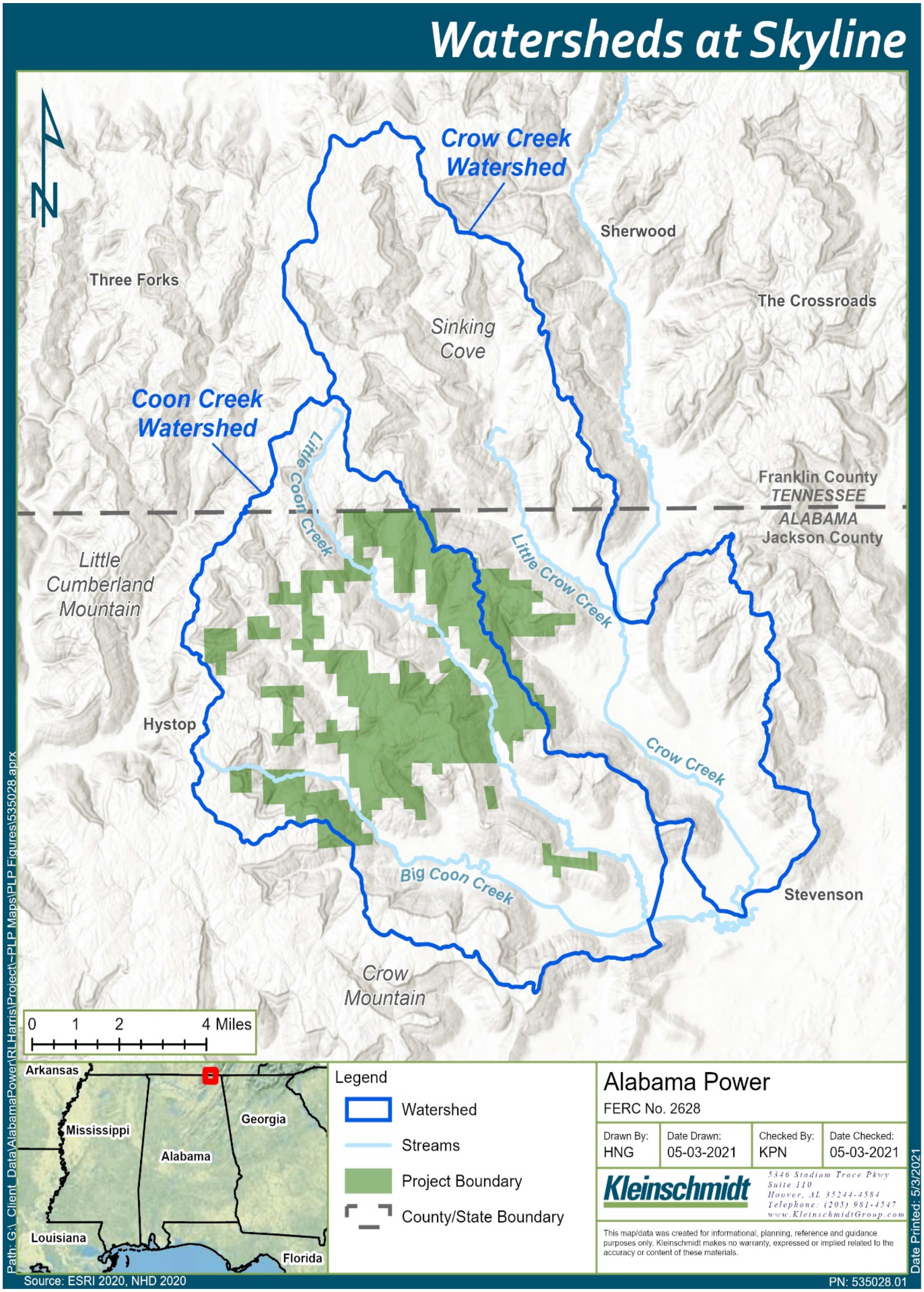

Figure 7-1 Skyline Watersheds

The state of Alabama designated uses for Coon Creek from Guntersville Lake upstream to its source are swimming and fish and wildlife (S/F&W) (ADEM 2017 as cited in Alabama Power and Kleinschmidt 2018). Of these streams, only the Little Coon Creek is currently included in Alabama's 303(d) Impaired Waters List. The stream is listed as impaired for siltation/habitat alteration. The source of siltation is listed as non-irrigated crop production and pasture grazing (ADEM 2020). Water quality criteria applicable for these use designations are presented in Table 7-1.

Table 7-1 Specific Water Quality Criteria for State of Alabama Waters

VARIABLE	STANDARD FOR FISH AND WILDLIFE/SWIMMING	STANDARD FOR PUBLIC WATER SUPPLY
pH	Between 6.0 and 8.5	Between 6.0 and 8.5
Dissolved Oxygen	Not less than 5.0 mg/L at a depth of 5 feet	Not less than 5.0 mg/L at a depth of 5 feet
Water Temperature	Not greater than 90 degrees F	Not greater than 90 degrees F
Turbidity	Not greater than 50 NTUs	Not greater than 50 NTUs
Bacteria	E. coli: • 126 colonies/100 ml geometric mean; 235/100 ml in any sample (swimming) • 548 colonies /100 ml geometric mean; 2507 colonies/100 ml in any sample (fish & wildlife)	E. coli: • 548 colonies/100 ml geometric mean; 2,507 colonies/100 ml in any sample

Source: ADEM 2016a as cited in Alabama Power and Kleinschmidt 2018

The state of Alabama designated use for Crow Creek from Guntersville Lake to the Alabama-Tennessee state line is F&W (ADEM 2017 as cited in Alabama Power and Kleinschmidt 2018), indicating these waters are best suited for fish and wildlife habitat. No waters in the Crow Creek watershed are included in Alabama's 303(d) Impaired Waters List (ADEM 2020).

The 2020 ADEM 303(d) Impaired Waters List identifies 79 stream segments in the Tennessee River Basin as partially or not supporting designated uses for fish and wildlife, agriculture and industry, swimming, and public water supply (ADEM 2020). Organic enrichment, siltation, and pathogens are the most frequently cited reasons for the stream segments not meeting Alabama's water quality standards.

ADEM performed periodic sampling at six stream sites that drain land within the Skyline Project Boundary. A summary of results from common parameters that were tested at each site is presented in the *Baseline Water Quality Report* (Appendix E).

7.1.1.2 Water Quantity

Alabama Power does not manage any water body within the Skyline Project Boundary and there is no Project discharge.

7.1.2 Lake Harris

7.1.2.1 Water Quality

The primary designations for best use of Harris Reservoir are for swimming and fish and wildlife (S/F&W) (refer to ADEM Administrative Code r. 335-6-11-.02(11)) (ADEM 2017 as cited in Alabama Power and Kleinschmidt 2018). From Highway 431 to Wolf Creek, the Little Tallapoosa River has the additional classification of public water supply.

Additionally, ADEM's regulations contain a specific standard for Chlorophyll *a* (corrected, as described in Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998) for Harris Reservoir:

> The mean of photic-zone composite chlorophyll *a* samples collected monthly, April through October, shall not exceed 10 micrograms per liter (µg/l), as measured at the deepest point, main river channel, dam forebay; or 12 µg /l, as measured at the deepest point, main river channel, immediately upstream of the Tallapoosa River – Little Tallapoosa River confluence (ADEM Administrative Code r. 335-6-10-.11(h)4).

Water bodies not attaining set standards are placed on the state of Alabama's list of water bodies impaired pursuant to CWA Section 303(d), then the state designs a program which establishes total maximum daily loads (TMDLs) to improve water quality to set criteria.

A portion of the Harris Reservoir was placed on ADEM's 2020 303(d) Impaired Waters List due to mercury in fish tissue samples. The 2020 303(d) Impaired Waters List included portions of 49 other lakes/reservoirs in Alabama including portions of Lakes Martin, Yates, and Thurlow downstream of Harris on the Tallapoosa River due to mercury in fish tissue attributed to atmospheric deposition (ADEM 2020).

ADEM, Alabama Power, and Alabama Water Watch (AWW) collected water quality data at Lake Harris (Table 7-2), which was included in the *Water Quality Study Report* (Kleinschmidt 2021b). Baseline water quality data collected by ADEM from 2005 to 2015 is presented in the *Baseline Water Quality Report* (Appendix E). Based on monitoring results, water quality criteria at Lake Harris are being met and designated uses are being fully supported.

Table 7-2 Summary of Water Quality Data Sources at Lake Harris

SOURCE	DESCRIPTION	PERIOD
ADEM	Vertical profiles and discrete chemistry samples at six locations	April - October 2018; June, July, September, and October 2020
Alabama Power	Vertical profiles in the forebay	March - October 2017 – 2020
Alabama Water Watch	Surface samples at six locations	Monthly to semi-monthly, 2011 – 2019

Source: Kleinschmidt 2021b

As part of its monitoring program, ADEM collected basic water quality data throughout vertical profiles from the reservoir surface to the bottom at regular depth intervals (approximately 3 feet). Water temperature, dissolved oxygen, pH, and conductivity data from these profiles are presented in the *Water Quality Study Report*. In 2020, only water temperature and dissolved oxygen profiles were available. Alabama Power collected monthly vertical dissolved oxygen and temperature profile data in the forebay from March through October each year from 2017 to 2020 (Figure 7-2). Due to high flows, Alabama Power was unable to collect vertical profile data in September 2017 (Kleinschmidt 2021b). Data from these forebay profiles are presented in the *Water Quality Study Report*.

Generally, during the spring and summer, the Harris Reservoir stratifies into three layers (Kleinschmidt 2021b):

- An epilimnion, which is fairly uniform in temperature and is well oxygenated.
- A hypolimnion, a cold, less oxygenated bottom layer.
- A metalimnion or thermocline, which is a transition layer between the epilimnion and hypolimnion.

Harris Reservoir is typically stratified from June through October, with hypoxic/anoxic conditions at depths greater than 30 feet (Kleinschmidt 2021b). However, in the summer months of some years, the reservoir may develop a negative heterograde dissolved oxygen profile, with oxygenated surface and bottom layers and a mid-depth layer with lower oxygen levels.

In addition to vertical profiles, ADEM collected and analyzed monthly surface water samples for numerous parameters (discrete chemistry samples) at six stations (Figure 7-3) on Harris Reservoir in April through October 2018, and in June, July, September, and October 2020. Water clarity, as measured by Secchi Disk depth, was highest at reservoir station RLHR-6 and lowest at RLHR-3. Similarly, concentrations of nutrients such as nitrogen and phosphorus, as well as chlorophyll *a* (a measure of algal abundance), were higher at the upper reservoir stations (RLHR-3, RLHR-4, and RLHR-5) (Kleinschmidt 2021b).

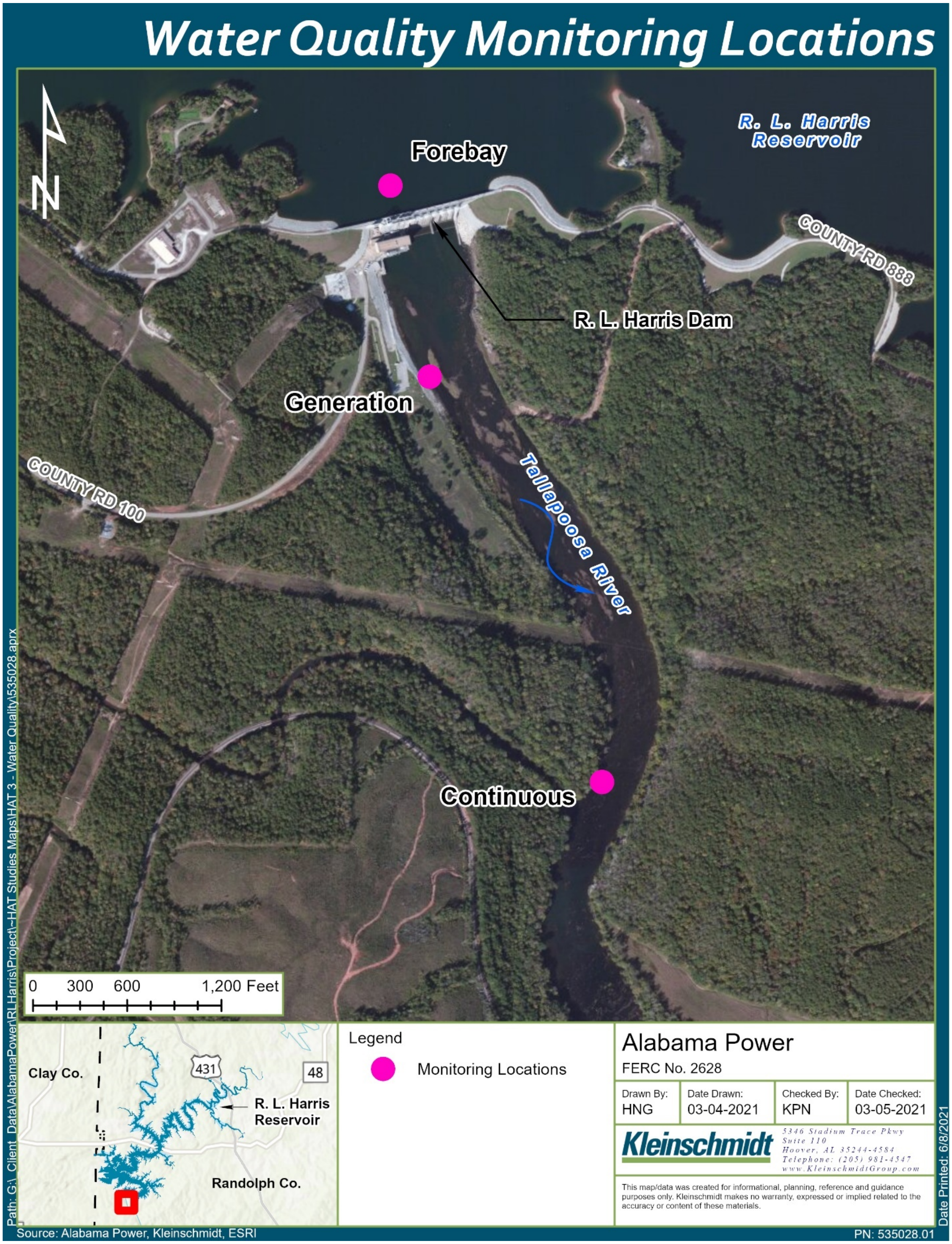

Figure 7-2 Alabama Power Water Quality Monitoring Locations

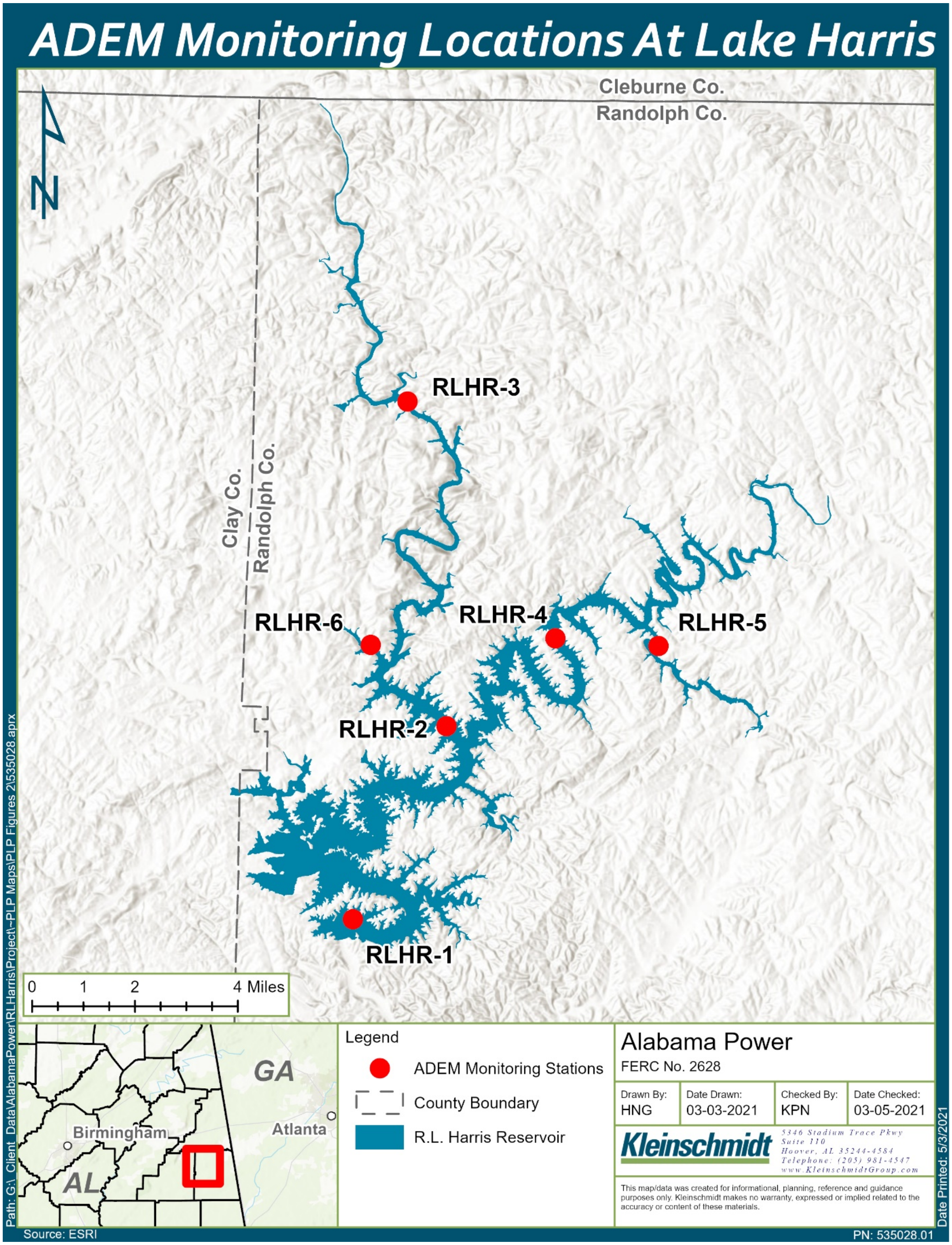

Figure 7-3 Alabama Department of Environmental Management Monitoring Sites on Harris Reservoir

Water quality data collected by AWW was also included in the *Water Quality Study Report*. AWW is a citizen volunteer water quality monitoring program that was established in 1992. As part of this program, citizens, including members of the Lake Wedowee Property Owners Association, have performed monitoring at over 40 sites on Harris Reservoir according to U.S. Environmental Protection Agency (USEPA)-approved monitoring plans. Many of the sites are currently inactive and did not have recent data available. AWW collected surface samples at six locations (Figure 7-4) monthly to semi-monthly from 2011 to 2019 and data are summarized in the *Water Quality Study Report* (Kleinschmidt 2021b).

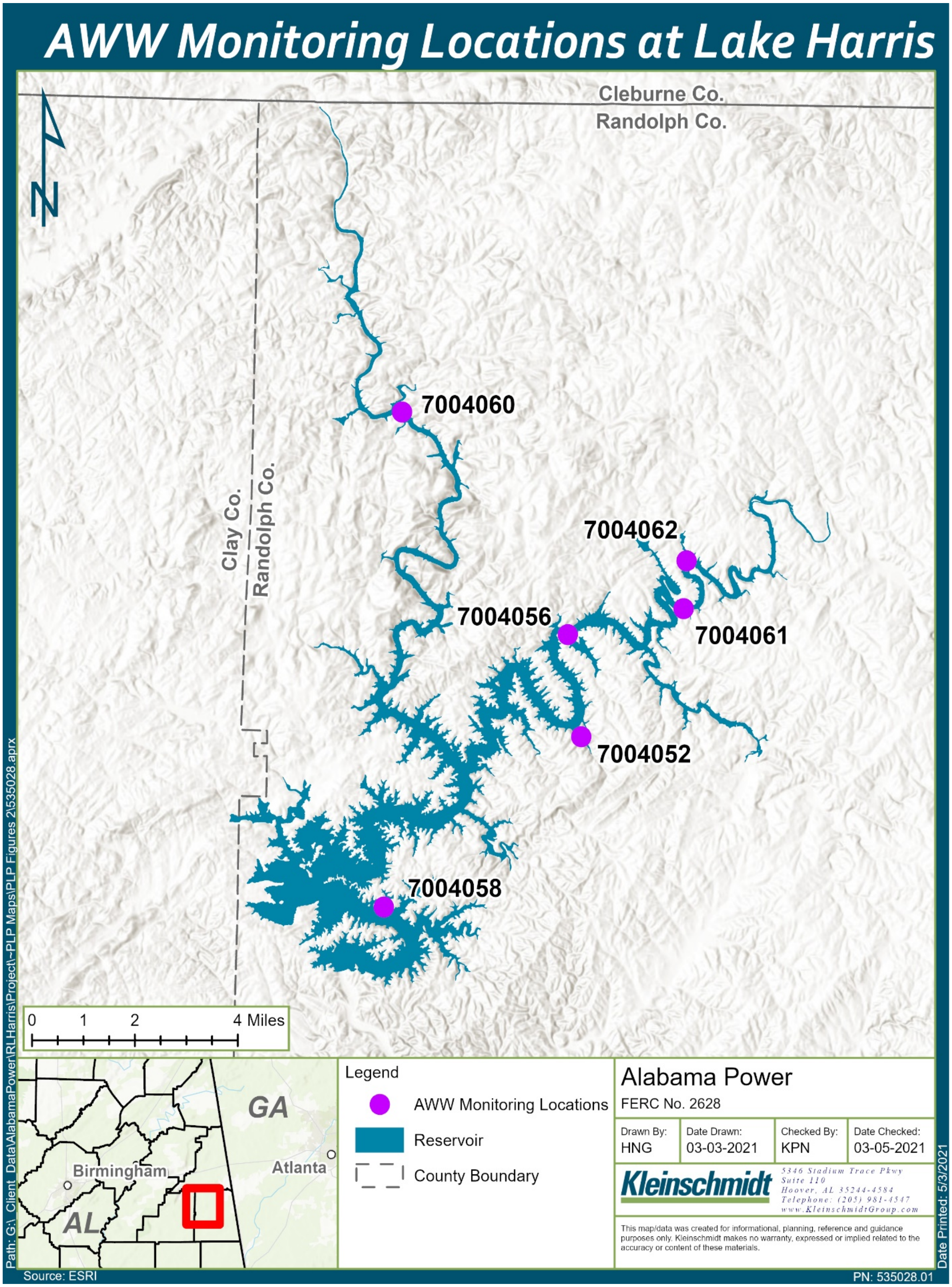

Figure 7-4 Alabama Water Watch Monitoring Sites at Harris Reservoir

7.1.2.2 Water Quantity

The Tallapoosa River drainage basin encompasses approximately 4,687 square miles, including 1,454 square miles above Lake Harris. Approximately 15 percent of the basin's drainage area lies in Georgia. The remaining 85 percent of the basin's drainage area is in Alabama (CH2MHILL 2005 as cited in Alabama Power and Kleinschmidt 2018). Precipitation in the Tallapoosa River Basin typically ranges from 46 to 64 inches annually. Approximately 80 percent of the flood-producing storms occur in the winter and spring months, of which approximately 27 percent occur in the month of March (Alabama Power 2015b as cited in Alabama Power and Kleinschmidt 2018). The principal tributaries to Lake Harris are the Tallapoosa River, Little Tallapoosa River, Wedowee Creek, and Ketchepedrakee Creek (Alabama Power and Kleinschmidt 2018).

Lake Harris has a surface area of 9,870 acres and a gross storage volume of 425,721 acre-feet at the normal (full) pool level of 793.0 feet-msl. The reservoir is 29-miles-long, has a maximum depth of 121 feet, and a mean depth of 110 feet. The average flushing rate (residence time) for the reservoir is estimated to be approximately 109 days. The reservoir has a total shoreline length of 367 miles. Reservoir substrates are comprised of bedrock, sand, and silt (Alabama Power and Kleinschmidt 2018).

Article 14 of the existing FERC license for the Harris Project states that, upon the application by any person, association, corporation, federal agency, state, or municipality, Alabama Power will permit reasonable use of its reservoir in the interest of the comprehensive development of the waterway as ordered by FERC (FERC 1973 as cited in Alabama Power and Kleinschmidt 2018).

With very little industrial and agricultural use in the Lake Harris area, most of the demand for water is for municipal use. The population of Randolph and Clay counties are projected to decrease by 2.7 percent and 12.8 percent, respectively, between 2015 and 2040; the population of Cleburne County is projected to increase 3.3 percent (CBER 2017)[50].

[50] Population projection data referenced in the *Recreation Evaluation Report* were obtained from a different source and differs from the statistics provided here. Population projection data referenced in the *Recreation Evaluation Report* were obtained from the Alabama Statewide Comprehensive Outdoor Recreation Plan and states the following: "There is a projected decrease in population between 2020 and 2040 in Clay County, Alabama and a projected increase in Cleburne and Randolph counties in Alabama and in Carroll County, Georgia (ADECA 2013 as cited in Kleinschmidt 2020)."

The Wedowee Water, Sewer, and Gas Board (WSGB) withdraws from and discharges to the upper Little Tallapoosa River and is the only water user that withdraws within the Project Boundary. The Wedowee WSGB withdraws from the upper Little Tallapoosa River a daily average of 0.411 mgd (0.636 cfs) and a permitted daily maximum of 0.50 mgd (0.774 cfs) and discharges a daily average of 0.045 mgd (0.070 cfs) and a daily maximum of 0.150 mgd (0.232 cfs) (Appendix E).

7.1.3 Tallapoosa River Downstream of Harris Dam

7.1.3.1 Water Quality

The Harris tailrace is designated for fish and wildlife (Alabama Power and Kleinschmidt 2018). ADEM, Alabama Power, and AWW collected water quality data in the Tallapoosa River downstream of Harris Dam (Table 7-3), which is included in the *Water Quality Study Report*. Historic water quality data collected by ADEM from 2005-2016 is presented in the *Baseline Water Quality Report* (Appendix E). Based on monitoring results, water quality criteria in the Tallapoosa River downstream of Harris Dam are being met, with the exception of dissolved oxygen in the tailrace during some limited summer periods.

Table 7-3 Summary of Water Quality Study Data Sources in the Tallapoosa River Downstream of Harris Dam

SOURCE	DESCRIPTION	PERIOD
ADEM	Monthly measurements and discrete samples at Tailrace, Malone, Wadley, and Horseshoe Bend	2018 – 2020 (no measurements collected at Tailrace in 2019)
ADEM	Continuous (15-minute intervals) monitoring at Malone	May 2018 – November 2019; April – November 2020
Alabama Power	15-minute intervals monitoring during generation (approximately 800 ft downstream of dam)	June – October of 2017 – 2020
Alabama Power	Continuous (15-minute interval) monitoring (approximately 0.5 miles downstream of dam)	March – October 2019; May – October 2020
Alabama Water Watch	Surface samples at Horseshoe Bend	1993 to 2007, and 2014 through 2017

Source: Kleinschmidt 2021b

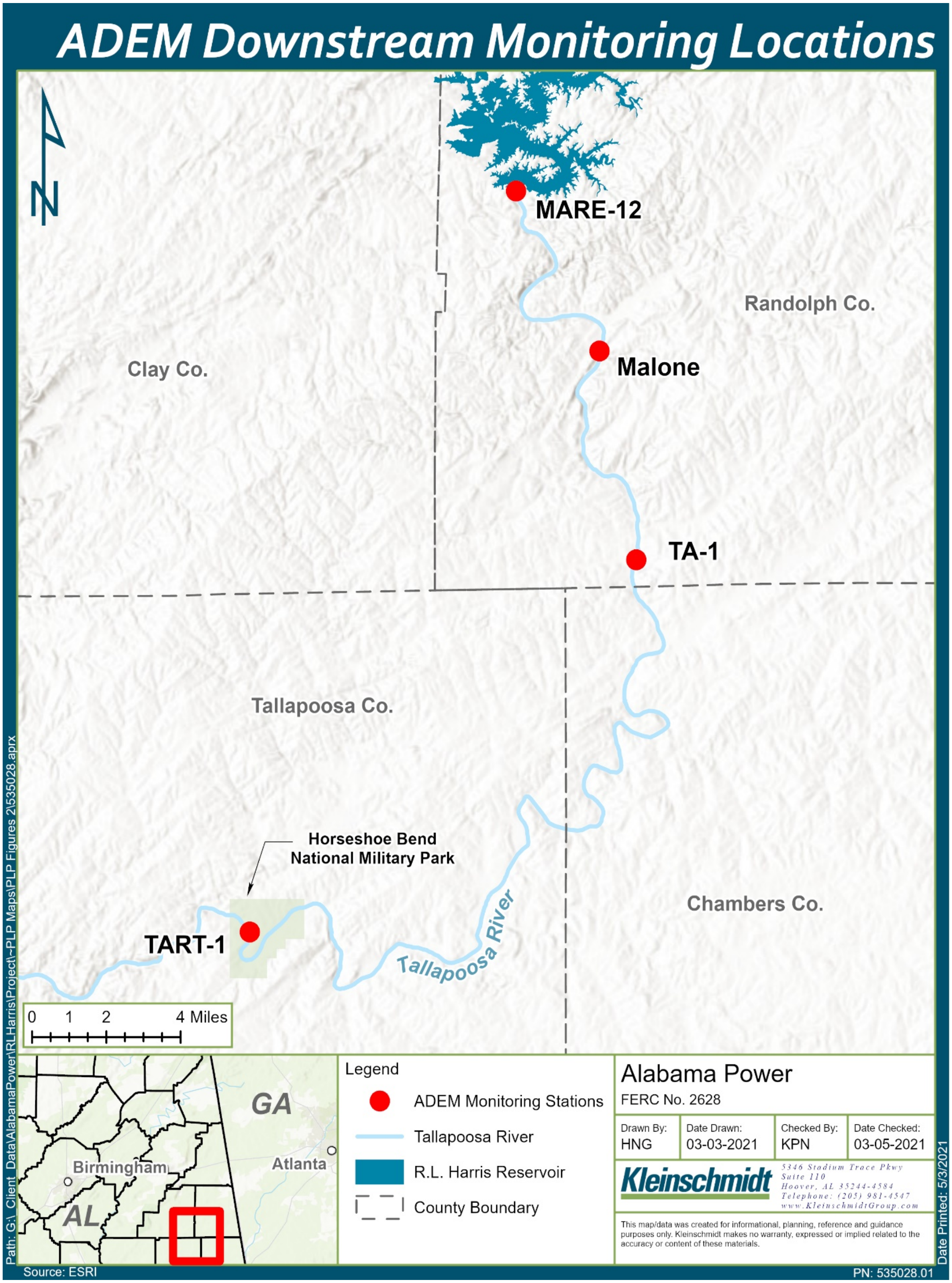

Figure 7-5 ADEM Monitoring Sites on Tallapoosa River

ADEM performed monitoring in the Tallapoosa River at four sites downstream of Harris Dam in 2018, 2019, and 2020 (Figure 7-5). The site immediately downstream of Harris Dam (MARE-12) was sampled monthly in 2018 from April to October during non-generation and in 2020 from June to October during periods of both generation and non-generation. Dissolved oxygen levels at this station were all above 5.0 milligrams per liter (mg/L). Conductivity ranged from 39 to 45 microsiemens per centimeter (µs/cm), and pH ranged from 6.44 to 6.92 (Kleinschmidt 2021b).

In May 2018, ADEM installed a monitoring station in the Tallapoosa River at the Malone bridge crossing, approximately 7 RMs downstream of Harris Dam. The station recorded measurements of water temperature, dissolved oxygen, conductivity, pH, Turbidity, and chlorophyll *a* at 15-minute intervals. Overall, dissolved oxygen levels were above 5 mg/L for a majority of monitoring period, with less than 1 percent of all measurements falling below 5 mg/L (Kleinschmidt 2021b).

Results of the monthly in-stream measurements collected by ADEM from March 2018 through February 2019 at the Wadley site (TA-1), located approximately 14-miles downstream of Harris Dam, indicated the highest water temperatures occurred during July through September. Lowest dissolved oxygen levels occurred in the July through October samples, though no measurements less than 6.0 mg/L were recorded. Measurements of pH were typically circumneutral[51], and conductivity ranged between 34 and 45 µs /cm (Kleinschmidt 2021b).

Results of the monthly in-stream measurements collected by ADEM from January 2018 through December 2020 at the Horseshoe Bend site (TART-1) located approximately 44-miles downstream of Harris Dam indicated the highest water temperatures occurred during July. Lowest dissolved oxygen levels typically occurred in June through October, though no measurements less than 7.1 mg/L were recorded. Measurements of pH were typically circumneutral, and conductivity ranged from 33 to 45 µs/cm (Kleinschmidt 2021b).

The existing water quality certification for the Harris Project states that the Harris Project be operated in a manner that: (1) will not violate applicable water quality standards for the Tallapoosa River; and (2) will maintain a minimum continuous flow of not less than 45

[51] Meaning "nearly neutral".

cfs at the gaging station on the Tallapoosa River at the bridge on Alabama State Highway 22 at Wadley, Alabama.

Alabama Power operates an aeration system, which was incorporated into the original turbine design, to provide up to 2 mg/L increase in dissolved oxygen (Alabama Power 1980 as cited in Alabama Power and Kleinschmidt 2018). Prior to 2017, Alabama Power employed a surveillance program at Harris Dam to assess dissolved oxygen levels. In May of each year, Alabama Power would begin monitoring dissolved oxygen in the tailrace of the Harris Dam during generation every two weeks using a handheld instrument and the turbine aeration system was turned on when dissolved oxygen levels approached 5.5 mg/L. Beginning September 1 of each year, Alabama Power again would begin measuring dissolved oxygen in the Harris Dam tailrace every two weeks using a handheld instrument during generation. When dissolved oxygen levels were maintained at or above 6.0 mg/L, turbine aeration was turned off. In 2017, a dissolved oxygen and temperature monitor was installed in the tailrace for purposes of gathering data during discharge for development of a Section 401 water quality certification application. Data from this monitor are now used to determine aeration system operation.

In addition, the Harris Dam intake structure includes a skimmer weir, which was designed to be raised or lowered to meet water quality needs. The skimmer weir was incorporated into the design to allow the intake to draw from different layers in water column, providing for warmer releases with the added benefit of higher dissolved oxygen during periods of stratification. The weir has been in the uppermost position for the last 15-20 years drawing from relatively high in the water column. The invert elevation of the plant intake structure is located at 746.0-feet msl when the skimmer weir is fully lowered, and it is at 764.0-feet msl when it is fully raised.

For purposes of developing an application for a Section 401 water quality certification, per agreement with ADEM, Alabama Power conducted dissolved oxygen and temperature monitoring in the tailrace approximately 800-feet downstream of the Harris Dam on the west bank of the river. Measurements were recorded at 15-minute intervals during generation from June to October of 2017 – 2020. Dissolved oxygen levels were consistently greater than 5 mg/L during the 2018, 2019, and 2020 monitoring periods and were typically lowest in August of each year of the monitoring period. Dissolved oxygen levels in 2017 were lower than those measured during the 2018, 2019, and 2020 monitoring periods. Water temperatures were typically lowest in June and October and highest in August and September during the monitoring period (Kleinschmidt 2021b).

Tabular descriptions and line plots of dissolved oxygen and temperature data from the generation monitor are presented in the *Water Quality Study Report* (Kleinschmidt 2021b).

Alabama Power monitored dissolved oxygen and water temperature continuously regardless of discharge approximately 0.5 miles downstream of Harris Dam from March to October 2019 and May to October 2020 (Figure 7-2). Measurements of dissolved oxygen and water temperature were recorded at 15-minute intervals. Dissolved oxygen levels were generally lowest from June through October. These data indicate the highest average water temperature occurred during August. Tabular descriptions and line plots of dissolved oxygen and temperature data from the continuous monitor are presented in the *Water Quality Study Report* (Kleinschmidt 2021b).

AWW performed periodic monitoring on the Tallapoosa River at Horseshoe Bend since 1993, including from 1993 to 2007, and 2014 through 2017. Results were similar to those obtained by ADEM during its monitoring events at the same location.

7.1.3.2 Water Quantity

Releases from Harris Dam flow into the Tallapoosa River approximately 78 miles upstream of Martin Dam. The Upper Tallapoosa River Basin stretches from the Tallapoosa River headwaters to Harris Dam. The Middle Tallapoosa River Basin stretches from Harris Dam to Martin Dam. The river descends at an average rate of 3.4 feet-per-mile in the upper and middle segments of the basin. The lower Tallapoosa River Basin, from Martin Dam to the Tallapoosa River's confluence with the Coosa River, has more gradual gradient averaging 1.6 feet-per-mile (CH2MHILL 2005 as cited in Alabama Power and Kleinschmidt 2018). As noted in Section 3.5, Alabama Power is required to meet a minimum flow of 45 cfs, as measured at the downstream Wadley gage near Wadley, Alabama. Alabama Power supplements this minimum flow requirement with downstream flow release pulses, known as the Green Plan (baseline) (see Section 3.6). The Green Plan (baseline) outlines specific daily and hourly release schedules from Harris Dam based on the previous day's flow at the USGS's gage near Heflin (Station. No. 02412000). The daily volume releases are suspended during flood operations, and specific drought release criteria are also outlined.

The primary source of information relating to flow statistics downstream of Harris Dam is the USGS's Wadley gage (Station No. 02414500). The highest flows typically occur in late winter and early spring, and the lowest flows typically occur in the fall. The peak instantaneous daily flow at the Wadley gage was 125,000 cfs on May 8, 2003 (USGS 2016a as cited in Alabama Power and Kleinschmidt 2018). Compared to long-term averages, flows in the Tallapoosa River downstream of Harris Dam, as measured at the USGS Wadley gage, were lower in February and March, and higher in June to October of 2017. In 2018 and 2019, flows were below the long-term average for most of the summer months. In 2020, flows were higher from January to April but similar to long-term averages the remainder of the year (Kleinschmidt 2021b).

7.2 Environmental Analysis

Alabama Power conducted relicensing studies and associated analyses that pertain to effects on water resources. Those analyses are presented in the following reports.

- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*
- **Final** *Water Quality Study Report*
- **Final** *Baseline Water Quality Report* (Appendix E)
- **Final** *Water Quantity, Water Use, and Discharge Report* (Appendix E)

Table 7-4 includes the proposed operations and PME measures that may affect water resources at Skyline, Lake Harris, and the Tallapoosa River Downstream of Harris Dam. Not all operations or PME measures apply to each geographic area of the Harris Project; therefore, the analysis of beneficial and adverse effects is presented accordingly. A complete list of Alabama Power’s operations and PME measures is in Table 5-2.

Table 7-4 Proposed Operations and PME Measures That May Affect Water Resources

PROPOSED OPERATIONAL AND PME MEASURES THAT MAY AFFECT WATER RESOURCES
• Continue operating the Harris Project according to the existing operating curve and flood control procedures • Continue daily peak-load operations • Continue operating in accordance with ADROP to address drought management
• Design, install, operate, and maintain a minimum flow unit to provide a CMF between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam ❖ Develop minimum flow operations during drought and unit outages
• Develop and implement a Project Operations and Flow Monitoring Plan to monitor compliance with: (1) Project Operation and Water Level Management; (2) flood control operations (3) drought management; and (4) flow releases from the Harris Dam
• Develop and implement a Water Quality Monitoring Plan consistent with the 401 Water Quality Certification • Continue operating the existing aeration system • Continue to maintain the skimmer weir at the highest setting
• Implement a WMP for Lake Harris and Skyline ❖ Incorporate timber management into the WMP
• Develop and implement a SMP for Lake Harris ❖ Incorporate proposed changes in land use classifications (including reclassifying the botanical area at Flat Rock Park from recreation to natural/undeveloped) ❖ Continue to encourage the use of alternative bank stabilization techniques other than seawalls ❖ Continue implementing the Dredge Permit Program ❖ Continue implementing the Water Withdrawal Policy ❖ Continue implementing a shoreline classification system to guide management and permitting activities ❖ Continue the requirements of a scenic easement for the purpose of protecting scenic and environmental values ❖ Continue implementing a shoreline compliance program and shoreline permitting program ❖ Continue to encourage the adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation

7.2.1 Skyline

Wildlife Management Plan/Timber Management

Little Coon Creek at Skyline is listed as impaired on the 303(d) Impaired Waters List due to siltation/habitat alteration. The sources of this impairment include non-irrigated crop production and pasture grazing on adjacent land, which more easily allows for soils loosened due to tilling or other agricultural practices to be washed into the creek, resulting in sedimentation of the creek bottom. Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies within Skyline. As described in Section 6.2.1, Alabama Power's timber management practices would maintain the overall soil stability in the adjacent forested areas of Little Coon Creek potentially having a beneficial effect on water quality.

7.2.2 Lake Harris

7.2.2.1 Water Quality

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. Water quality conditions support the designated uses of the reservoir (S and F&W) (Kleinschmidt 2021b) and would be expected to continue under Alabama Power's proposal. No changes to water quality at Lake Harris are expected due to this proposal.

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies at Lake Harris. The proposed WMP would likely benefit water quality by minimizing adverse effects at Lake Harris.

Shoreline Management Plan

Alabama Power proposes to develop and implement a SMP for Lake Harris that would likely benefit water quality by minimizing adverse effects at Lake Harris. Those activities are described in Table 7-4 and Table 5-2.

Alabama Power encourages the use of alternative bank stabilization techniques other than seawalls. Such alternatives include, but are not limited to, riprap, bioengineering techniques, natural vegetation with riprap, and gabions. Alabama Power requires, as a condition of a permit, that any future seawall proposals include the placement of riprap, for fish and other semi-aquatic species habitat and increased stability, in front of the seawall. Alternative bank stabilization techniques are preferred methods of erosion control and would likely benefit water quality by minimizing adverse effects at Lake Harris.

Alabama Power's continued implementation of the Dredge Permit Program, developed in consultation with the USACE and other agencies, establishes the processes and procedures for permittees seeking to obtain direct authorization from Alabama Power for dredging activities up to 500 CY of material (below the full pool elevation). The Dredge Permit Program is not intended to cover applications for dredging on lands determined to be "sensitive". The Dredge Permit Program streamlines the process for allowing dredging under 500 CY thus providing opportunity for homeowners to remove sediments that may restrict access. Dredging can contribute to turbidity and localized water quality issues; therefore, managing dredging through a permit program may also minimize adverse effects on water quality.

Alabama Power's continued implementation of the Water Withdrawal Policy would allow Alabama Power to evaluate each application for permission to withdraw water from its Project reservoirs, and, in appropriate circumstances, seek FERC authorization to permit water withdrawals on Project lands. Water withdrawals can affect the assimilative capacity of the reservoir and the Water Withdrawal Policy would provide a beneficial effect on Lake Harris water quality.

Alabama Power proposes to continue implementing a shoreline classification system to guide management and permitting activities. Restrictions on land use along the shoreline could minimize runoff and erosion and potentially benefit water quality by minimizing adverse effects at Lake Harris. In addition, Alabama Power would continue to encourage adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation. Implementation of shoreline BMPS may result in less stormwater runoff and may minimize adverse effects on Lake Harris water quality.

Alabama Power proposes to continue the requirements of a scenic easement on Lake Harris. Continuing this requirement would provide an overall beneficial effect to land management and provide an opportunity for stable shorelines, potentially benefiting water quality.

7.2.2.2 Water Quantity

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. The implementation of ADROP, would reduce impacts to lake levels and conserve water during drought periods, and have a beneficial effect on water quantity.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. Hydrologic Engineering Center's Reservoir System Simulation (HEC-ResSim) models were used to determine Alabama Power's ability to maintain the Harris Reservoir at the current operating curve under downstream release alternatives. The HEC-ResSim model indicated that 150 cfs and 300 cfs continuous minimum flow have negligible effects on average reservoir elevations throughout the year compared to the Green Plan (baseline) (Figure 7-6) and would not affect current water users in Lake Harris (Alabama Power and Kleinschmidt 2021a).

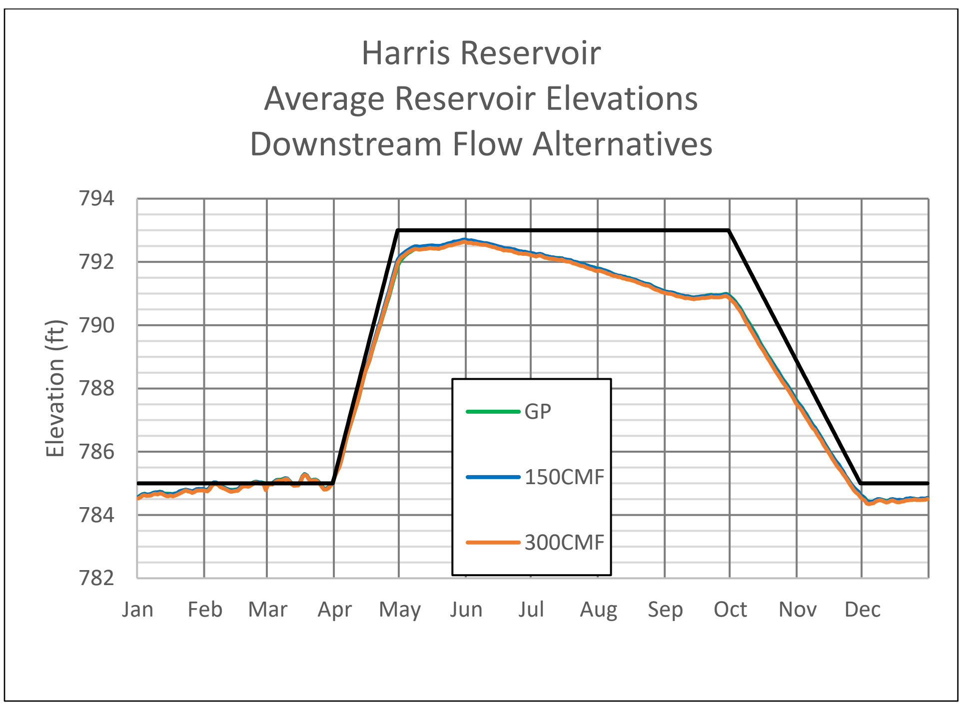

Figure 7-6 Average Elevations of Harris Reservoir Based on HEC-ResSim Model of Downstream Release Alternatives (GP and CMF)

Shoreline Management Plan

Alabama Power proposes to develop and implement a SMP for Lake Harris that includes continued implementation of the Water Withdrawal Policy that would continue to promote conservation of the resource and maintain adequate water supply for the existing and future withdrawals.

7.2.3 Tallapoosa River Downstream of Harris Dam

7.2.3.1 Water Quality

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. These continued operations would maintain existing conditions and have no effect on water quality in the Tallapoosa River downstream of Harris Dam.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. The continuous minimum flows of 150 cfs and 300 cfs do not lower average lake level elevations, and in that regard should have no effect on water quality in the tailrace. The continuous minimum flow would also meet state water quality standards. The effects of the proposed minimum flow on water temperature in the Tallapoosa River downstream of Harris Dam are discussed in Fish and Aquatics Section 8.2.

Water Quality Monitoring Plan

Alabama Power proposes to continue monitoring water quality to ensure compliance with state water quality standards. Alabama Power would develop and implement a Water Quality Monitoring Plan consistent with a Section 401 water quality certification issued by ADEM, to monitor and address any potential effects on water quality in the Tallapoosa River downstream of Harris Dam.

Aeration System and Skimmer Weir

Alabama Power proposes to continue operating the existing aeration system at the Harris Project, as well as include an aeration system in the design of the new minimum flow unit, to ensure compliance with state water quality standards in the Harris Project tailrace. In addition, Alabama Power proposes to continue to maintain the skimmer weir in the highest position to pull water from as high as possible in the water column. Operating these systems would have a long-term beneficial effect on water quality, as measured in the Harris tailrace.

7.2.3.2 Water Quantity

Continued Operations (Normal, Flood, Drought)

Alabama Power's proposal to continue operating the Harris Project during daily peak-load periods according to the existing operating curve and flood control procedures would not affect Alabama Power's ability to provide the proposed continuous minimum flow in the Tallapoosa River downstream of Harris Dam. In addition, the implementation of ADROP would provide a beneficial effect on water quantity downstream by ensuring sufficient water to the extent possible for downstream releases during drought periods.

Continuous Minimum Flow

Current water users downstream of Harris Dam are not likely to be affected by a continuous minimum flow release as water users are located in tributaries of the Tallapoosa River. Downstream releases of 150 cfs to 300 cfs could increase the assimilative capacity of the Tallapoosa River downstream of Harris Dam, but this is unlikely to affect the town of Wadley Water System due to the location of their discharge in Hutton Creek. Furthermore, there are no reported issues with the existing assimilative capacity (Alabama Power and Kleinschmidt 2021b).

Flow Monitoring Plan

Alabama Power proposes to develop and implement a Flow Monitoring Plan to ensure that Project operations comply with applicable requirements of the new license. The Flow Monitoring Plan may include, but not be limited to (1) project operation and water level management; (2) flood control operations (3) drought management; and (4) flow releases from the Harris Dam. Implementing a Flow Monitoring Plan would have a long-term beneficial effect by providing policies and procedures to govern flow management at the Harris Project.

7.3 Unavoidable Adverse Impacts

7.3.1 Skyline

There are no known unavoidable adverse effects to water resources at Skyline.

7.3.2 Lake Harris

Inflows to the Harris Project may not always meet both Project and downstream water requirements during drought periods. During these times, Alabama Power would operate the Project according to the ADROP to minimize adverse impacts to water quality and quantity.

Ground disturbing activities associated with recreation development on Lake Harris including the proposed day use park may result in short-term unavoidable adverse impacts to water quality, potentially causing short-term increases in turbidity near the construction site. Construction BMPs would be implemented to minimize or eliminate these unavoidable adverse impacts.

Dredging on Lake Harris may cause short-term, localized effects on water quality due to increases in turbidity and suspended solids. Continued implementation of Alabama Power's Dredge Permit Program would result in practices that minimize water quality impacts.

7.3.3 Tallapoosa River Downstream of Harris Dam

Inflows to the Harris Project may not always meet both Project and downstream water requirements during drought periods. During these times, Alabama Power would operate the Project according to the ADROP to minimize adverse impacts to water quality and quantity.

Ground disturbing activities associated with canoe/kayak access development in the tailrace downstream of Harris Dam may result in short-term unavoidable adverse impacts to water quality, potentially causing short-term increases in turbidity near the construction site. Construction BMPs would be implemented to minimize or eliminate these unavoidable adverse impacts.

8 FISH AND AQUATIC RESOURCES

8.1 Affected Environment

8.1.1 Skyline

8.1.1.1 Fish Community

Little information is available relative to fish communities within the Skyline Project Boundary. The aquatic habitat information that is available for Skyline indicates it is comprised primarily of intermittent or first order streams. Alabama Power performed surveys at four locations in Little Coon Creek to determine if the federally endangered Palezone Shiner (*Notropis albizonatus*) was present. The most upstream location sampled occurred just downstream of a spring. Above that point, Little Coon Creek appeared to be more intermittent in nature and likely is periodically dry. No Palezone Shiner were detected (see Section 10). The most encountered fish species in those surveys included Banded Sculpin (*Cottus carolinae*), Striped Shiner (*Luxilus chrysocephalus*), Bluegill (*Lepomis macrochirus*), and Bluntnose Minnow (*Pimephales notatus*) (Alabama Power and Kleinschmidt 2021d).

A study by the Geological Survey of Alabama (GSA) in nearby Hurricane Creek found fish assemblages dominated by cyprinids, small catastomids, and darters (GSA 2013 as cited in Alabama Power and Kleinschmidt 2018).

8.1.1.2 Benthic Macroinvertebrates

The ADEM sampled the benthic macroinvertebrate community in Little Coon Creek, Alabama, in June 2013, using standardized methodology. The sample site is located approximately 4 miles downstream of the Skyline Project Boundary. Sample results indicated a total of 72 taxa, with 13 of those taxa in the Ephemeroptera (Mayfly), Plecoptera (Stonefly), or Trichoptera (Caddisfly) orders (EPT species). Based on metrics that compare sample results to those expected for the region, this sample was assessed a rating of Fair (ADEM 2013b as cited in Alabama Power and Kleinschmidt 2018).

8.1.2 Lake Harris

8.1.2.1 Fish Community

The reservoir supports several sport fisheries. Anglers frequently target Largemouth Bass (*Micropterus salmoides*) with several bass fishing tournaments occurring on Harris Reservoir annually. A 13-inch to 16-inch slot limit for all Black Bass (*Micropterus salmoides*) species on the reservoir (meaning that all fish 13 inches to 16 inches must be released) was implemented in 1993 (Andress and Catchings 2005 as cited in Alabama Power and Kleinschmidt 2021c). The percentage of Largemouth Bass in Harris Reservoir that are greater than 20 inches (12 percent) exceeds the state average (7 percent) for Alabama reservoirs. However, there was low recruitment to age one in 2015, with just 2 percent of the population reaching this age class. Growth rates for Largemouth Bass in their first 4 years of life are similar to growth rates for Largemouth Bass found in other reservoirs throughout the state (ADCNR 2015 as cited in Alabama Power and Kleinschmidt 2018).

Alabama Bass (*Micropterus henshalli*) occur in Harris Reservoir. The 13-inch to 16-inch slot limit was removed for this species in 2006 due to an overabundance of specimens smaller than 13 inches (Andress and Catchings 2007 as cited in Alabama Power and Kleinschmidt 2021c). The condition of Largemouth Bass had steadily improved in 2010 (Holley et al. 2010 as cited in Alabama Power and Kleinschmidt 2021c) and by 2012, maintaining the slot limit for Largemouth Bass and removing the slot limit for Alabama Bass in 2006 was found to have a positive effect on Black Bass populations (Holley et al. 2012 as cited in Alabama Power and Kleinschmidt 2021c). As of 2018, the slot limit on Largemouth Bass and removal of the slot limit on Alabama Bass in 2006 have continued to yield positive results, indicated by a greater relative density of slot-sized or larger bass (Hartline et al. 2018 as cited in Alabama Power and Kleinschmidt 2021c); however, annual Alabama Bass mortality appears to be high in Harris Reservoir and Largemouth Bass mortality is relatively low as compared to other reservoirs in the state as indicated by age distributions of sampled fish (ADCNR 2015 as cited in Alabama Power and Kleinschmidt 2018).

Relative weight of Black Bass species in the reservoir is low. This low condition rating is likely associated with the relatively low primary productivity of Harris Reservoir (ADCNR 2016a as cited in Alabama Power and Kleinschmidt 2018). Primary productivity can be defined as the rate at which biomass is produced by the conversion of inorganic substrates into organic substances. In Harris Reservoir, this refers to the number of photosynthetic organisms at the bottom of the food web.

In 2015, Black Crappie (*Pomoxis nigromaculatus*) were sampled to investigate low catch rates reported in 2010 creel surveys (Holley et al. 2010 and Hartline et al. 2018 as cited in Alabama Power and Kleinschmidt 2021c). Black Crappie were found in large numbers in the Harris Reservoir and exhibited much better growth and size structure than crappie (Pomoxis spp.) in the Tallapoosa River near Foster's Bridge, which was attributed to more abundant habitat and forage availability in the reservoir (Hartline et al. 2018 as cited in Alabama Power and Kleinschmidt 2021c).

ADCNR has historically provided supplemental stocking of sport fish to Harris Reservoir. During 1983 and 1984, ADCNR stocked White Bass x-Striped Bass (*Morone chrysops x Morone saxatilis*) hybrids, Largemouth Bass, Channel Catfish (*Ictalurus punctatus*), and Bluegill in Harris Reservoir (ADCNR 1983 and 1984 as cited in Alabama Power and Kleinschmidt 2018). Currently, the reservoir provides a fishery for crappie, catfish, White Bass (*Morone chrysops*), and sunfish species, along with Largemouth Bass; however, Striped Bass (*Morone saxatilis*) and hybrids are not commonly observed in the reservoir. There are fish consumption advisories for Blue Catfish (*Ictalurus furcatus*) (2 meals per month) and Alabama Bass (1 meal per month) associated with mercury contamination due to atmospheric deposition (AL Department of Public Health 2020). A list of fish species documented in Harris Reservoir, as well as in the reaches upstream and downstream of the reservoir, is presented in Table 8-1.

TABLE 8-1 FISHES KNOWN OR EXPECTED TO OCCUR IN THE LAKE HARRIS PROJECT VICINITY

FAMILY	COMMON NAME	SCIENTIFIC NAME
Petromyzontidae (Lampreys)	Southern Brook Lamprey	*Ichthyomyzon gagei*
Amiidae (Bowfins)	Bowfin	*Amia calva*
Clupeidae (Herrings and Shads)	Blueback Herring	*Alosa aestivalis*
	Gizzard Shad	*Dorosoma cepedianum*
	Threadfin Shad	*Dorosoma petenense*
Cyprinidae (Minnows and Carps)	Largescale Stoneroller	*Campostoma oligolepis*
	Alabama Shiner	*Cyprinella callistia*
	Tallapoosa Shiner	*Cyprinella gibbsi*
	Blacktail Shiner	*Cyprinella venusta*
	Common Carp	*Cyprinus carpio*
	Lined Chub	*Hybopsis lineapunctata*
	Striped Shiner	*Luxilus chrysocephalus*
	Bandfin Shiner	*Luxilus zonistius*
	Pretty Shiner	*Lythrurus bellus*
	Speckled Chub	*Macrhybopsis aestivalis*
	Coosa Chub	*Macrhybopsis etnieri*
	Bluehead Chub	*Nocomis leptocephalus*
	Golden Shiner	*Notemigonus crysoleucas*
	Longjaw Minnow	*Notropis amplamala*
	Emerald Shiner	*Notropis atherinoides*
	Rough Shiner	*Notropis baileyi*
	Silverstripe Shiner	*Notropis stilbius*
	Weed Shiner	*Notropis texanus*
	Coosa Shiner	*Notropis xaenocephalus*
	Riffle Minnow	*Phenacobius catostomus*
	Fathead Minnow	*Pimephales promelas*
	Bullhead Minnow	*Pimephales vigilax*
	Creek Chub	*Semotilus atromaculatus*
	Dixie Chub	*Semotilus thoreauianus*
Catostomidae (Suckers)	Alabama Hog Sucker	*Hypentelium etowanum*
	Spotted Sucker	*Minytrema melanops*
	River Redhorse	*Moxostoma carinatum*
	Black Redhorse	*Moxostoma duquesnei*
	Golden Redhorse	*Moxostoma erythrurum*
	Blacktail Redhorse	*Moxostoma poecilurum*
Ictaluridae (Catfishes)	Snail Bullhead	*Ameiurus brunneus*
	Black Bullhead	*Ameiurus melas*
	Yellow Bullhead	*Ameiurus natalis*
	Brown Bullhead	*Ameiurus nebulosus*
	Blue Catfish	*Ictalurus furcatus*
	Black Madtom	*Ictalurus punctatus*

FAMILY	COMMON NAME	SCIENTIFIC NAME
	Speckled Madtom	*Noturus leptacanthus*
	Flathead Catfish	*Pylodictis olivaris*
Fundulidae (Topminnows and Killifishes)	Stippled Studfish	*Fundulus bifax*
	Blackspotted Topminnow	*Fundulus olivaceus*
Poeciliidae (Livebearers)	Western Mosquitofish	*Gambusia affinis*
	Tallapoosa Sculpin	*Cottus tallapoosae*
Moronidae (Temperate Basses)	White Bass	*Morone chrysops*
	Striped Bass	*Morone saxatilis*
	White Bass X Striped Bass Hybrid	*Morone chrysops x saxatilis*
Centrarchidae (Sunfishes)	Shadow Bass	*Ambloplites ariommus*
	Redbreast Sunfish	*Lepomis auritus*
	Green Sunfish	*Lepomis cyanellus*
	Warmouth	*Lepomis gulosus*
	Bluegill	*Lepomis macrochirus*
	Longear Sunfish	*Lepomis megalotis*
	Redear Sunfish	*Lepomis microlophus*
	Redspotted Sunfish	*Lepomis miniatus*
	Tallapoosa Bass	*Micropterus tallapoosae*
	Alabama Bass	*Micropterus henshalli*
	Largemouth Bass	*Micropterus salmoides*
	White Crappie	*Pomoxis annularis*
	Black Crappie	*Pomoxis nigromaculatus*
Percidae (Perches)	Lipstick Darter	*Etheostoma chuckwachatte*
	Goldstripe Darter	*Etheostoma parvipinne*
	Speckled Darter	*Etheostoma stigmaeum*
	Gulf Darter	*Etheostoma swaini*
	Tallapoosa Darter	*Etheostoma tallapoosae*
	Mobile Logperch	*Percina kathae*
	Blackbanded Darter	*Percina nigrofasciata*
	Bronze Darter	*Percina palmaris*
	Muscadine Bridled Darter	*Percina smithvanizi*

Source: Travnichek and Maceina 1994 and Mettee et al. 1996 as cited in Alabama Power and Kleinschmidt 2018; Auburn University 2021 as cited in Alabama Power and Kleinschmidt 2021c.

8.1.2.2 Entrainment

The rate of fish entrainment at Harris Dam was estimated under current operations using a database of fish entrainment information from Electric Power Research Institute (EPRI) (Alabama Power and Kleinschmidt 2018). Information used for the study was derived from specific studies on projects similar to Lake Harris regarding geographic location, station hydraulic capacity, station operation, and fish information (species, assemblage, water quality) and that had available entrainment data. Estimated turbine-induced mortality rates were applied to fish entrainment estimates to determine potential fish mortality (Appendix F).

Fish entrainment is estimated to be highest during the winter (263,847 fish entrained) and lowest during the summer (3,714 fish entrained) (Table 8-2). Clupeids (Gizzard Shad [*Dorosoma cepedianum*] and Threadfin Shad [*Dorosoma petenense*]) comprise the majority of estimated fish losses associated with entrainment at the Harris Project (Table 8-3). Details about the entrainment and mortality at the Harris Project are included in the *Desktop Fish Entrainment and Turbine Mortality Report* (Appendix F).

Table 8-2 Estimated Seasonal Number of Entrained Fish by Family/Genus Group at the Harris Project

Family/Genus Group	Winter	Spring	Summer	Fall	Total
Catostomidae	18	9	1	0	28
Sunfish	461	1,479	468	158	2,566
Bass	5	51	2	5	63
Clupeidae	253,752	13,649	3,108	8,926	279,435
Cyprinidae	287	154	22	68	531
Ictaluridae	9,324	231	113	2,136	11,804
Total	**263,847**	**15,573**	**3,714**	**11,293**	**294,427**

Source: Alabama Power and Kleinschmidt 2018

Table 8-3 Estimated Number of Entrained Fish Lost Due to Turbine Mortality by Season and Family/Genus Group at the Harris Project

FAMILY/GENUS GROUP	WINTER	SPRING	SUMMER	FALL	TOTAL
Catostomidae	5	2	0	0	7
Sunfish	135	483	152	44	814
Bass	2	16	0	2	20
Clupeidae	13,606	734	169	488	14,997
Cyprinidae	45	25	3	10	83
Ictaluridae	2,273	55	28	531	2,887
Total	**16,066**	**1,315**	**352**	**1,075**	**18,808**

Source: Alabama Power and Kleinschmidt 2018

8.1.2.3 Temperature

Alabama Power collected monthly vertical dissolved oxygen and temperature profiles in Harris Reservoir at the forebay (i.e., just upstream of Harris Dam) from March through October each year from 2017 to 2020 (Figure 8-1). Due to high flows, Alabama Power was unable to collect vertical profile data in September 2017. Average surface water temperatures ranged from a low of 14.8 degrees Celsius (°C) in March to a high of 30.4 °C in August. Average water temperatures at a depth of 30 feet (approximate depth of Harris intake with skimmer weir fully raised) ranged from a low of 12.5 °C in March to a high of 23.8 °C in September (Kleinschmidt Associates 2021b).

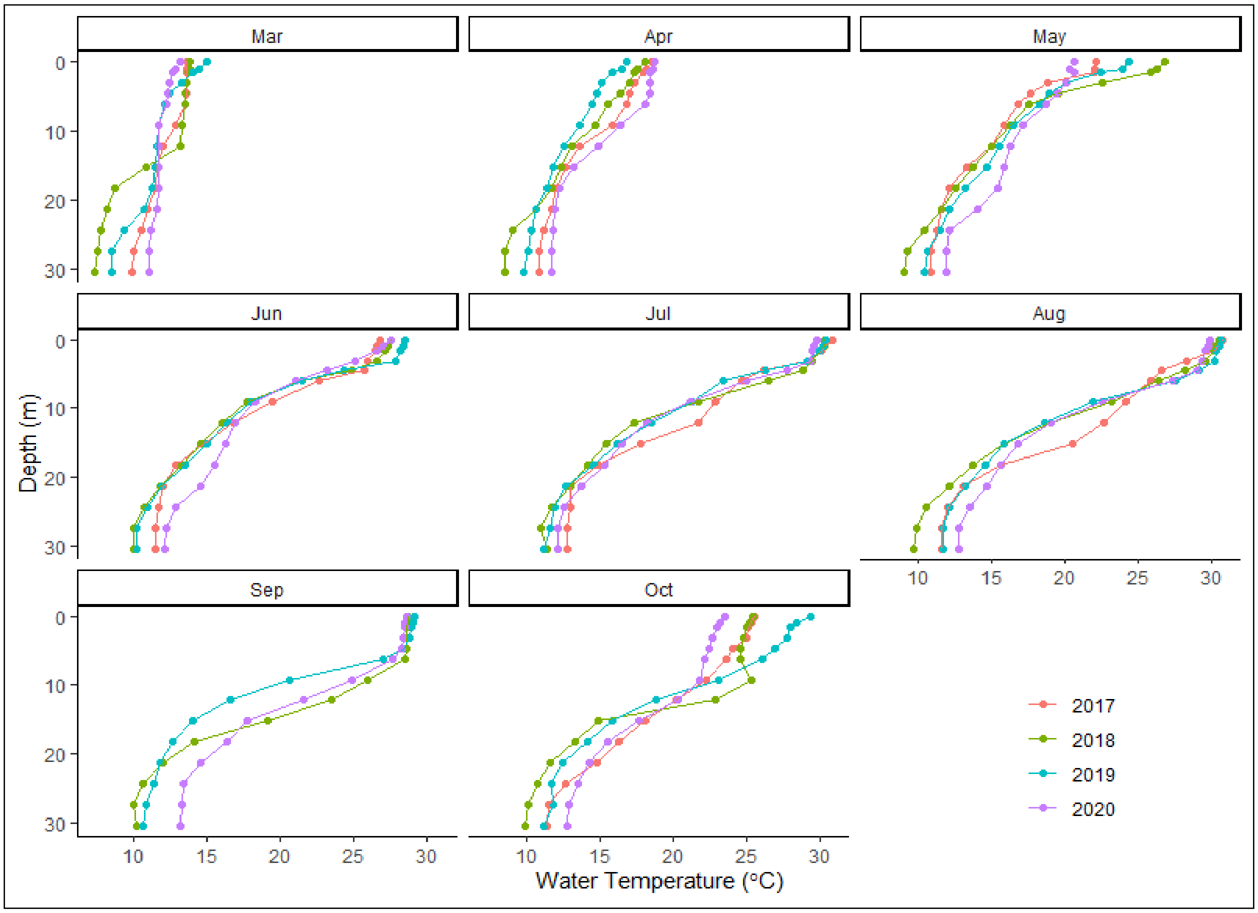

Figure 8-1 Vertical Water Temperature Profiles in Harris Reservoir at Dam Forebay

8.1.2.4 Benthic Macroinvertebrates

There is no existing information on benthic macroinvertebrates in Lake Harris.

8.1.3 Tallapoosa River Downstream of Harris Dam

8.1.3.1 Fish Community

Sport fish species (including Black Bass and sunfish) are present downstream of the Harris Dam (Travnichek and Maceina 1994 as cited in Alabama Power and Kleinschmidt 2018). Alabama Power and ADCNR funded research to assess the effects of Green Plan (baseline) operations on the fishery in the Tallapoosa River downstream of Harris Dam. During that assessment, ACFWRU conducted fish assemblage studies from 2005 to 2015. These efforts are described in greater detail in a 2018 report entitled *Summary of R.L. Harris Downstream Flow Adaptive Management History and Research* (Alabama Power and Kleinschmidt 2018). This report is included in Appendix B and is summarized below.

The ACFWRU performed fishery surveys at six sites. Four of the sites were located on the Tallapoosa River between Harris Dam and Lake Martin: Malone, Wadley, Griffin Shoals, and Peters Island (known collectively as Middle Tallapoosa) (Figure 8-2). Two unregulated sites were sampled as reference sites – one upstream of Harris on the Tallapoosa River near Heflin, Alabama (Upper Tallapoosa) and one on Hillabee Creek, a tributary to the Tallapoosa River near Alexander City, Alabama.

The ACFWRU collected 45 fish species at the Hillabee Creek site, 43 species at the Middle Tallapoosa sites, and 42 species at the Upper Tallapoosa site. The most abundant species collected from 2005 through 2015 included Alabama Shiner (*Cyprinella callistia*) (n=12,949), Lipstick Darter (*Etheostoma chuckwachatte*) (n=12,710), and Bronze Darter (*Percina palmaris*) (n=11,730). Combined, these three species comprised approximately 50 percent of all fish collected (Table 8-4).

The most abundant species collected during the study were generally abundant both upstream and downstream of Harris Dam. However, Threadfin Shad were only observed downstream of Harris Dam. Sport fish species collected downstream of Harris Dam included Channel Catfish, Bluegill, Redbreast Sunfish (*Lepomis auritus*), Flathead Catfish (*Pylodictis olivaris*), and Largemouth Bass. Ictalurids collected during the study include Speckled Madtom (*Noturus leptacanthus*), Black Madtom (*Noturus funebris*), Channel Catfish, and Flathead Catfish (Irwin 2016 as cited in Alabama Power 2018). Reaches of Hillabee Creek sampled during the study had a similar species composition to the upstream and downstream sites, with cyprinids and percids as the most abundant species collected across years and sites.

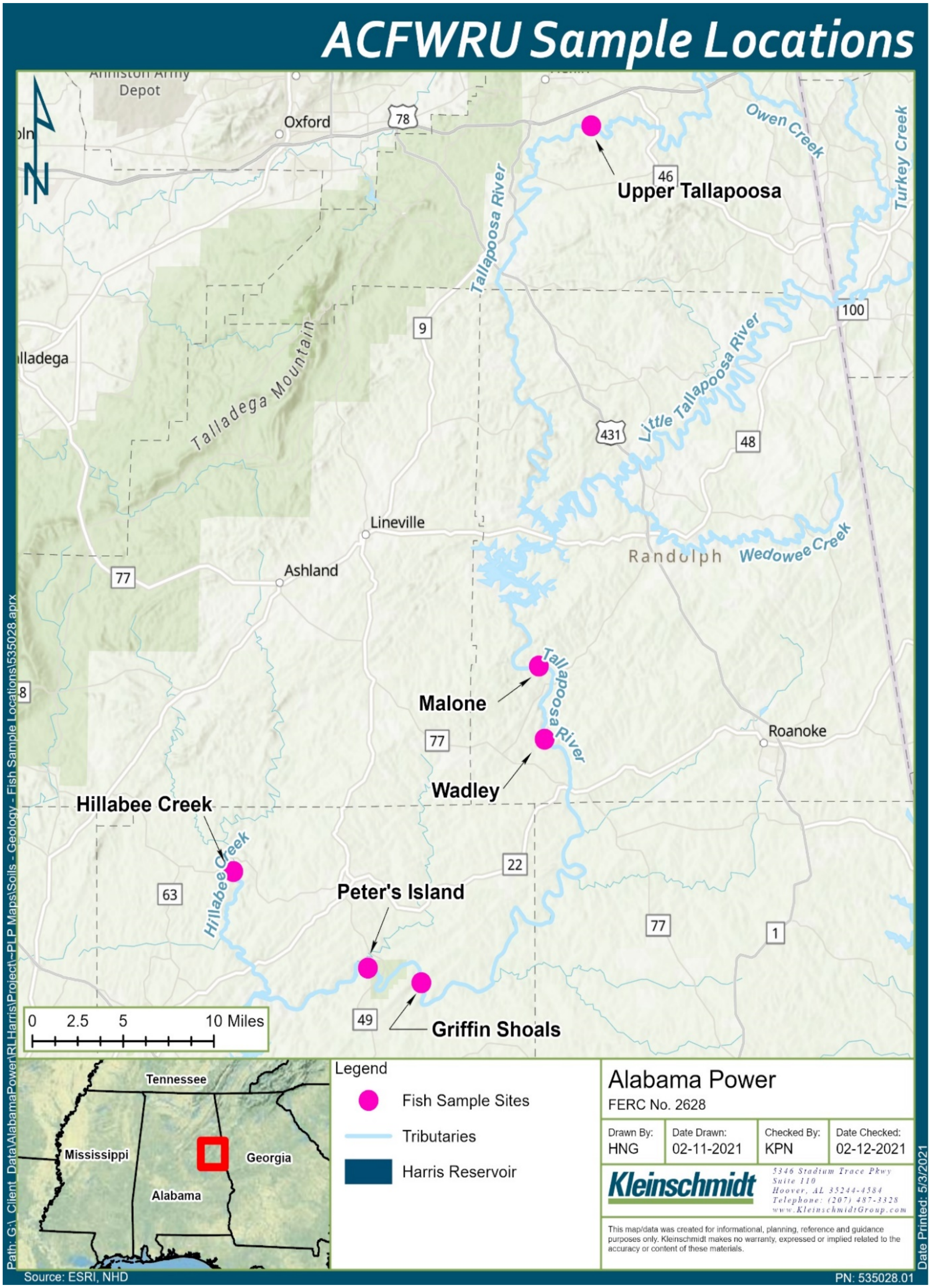

Figure 8-2 ACFWRU Fish Sampling Locations

Table 8-4 Relative Abundance of 10 Most Common Fish Species Collected During ACFWRU Surveys, 2005-2015

COMMON NAME	UPPER TALLAPOOSA (UPSTREAM)	MIDDLE TALLAPOOSA (DOWNSTREAM)	HILLABEE CREEK	TOTAL
Alabama Shiner	12.59%	21.22%	16.92%	17.16%
Lipstick Darter	11.45%	19.64%	18.85%	16.84%
Bronze Darter	8.30%	25.72%	10.90%	15.54%
Largescale Stoneroller	16.01%	3.56%	7.45%	8.67%
Bullhead Minnow	12.59%	0.42%	8.32%	6.74%
Speckled Darter	11.89%	3.18%	3.67%	6.04%
Tallapoosa Shiner	3.10%	1.47%	9.27%	4.48%
Muscadine Darter	3.55%	6.01%	2.68%	4.18%
Silverstripe Shiner	1.87%	3.06%	6.02%	3.64%
Alabama Hog Sucker	6.43%	2.56%	1.29%	3.36%

Source: Alabama Power and Kleinschmidt 2018

Alabama Power sampled fish communities in 2017 and 2018 using standardized methods developed by GSA and ADCNR known as the "30+2" method (GSA 2011 as cited in Alabama Power and Kleinschmidt 2018). Samples were collected at the Malone and Wadley sites along the Middle Tallapoosa in the spring and fall and the Upper Tallapoosa site in July and October. A total of 31 species representing 8 families were collected at the Middle Tallapoosa sites during the spring and fall of 2017 and 2018, combined, compared with a total of 33 species, representing 8 families, collected at the Upper Tallapoosa site. The most common species collected along the Middle Tallapoosa were the Lipstick Darter (n=212), Bronze Darter (n=175), and Redbreast Sunfish (n=150). The most common species collected at the upstream site were Speckled Darter (*Etheostoma stigmaeum*) (n=163), Tallapoosa Shiner (*Cyprinella gibbsi*) (n=101), Muscadine Darter (*Percina smithvanizi*) (n=88), Redbreast Sunfish (n=87), and Lipstick Darter (n=63). Index of Biological Integrity (IBI) scores at the Middle Tallapoosa sites during the spring and fall ranged from 30 (Poor) to 40 (Fair). Scores at the upstream site were 32 (Poor) to 42 (Fair).

Auburn University performed fish assemblage studies in 2019 and 2020 for the Aquatic Resources Study (Alabama Power and Kleinschmidt 2021c) using boat and barge electrofishing. Bimonthly sampling that consisted of six, 10-minute transects occurred at Horseshoe Bend, Wadley, the Harris Dam tailrace, and an unregulated reference site approximately 4 miles upstream of Lee's Bridge. A total of 57 species were collected, with 20 occurring at all four sites. Species richness was lowest at Horseshoe Bend (35) and greatest at the reference site and the tailrace (39). Shannon's diversity index (H) scored highest at Wadley (2.90) and lowest at Horseshoe Bend (2.56). Four species were unique to Horseshoe Bend, one species was unique to Wadley, five species were unique to the Harris Dam tailrace, and seven species were unique to the reference site near Lee's Bridge (Alabama Power and Kleinschmidt 2021c).

8.1.3.2 Temperature

Water temperatures in the Tallapoosa River below Harris Dam are generally coldest in January and warmest in August. Alabama Power collected water temperature data March to October from 2000 to 2018 in the tailrace, 7 and 14-miles downstream of Harris Dam. Those data indicate water temperatures in the tailrace are slightly cooler than downstream locations during most months. Daily average water temperatures reach a maximum of approximately 26 °C in August at the downstream locations, with a maximum of 24 °C in the tailrace. Monthly average water temperatures at each of these three locations are provided in Table 8-5. For comparison, monthly average water temperature data from the unregulated sites on the Tallapoosa River (Heflin) and Little Tallapoosa River (Newell) upstream of Lake Harris are also provided.

Table 8-5 Monthly Average Water Temperatures in the Tallapoosa River and Little Tallapoosa River

MONTH	TAILRACE[1]	7 MILES DOWNSTREAM OF HARRIS DAM[1]	14 MILES DOWNSTREAM OF HARRIS DAM[1]	HEFLIN[2]	NEWELL[2]
Mar	11.2	11.7	11.9	13.2	13.9
Apr	14.8	15.5	16.1	16.1	16.9
May	17.8	18.9	19.7	20.5	21.3
Jun	20.7	22.5	23.4	23.6	24.2
Jul	22.7	24.5	25.3	26.0	26.4
Aug	24.0	25.4	26.1	25.9	26.1
Sep	23.5	24.1	24.5	24.6	24.5
Oct	20.7	20.0	20.0	18.5	19.5

Source Alabama Power and Kleinschmidt 2021c
[1] 2000 – 2018
[2] 2018 - 2020

8.1.3.3 Migratory Fish

Alabama Power owns four hydroelectric developments (Harris Dam, Martin Dam, Yates Dam, and Thurlow Dam) on the Tallapoosa River upstream of its confluence with the Coosa River, which are located on the Tallapoosa River at RM 139.1; RM 60.6; RM 52.7; and RM 49.7, respectively. In addition to the dams, Tallassee Falls, a natural bedrock outcrop, exists between RM 49 and RM 47. The river channel drops approximately 9 feet in elevation over this 2-mile section. This change in elevation was likely a natural barrier to fish movement even before the impoundments were built. None of the dams on the Tallapoosa River have locks that allow passage for fish. Use of the Tallapoosa River by migratory fish species has been impeded or blocked by the construction of navigation and hydropower projects in the Alabama River system including the USACE Claiborne Dam and Millers Ferry Dam (Alabama Power and Kleinschmidt 2018). Mettee noted that there are 144 species of fish in the Alabama River, and 30 of these species are migratory (Table 8-6) (Alabama Power and Kleinschmidt 2018). Alabama Power has conducted fisheries studies periodically between 1984 – 2015 in the Tallapoosa River downstream of Thurlow Dam. Table 8-6 lists the anadromous, catadromous, and diadromous fish species collected during those surveys or believed by the USFWS to be present in the Tallapoosa River below Thurlow Dam.

Table 8-6 Anadromous, Catadromous, and Diadromous Fish Species Collected or Believed to be Present in the Alabama River and the Tallapoosa River Downstream of Thurlow Dam

Species		Movement	Alabama River	Tallapoosa River
Common Name	**Scientific Name**			
Alabama Hog Sucker	*Hypentelium etowanum*	Diadromous	X	
Alabama Shad	*Alosa alabamae*	Anadromous	X	X
Alabama Sturgeon	*Scaphirhynchus suttkusi*	Diadromous	X	X
Alligator Gar	*Lepisosteus spatula*	Diadromous	X	
American Eel	*Anguilla rostrata*	Catadromous	X	X
Atlantic Needlefish	*Strongylura marina*	Diadromous	X	
Black Redhorse	*Moxostoma duquesnei*	Diadromous	X	
Blacktail Redhorse	*Moxostoma poecilurum*	Diadromous	X	
Blue Catfish	*Ictalurus furcatus*	Diadromous	X	
Channel Catfish	*Ictalurus punctatus*	Diadromous	X	
Flathead Catfish	*Pylodictis olivaris*	Diadromous	X	
Freshwater Drum	*Aplodinotus grunniens*	Diadromous	X	
Golden Redhorse	*Moxostoma erythrurum*	Diadromous	X	
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	Anadromous	X	
Highfin Carpsucker	*Carpiodes velifer*	Diadromous	X	
Hogchoker	*Trinectes maculatus*	Diadromous	X	
Largemouth Bass	*Micropterus salmoides*	Diadromous	X	
Mooneye	*Hiodon tergisus*	Diadromous	X	X
Paddlefish	*Polyodon spathula*	Diadromous	X	X
Quillback	*Carpiodes cyprinus*	Diadromous	X	
River Redhorse	*Moxostoma carinatum*	Diadromous	X	X
Skipjack Herring	*Alosa chrysochloris*	Diadromous	X	X
Smallmouth Buffalo	*Ictiobus bubalus*	Diadromous	X	
Spotted Bass	*Micropterus punctulatus*	Diadromous	X	
Spotted Sucker	*Minytrema melanops*	Diadromous	X	
Southeastern Blue Sucker	*Cycleptus meridionalis*	Diadromous	X	X
Southern Walleye	*Sander vitreus*	Diadromous	X	X
Striped Bass	*Morone saxatilis*	Anadromous	X	
Striped Mullet	*Mugil cephalus*	Diadromous	X	
White Bass	*Morone chrysops*	Diadromous	X	

Source: Mettee 1996 as cited in Alabama Power and Kleinschmidt 2018; Alabama Power 2011 as cited in Alabama Power and Kleinschmidt 2018

8.1.3.4 Benthic Macroinvertebrates

The ADEM sampled the benthic macroinvertebrate community in the Tallapoosa River at Wadley, Alabama, in July 2010, using standardized methodology. Sample results indicated a total of 38 taxa, with 11 of those taxa in the EPT orders (i.e., Ephemeroptera, Plecoptera, Trichoptera species). Based on metrics that compare sample results to those expected for the region, this sample was assessed a rating of Fair/Poor (ADEM 2010).

ACFWRU sampled benthic macroinvertebrate communities using a surber sampler in 2005 and 2014 at the same six sites where they sampled fish. ACFWRU identified a total of 151 taxa in the 2005 and 2014 samples, 62 of which were from the family Chironomidae.

Table 8-7 provides a summary of the benthic macroinvertebrate taxa by class and order. Generally, more individuals and taxa were collected in 2005 samples versus 2014. Differences in species composition between sites and years were variable. At the unregulated sites (Heflin and Hillabee), Plecoptera (Stoneflies) made up a larger percentage of insect order composition in comparison with the regulated sites (Malone and Wadley). The unregulated sites appeared to consist of a higher percentage of Ephemeroptera (mayflies) in comparison with the regulated sites (Kleinschmidt 2018a as cited in Alabama Power and Kleinschmidt 2018). Total macroinvertebrate abundance was highest in 2005 at the regulated site nearest Harris Dam (Malone).

Table 8-7 Number of Individual Benthic Macroinvertebrates Collected by Taxon in 2005 and 2014

	Heflin		Hillabee		Malone[1]		Wadley[2]	
Taxa	**2005**	**2014**	**2005**	**2014**	**2005**	**2014**	**2005**	**2014**
Arachnida								
Trombidiformes	10		6		16	5	5	2
Bivalvia								
Veneroida	12	3	11	21	72	5	38	12
Clitellata								
Lumbriculida	1	2			37	37	17	16
Tubificida	17	4	12	8	216	28	19	17
Gastropoda								
Basommatophora	16							
Neotaenioglossa	5	27	6	95	1	3	90	14
Insecta								
Coleoptera	14	97	85	170	49	25	15	25
Diptera	331	23	230	87	648	113	109	96
Ephemeroptera	43	9	125	52	111	150	70	228
Megaloptera	1	2	3	1			2	
Odonata	2	1	5			1		1
Plecoptera	55	34	56	59	5		2	4
Trichoptera	53	22	129	19	103	96	56	29
Malacostraca								
Amphipoda					1			
Isopoda					5			
Nematoda	2		4		10		1	1
Turbellaria								
Tricladida					12			2
Total	**562**	**224**	**672**	**512**	**1286**	**463**	**424**	**447**

Source: Kleinschmidt 2018a as cited in Alabama Power and Kleinschmidt 2018

[1] Seven miles downstream of Harris Dam

[2] Fourteen miles downstream of Harris Dam

An estimated nine crustacean species in the Upper and Middle Tallapoosa River Basins have been reported in ADCNR's Natural Heritage Database (Table 8-8). One species, the Virile Crayfish (*Orconectes virilis*), was reported only in the Upper Tallapoosa River Basin and two species, the Jewel Mudbug (*Lacunicambarus dalyae*) and the Grainy Crayfish (*Procambarus verrucosus*), were reported only in the Middle Tallapoosa River Basin (ADCNR 2020 and Johnson 1997 as cited in Alabama Power and Kleinschmidt 2021c).

Table 8-8 Crustacean Species Reported in the Upper and Middle Tallapoosa River Basins

COMMON NAME	SCIENTIFIC NAME	PRE-DAM	PRE-GREEN PLAN	GREEN PLAN
Tallapoosa Crayfish	*Cambarus englishi*	UM	UM	UM
Slackwater Crayfish	*Cambarus halli*	UM	UM	UM
Variable Crayfish	*Cambarus latimanus*	UM	UM	UM
Ambiguous Crayfish	*Cambarus striatus*	UM		UM
Jewel Mudbug	*Lacunicambarus dalyae*		M	
Reticulate Crayfish	*Orconectes erichsonianus*		UM	
Virile Crayfish	*Orconectes virilis*			U
White Tubercled	*Procambarus spiculifer*	UM	UM	UM
Grainy Crayfish	*Procambarus verrucosus*			M

Source: ADCNR 2020 and Johnson 1997 as cited in Alabama Power and Kleinschmidt 2021c
Upper Tallapoosa Basin (U), Middle Tallapoosa Basin (M)

8.2 Environmental Analysis

Alabama Power conducted relicensing studies and associated analyses that pertain to effects on fish and aquatic resources. Those analyses are presented in the following reports.

- **Final** *Threatened and Endangered Species Study Report*
- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*
- **Final** *Aquatic Resources Study Report*
- **Final** *Downstream Aquatic Habitat Study Report*
- *Fish Entrainment and Mortality Desktop Assessment* (Appendix F)
- **Final** *R.L. Harris 2018 Downstream Flow Adaptive Management History and Research Report* (Appendix B)

Table 8-9 includes the proposed operations and PME measures that may affect fish and aquatic resources at Skyline, Lake Harris, and the Tallapoosa River Downstream of Harris Dam. Not all operations or PME measures apply to each geographic area of the Harris Project; therefore, the analysis of beneficial and adverse effects will be presented accordingly. A complete list of Alabama Power's operations and PME measures is located in Table 5-2.

Table 8-9 Proposed Operations and PME Measures That May Affect Fish and Aquatic Resources

PROPOSED OPERATIONAL AND PME MEASURES THAT MAY AFFECT FISH AND AQUATIC RESOURCES
• Continue operating the Harris Project according to the existing operating curve and flood control procedures • Continue daily peak-load operations • Continue operating in accordance with ADROP to address drought management
• Design, install, operate, and maintain a minimum flow unit to provide a CMF between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam
• Develop and implement an Aquatic Resources Monitoring Plan following implementation of the CMF
• Develop and implement a Water Quality Monitoring Plan consistent with the 401 Water Quality Certification • Continue operating the existing aeration system • Continue to maintain the skimmer weir at the highest setting
• When conditions exist, and upon request from ADCNR, hold Harris Reservoir water levels constant or slightly increasing for a 14-day period for spring spawning
• Provide fish habitat improvements by adding habitat enhancements to Harris Reservoir
• Implement a WMP for Lake Harris and Skyline ❖ Incorporate timber management into the WMP
• Develop and implement a SMP for Lake Harris ❖ Continue to encourage the use of alternative bank stabilization techniques other than seawalls ❖ Continue implementing a shoreline classification system to guide management and permitting activities ❖ Continue the requirements of a scenic easement for the purpose of protecting scenic and environmental values ❖ Continue to encourage the adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation

8.2.1 Skyline

<u>Wildlife Management Plan/Timber Management</u>

Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies within Skyline. Over the years, these controlled management practices have contributed to the protection of watersheds and associated reservoirs and have indirectly improved fisheries habitats of lakes, rivers, and streams

(Alabama Power 2021a). Implementation of the WMP may have a beneficial effect on aquatic resources in Skyline, although Alabama Power does not have jurisdiction over any waterbody at Skyline.

8.2.2 Lake Harris

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. Maintaining the current operating curve and flood control procedures would cause no changes to the amount of littoral habitat available for fish spawning or for juvenile fish and mussels. Summer lake stratification would not deviate from what is typical under current operations and would have no adverse effect on reservoir fisheries during the summer months.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. HEC-ResSim modeling by Alabama Power determined the proposed minimum flow would not lower average lake level elevations; therefore, there would be no effect on aquatic resources in Lake Harris.

The effect of the proposed minimum flow on fish entrainment and mortality rates was assessed qualitatively using the *Desktop Fish and Entrainment and Turbine Mortality Report* (Appendix F). The effect of the proposed minimum flow on water temperature and aquatic habitat were simulated using the HEC-RAS model.

The estimated number of entrained fish can vary based on the volume of water passing through the turbines. However, the same volume of water would continue to be passed under the proposed continuous minimum flow operations as compared to Green Plan (baseline) operations; some of the water that would have otherwise been passed through the existing turbines during peak generation or during Green Plan (baseline) pulses would now be passed through the minimum flow turbine. Therefore, Alabama Power's proposed continuous minimum flow would have no effect on fish entrainment at Lake Harris. Turbine-induced mortality is largely dependent on turbine characteristics such as turbine speed, and number of blades. Therefore, any assessment of potential changes in turbine-induced mortality would have to be performed after design specifications of any minimum flow unit are finalized.

Spring Spawning Stabilization

Currently, based on input from ADCNR and when conditions permit, Alabama Power voluntarily maintains the lake at a stable or a slightly rising elevation for a period of 14 days to increase the spawning success of fish species that spawn in littoral areas such as Largemouth Bass and crappie. Alabama Power proposes to continue to hold Lake Harris stable for spring fish spawning when conditions permit and upon request from ADCNR. This action would have a beneficial effect on fish and aquatic populations in Lake Harris.

Fish Habitat Improvements

Alabama Power proposes continuing to improve fish habitat by adding habitat enhancements within Lake Harris. Alabama Power initiated programs to enhance fisheries resources within Alabama Power managed reservoirs in January of 1993 by installing recycled Christmas trees as fish habitat (Alabama Power and Kleinschmidt 2018) and most recently in consultation with ADCNR, installed artificial habitat. These and other habitat enhancements provide structure for predator avoidance, substrate for macroinvertebrates, and mitigate the effects of entrainment and turbine-induced mortality on fish populations. Providing fish habitat improvements would have a beneficial effect on fish and aquatic populations in Lake Harris.

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies at Lake Harris. Over the years, these controlled management practices have contributed to the protection of watersheds and associated reservoirs and have indirectly improved fisheries habitats of lakes, rivers, and streams (Alabama Power 2021a). Implementation of the WMP would likely have a beneficial effect on aquatic resources at Lake Harris.

Shoreline Management Plan

Alabama Power's proposed SMP would continue to limit the construction of new sea walls to areas where erosion, wave action, and boat traffic are substantial or in areas where a previously installed seawall has failed. Alabama Power encourages the use of alternative bank stabilization techniques other than seawalls. Such alternatives include, but are not limited to, riprap, bioengineering techniques, natural vegetation with riprap, and gabions. Alabama Power requires, as a condition of a permit, that any future seawall proposals include the placement of riprap, for fish and other semi-aquatic species habitat and increased stability, in front of the seawall. Alternative bank stabilization techniques are preferred methods of erosion control and would likely benefit aquatic resources by minimizing adverse effects at Lake Harris.

Implementing a shoreline classification system to guide management and permitting activities, along with continuing the requirements of the scenic easement on Lake Harris would provide an overall beneficial effect to land management and provide an opportunity for stable shorelines, potentially benefiting water quality and aquatic resources on Lake Harris. Encouraging landowners to implement shoreline BMPs may also benefit the aquatic resources on Lake Harris by reducing runoff and maintaining vegetative cover.

8.2.3 Tallapoosa River Downstream of Harris Dam

Continued Operations (Normal, Flood, Drought)

Alabama Power is proposing to continue operating the Harris Project according to the existing operating curve, flood control procedures, and ADROP. Maintaining the existing operating curve and flood control procedures would have no effect on aquatic resources in the Tallapoosa River downstream of Harris Dam. Operating in accordance with ADROP potentially benefits aquatic resources downstream of Harris Dam by conserving water to maintain some level of flow in the river during periods of extreme drought.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. The proposed continuous minimum flow would result in a more stable riverine environment downstream of Harris Dam as continuous minimum flows within the stated range increase the amount and stability of wetted habitat downstream of Harris Dam.

Table 8-10 shows the location below Harris Dam, the type of habitat and the percent difference from the Green Plan (baseline) to the two continuous minimum flows with regard to average wetted perimeter. The largest percent increase occurs in the first seven miles below Harris Dam in both pool and riffle habitat. As water perimeter fluctuations decrease, littoral habitat viability increases. A more stable water surface elevation results in greater uniformity among the environment and shallow breeding sites for early spring breeding aquatic species. Therefore, the proposed continuous minimum flow would have a beneficial effect on aquatic resources habitat in the Tallapoosa River between Harris Dam and Horseshoe Bend.

Table 8-10 Comparison of Percent Difference from Green Plan (Baseline) Conditions in Average Wetted Perimeter Based on HEC-RAS Model of Downstream Release Alternatives

Alternative	Miles Below Harris Dam Habitat Type										
	0.4	1	2	4	7	10	14	19	23	38	43
	Riffle	Riffle	Riffle	Pool	Pool	Riffle	Run-Pool	Riffle-Run	Riffle	Riffle	Pool
GP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
150CMF	2.5%	0.7%	2.4%	0.2%	2.3%	0.5%	0.3%	0.7%	1.1%	0.6%	0.3%
300CMF	5.8%	2.2%	6.8%	0.5%	6.0%	1.1%	0.6%	2.4%	2.8%	1.3%	0.7%

Source: Alabama Power and Kleinschmidt 2021b

Alabama Power's proposal to implement a continuous minimum flow between 150 cfs and 300 cfs would result in a more stable riverine environment downstream of Harris Dam. This continuous minimum flow would decrease the wetted perimeter fluctuation between Harris Dam and Horseshoe Bend. As continuous minimum flow increases, percent wetted area would increase, while fluctuation in water surface elevation decreases. Both the 150 cfs and 300 cfs continuous minimum flow releases provide a greater benefit compared to the Green Plan (baseline) operation of releasing periodic pulse flows downstream. A reduction in water surface fluctuation and increased wetted perimeter would have a beneficial effect on the amount of available littoral habitat.

Table 8-11 shows the results of evaluating the continuous minimum flow and habitat stability. The negative number in the table refers to the percent difference (decrease) in fluctuation of the wetted perimeter; therefore, the higher the negative number, the larger the reduction in fluctuation compared to Green Plan (baseline). Similar to the wetted habitat, the greatest decreases in fluctuation occur in the first 7 miles downstream of Harris Dam. Increasing habitat stability would provide a beneficial effect for fish and other aquatic organisms below Harris Dam.

Table 8-11 Comparison of Percent Difference from Green Plan (Baseline) in Daily Wetted Perimeter Fluctuation Based on HEC-RAS Model of Downstream Release Alternatives

Alternative	Miles Below Harris Dam Habitat Type										
	0.4	1	2	4	7	10	14	19	23	38	43
	Riffle	Riffle	Riffle	Pool	Pool	Riffle	Run-Pool	Riffle-Run	Riffle	Riffle	Pool
GP	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
150CMF	-20%	-7%	-31%	-7%	-11%	-3%	-5%	1%	1%	-3%	-2%
300CMF	-37%	-23%	-68%	-14%	-31%	-13%	-13%	0%	3%	-9%	-9%

Source: Alabama Power and Kleinschmidt 2021b

The proposed continuous minimum flow would have a minor beneficial effect on water temperature downstream of Harris Dam. Results of HEC-RAS model simulations (during summer months) show that continuous minimum flows of 150 cfs and 300 cfs would cause reductions in average and maximum daily, and maximum hourly temperature fluctuations (Table 8-12). The minimum flows would not result in changes in average monthly water temperature or average hourly temperature fluctuations. Any effect on water temperature from the proposed minimum flow would diminish seven or more miles downstream of Harris Dam as the effects of operations attenuate (Alabama Power and Kleinschmidt 2021b).

Table 8-12 Results of HEC-RAS Water Temperature Modeling Simulations for Downstream Release Alternatives

Alternative	Spring					Summer					Fall				
	Period Avg	Avg Daily Δ	Max Daily Δ	Avg Hourly Δ	Max Hourly Δ	Period Avg	Avg Daily Δ	Max Daily Δ	Avg Hourly Δ	Max Hourly Δ	Period Avg	Avg Daily Δ	Max Daily Δ	Avg Hourly Δ	Max Hourly Δ
0.2 Miles Downstream of Harris Dam															
GP	16.95	3.88	6.79	0.35	5.90	23.94	4.32	5.23	0.54	3.90	25.39	3.61	4.40	0.39	2.99
150CMF	17.02	2.89	4.88	0.27	3.98	23.79	3.27	4.08	0.40	2.81	25.63	3.09	4.01	0.28	1.99
300CMF	17.06	2.36	3.71	0.23	2.85	23.65	2.54	3.24	0.31	2.04	25.56	2.20	2.89	0.23	1.61
1 Mile Downstream of Harris Dam															
GP	16.85	5.00	8.85	0.43	6.96	24.15	5.15	6.04	0.59	4.07	25.41	4.75	5.67	0.45	2.22
150CMF	16.94	3.80	6.47	0.34	4.40	24.03	4.20	5.03	0.47	3.11	25.75	4.47	5.71	0.38	2.38
300CMF	17.02	2.90	4.78	0.27	2.82	23.88	3.28	4.05	0.36	2.24	25.65	2.98	3.72	0.26	1.63
7 Miles Downstream of Harris Dam															
GP	16.78	3.67	5.31	0.29	2.65	25.80	4.19	5.31	0.33	1.89	26.66	2.84	3.64	0.24	0.78
150CMF	16.78	3.64	5.07	0.29	2.51	25.62	4.05	5.12	0.32	1.79	26.41	2.92	4.11	0.25	0.76
300CMF	16.79	3.57	5.15	0.28	2.29	25.37	3.90	5.10	0.31	1.63	26.18	2.97	4.14	0.25	0.71

Source: Alabama Power and Kleinschmidt 2021b

The effects of temperature reductions on spawning and growth of aquatic resources downstream of Harris Dam may vary due to several factors, such as fish age and species. Fish growth typically increases with increasing temperature until a thermal maximum is reached or exceeded, at which point fish become stressed and growth decreases. Bioenergetic modeling performed by Auburn University determined that simulated dam operations characterized by increasing flows and temperature decreases of 5°C had a variety of effects on Redbreast Sunfish. Simulated operations increased growth rate of age-1 Redbreast Sunfish, which was attributed to cooler water from releases preventing temperatures from reaching the thermal maxima for growth; however, growth rates of age-3 and age-5 Redbreast Sunfish were slightly reduced, which was attributed to the higher energetic cost required for older, larger fish to maintain position in the river during increased flows (Auburn University 2021 as cited in Alabama Power and Kleinschmidt 2021c). This model assumed that operations caused temperature decreases of 5°C and that fish were not sheltering from increased water velocity, though Auburn's analysis of the temperature data showed that average daily temperature fluctuations are typically much smaller (99.7 percent were less than 2°C). Other studies have attributed delayed or prolonged spawning periods for Channel Catfish to lower temperatures downstream of Harris Dam (Sakaris 2006 as cited in Alabama Power and Kleinschmidt 2021c). Any temperature-related beneficial effects of 150 cfs and 300 cfs continuous minimum flows on aquatic resources would likely be minor and would be limited mainly to the first few miles downstream of Harris Dam.

Aquatic Resources Monitoring Plan

Alabama Power proposes to develop and implement a biological monitoring plan to begin after the continuous minimum flows have been operational to document effects of the minimum flow release. Periodic monitoring of aquatic resources would provide information such as changes to habitat and the aquatic community from implementing the minimum flow.

Aeration System

Continuing to operate the existing aeration system at the Harris Project, as well as incorporating an aeration system in the design of the new minimum flow unit, would ensure that discharges meet state water quality standards which would have a beneficial effect on fish and other aquatic organisms downstream of Harris Dam. In addition, continuing to maintain the skimmer weir in its highest position would continue to pull higher temperature water through the turbines.

8.3 Unavoidable Adverse Impacts

8.3.1 Skyline

Some level of short-term erosion and runoff may occur during timber harvesting, but timber is managed using standard BMPs which serves to prevent long-term impact to water bodies and reduce effects on aquatic resources.

8.3.2 Lake Harris

Under the proposed downstream minimum flow release, fish entrainment and turbine-induced mortality during Project operation would continue at a level similar to that under current operations.

Shoreline development could have an adverse effect on fish and aquatic habitat in the littoral zone. However, permitting guidelines that encourage alternative bank stabilization techniques instead of seawalls and/or require rip rap at the base of seawalls, and adopting BMPs would mitigate this impact.

8.3.3 Tallapoosa River Downstream of Harris Dam

Under the proposed operation, minor water temperature fluctuations will continue to occur and may have a minor adverse effect on some fish species' growth and spawning, and life cycles.

9 WILDLIFE AND TERRESTRIAL RESOURCES

9.1 Affected Environment

9.1.1 Skyline

9.1.1.1 Wildlife Resources

The James D. Martin-Skyline WMA is located in Jackson County, Alabama, and is approximately 60,000 acres. Approximately 15,000 acres are owned by Alabama Power and are included in the Harris Project. Alabama Power leases Skyline Project lands to ADCNR and provides funding for wildlife management activities while ADCNR is responsible for performing management activities, including the development and maintenance of wildlife habitat and recreational access (Alabama Power 1988 as cited in Alabama Power and Kleinschmidt 2018). Skyline is also managed for timber harvesting, which ensures long-term health and sustainability of the forest, while enhancing wildlife management through ecological diversity and habitat improvement.

The Skyline WMA provides quality habitat for a variety of upland wildlife species. Representative wildlife species (mammals, birds, amphibians, and reptiles) found in the Skyline Project Area are listed in Appendix G. A list of birds of conservation concern (BCC) found within the Skyline vicinity is also provided in Appendix G. Currently, invasive wildlife species are not being managed within the Skyline Project Area.

As part of the original license, Alabama Power developed a Harris Project Wildlife Mitigation Plan (Alabama Power 1988 as cited in Alabama Power and Kleinschmidt 2018) in consultation with ADCNR and USFWS that FERC approved on July 29, 1988. The Harris Project Wildlife Mitigation Plan outlined specific measures to mitigate for the impacts to wildlife and habitats caused by the development of the Harris Project. The Harris Project Wildlife Mitigation Plan included provisions for the management of 5,900 acres of existing Project lands and acquisition of 779.5 additional acres of land in the vicinity of the Harris Reservoir. The Harris Project Wildlife Mitigation Plan required Alabama Power to install Wood Duck (*Aix sponsa*) boxes and Osprey (*Pandion haliaetus*) nesting platforms, develop and implement a Canada Goose (*Branta canadensis*) restoration project, manage wildlife openings, and create artificial nesting structures. In addition, the Harris Project Wildlife Mitigation Plan included provisions for Alabama Power to purchase and subsequently lease to ADCNR, over 15,000 acres of land adjacent to the already established Skyline

WMA. The Harris Project Wildlife Mitigation Plan resulted in the development of a Skyline WMP (Alabama Power 1989 as cited in Alabama Power and Kleinschmidt 2018) to guide the development and maintenance of wildlife habitat, timber management, and recreational access. The Skyline WMP was approved by FERC on June 29, 1990.

In conjunction with wildlife management, hunting opportunities are provided at Skyline and are managed by ADCNR as outlined in the 1990 Skyline WMP. Hunting management includes issuance of permits and maps and regulation determinations such as hunting seasons and bag limits.

9.1.1.2 Terrestrial Resources

Skyline is located in Jackson County, in the Cumberland Plateau Region of Alabama. This area is underlain by sandstones along with siltstones, shales, and coal. The landscape consists of flat-topped, high-elevation plateaus separated by deep, steep-sided valleys. The plateaus slope gently from the northeast to the southwest, and most of the area is forested, with characteristics of Southern Ridge and Valley/Cumberland Dry Calcareous Forest and South-Central Interior Mesophytic forest, and Allegheny Cumberland Dry Oak Forest and Woodland. Additional information about the forest types and associated dominant plant and animal species is available in Appendix G.

Contemporary timber stands at Skyline are dominated by Upland Hardwood. Timber stand composition on the 15,063 acres within Skyline is shown in Table 9-1.

Table 9-1 Timber Stand Composition on Harris Project Lands at Skyline

STAND TYPE	PERCENT COVER	ACREAGE
Mixed Pine-Hardwood	0.15	23
Natural Longleaf Pine	0	0
Natural Pine	0	0
Upland Hardwood	99	14,922
Planted Pines	0	0
Other	0.85	118
Total	**100**	**15,063**

Source: Alabama Power Timber Stand Data, Alabama Power 2021a

9.1.1.3 Wetlands

Results of a 2018 desktop assessment conducted by Cahaba Consulting, LLC (Cahaba Consulting) confirmed that it was unlikely that large areas of wetlands occur in the Skyline

Project Boundary due to steep terrain and smaller floodplains (Alabama Power and Kleinschmidt 2018). Additional information on wetlands at Skyline is available in Appendix G.

9.1.2 Lake Harris

9.1.2.1 Wildlife Resources

Harris Reservoir lies within the Northern Piedmont Upland district of the Piedmont Upland Physiographic Section. Harris Reservoir and surrounding woodland, agricultural, and residential areas provide high quality habitat for a variety of upland and semi-aquatic wildlife species. Representative wildlife species (mammals, birds, amphibians, and reptiles) found in the Lake Harris Project Vicinity, including their common and scientific names along with a list of BCCs found within the Lake Harris Project Vicinity are provided in Appendix G.

As described in Section 9.1.1, Alabama Power developed a Harris Project Wildlife Mitigation Plan (Alabama Power 1988 as cited in Alabama Power and Kleinschmidt 2018) in consultation with ADCNR and USFWS that FERC approved on July 29, 1988. The Harris Project Wildlife Mitigation Plan outlined specific mitigation measures regarding possible impacts to wildlife and habitats caused by the development of the Harris Project. The Harris Project Wildlife Mitigation Plan included provisions for the management of 5,900 acres of existing Project lands and acquisition of 779.5 additional acres of land in the vicinity of the Harris Reservoir. As part of the management activities, Alabama Power identified 263 acres of suitable Wood Duck habitat, erected Wood Duck boxes, and released Canada Geese to establish a population in and around Lake Harris, and constructed Osprey nesting platforms along the reservoir shoreline. Finally, Alabama Power managed forest lands within the Lake Harris Project Area and established 105 acres of permanent openings to provide diverse habitat that benefits both game and non-game species.[52]

Alabama Power conducts annual monitoring and maintenance of Wood Duck boxes installed around Lake Harris. Maintenance activities included repair and replacement of broken boxes, as well as the relocation of underutilized boxes. Double boxes were installed in most areas but clusters of 10 boxes were installed in higher use areas. Annual

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[52] See the AIR letter response submitted by APC to FERC (Accession No. 20181113-0016) and Alabama Power's response to FERC's AIR (Accession No. 20181113-4002).

use of boxes by Wood Ducks from 2000 to 2019 ranged from 17 percent in 2000 to 47 percent in 2017 (average of 32 percent). Annual Wood Duck hatchlings ranged from 28 successful nests in 2011 to 47 successful nests in 2017, averaging 37 hatchlings since 2010. Other wildlife found utilizing the boxes included Eastern Screech Owl (*Megascops asio*), Eastern Gray Squirrel (*Sciurus carolinesis*), and flycatchers (Tyrannidae) (Alabama Power and Kleinschmidt 2018).

Lands located at Lake Harris provide hunting opportunities through either hunting leases or individual permits. In consultation with ADCNR, Alabama Power developed the Harris physically disabled hunting area, which included the construction of four shooting houses specifically designed to accommodate disabled hunters and associated access roads and greenfields. Information on the recreational use of the shooting houses for persons with disabilities is presented in Recreation and Land Use, Section 11.

9.1.2.2 Terrestrial Resources

Lake Harris is located predominately in the Northern Piedmont Upland Region of Alabama. Lake Harris is comprised of an impounded portion of the Tallapoosa River and includes mainly open water, deciduous, and evergreen forests with only small areas of agricultural and residential development (Alabama Power and Kleinschmidt 2018). Additional information about the forest types and associated dominant plant and animal species is available in Appendix G.

Alabama Power has actively managed timber on its lands for many years. At Lake Harris, contemporary timber stands are dominated by Mixed Pine-Harwood. Timber stand composition on the 6,269 acres within the Lake Harris Project Boundary is shown in Table 9-2.

Table 9-2 Timber Stand Composition on Harris Project Lands at Lake Harris

STAND TYPE	PERCENT COVER	ACREAGE
Mixed Pine-Hardwood	47	2938
Natural Longleaf Pine	0	0
Natural Pine	18	1109
Upland Hardwood	21	1343
Planted Pines	8	476
Other	6	403
Total	**100**	**6269**

Source: Alabama Power Timber Stand Data as cited in Alabama Power 2021a

9.1.2.3 Botanical Inventory

Botanical inventories were conducted to catalog all plant species present at a 20-acre parcel and a 35-acre parcel at the rare Blake's Ferry Pluton; both parcels are located adjacent to Alabama Power's Flat Rock Park on Lake Harris. The proximity of this 57-acre wooded tract to the rare granite pluton allows animals to take potential shelter during the heat of Alabama summer and creates safe habitat for vulnerable animals such as the Carolina box turtle (*Terrapene carolina*) during their breeding season. All plant species were identified either in the field, or in cases where identification was more difficult, a voucher specimen was taken for later identification in the laboratory. During the inventory of the 20-acre parcel, 365 species of plants were documented from the Inventory Area and surrounding buffer areas. These 365 species represent 97 plant families. During the inventory of the 35-acre parcel, 401 species of plants were documented from the Inventory Area and surrounding buffer areas. These 401 species represent 106 plant families. No federally protected species were found during the survey.

9.1.2.4 Wetlands

Alabama Power contracted Cahaba Consulting to identify, assess, and document possible wetlands located at, or below Alabama Power regulated property on Lake Harris (Appendix G). Cahaba Consulting identified three types of wetlands along the Lake Harris shoreline, including riverine wetlands, emergent/lacustrine fringe wetlands, and alluvial forested or scrub-shrub wetlands. Detailed maps of delineated wetlands are provided in Appendix G.

Riverine wetlands are associated with the floodplains and riparian corridors of streams and rivers. In the Lake Harris Project Boundary, the riverine wetlands occur where perennial streams flow into the reservoir. Primary hydrological inputs include overbank flow from the stream or river or groundwater connections between the stream channel and wetland. Other hydrological sources may include overland flow from neighboring uplands, tributary inflow, or precipitation. Riverine wetlands are typically associated with first order streams; however, perennial flow is not required for a riverine classification (Cahaba Consulting 2016 as cited in Alabama Power and Kleinschmidt 2018).

One hundred sixty-five wetlands were identified and mapped on Harris Reservoir (Appendix G). Identified wetlands totaled 11.35 miles or 14.89 acres along the Lake Harris shoreline (Table 9-3).

Table 9-3 Acres, Linear Feet, and Quality of Wetland Types at Harris Reservoir

QUALITY	LACUSTRINE/LITTORAL ON SHORELINE		SHORELINE AND ALLUVIAL WETLANDS
	LINEAR FEET	MILES	WETLAND ACRES
Poor	5268	1.00	2.16
Moderate	24,258	4.59	3.45
Good	30,430	5.76	9.28
Total	**59,956**	**11.35**	**14.89**

Source: Cahaba Consulting 2018

9.1.3 Tallapoosa River Downstream of Harris Dam

9.1.3.1 Wildlife Resources

Wildlife resources along the Tallapoosa River downstream of Harris Dam resemble those at Lake Harris. Animal and plant species common to the area are described in Appendix G.

9.1.3.2 Terrestrial Resources

Terrestrial resources along the Tallapoosa River downstream of Harris Dam resemble those at Lake Harris. Animal and plant species common to the area are described in Appendix G.

9.1.3.3 Wetlands

Alabama Power used wetland data from the National Wetland Inventory (NWI) (NWI 2021) to identify wetlands from Harris Dam to Horseshoe Bend (2021). Wetlands in the area include: 4.0 acres freshwater emergent; 33.10 acres freshwater forested/shrub; 0.36 acres freshwater pond; and 1,320.51 acres riverine.

9.2 Environmental Analysis

FERC did not identify terrestrial and wildlife resources as an affected resource in the SD2[53]; therefore, Alabama Power did not conduct any studies specific to these resources during relicensing. However, several studies incorporated components that evaluated wildlife and terrestrial resources at the Harris Project. Those analyses are presented in the following reports.

- **Final** *Phase 1 Project Lands Evaluation Study Report*
- **Final** *Threatened and Endangered Species Study Report*
- **Final** *Erosion and Sedimentation Study Report*
- **Final** *Recreation Evaluation*
- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*

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[53] Accession Number: 20181116-3065

Table 9-4 includes the proposed operations and PME measures that may affect wildlife and terrestrial resources at Skyline, Lake Harris, and the Tallapoosa River Downstream of Harris Dam. Not all operations or PME measures apply to each geographic area of the Harris Project; therefore, the analysis of beneficial and adverse effects will be presented accordingly. A complete list of Alabama Power's operations and PME measures is located in Table 5-2.

Table 9-4 Proposed Operations and PME Measures That May Affect Wildlife and Terrestrial Resources

PROPOSED OPERATIONAL AND PME MEASURES THAT MAY AFFECT WILDLIFE AND TERRESTRIAL RESOURCES
• Continue operating the Harris Project according to the existing operating curve and flood control procedures • Continue daily peak-load operations • Continue operating in accordance with ADROP to address drought management
• Design, install, operate, and maintain a minimum flow unit to provide a CMF between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam
• Develop and implement a Nuisance Aquatic Vegetation and Vector Control Program
• Implement a WMP for Lake Harris and Skyline ❖ Follow current guidelines and consult with USFWS to develop measures protective of federally listed bats ❖ Incorporate timber management into the WMP ❖ Continue to provide hunting opportunities to the public
• Develop and implement a SMP for Lake Harris ❖ Incorporate proposed changes in land use classifications (including reclassifying the botanical area at Flat Rock Park from recreation to natural/undeveloped) ❖ Continue to encourage the use of alternative bank stabilization techniques other than seawalls ❖ Continue implementing a shoreline classification system to guide management and permitting activities ❖ Continue the requirements of a scenic easement for the purpose of protecting scenic and environmental values ❖ Continue the use of a "sensitive resources" designation in conjunction with shoreline classifications on Project lands managed for the protection and enhancement of cultural resources, wetlands, and threatened and endangered species ❖ Continue to encourage the adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation
• Develop and implement a Recreation Plan ❖ Install and maintain recreation (canoe/kayak) access below Harris Dam within the Project Boundary ❖ Provide an additional recreation site on Lake Harris to include a day use park (swimming, picnicking, and boat ramp)

9.2.1 Skyline

9.2.1.1 Wildlife and Terrestrial Resources

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies within Skyline. These management activities would continue to benefit ecological diversity and improve wildlife habitat. Management activities would also include continued provisions for hunting.

Through the WMP, Alabama Power proposes to implement and follow USFWS guidance regarding protections for federally listed bat species. Alabama Power would adhere to current USFWS guidance concerning known hibernacula and maternity roost trees. Additional analysis on the effects of the timber management on threatened and endangered species is discussed in Section 10, and Alabama Power continues to consult with the USFWS on final timber management practices.

Alabama Power's proposal to manage the timber not only works in concert with, but also enhances, the primary objectives of sound wildlife management, habitat improvement, and aesthetics. Continuing to implement timber management as part of the WMP would have a long-term beneficial effect on timber and wildlife.

9.2.1.2 Wetland Resources

Due to steep terrain and smaller floodplains, there are few large areas of wetlands that occur within the Skyline Project Boundary (Alabama Power and Kleinschmidt 2018). The limited wetlands within Skyline would not be affected by the proposed operational changes because there Alabama Power does not have jurisdiction over any waterbody at Skyline.

9.2.2 Lake Harris

9.2.2.1 Wildlife and Terrestrial Resources

Continued Operation (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP.

Existing operations result in a winter pool elevation of 785-feet msl. Maintaining the existing winter pool elevation would continue providing both unwetted and littoral habitat for foraging species.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. The proposed continuous minimum flow would not cause significant water surface elevation fluctuations or changes in wetted perimeter around Lake Harris. Therefore, Lake Harris wildlife and terrestrial resources would not be affected by the proposed continuous minimum flow.

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies at Lake Harris. The WMP would consolidate numerous wildlife management activities into a single document and provide the additional technical information and management guidelines requested by resource agencies and other stakeholders during relicensing. Wildlife management objectives identified during relicensing in consultation with ADCNR and USFWS include management of shoreline areas for native vegetative communities and enhanced value as wildlife habitat; implementation of timber management methods that result in enhanced value of Project lands as wildlife habitat; and management of public hunting areas, including areas for the physically disabled.

Under the 1988 Wildlife Mitigation Plan, Wood Duck boxes and Osprey nesting platforms were built, a Canada Goose restoration project was completed, wildlife openings were managed, and artificial nesting structures were created. Since then, Alabama Power has conducted annual monitoring and maintenance of Wood Duck boxes installed around Lake Harris. Maintenance included replacing, repairing and the relocation of underutilized boxes. Wood Ducks have likely adapted to the surrounding habitat at Lake Harris and tolerate human presence. Therefore, Alabama Power is not proposing to continue monitoring and maintaining Wood Duck boxes in the WMP. Wood Duck boxes would remain in place for use until no longer usable, allowing the wildlife using the structures to transition to other suitable habitats. Osprey platforms are constructed of concrete poles with a galvanized steel ring at the top to serve as a nesting platform. Due to construction materials, the platforms require minimal maintenance. While many of the platforms have been used by Osprey, they are not included in a monitoring program. Furthermore, no additional platforms are planned for construction.

Forest lands located within the Lake Harris Project Boundary would be managed according to the timber management actions described in the WMP. The objective of timber management at Lake Harris is to ensure long-term health and sustainability of the forest, while enhancing wildlife management through ecological diversity and habitat improvement. Through the WMP, Alabama Power would implement and follow USFWS guidance regarding protections for federally listed bat species. Alabama Power would adhere to current USFWS guidance concerning known hibernacula and maternity roost trees.

Alabama Power would continue to plant and maintain greenfields and/or other wildlife openings in the vicinity of the shooting houses annually. Shooting houses, specifically designed to accommodate disabled hunters, as well as road access to the shooting houses, would be maintained.

Shoreline Management Plan

At Lake Harris, protection and enhancement of available shoreline habitat for wildlife would occur through implementation of a SMP. The SMP outlines management practices for the 367 miles of shoreline within the Lake Harris Project Boundary. Alabama Power proposes to continue the shoreline classification system to guide management and permitting activities and proposes to continue the use of the "sensitive resources" designation in conjunction with shoreline classifications on Project lands managed for the protection and enhancement of cultural resources, wetlands, and threatened and endangered species.

The SMP would incorporate proposed changes in land use classifications (including reclassifying the botanical area at Flat Rock Park from recreation to natural/undeveloped) and a modified definition for lands classified as natural/undeveloped to include Project lands that would remain undeveloped for the following specific Project purposes.

- Protecting environmentally sensitive areas
- Preserving natural aesthetic qualities
- Serving as buffer zones around public recreation areas
- Preventing overcrowding of partially developed shoreline

This classification would assist in protecting environmentally sensitive areas and preserve vegetative buffer zones at Lake Harris. Alabama Power's proposal to reclassify 57-acres of project lands near Flat Rock Park from "Recreational" to "Natural/Undeveloped" would provide the natural plant and animal community at this location additional protection. Limiting development on these natural undeveloped lands would protect terrestrial resources along the shoreline, enhance food and cover availability for wildlife species, and provide corridors for passage among the larger habitats. These nearshore environments provide important breeding and nursery areas for fish and amphibians species, as well as feeding cover for North American River Otters (*Lontra canadensis*), North American Beavers (*Castor canadensis*), and waterfowl. Specific management actions associated with the natural undeveloped lands are included in the SMP.

The SMP would also recommend shoreline BMPs to landowners to maintain and preserve naturally vegetated shorelines to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation. Shoreline BMPs would continue to encourage the use of alternative bank stabilization techniques other than seawalls and include planting native trees, shrubs, and plants to improve bank stabilization in locations with limited exposure to erosional forces.

Alabama Power proposes to continue to incorporate a scenic easement for the purpose of protecting scenic and environmental values. This classification includes lands located between the 795-feet msl contour and the 800-feet msl[54] contour. These lands are currently controlled by easement for the Project purpose of protecting scenic and environmental values, maintaining a beneficial effect on wildlife and terrestrial resources.

Alabama Power's continued implementation of the Dredge Permit Program, developed in consultation with the USACE and other agencies, establishes the processes and procedures for permittees seeking to obtain direct authorization from Alabama Power for dredging activities up to 500 CY of material (below the full pool elevation). The Dredge Permit Program is not intended to cover applications for dredging on lands determined

[54] Or 50 horizontal feet from 793-feet msl, whichever is less, but never less than 795-feet msl.

to be “sensitive”. The Dredge Permit Program streamlines the process for allowing dredging under 500 cubic yards thus providing opportunity for homeowners to remove sediments that may restrict access. The proposed location of the spoil site for placement of dredged materials requires approval by Alabama Power and must be identified and included with the application. Spoils may not be placed in areas identified as potentially environmentally sensitive, adjacent waters, bottomland hardwoods, or wetlands, and spoils must be placed in a confined upland area in such a manner that sediment will not re-enter the waterway or interfere with natural drainage. Continuing the Dredge Permit Program would have a beneficial effect on wildlife and terrestrial resources in and around Lake Harris.

Recreation Plan

Alabama Power is proposing to develop and implement a Recreation Plan with provisions to provide an additional recreation site on Lake Harris to include a day use park with amenities for swimming, picnicking, and a boat ramp. Depending on siting, the addition of a new recreation site would cause a disruption of the Lake Harris shoreline and associated terrestrial resources. Land clearing activities would be conducted to accommodate for the new day use park. However, native plant species would be planted where possible following construction. In addition, short-term displacement of wildlife in the area would occur during construction activities.

9.2.2.2 Wetland Resources

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. Continuing to lower the winter pool 8 feet from December through March would not affect the existing wetlands that have developed through the years of operating the Project according to the operation curve.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. This proposal would not cause significant water surface elevation fluctuations or changes in wetted perimeter at Lake Harris; therefore, no effect on wetland resources.

Shoreline Management Plan

Alabama Power proposes to develop and implement a SMP, which would designate identified wetlands as sensitive resources. This designation allows for protecting environmentally sensitive areas. Permitted activities in these areas, if applicable, may be highly restrictive or prohibited in order to avoid potential impacts. There are 14.98 acres of alluvial wetlands totaling 11.35 miles of shoreline along the Lake Harris Project Boundary (Cahaba Consulting 2018). Implementation of the shoreline permitting program would have a beneficial effect on wetland resources by additional environmental review at the application stage of the permitting process.

Additionally, bioengineering techniques to improve bank stabilization would be encouraged. This would improve or provide more wetland habitat along the Lake Harris shoreline.

Recreation Plan

Alabama Power is proposing to develop and implement a Recreation Plan with provisions to provide an additional recreation site on Lake Harris to include a day use park with amenities for swimming, picnicking and a boat ramp. Alabama Power would develop this site outside of known wetlands, thus eliminating any effects to wetlands along the reservoir shoreline.

9.2.3 Tallapoosa River Downstream of Harris Dam

9.2.3.1 Wildlife and Terrestrial Resources

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. No impacts to wildlife and terrestrial resources in the Tallapoosa River Downstream of Harris Dam are expected.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. This proposal would result in a more stable riverine environment downstream of Harris Dam compared to the Green Plan (baseline) operation of releasing periodic pulse flows downstream. Under Alabama Power's proposed minimum flow, percent wetted area would increase, while fluctuation in water surface elevation would decrease (Figure 9-1 and Figure 9-2). A more stable water surface elevation results in greater uniformity among the environment and shallow breeding sites for early spring breeding amphibians. Therefore, the proposed continuous minimum flow between 150 cfs and 300 cfs would have a beneficial effect on wildlife habitat in the Tallapoosa River between Harris Dam and Horseshoe Bend. Changes in wetted perimeter, wetted perimeter fluctuation, and water surface elevation would have a beneficial effect on the littoral habitat between Harris Dam and Horseshoe Bend. No other habitat type, such as upland habitats, are expected to be affected by these changes.

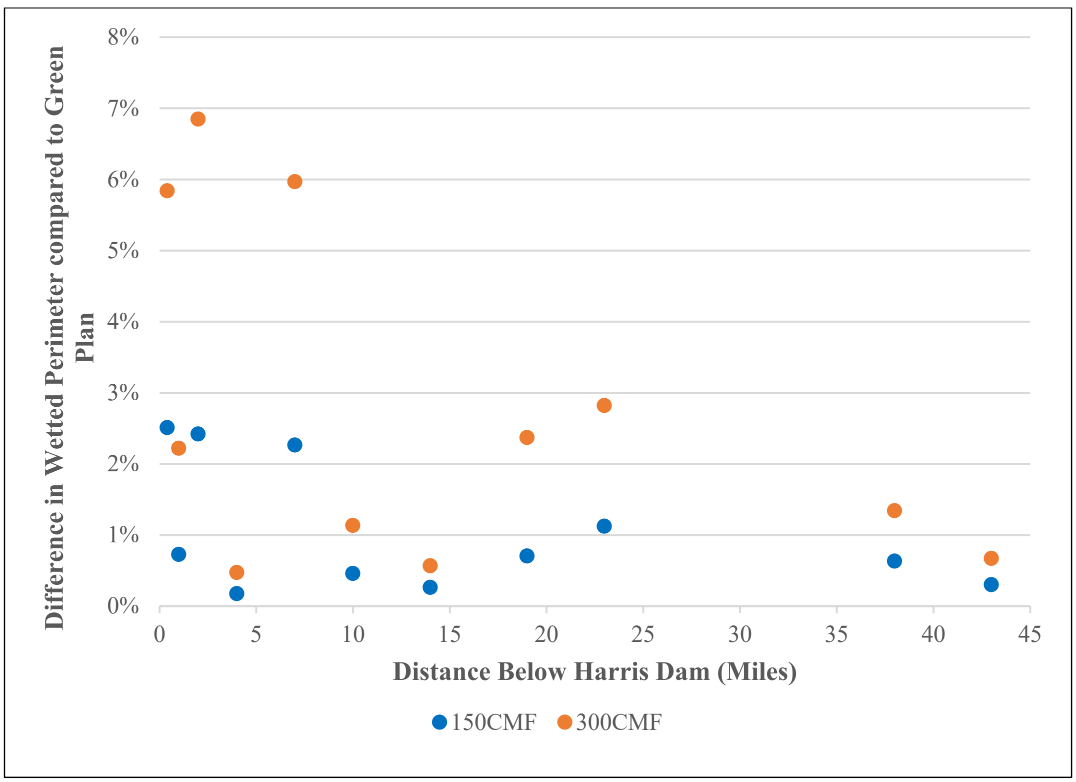


Figure 9-1 Wetted Perimeter Change Compared to Green Plan (Baseline) Operations

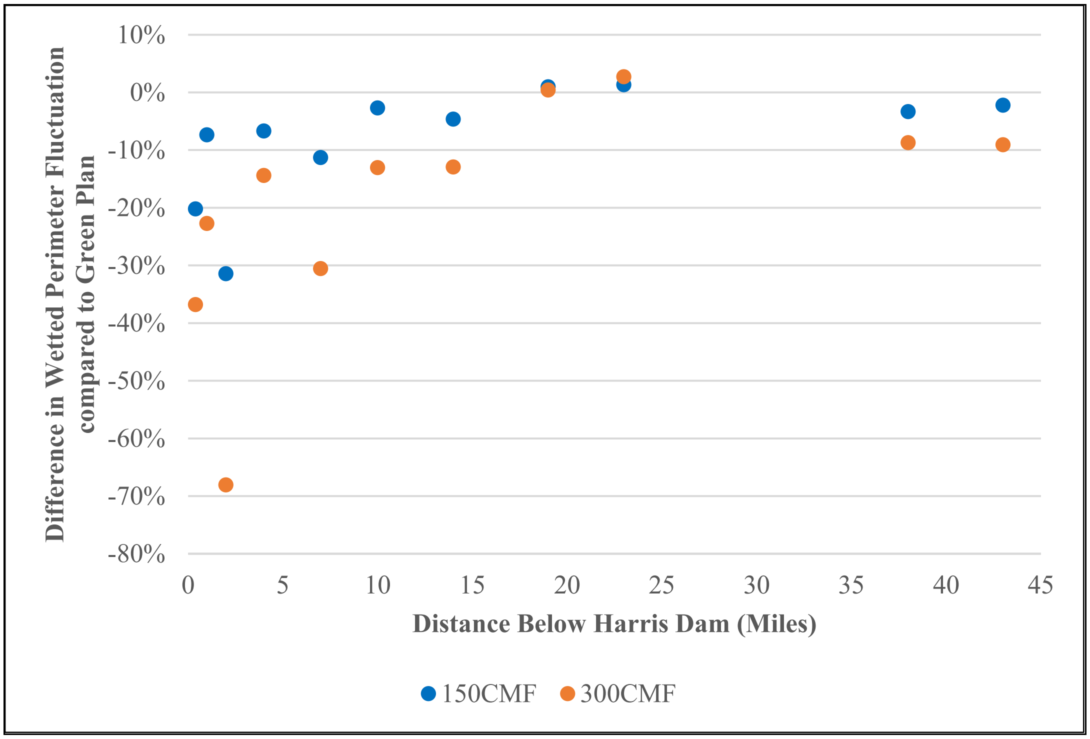


Figure 9-2 Wetted Perimeter Fluctuation Change Compared to Green Plan (Baseline) Operations

<u>Recreation Plan</u>

Alabama Power is proposing to develop and implement a Recreation Plan with provisions to install and maintain recreation access for canoes/kayaks within the Project Boundary below Harris Dam. The new recreation access area would cause temporary disturbance of the Tallapoosa River shoreline and associated terrestrial resources. Land clearing activities would be conducted to accommodate for the new access area; however, land clearing would be conducted to the least extent possible and would take into account BMPs. In addition, short-term displacement of wildlife in the area would occur during construction activities.

9.2.3.2 Wetland Resources

<u>Continued Operations (Normal, Flood, Drought)</u>

Alabama Power's proposal to continue operating the Harris Project according to the existing operating curve, flood control procedures, and ADROP would have no effect on wetland resources in the Tallapoosa River downstream of Harris Dam.

Continuous Minimum Flow

Alabama Power's proposal to implement a continuous minimum flow between 150 cfs and 300 cfs would result in a more stable riverine environment in the Tallapoosa River downstream of Harris Dam. Changes in wetted perimeter, wetted perimeter fluctuation, and water surface elevation would affect the littoral habitat between Harris Dam and Horseshoe Bend. These changes may have a minor beneficial effect on wetlands by providing more stable flows and wetted perimeter.

Recreation Plan

Alabama Power is proposing to develop and implement a Recreation Plan with provisions to install and maintain recreation access for canoes/kayaks below Harris Dam within the Project Boundary. Alabama Power would develop this site outside of wetlands and minimize shoreline disruption to the extent possible during construction.

9.3 Unavoidable Adverse Impacts

9.3.1 Skyline

During timber management activities, there may be short-term adverse effects on terrestrial and wildlife resources from timber harvests immediately following these management actions. Implementing specific management BMPs and procedures would reduce or eliminate adverse impacts to these resources.

9.3.2 Lake Harris

Similar to Skyline, during timber management activities around Lake Harris, there may be short-term adverse impacts to terrestrial and wildlife resources from timber harvests immediately following these management actions. Following specific management BMPs and procedures would reduce or eliminate adverse impacts to these resources. In addition, construction of recreation access/facilities on Lake Harris may result in a short-term adverse effect on terrestrial resources. Construction may cause short-term disturbance to the terrestrial environment due to deployment of construction machinery. Implementing construction BMPs and procedures would reduce or eliminate adverse impacts to terrestrial resources.

9.3.3 Tallapoosa River Downstream of Harris Dam

Short-term, unavoidable adverse impacts associated with the proposed installation of a minimum flow unit at Harris Dam and downstream recreation site include disturbance to the terrestrial environment due to deployment of construction machinery. Construction BMPs would reduce or eliminate potential effects. These impacts would be temporary during construction periods and would not impact the Tallapoosa River once construction is complete.

10 THREATENED AND ENDANGERED SPECIES

10.1 Affected Environment

Research conducted through the USFWS's *Information for Planning and Consultation* (IPaC) identified 20 federally protected species that are present in counties where the Harris Project is located. The USFWS's Environmental Conservation Online System (ECOS) was used to specifically determine the location of species' ranges and areas of critical habitat relative to the Project Boundary. Alabama Power conducted a desktop analysis that developed GIS overlays of habitat information and maps to determine if further evaluation (i.e., field surveys) of any identified species and their habitat was warranted. Results of the desktop analysis are included in the *Final Threatened and Endangered Species Study Report* (Kleinschmidt 2021c).

Consultation with the USFWS, ADCNR, and the Alabama Natural Heritage Program (ALNHP) confirmed the need for field surveys to determine the presence or absence of certain listed species. Field surveys were performed for the Red-cockaded Woodpecker (RCW) (*Picoides borealis*), Palezone Shiner, Finelined Pocketbook (*Hamiota altilis*), White Fringeless Orchid (*Platanthera integrilabia*), and Price's Potato-bean (*Apios priceana*) to determine if there are existing specimens or habitats within the Harris Project Boundary. The five species and general survey locations are listed in Table 10-1 and described below.

A table of state protected species is presented in Appendix H.

Table 10-1 Threatened and Endangered Species Field-Surveyed at Skyline and Lake Harris

SPECIES	SURVEYS CONDUCTED AT SKYLINE	SURVEYS CONDUCTED AT LAKE HARRIS
Red-cockaded Woodpecker		*
Palezone Shiner	*	
Finelined Pocketbook		*
White Fringeless Orchid	*	*
Price's Potato-bean	*	

Source: Kleinschmidt 2021c

General species information on Palezone Shiner, White Fringeless Orchid, and Price's Potato-bean is presented in the Skyline section of this PLP. General species information on the Red-cockaded woodpecker and Finelined Pocketbook is presented in the Lake Harris section of this PLP. Surveys conducted for these species at both or either Skyline or Lake Harris are presented in those sections, respectively. Species information on the Gray Bat, Indiana Bat, and Northern Long-eared Bat are presented in the Skyline section of the Affected Environment and referenced in the Lake Harris section of the Affected Environment, as applicable.

10.1.1 Skyline

10.1.1.1 Palezone Shiner

The federally endangered Palezone Shiner is a small, slender minnow species with a pointed snout and large eyes. It has a small, dark, wedge-shaped spot at the base of the caudal fin and may exhibit a light-yellow color at the base of its pectoral fins during breeding. Historically, this species was found in the Tennessee and Cumberland River systems; however, the only known extant populations occur in the Paint Rock River watershed (Tennessee River tributary), and the Little South Fork of the Cumberland River, both of which are outside of Skyline Project Boundary (Kleinschmidt 2021c).

Source: Wikipedia. 2018. Palezone Shiner. [Online] URL: https://en.wikipedia.org/wiki/Palezone_shiner

Palezone Shiner are found in runs and pools of large creeks and small rivers with clean bedrock, cobble, gravel, and sand. Spawning likely occurs between May and July, peaking in June. Limited distribution makes this species vulnerable to extinction. The USFWS has both a Recovery Plan (USFWS 1997a as cited in Kleinschmidt 2021c) and a Five-Year Review (USFWS 2014 as cited in Kleinschmidt 2021c). The Palezone Shiner is not listed as occurring in the counties where the Lake Harris Project Boundary is located. Habitat range for this species is located immediately to the west of the Skyline Project Boundary (Figure 10-1).

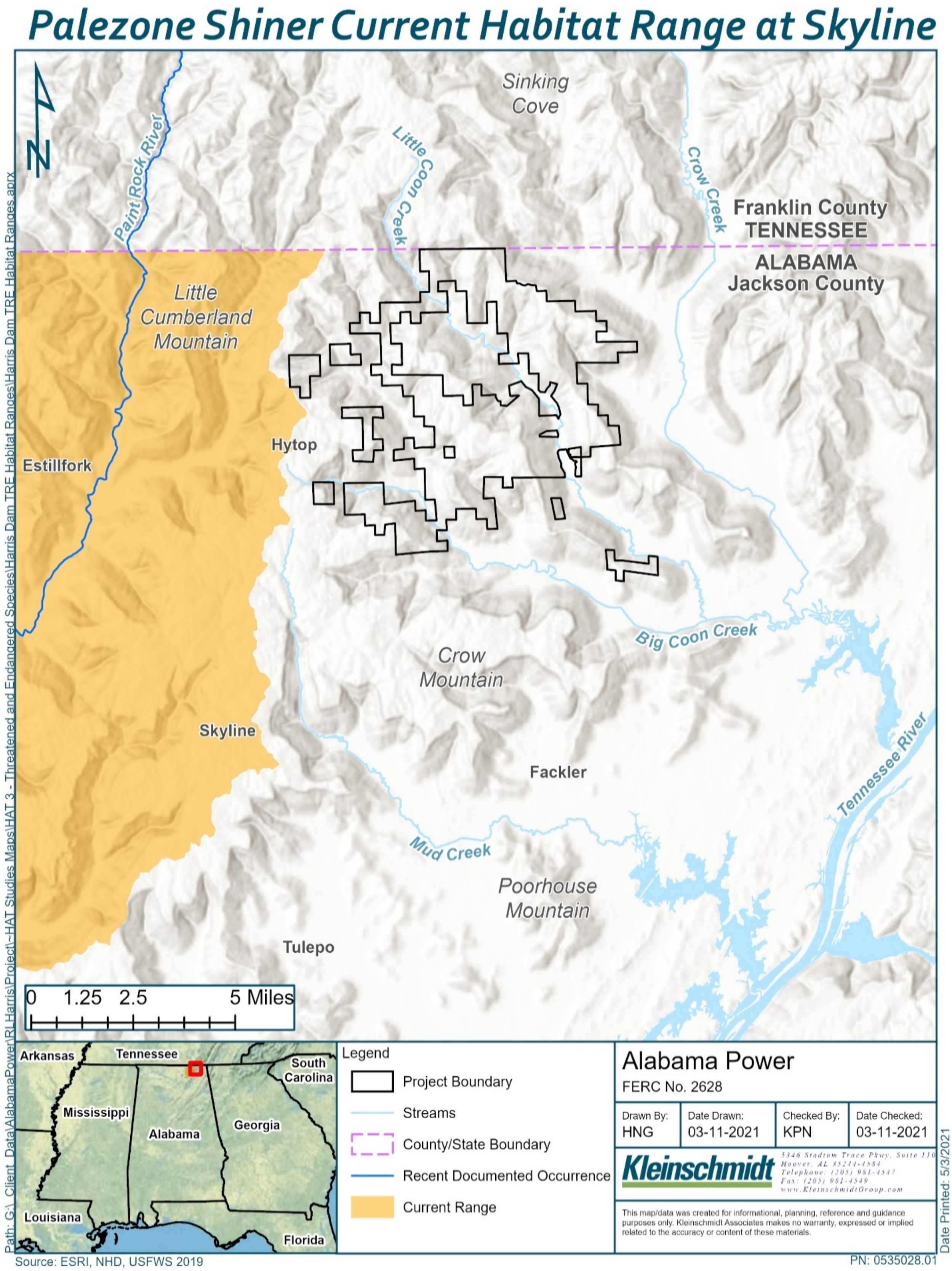


Figure 10-1 Palezone Shiner Current Range Habitat at Skyline

On June 10-11, 2020, Alabama Power conducted surveys for Palezone Shiner at four locations on Little Coon Creek (Table 10-2 and Figure 10-2).

Table 10-2 Palezone Shiner Survey Locations

Site Number	Miles Upstream of Mouth of Little Coon Creek	Description
1	1.8	County Road 53
2	7.0	County Road 566
3	8.6	County Road 567
4	10.8	County Road 54

Source: Kleinschmidt 2021c

Alabama Power and ADEM surveyors performed fish IBI sampling according to methods in O'Neil and Shepard (2010). Sites were sampled by backpack electrofishing and seining and stratified over riffle, run, pool, and shoreline habitats. Sampling efforts were expended proportionally in each of the riffle, run, and pool habitat types (30 efforts total) and two efforts were expended along stream shorelines. All captured fish were identified to species and released. No Palezone Shiners were collected or observed at any of the four survey sites (Kleinschmidt 2021c).

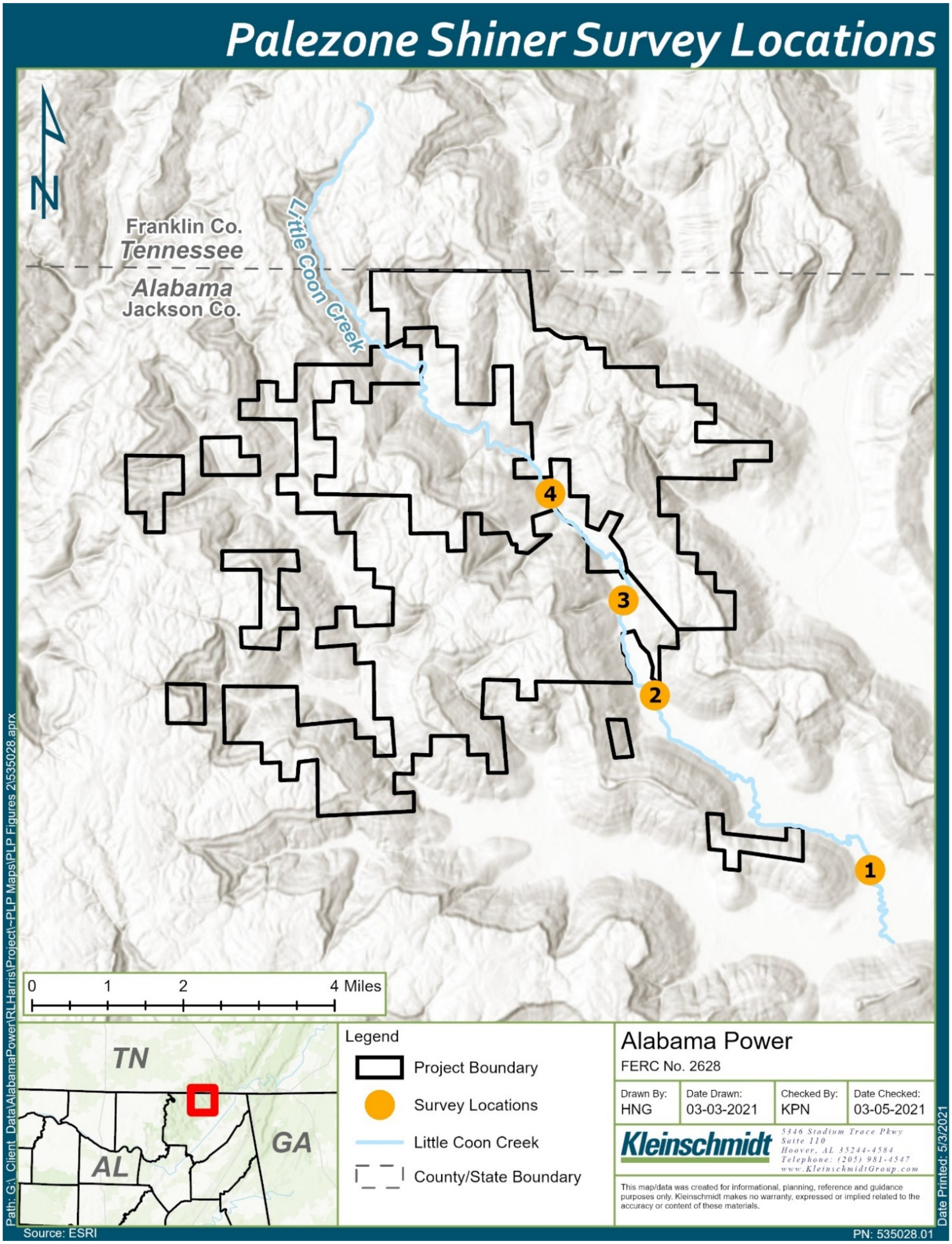


Figure 10-2 Palezone Shiner Survey Locations

10.1.1.2 White Fringeless Orchid

The White Fringeless Orchid was listed as threatened under the Endangered Species Act (ESA) in September of 2016 (USFWS 2016a as cited in Kleinschmidt 2021c). Two extant populations were identified in Clay and Cleburne counties in the Talladega National Forest (Kleinschmidt 2021c) (Figure 10-3). This species is a slender, erect, perennial herb that grows in colonies. The fragrant, white flowers grow in loose, round to elongated, terminal clusters with 6 to 15 flowers in each cluster. The stem is light green, smooth, and can grow up to 3.6 inches. The orchid blooms from late July to early September with fruits maturing in October. White Fringeless Orchid typically occurs in wet, flat, or boggy areas with acidic muck or sand. This plant prefers partially shaded areas at the heads of streams or seepage slopes. The primary threat to this species is the destruction and alteration of its habitat including excessive shading, soil disturbance, altered hydrology, and the spread of invasive species. Other threats include unauthorized collection for recreational or commercial purposes, herbivory, and small population sizes (Federal Register 2016 as cited in Kleinschmidt 2021c). A Recovery Plan has not been completed for this species. The habitat range of the White Fringeless Orchid overlaps the Project Boundaries at Lake Harris and Skyline; however, there are no published reports of White Fringeless Orchid occurrences within the Lake Harris Project Boundary or Skyline Project Boundary (Kleinschmidt 2021c). Although this species uses wetland habitats, the NWI is not detailed enough to identify wetlands containing the plant's unique habitat characteristics; however, consultation with the ALNHP determined that suitable habitat was likely present within the Project Boundaries at Lake Harris and Skyline.

Source: US Fish and Wildlife Service. 2016. Tennessee Ecological Services Field Office. [Online] URL: https://www.fws.gov/cookeville/Whitefringelessrchid.html

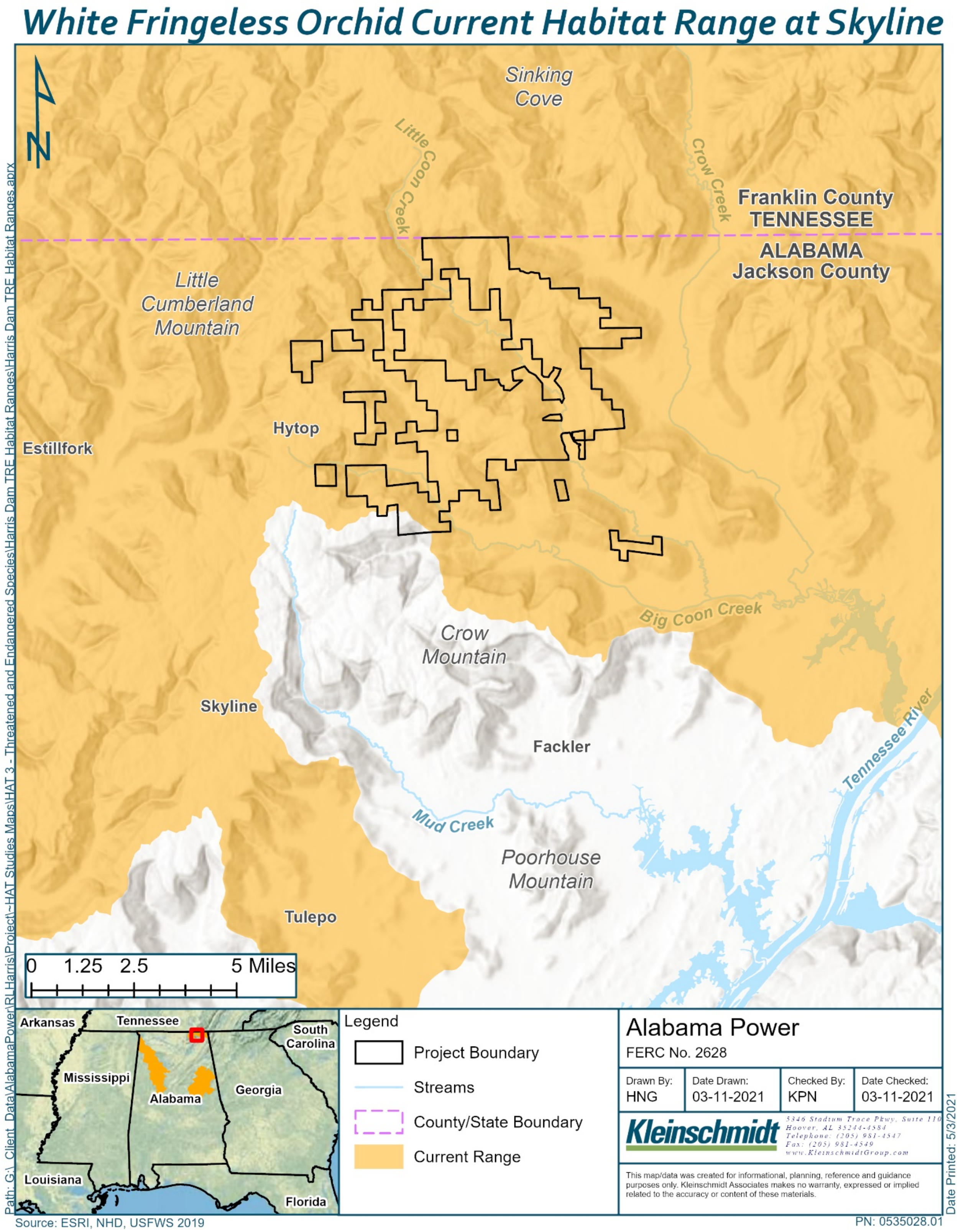


Figure 10-3 White Fringeless Orchid Current Habitat Range at Skyline

On September 2 and 3, 2020, Alabama Power and Kleinschmidt surveyed eight sites at Skyline containing springs, ponds, or wetlands. Although survey sites were selected based on potential habitat (i.e., wetlands, springs, and ponds), surveyors found that much of this habitat was unsuitable due to shade from thick canopies, disturbance, soil type, inundation, vegetation community (lack of common associates), and steep slopes. Survey at a ninth site at Skyline (Site 9) was attempted, but the area was blocked by private property and did not contain suitable habitat, at least within the Skyline Project Boundary, upon closer inspection in the field. No White Fringeless Orchid specimens were collected or observed at any of the Skyline survey sites (Kleinschmidt 2021c) (Table 10-3) (Figure 10-4).

Table 10-3 White Fringeless Orchid Survey Locations at Skyline

Site Number	Survey Date	Site Description	Habitat Suitability*
1	September 2, 2020	Spring	U
2	September 2, 2020	Pond	M
3	September 2, 2020	Spring	U
4	September 2, 2020	Spring	U
5	September 2, 2020	Pond	M
6	September 2, 2020	Pond	M
7	September 3, 2020	Pond	U
8	September 3, 2020	Pond	M
9**	September 3, 2020	Forested wetland	U

Source: Kleinschmidt 2021c
*Habitat Suitability: Marginal = M, unsuitable = U
**This site was not surveyed due to private property restrictions.

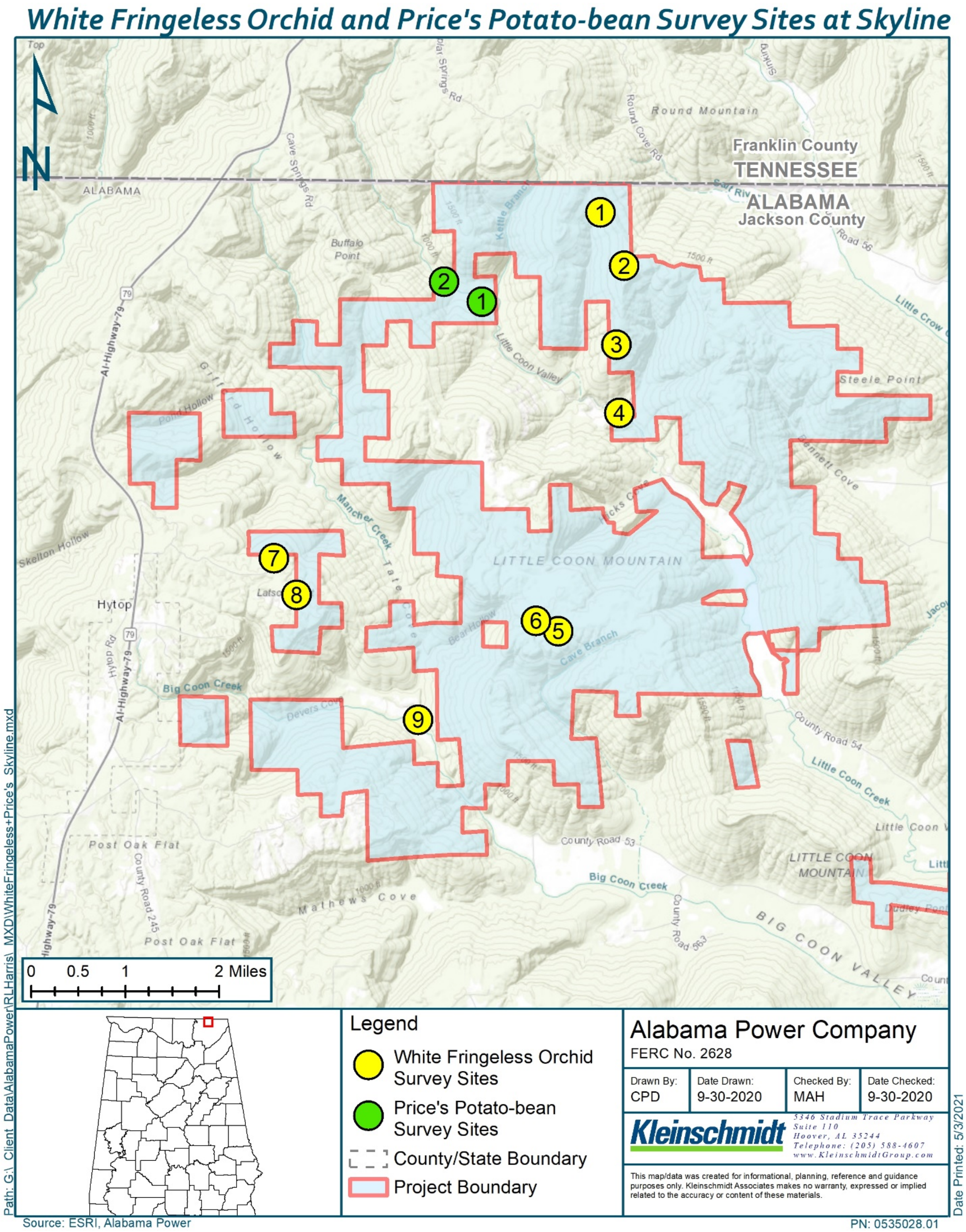


Figure 10-4 White Fringeless Orchid and Price's Potato-bean Survey Sites at Skyline

10.1.1.3 Price's Potato-bean

Price's Potato-bean

Source: US Fish and Wildlife Service. 2019. US Fish and Wildlife Service Midwest Region. Bloomington, MN. [Online] URL: https://www.fws.gov/midwest/endangered/plants/pricesp.html

Price's Potato-bean was listed as threatened in 1990. A member of the pea family (*Fabaceae*), this species' historic range included Alabama, Illinois, Kentucky, Mississippi, and Tennessee. Price's Potato-bean is a twining, herbaceous, perennial vine that grows from a tuber and has greenish-white or brownish-pink flowers. This species is found in open, bottom areas near or along the banks of streams and rivers, sometimes near the base of limestone bluffs (Kleinschmidt 2021c). Since publication of this species' Recovery Plan, many new populations have been discovered. Twenty of the 25 populations included in the Recovery Plan are still extant and apparently stable (USFWS 1993b as cited in Kleinschmidt 2021c). According to the Five-Year Review, there are currently 16 extant populations of Price's Potato-bean in Alabama distributed among nine counties: Autauga (2), Butler (1), Dallas (2), Jackson (2), Lawrence (1), Madison (5), Marshall (1), Monroe (1), and Wilcox (1) (Figure 10-5 [55]). The populations in Jackson County occur on Sauta Cave National Wildlife Refuge, and near Little Coon Creek in the Skyline WMA (Kleinschmidt 2021c). One of these extant populations intersects the Project Boundary at Skyline and comprises 11 percent of the extant population occurring at Little Coon Creek; however, 89 percent of this single population occurs outside of the Project Boundary. According to its Five-Year Review, 7 of the 16 populations of Price's Potato-bean in Alabama face one or more of the following threats: incompatible logging, excessive shading by canopy trees, road and right-of-way interference, and competition with non-native, invasive species (USFWS 2016g as cited in Kleinschmidt 2021c).

[55] A 100-foot stream buffer within limestone landscape was included in this figure to highlight low areas along or near the banks of streams and rivers, which this species seems to prefer. The buffer indicated on the figure is not regulatory. It is meant to depict areas where this species could potentially occur based on known habitat preferences. The recent documented occurrence (1995-2020) of Price's Potato-bean in this figure is portrayed as the entirety of Little Coon Creek. More specifically, the recent documented occurrence of this species is restricted to the section of Little Coon Creek near the northern Skyline Project Boundary and extends partially into the Project Boundary.

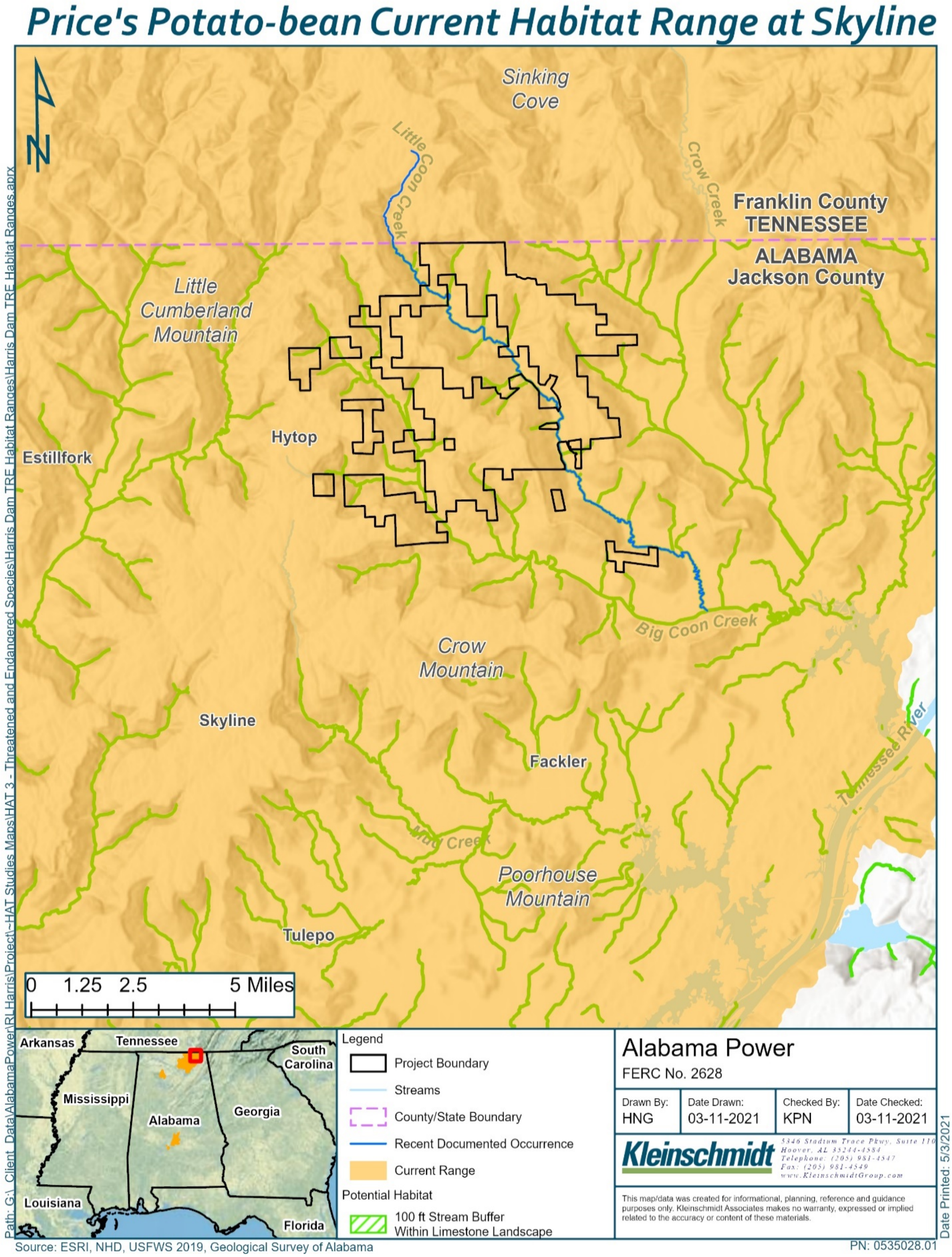


Figure 10-5 Price's Potato-bean Current Habitat Range at Skyline

During the White Fringeless Orchid surveys conducted at Skyline on September 2 and 3, 2020, Price's Potato-bean was passively searched, and on September 3, Alabama Power and Kleinschmidt searched for Price's Potato-bean at and in the proximity of the known population located within the Skyline WMA but outside of the Project Boundary. No specimens were observed, potentially due to dense canopy cover in areas that otherwise may support Price's Potato-bean populations. On September 29, 2020, surveyors from Alabama Power returned to survey two sites with suitable habitat, but no specimens were observed (Kleinschmidt 2021c) (Figure 10-4).

10.1.1.4 Gray Bat

Source: US Fish and Wildlife Service. 2019. US Fish and Wildlife Service Midwest Region. Bloomington, MN. [Online] URL: https://www.fws.gov/midwest/endangered/mammals/grbat_fc.html

The Gray Bat (*Myotis grisescens*) was listed as endangered on April 28, 1976. The Gray Bat is distinguished from other bats by the uni-colored fur on its back. This species molts in the summer, when its dark gray fur turns to a chestnut brown (USFWS 1997b as cited in Kleinschmidt 2021c). This species can be found in caves year-round, using them both in the summer roosting and winter hibernating periods (Figure 10-6). Typically, these caves are scattered along rivers or lakes where the Gray Bat feeds on flying aquatic and terrestrial insects (USFWS 1997b as cited in Kleinschmidt 2021c). Breeding takes place in the fall, with a single pup born in late May or early June (Mirarchi et al. 2004 as cited in Kleinschmidt 2021c, USFWS 1997b as cited in Kleinschmidt 2021c). According to its Five-Year Review, the main threat to Gray Bat populations is human disturbance in unprotected caves (USFWS 2009 as cited in Kleinschmidt 2021c).

The USFWS has both a Recovery Plan (USFWS 1982 as cited in Kleinschmidt 2021c) and Five-Year Review (USFWS 2009 as cited in Kleinschmidt 2021c) for the Gray Bat; however, the IPaC and Federal Register Listings do not list the Gray Bat as occurring in the counties where the Lake Harris Project Boundary is located.

Skyline falls within the current habitat range of the Gray Bat and has approximately 10,782 acres of karst geology (Figure 10-6). Although the Gray Bat uses caves for both winter hibernaculum and summer roosting, there have been no reports of overwintering or summer roosting occurrences within the Skyline Project Boundary.

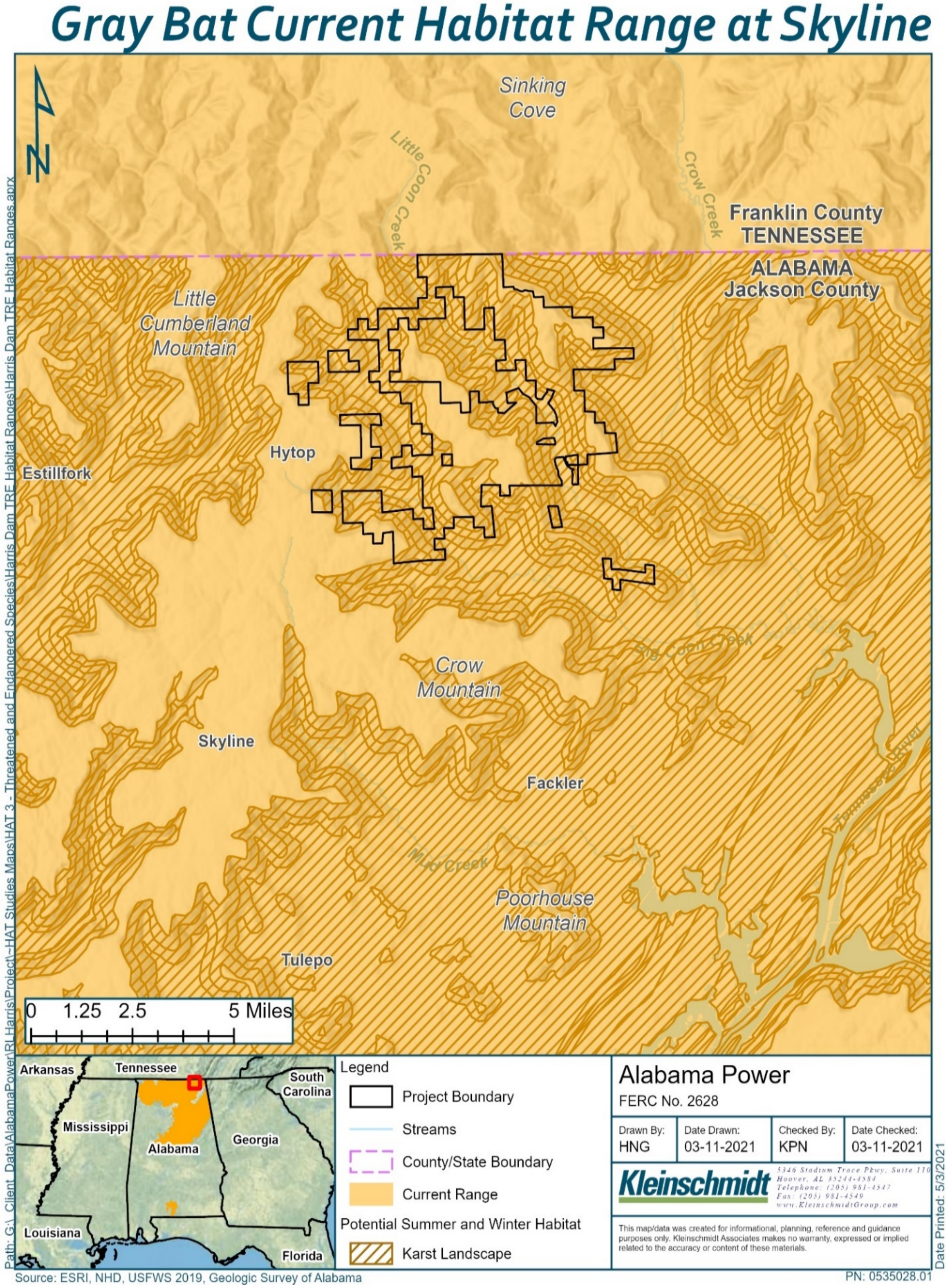


Figure 10-6 Gray Bat Current Habitat Range and Karst Landscape at Skyline

10.1.1.5 Northern Long-eared Bat

Source: US Fish and Wildlife Service. 2019. US Fish and Wildlife Service Midwest Region. Bloomington, MN. [Online] URL: https://www.fws.gov/Midwest/endangered/mammals/nleb/nlebFactSheet.html

The USFWS listed the Northern Long-eared Bat (*Myotis septentrionalis*) as threatened on April 2, 2015, with a final rule published in the Federal Register on January 14, 2016. On April 27, 2016, the USFWS determined that the designation of critical habitat for the species was not prudent; therefore, critical habitat has not been established for the Northern Long-eared Bat (USFWS 2016f as cited in Kleinschmidt 2021c). The Northern Long-eared Bat was historically distributed statewide; however, there is only low occurrence, if at all, in the southwestern region of Alabama (Mirarchi et al. 2004 as cited in Kleinschmidt 2021c). The Northern Long-eared Bat feeds on invertebrates and is known to glean prey from vegetation and water surfaces. The Northern Long-eared Bat winters in groups in underground caves and cave-like structures but in the summers, it roosts singularly or in small colonies in cavities, under bark, or in hollows of live and dead trees typically greater than 3 inches in diameter. Suitable roosting trees possess exfoliating bark, cavities, or cracks (USFWS 2016f as cited in Kleinschmidt 2021c). The Northern Long-eared Bat has a single pup born in late spring or early summer with the offspring weaned approximately one month after birth (Mirarchi et al. 2004 as cited in Kleinschmidt 2021c). The primary threat to the Northern Long-eared Bat is White Nose Syndrome, a fungal disease (USFWS 2016f as cited in Kleinschmidt 2021c).

The USFWS does not have a Recovery Plan, Five-Year Review, or designated critical habitat for the Northern Long-eared Bat.

While the Skyline and Lake Harris Project Boundaries fall within the range of the Northern Long-eared Bat, there have been no reports of overwintering or summer roosting occurrences at either location. A large portion (66.5 percent) of the Harris Project is comprised of forested cover that likely provides some suitable summer roosting habitat for the Northern Long-eared Bat (Figure 10-7). In addition, Skyline has 10,782 acres of karst geology conducive to cave formation; however, no known hibernacula or maternity roost trees have been reported in or within 0.25 miles and 150 feet[56] of the Project Boundary, respectively.

The Northern Long-eared Bat could potentially use the forests within the Skyline and Lake Harris Project Boundaries for roosting during the summer months and could potentially use the Skyline WMA year-round because of the presence of potentially suitable habitat (i.e., karst geology) (Figure 10-8).

[56] The USFWS's Northern Long-eared Bat 4(d) rule prohibits incidental take that may occur from tree removal activities within 0.25 miles of hibernacula at any time or within 150 feet of roost trees during the months of June and July.

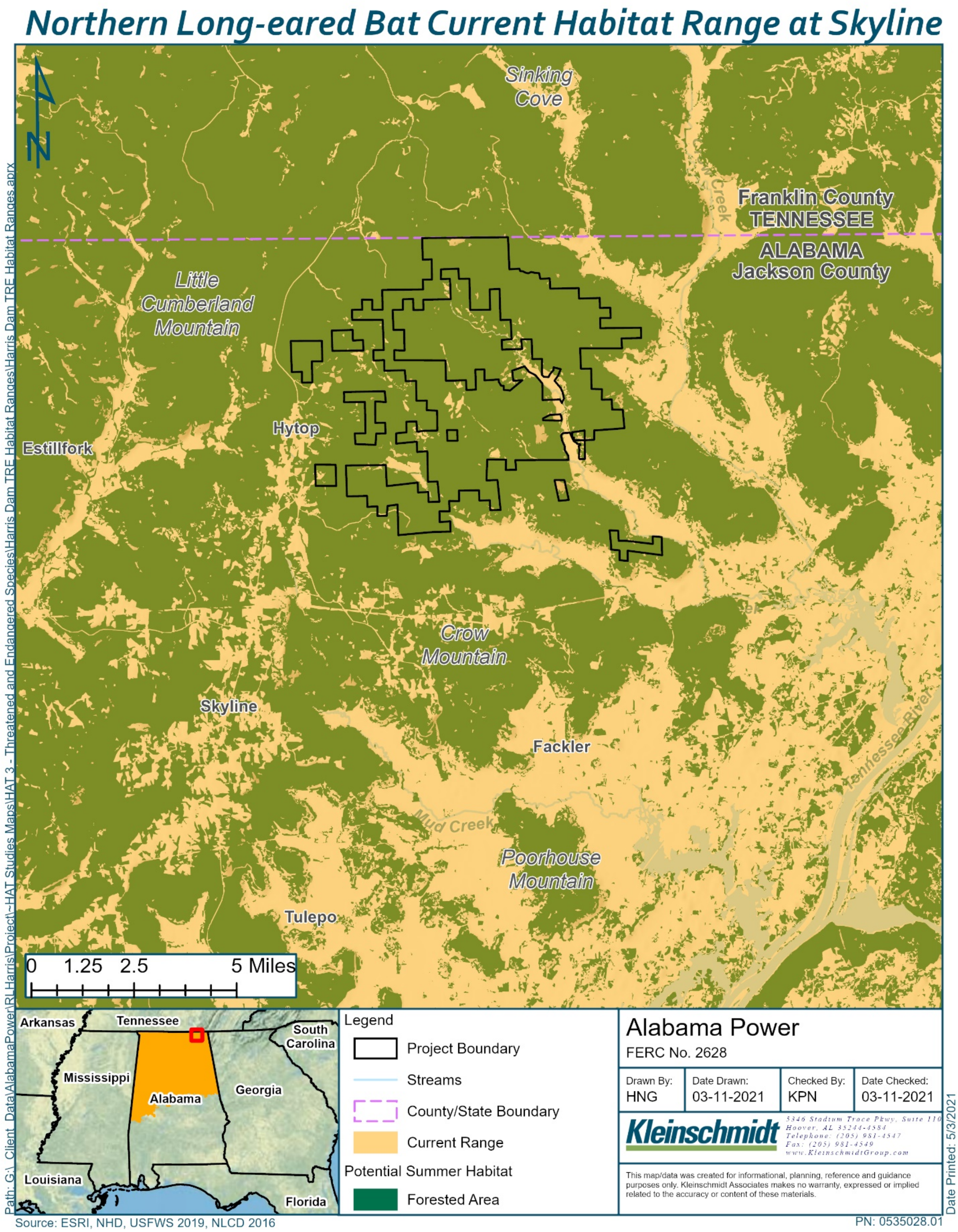


Figure 10-7 Northern Long-eared Bat Current Habitat Range and Forested Lands at Skyline

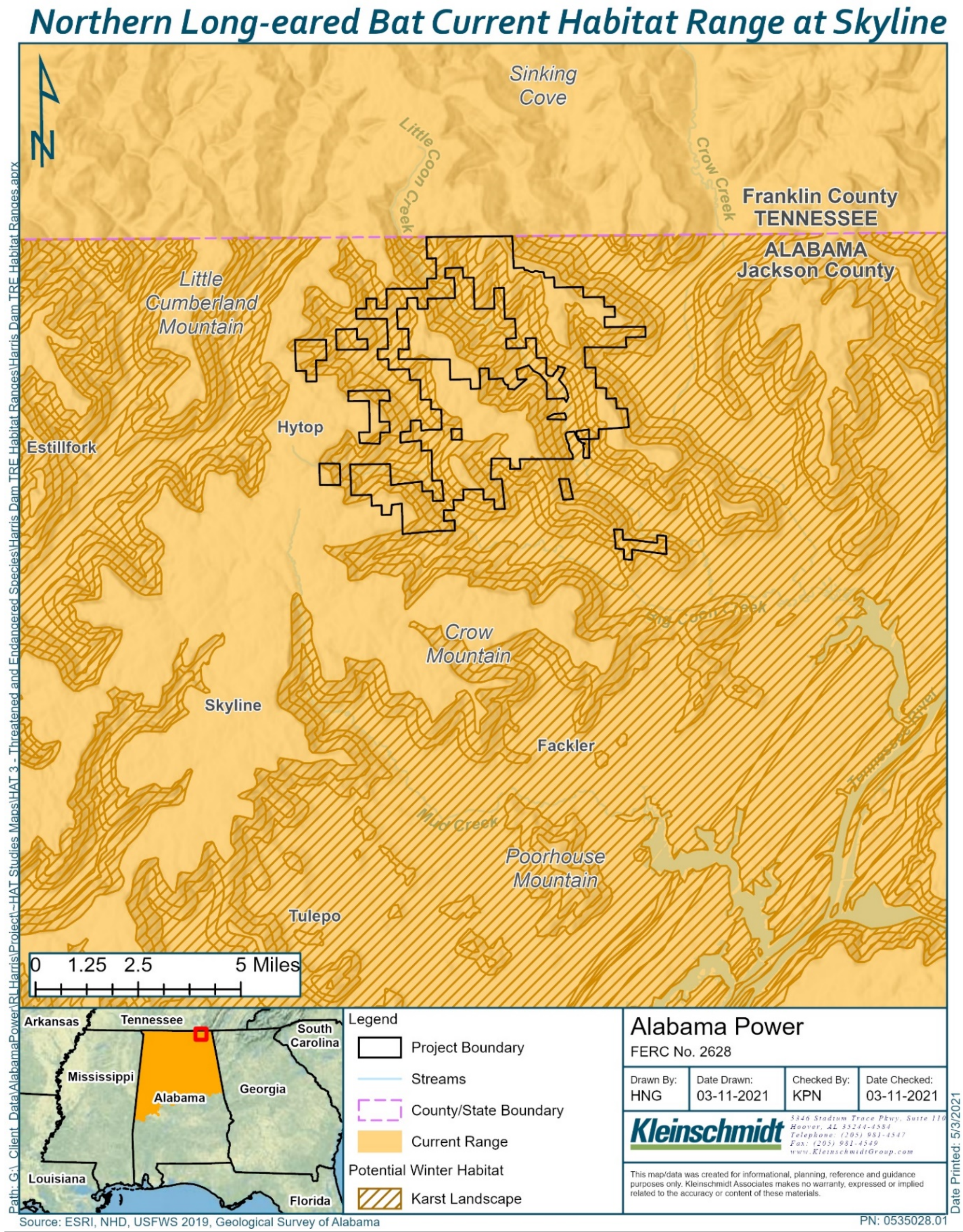


Figure 10-8 Northern Long-eared Bat Current Habitat Range at Skyline-Karst Landscape

10.1.1.6 Indiana Bat

Source: US Fish and Wildlife Service. 2019. US Fish and Wildlife Service Midwest Region. Bloomington, MN. [Online] URL: https://www.fws.gov/midwest/endangered/permits/hcp/FowlerRidge/

The USFWS listed the Indiana Bat as an endangered species in 1976. Habitat conducive to the Indiana Bat is located in the central to north and eastern portions of Alabama (Figure 10-9 and Figure 10-10). This species hibernates in caves, mostly in tight clusters. In the summer, females form small maternity colonies in tree hollows and behind loose bark. A single pup is born in June or early July and weaned in 25-35 days. The diet of this species includes small, soft-bodied insects, including moths, flies, and beetles (Mirarchi et al. 2004 as cited in Kleinschmidt 2021c). The Indiana Bat is vulnerable to extinction due to habitat loss and White Nose Syndrome, a fungal disease.

The USFWS has a 2007 Draft Recovery Plan (USFWS 2007b as cited in Kleinschmidt 2021c) for the Indiana Bat, as well as a 1977 final correction and augmentation of critical habitat (USFWS 1977 as cited in Kleinschmidt 2021c). Designated critical habitat does not occur within the Project Boundary.

While the Lake Harris and Skyline Project Boundaries fall within the range of the Indiana Bat, there have been no reports of overwintering or summer roosting occurrences at either location. A large portion (66.5 percent) of the Harris Project is comprised of forested cover that likely provides some suitable summer roosting habitat for the Indiana Bat (Figure 10-9). In addition, Skyline has 10,782 acres of karst geology conducive to cave formation (Figure 10-10); however, no known hibernacula have been reported within the Skyline Project Boundary. Furthermore, no known Priority 1 or 2 hibernacula have been identified within established buffer distances relative to the Project Boundary

The Indiana Bat could potentially use the forests within the Lake Harris and Skyline Project Boundaries for roosting during the summer months and could potentially use the Skyline WMA year-round because of the presence of potentially suitable habitat (i.e., karst geology).

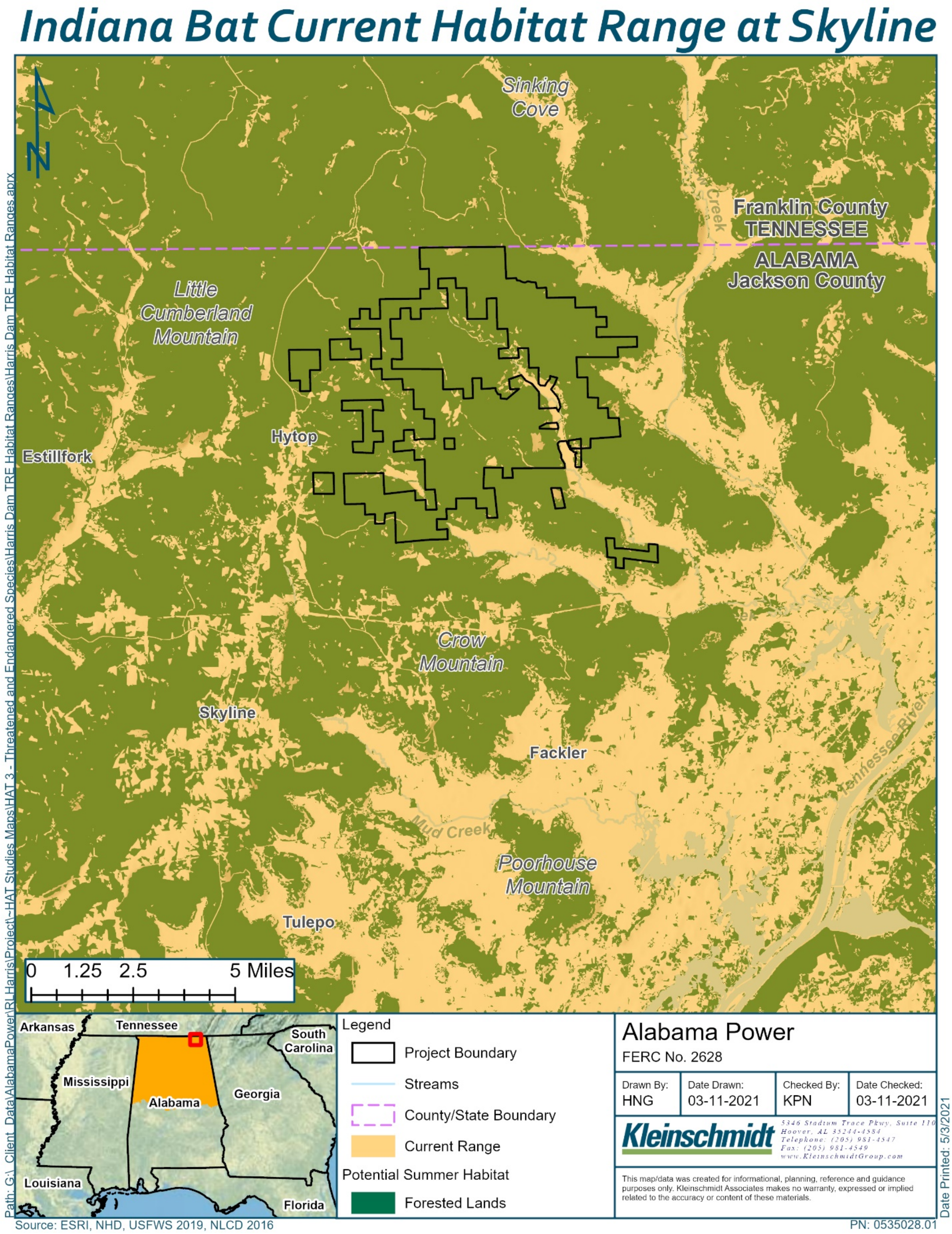


Figure 10-9 Indiana Bat Current Habitat Range and Forested Lands at Skyline

Indiana Bat Current Habitat Range at Skyline

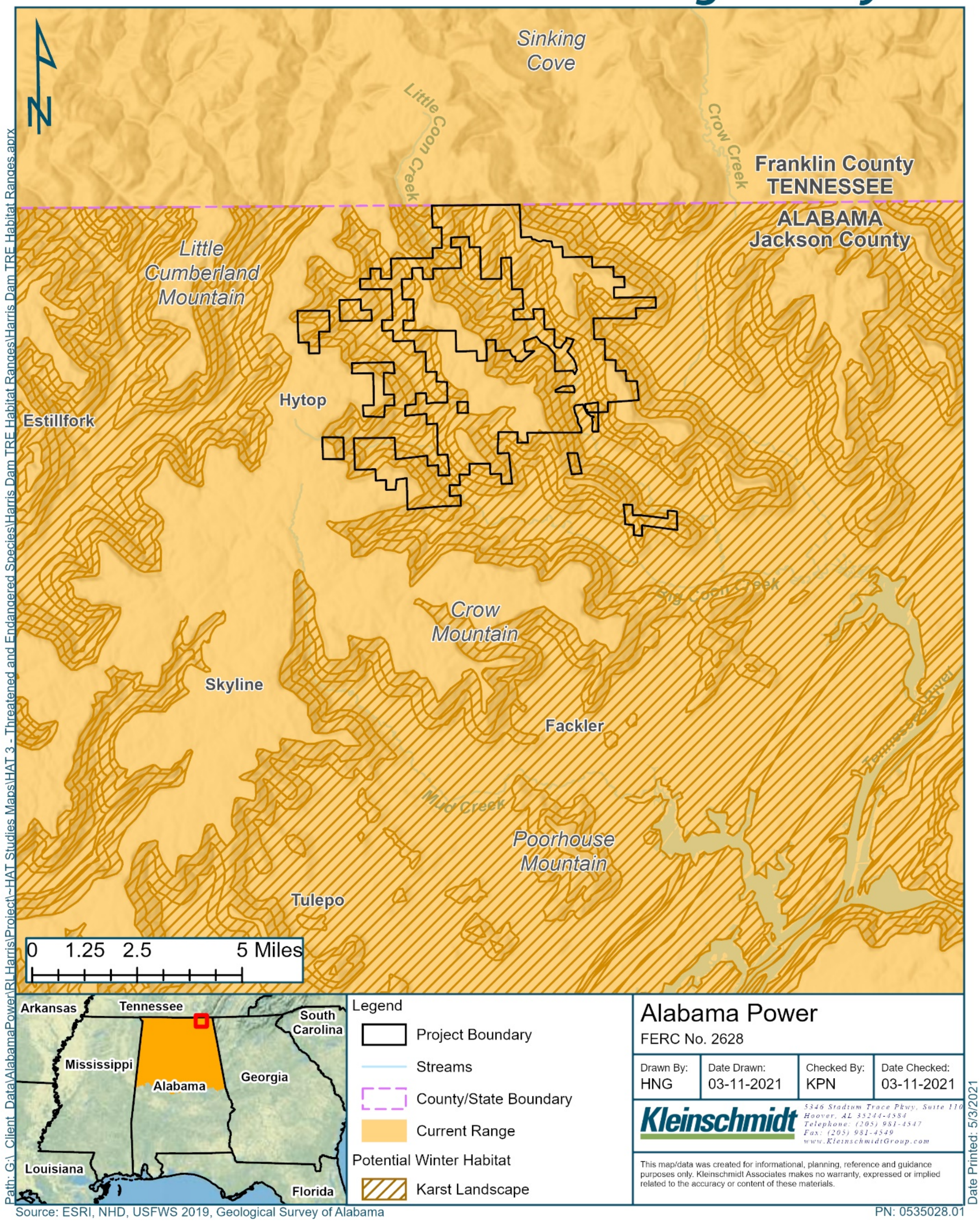


Figure 10-10 Indiana Bat Current Habitat Range and Karst Landscape at Skyline

10.1.2 Lake Harris

10.1.2.1 Red-cockaded Woodpecker

Source: U.S. Fish and Wildlife Service. 2019. Red-cockaded Woodpecker. [Online] URL: https://www.fws.gov/rcwrecovery/rcw.html

The RCW is a federally listed endangered species that potentially occurs in Clay and Randolph counties (Figure 10-11). The RCW requires open pine woodlands and savannahs with large old pines which are used as cavity trees for nesting and roosting habitat. The cavity trees are located in open stands with little or no hardwood mid-story and few or no over-story hardwoods. The excavated cavities within inactive heartwood are free of resin, which can entrap the birds (USFWS 2016e as cited in Kleinschmidt 2021c). The resin produced by the tree from outer vascular tissue, after excavation, may provide protection for RCWs against climbing snakes or other predators. However, the excavated cavities that are not free of resin, can entrap RCWs (USFWS 2006 as cited in Kleinschmidt 2021c).

RCWs require abundant native bunchgrass and groundcovers suitable for foraging within their habitat (USFWS 2016e as cited in Kleinschmidt 2021c). The two primary factors threatening RCWs are habitat loss and habitat degradation (USFWS 2006 as cited in Kleinschmidt 2021c).

The USFWS has both a Recovery Plan (USFWS 2003 as cited in Kleinschmidt 2021c) and a Five-Year Review (USFWS 2006 as cited in Kleinschmidt 2021c) for the RCW. RCW is not listed as occurring in the county where the Skyline Project Boundary is located. There are no published reports of RCWs occurring within the Lake Harris Project Boundary; however, the species range does overlap with the Lake Harris Project Boundary. The Lake Harris Project Boundary contains 3,068 acres of coniferous forest; however, the land use data is not specific enough to determine if these forests contain the more specific habitat characteristics to be suitable for RCWs (Kleinschmidt 2021c).

On September 22, 2020, Alabama Power performed habitat assessments for the RCW at six locations around Lake Harris (Figure 10-12). Suitable nesting habitat was not observed at any of the sites during the survey, including three high priority (oldest tracts) search areas (Table 10-4). Results suggest that RCW is not likely to use the habitat along Lake Harris for foraging (Kleinschmidt 2021c).

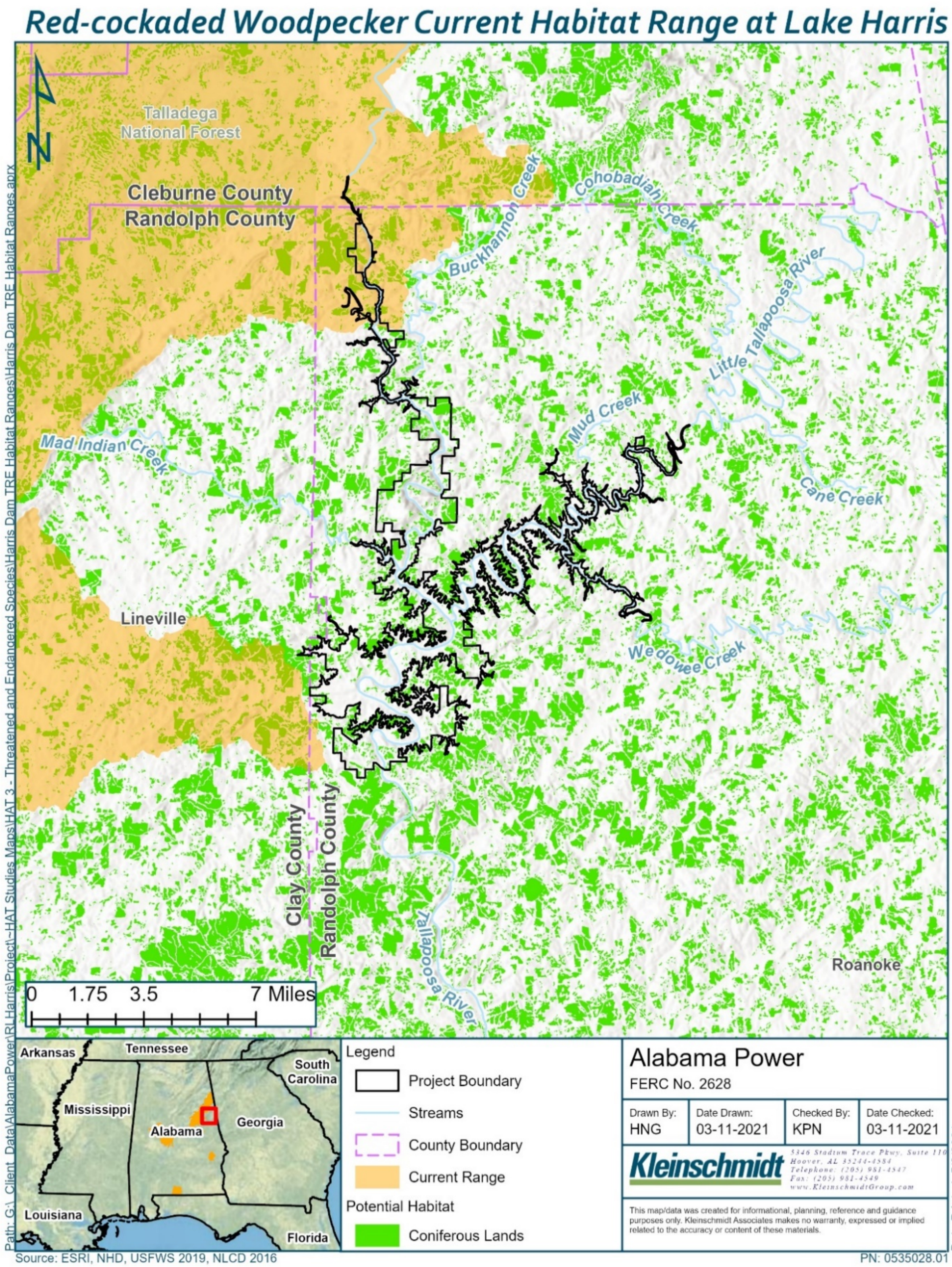


Figure 10-11 Red-cockaded Woodpecker Current Habitat Range at Lake Harris

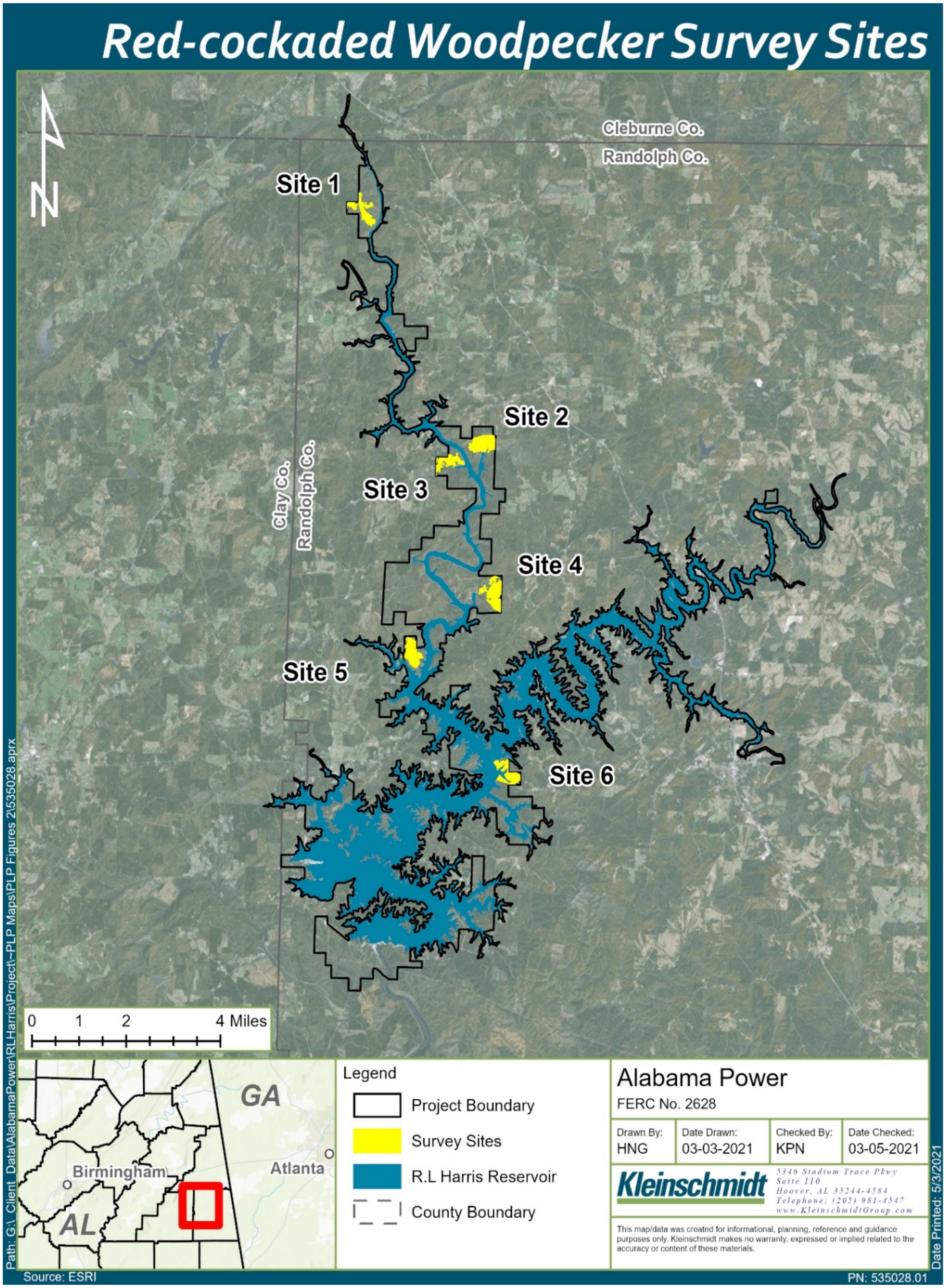


Figure 10-12 Red Cockaded Woodpecker Survey Sites on Lake Harris

Table 10-4 Harris Red-cockaded Woodpecker Habitat Assessment Sites

Site Number	Site Size (Acres)	Site Location	Habitat Suitability
1*	84	33.474752, -85.620624	Unsuitable
2	105	33.407346, -85.574600	Unsuitable
3*	69	33.401295, -85.586397	Unsuitable
4	116	33.364561, -85.574204	Unsuitable
5	95	33.348224, -85.601981	Unsuitable
6*	85	33.307157, -85.563305	Unsuitable

Source: Kleinschmidt 2021c
*Considered a priority sreach area based on the age of the stand.

10.1.2.2 Finelined Pocketbook Mussel

Source: International Union for Conservation of Nature and Natural Resources. 2019. Finelined Pocketbook. [Online] URL: https://www.iucnredlist.org/species/11250/502085

The Finelined Pocketbook is a threatened mussel with a species range within the Lake Harris Project Boundary (Kleinschmidt 2021c) (Figure 10-13). The Finelined Pocketbook is a sub-oval shaped mussel that has a maximum length of approximately 3⅜ inches (Mirarchi et al. 2004 as cited in Kleinschmidt 2021c). This mussel lives in large to small streams in habitats primarily above the fall line having stable sand/gravel/cobble substrates and moderate to swift currents. Historically, this mussel existed in the Alabama, Tombigbee, Black Warrior, Cahaba, Tallapoosa, and Coosa Rivers, and their tributaries (USFWS 2004 as cited in Kleinschmidt 2021c). The ADCNR and USFWS are currently reintroducing the Finelined Pocketbook into suitable historical habitats within the state (USFWS 2019b as cited in Kleinschmidt 2021c). During reproduction, the Finelined Pocketbook mussel releases glochidia as a super-conglutinate from March through June, with confirmed host species that include Blackspotted Topminnow *(Fundulus olivaceus)*, Redeye Bass *(Micropterus coosae)*, Spotted Bass *(Micropterus punctulatus)*, Largemouth Bass, and Green Sunfish *(Lepomis cyanellus)* (Mirarchi et al. 2004 as cited in Kleinschmidt 2021c).

The historic construction of dams and impoundments along large reaches of river channels is the primary cause of the decline in Finelined Pocketbook's distribution and population size and continues to be a major threat to this species' persistence. This species continues to be imperiled due to a range of threats, including water withdrawal, water quality degradation including sedimentation released from dams and agricultural runoff, downstream flow alterations caused by hydropeaking dams, and climate change (USFWS 2019b as cited in Kleinschmidt 2021c).

The USFWS has both a Recovery Plan (USFWS 2000 as cited in Kleinschmidt 2021c) and a Five-Year Review (USFWS 2019b as cited in Kleinschmidt 2021c) for the Finelined Pocketbook. Critical habitat was designated for this species in 2004. Although there are no critical habitat areas identified by the USFWS within the Lake Harris Project Boundary, critical habitat for this species is located immediately upstream of Lake Harris (USFWS 2004 as cited in Kleinschmidt 2021c) (Figure 10-13). To date, no populations have been identified within the Lake Harris Project Boundary.

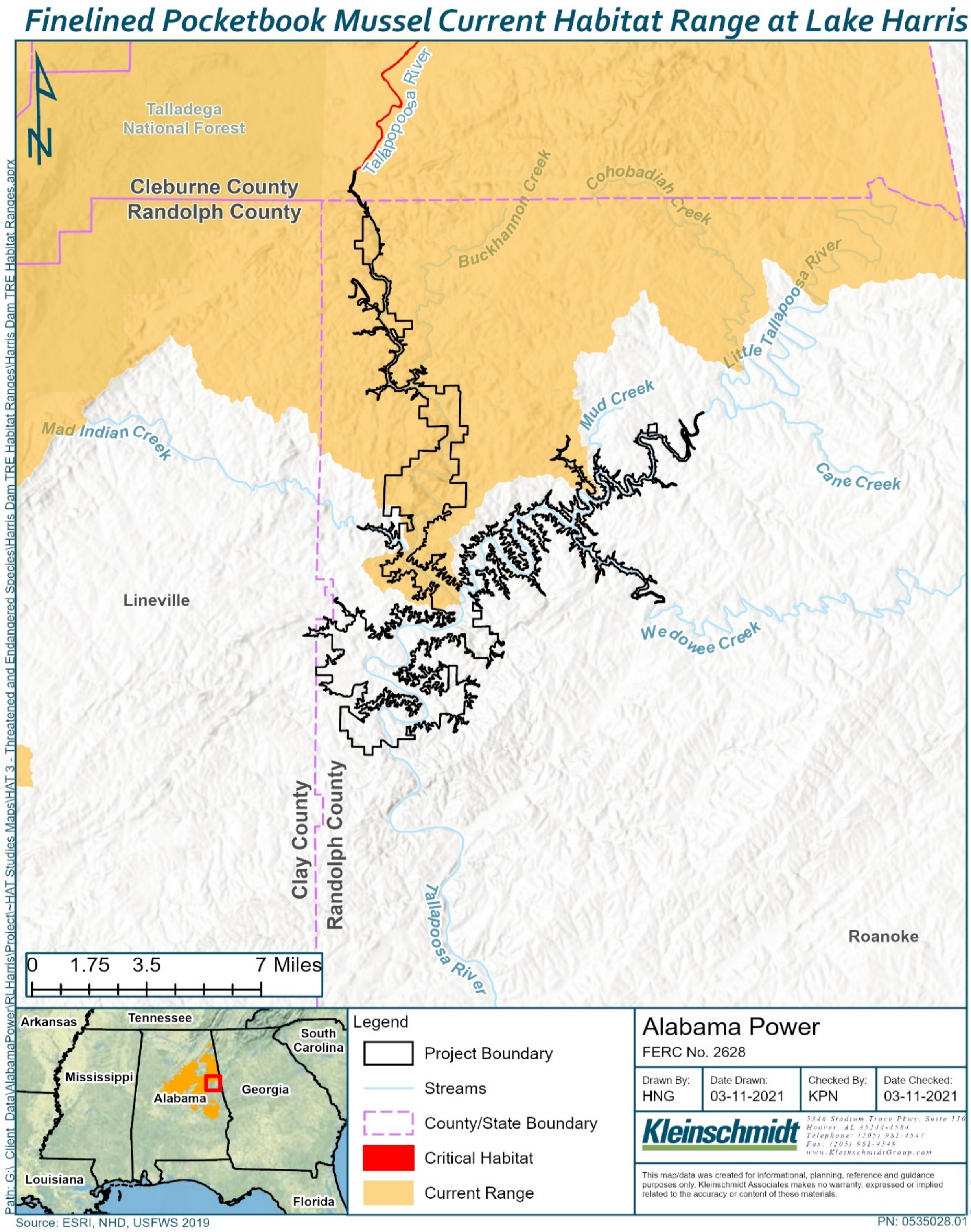


Figure 10-13 Finelined Pocketbook Mussel Current Habitat Range at Lake Harris

On November 21, 2019, Alabama Power, Kleinschmidt, and the USFWS surveyed the Tallapoosa River upstream of Lake Harris for Finelined Pocketbook (Figure 10-14). Alabama Power and USFWS determined that additional efforts would be necessary in warmer conditions with lower water level. Additional surveys were conducted in the summer of 2020 by Alabama Power and ADCNR on the Tallapoosa River and four of its tributaries (Carr Creek, Ketchepedrakee Creek, Little Ketchepedrakee Creek, and Mad Indian Creek) (Table 10-5) (Figure 10-14 through Figure 10-17) and the Little Tallapoosa and one of its tributaries (Pineywood Creek) (Table 10-5, Table 10-6, and Figure 10-14). During the surveys, critical habitat within the Tallapoosa River was observed to be degraded by siltation, and secondary tributaries depicted a similar lack of habitat (Kleinschmidt 2021c). Overall unionid diversity and density was low across sites (Kleinschmidt 2021c). Finelined Pocketbook was not collected at any site (Kleinschmidt 2021c) (Table 10-6).

Table 10-5 2019-2020 Finelined Pocketbook Survey Locations

<table>
<tr><th>TRIBUTARY</th><th>SITE NUMBER</th><th>MILES UPSTREAM OF MOUTH*</th><th>DESCRIPTION</th></tr>
<tr><td rowspan="6">Tallapoosa River</td><td>1</td><td>4.6</td><td rowspan="6">Downstream of Co. Rd. 36 crossing to just downstream of Hwy 431 crossing</td></tr>
<tr><td>2</td><td>4.4</td></tr>
<tr><td>3</td><td>4.2</td></tr>
<tr><td>4</td><td>4.0</td></tr>
<tr><td>5</td><td>3.3</td></tr>
<tr><td>6</td><td>0.7</td></tr>
<tr><td>Carr Creek</td><td>1</td><td>0.1</td><td>Upstream of Tallapoosa River Site 6</td></tr>
<tr><td rowspan="2">Ketchepedrakee Creek</td><td>1</td><td>1.8</td><td rowspan="2">Upstream (Site 1) and downstream (Site 2) of Co. Rd. 201 crossing</td></tr>
<tr><td>2</td><td>1.1</td></tr>
<tr><td>Little Ketchepedrakee Creek</td><td>1</td><td>1.9</td><td>Downstream of Co. Rd. 313 crossing</td></tr>
<tr><td>Mad Indian Creek</td><td>1</td><td>3.1</td><td>Upstream of Co. Rd. 113 crossing</td></tr>
<tr><td rowspan="4">Little Tallapoosa River</td><td>1</td><td>3.2</td><td rowspan="4">Downstream of Co. Rd. 59 crossing to upstream of reservoir</td></tr>
<tr><td>2</td><td>1.3</td></tr>
<tr><td>3</td><td>0.6</td></tr>
<tr><td>4</td><td>0.1</td></tr>
<tr><td rowspan="2">Pineywood Creek</td><td>1</td><td>2.5</td><td rowspan="2">Co. Rd. 270 crossing (Site 1) and Hwy 431 crossing (Site 2)</td></tr>
<tr><td>2</td><td>1.9</td></tr>
</table>

Source: Kleinschmidt 2021c

*The mouths of the Tallapoosa River and Little Tallapoosa River in this table are where the R.L. Harris reservoir begins, at an elevation of 793-feet msl.

Table 10-6 2019-2020 Effort and Mollusk Species Collected at Each Survey Site

TRIBUTARY	SITE NUMBER	TOTAL EFFORT (MINUTES)	SPECIES COLLECTED
Tallapoosa River	1	120	*Elimia* spp., *Corbicula* spp.
	2	120	*Elimia* spp., *Corbicula* spp.
	3	30	None
	4	270	*Elimia* spp., *Corbicula spp.*
	5	480	*Elimia* spp., *Corbicula* spp., *Ellipto* spp. (relic), *Villosa lineosa*[57]
	6	60	*Corbicula* spp. (relics)
Carr Creek	1	200	*Elimia* spp., *Corbicula* spp. (relics)
Ketchepedrakee Creek	1	135	*Elimia* spp., *Corbicula* spp. (relics)
	2	60	*Corbicula* spp. (relic)
Little Ketchepedrakee Creek	1	60	*Corbicula* spp. (live and relics)
Mad Indian Creek	1	60	*Corbicula* spp. (live and relics)
Little Tallapoosa River	1	100	*Elimia* spp., *Corbicula* spp. (relics)
	2	110	*Elimia* spp., *Corbicula* spp. (relics), *Villosa lineosa* (relic)
	3	125	*Elimia* spp., *Corbicula* spp. (relics), *Toxolasma* sp.
	4	150	*Elimia* spp., *Corbicula* spp. (relics)
Pineywood Creek	1	90	*Corbicula* spp. (relics)
	2	90	*Corbicula* spp. (relics)

Source: Kleinschmidt 2021c

[57] Little Spectaclecase is the common name for *Villosa lineosa*.

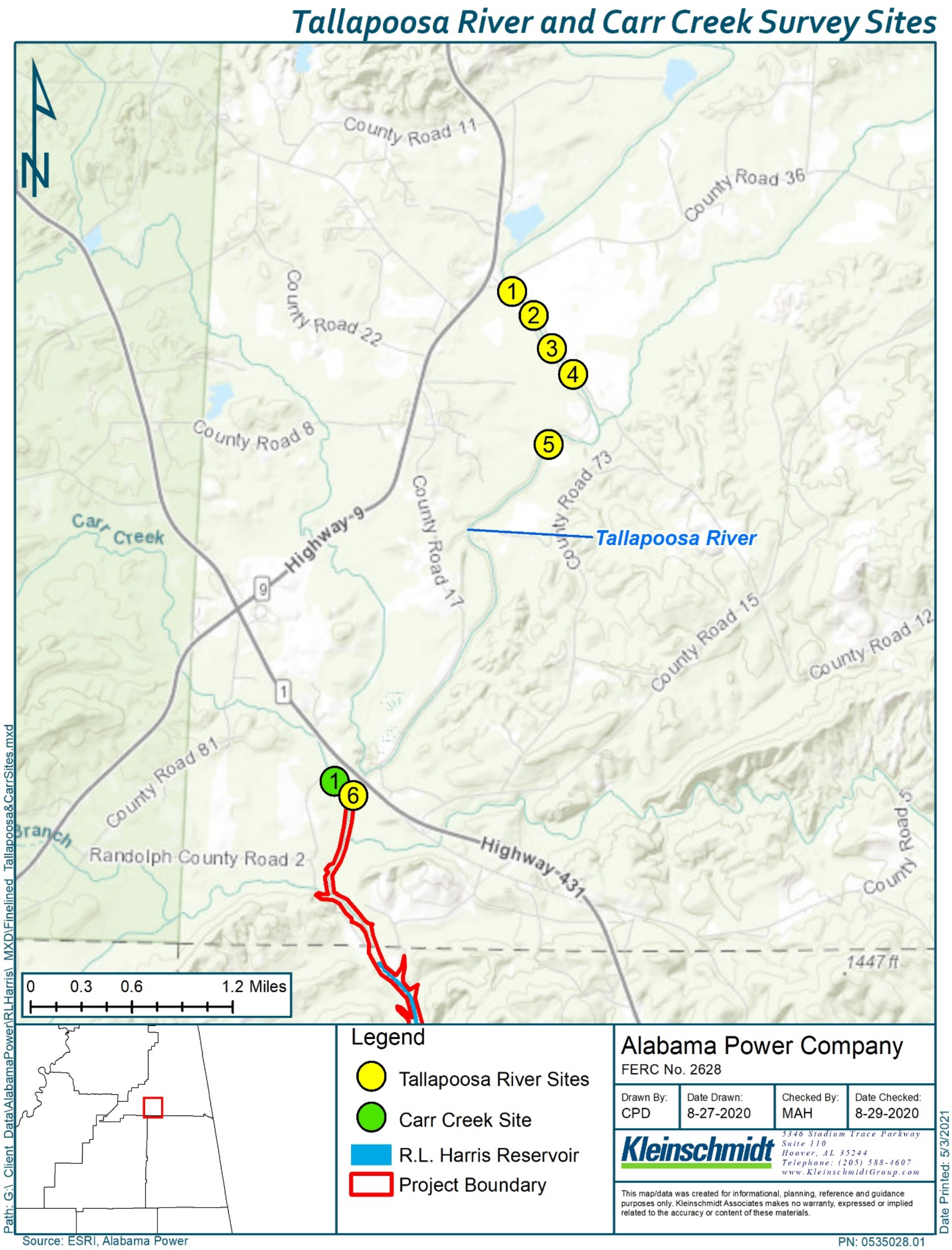


Figure 10-14 Finelined Pocketbook Survey Sites: Tallapoosa River and Carr Creek

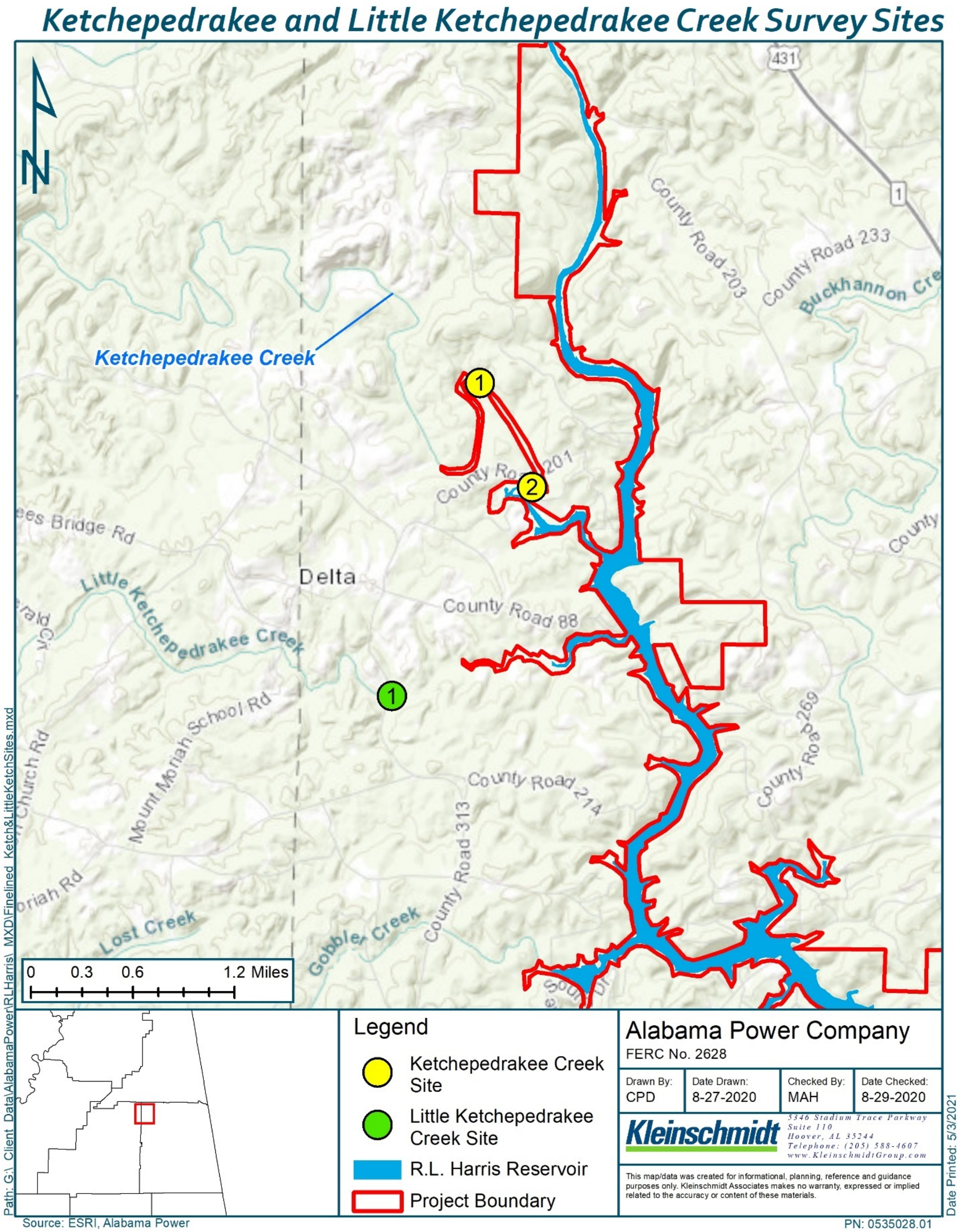


Figure 10-15 Finelined Pocketbook Survey Sites: Ketchepedrakee Creek and Little Ketchepedrakee Creek

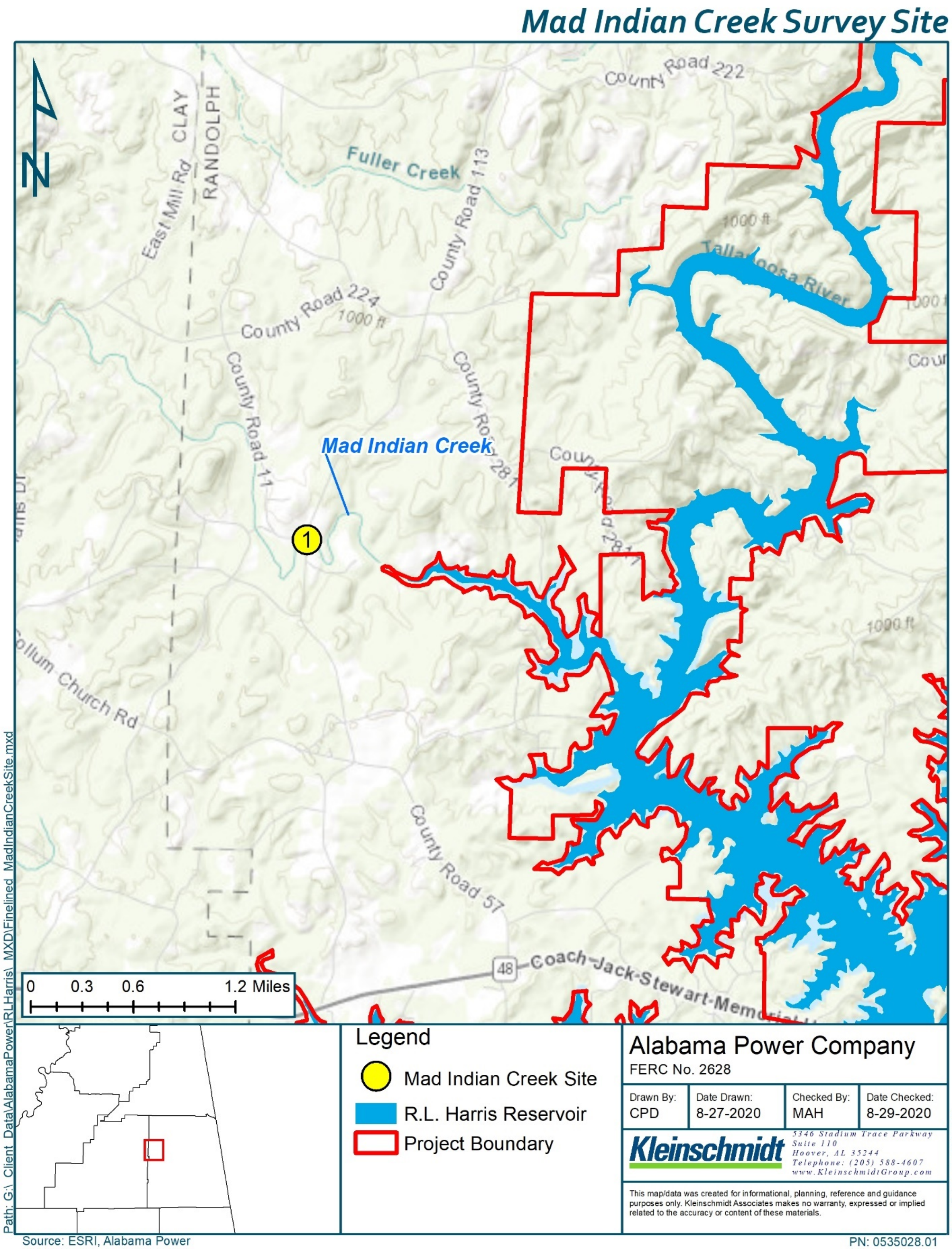


Figure 10-16 Finelined Pocketbook Survey Site: Mad Indian Creek

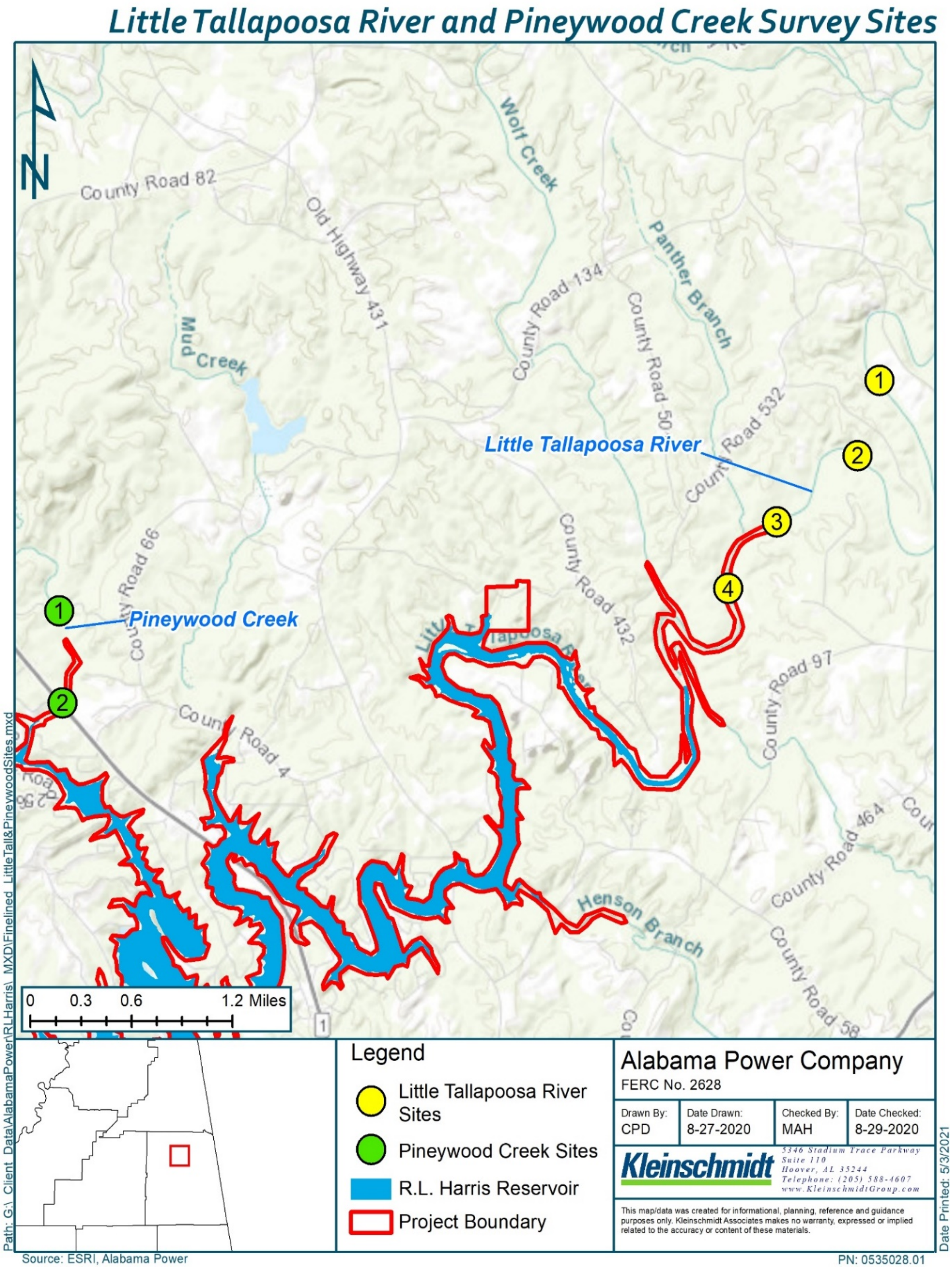


Figure 10-17 Finelined Pocketbook Survey Sites: Little Tallapoosa River and Pineywood Creek

10.1.2.3 White Fringeless Orchid

Species information is presented in 10.1.1.2. Habitat range for the White Fringeless Orchid at Lake Harris is shown in Figure 10-18.

On August 27, 2020, Alabama Power surveyed 12 sites at Lake Harris for White Fringeless Orchid (Table 10-7 and Figure 10-19). Although survey sites were selected based on potential habitat (i.e., wetlands), surveyors found that much of this habitat was unsuitable due to shade from thick canopies, disturbance, soil type, inundation, vegetation community (lack of common associates), and steep slopes. No White Fringeless Orchid specimens were collected or observed at any of the Lake Harris survey sites (Kleinschmidt 2021c).

Table 10-7 White Fringeless Orchid Survey Locations at Lake Harris

Site Number	Survey Date	Site Description	Habitat Suitability**
1	August 27, 2020	Forested/shrub wetland w/ TLROW*	S
2	August 27, 2020	Emergent wetland	U
3	August 27, 2020	Emergent wetland	U
4	August 27, 2020	Forested/shrub wetland	U
5	August 27, 2020	Forested/shrub wetland	U
6	August 27, 2020	Emergent wetland	U
7	August 27, 2020	Forested/shrub wetland	U
8	August 27, 2020	Emergent wetland	U
9	August 27, 2020	Emergent wetland	U
10	August 27, 2020	Emergent wetland	U
11	August 27, 2020	Forested/shrub wetland	U
12	August 27, 2020	Forested wetland	U

Source: Kleinschmidt 2021c
*Transmission line right-of-way = TLROW
**Habitat Suitability: Suitable = S, unsuitable = U

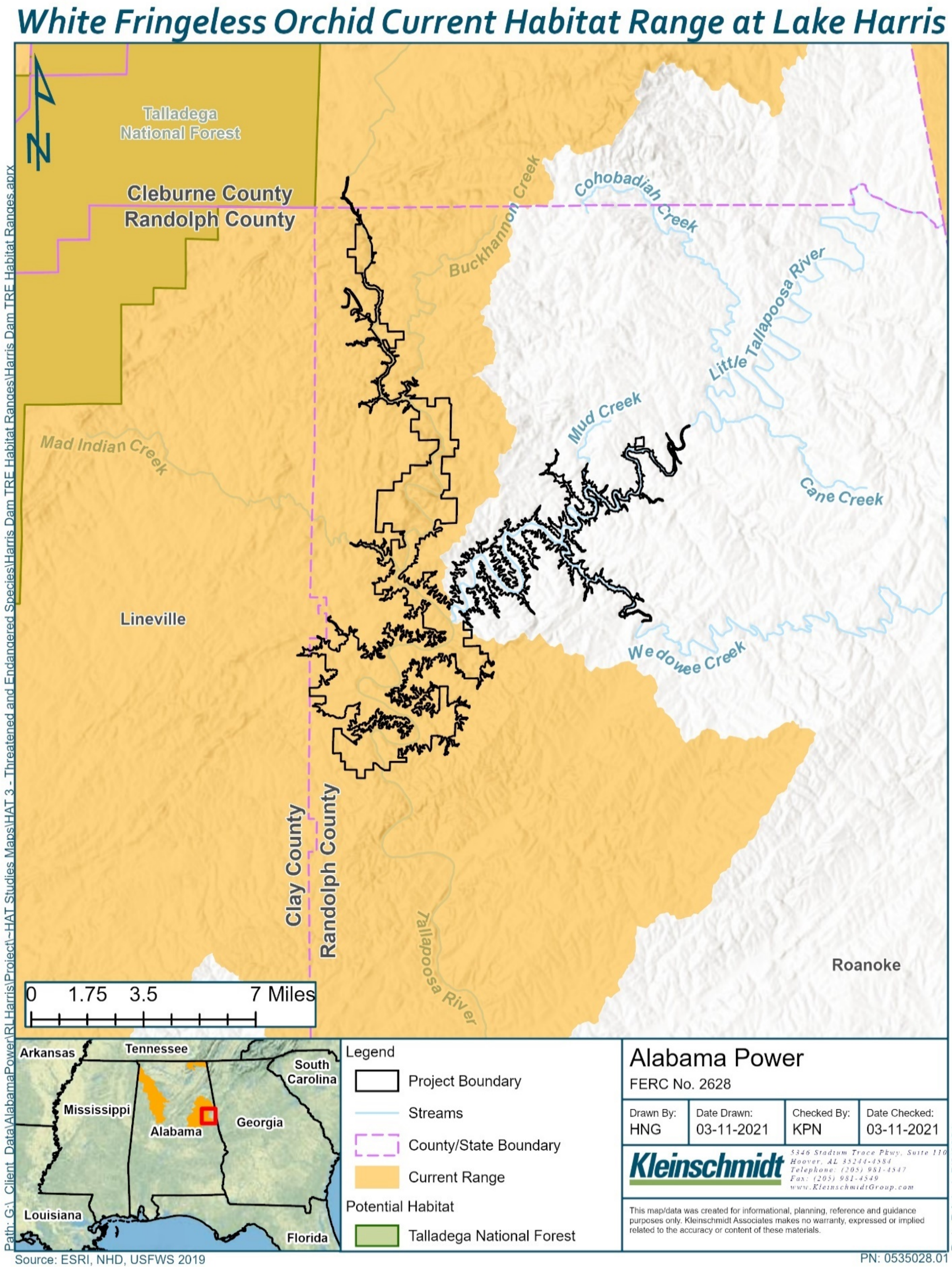


Figure 10-18 White Fringeless Orchid Current Habitat Range at Lake Harris

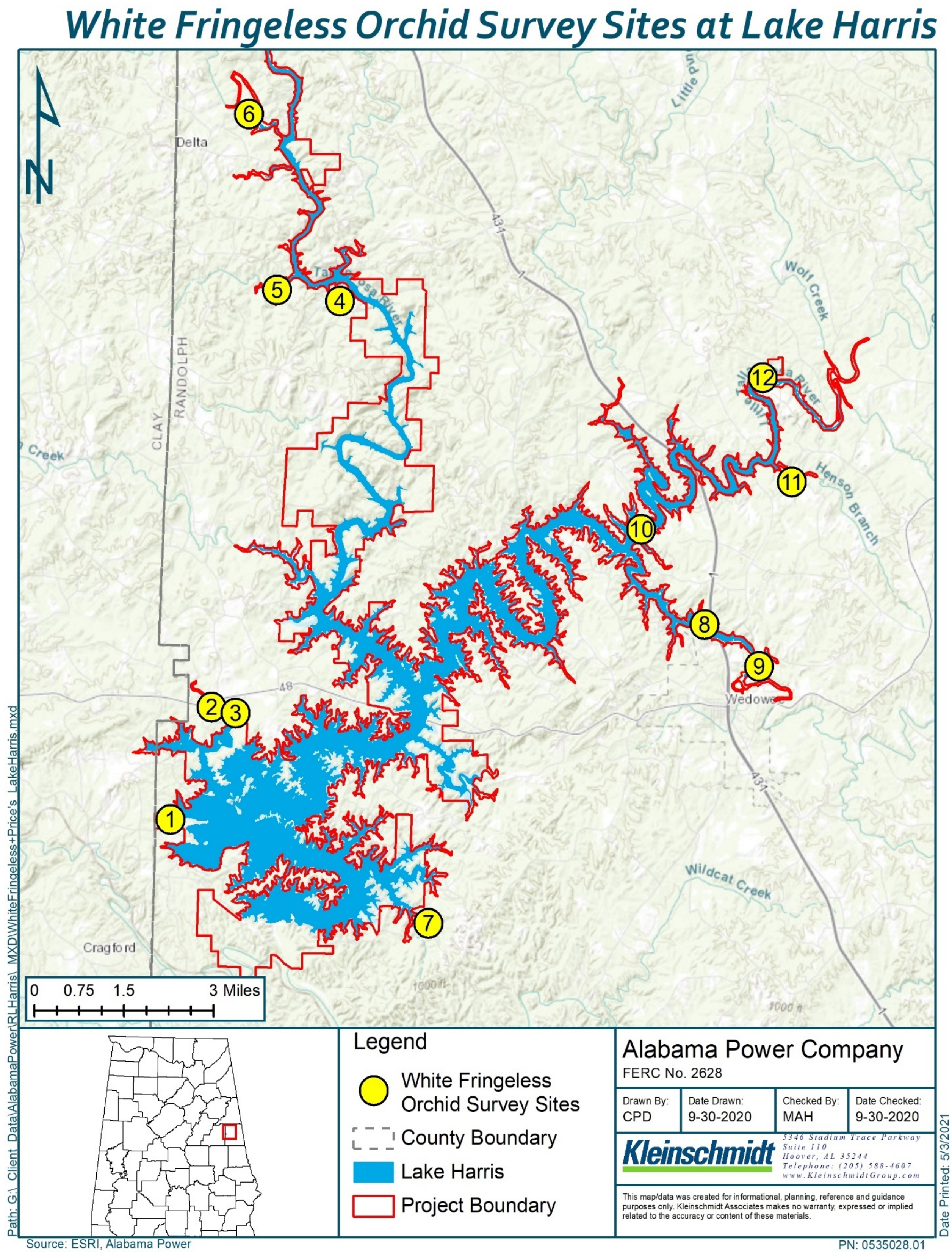


Figure 10-19 White Fringeless Orchid Survey Sites at Lake Harris

10.1.2.4 Northern Long-eared Bat

Species information is presented in Section 10.1.1.5. While the Lake Harris Project Boundary falls within the range of the Northern Long-eared Bat (Figure 10-20), there have been no reports of overwintering or summer roosting occurrences. A large portion (66.5 percent) of the Harris Project is comprised of forested cover that likely provides some suitable summer roosting habitat for the Northern Long-eared Bat. The Northern Long-eared Bat could potentially use the forests within the Lake Harris Project Boundary for roosting during the summer months.

10.1.2.5 Indiana Bat

Species information is presented in Section 10.1.1.6. While the Lake Harris Project Boundary falls within the range of the Indiana Bat, designated critical habitat does not occur within the Project Boundary. There have been no reports of overwintering or summer roosting occurrences. A large portion (66.5 percent) of the Harris Project is comprised of forested cover that likely provides some suitable summer roosting habitat for the Indiana Bat (Figure 10-21). The Indiana Bat could potentially use the forests within the Lake Harris Project Boundary for roosting during the summer months.

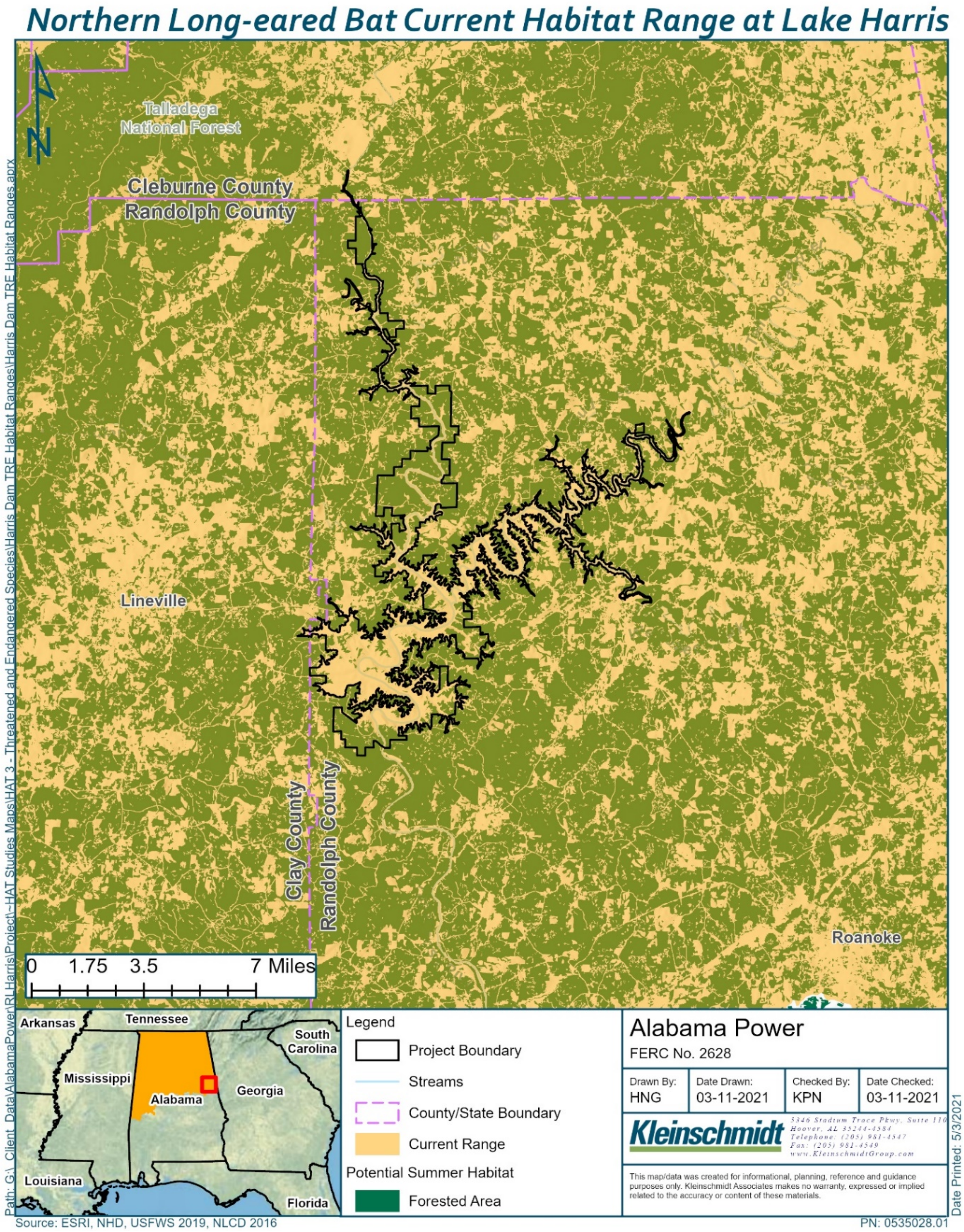


Figure 10-20 Northern Long-eared Bat Current Habitat Range and Forested Lands at Lake Harris

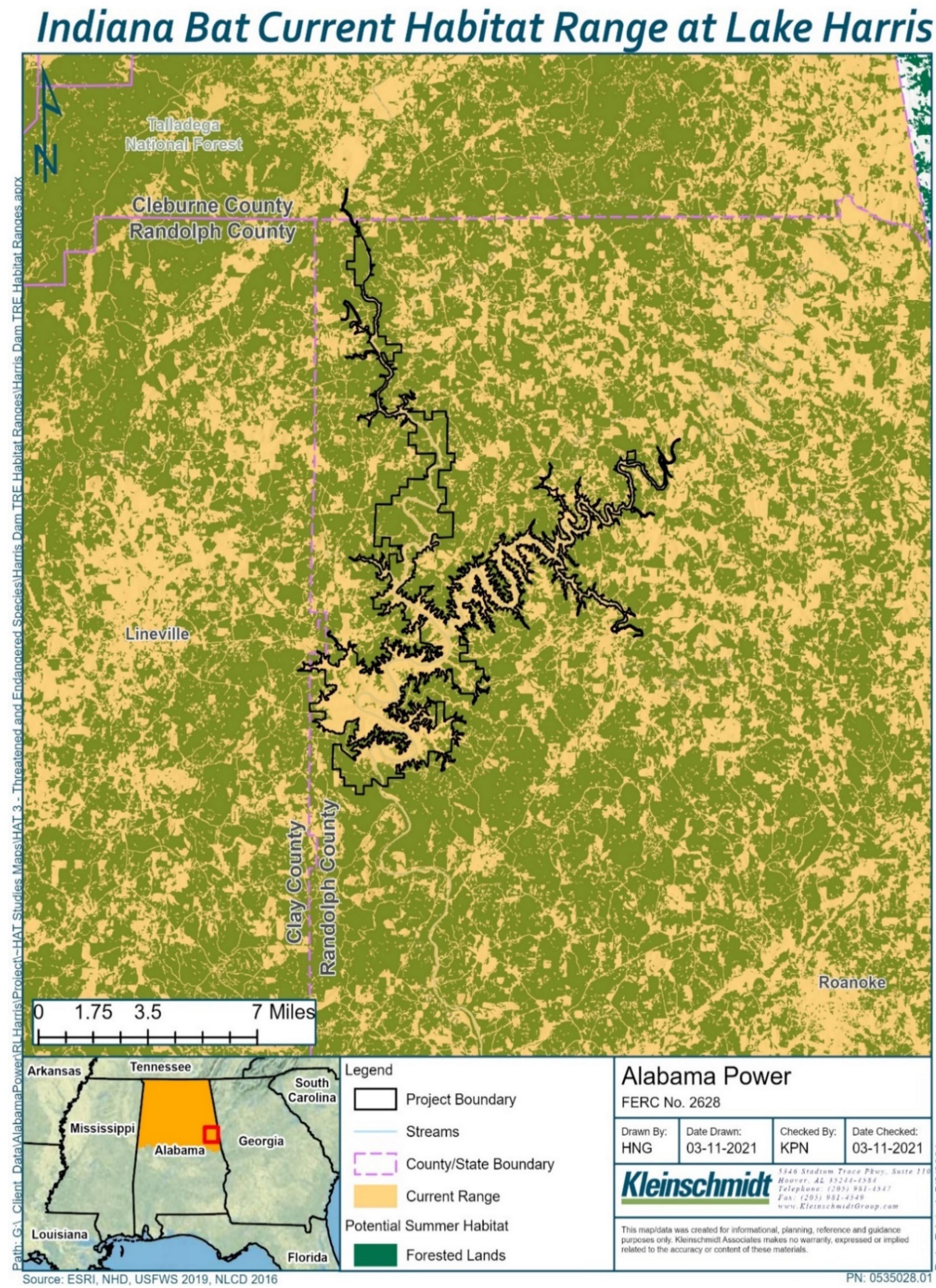


Figure 10-21 Indiana Bat Current Habitat Range and Forested Lands at Lake Harris

10.1.3 Tallapoosa River Downstream of Harris Dam

No federally listed T&E species are present in the Tallapoosa River downstream of Harris Dam through Horseshoe Bend (Kleinschmidt 2021c). Therefore, Alabama Power did not conduct any surveys in this area.

10.2 Environmental Analysis

Alabama Power conducted relicensing studies and associated analyses that pertain to effects on T&E species. Those analyses are presented in the following reports.

- **Final** *Threatened and Endangered Species Study Report*
- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*

Table 10-8 includes the proposed operations and PME measures that may affect threatened and endangered resources at Skyline, Lake Harris, and the Tallapoosa River Downstream of Harris Dam. Not all operations or PME measures apply to each geographic area of the Harris Project; therefore, the analysis of beneficial and adverse effects will be presented accordingly. A complete list of Alabama Power's operations and PME measures is located in Table 5-2.

Table 10-8 Proposed Operations and PME Measures That May Affect Threatened and Endangered Species

PROPOSED OPERATIONAL AND PME MEASURES THAT MAY AFFECT T&E SPECIES
• Implement a WMP for Lake Harris and Skyline ❖ Follow current guidelines and consult with USFWS to develop measures protective of federally listed bats ❖ Incorporate timber management into the WMP
• Develop and implement a Recreation Plan ❖ Install and maintain recreation (canoe/kayak) access below Harris Dam within the Project Boundary ❖ Provide an additional recreation site on Lake Harris to include a day use park (swimming, picnicking, and boat ramp)

10.2.1 Skyline

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions that are protective of federally listed bat species. The Harris Project forest lands at Skyline would continue to be managed according to the existing all or uneven-aged management procedures, with a sawtimber cycle of 20 years, and an overall forest rotation of 60 years. Timber management would continue to be completed according to USFWS guidance for federally listed bats. Alabama Power would continue to consult with USFWS concerning known hibernacula and maternity roost trees for the Indiana Bat, Northern Long-eared Bat, and Gray Bat.

A small portion of one of the known populations of Price's Potato-beans may still occur although recent surveys did not detect the species within the Skyline Project Boundary; however, Alabama Power would conduct additional surveys in the area of the known population prior to any timber management activities to ensure that the known population is not impacted if it is still present.

10.2.2 Lake Harris

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs. Continued timber management practices at Lake Harris would not adversely affect the RCW.

No surveys were performed for the Indiana Bat or Northern Long-eared Bat. Alabama Power adheres to current USFWS guidance concerning known hibernacula and maternity roost trees and continues to consult with USFWS to evaluate timber management practices relative to federally listed species. Aside from the potential bat occurrences, no T&E species were found in the Lake Harris Project Boundary; therefore, continued timber management at Lake Harris would not adversely affect T&E species.

Recreation Plan

Alabama Power proposes to develop a Recreation Plan that would include the construction and maintenance of an additional recreation site on Lake Harris to include a day use park with amenities such as a swimming area, picnic tables, and a boat ramp.

Alabama Power would follow current guidelines and consult with USFWS to develop protective measures for federally listed bats during construction of the day use park.

10.2.3 Tallapoosa River Downstream of Harris Dam

Recreation Plan

Alabama Power proposes to develop a Recreation Plan that would include the installation and maintenance of recreation (canoe/kayak) access below Harris Dam within the Project Boundary. Alabama Power would follow current guidelines and consult with USFWS to develop protective measures for federally listed bats during construction and maintenance of the recreation access.

10.3 Unavoidable Adverse Impacts

10.3.1 Skyline

Presence of the Indiana Bat, Northern Long-eared Bat, or Gray Bat may occur in Skyline; however, following the USFWS guidance for timber management would reduce any potential effect on these listed species. Alabama Power continues to consult with USFWS to evaluate timber management practices relative to federally listed species.

10.3.2 Lake Harris

Indiana Bat and Northern Long-eared Bat may potentially occupy land surrounding Lake Harris; however, following the USFWS guidance for timber management would reduce any potential effect on these listed species. Alabama Power continues to consult with USFWS to evaluate timber management practices relative to federally listed species.

10.3.3 Tallapoosa River Downstream of Harris Dam

Indiana Bat and Northern Long-eared Bat may potentially occupy land surrounding the Tallapoosa River downstream of Harris Dam; however, following the USFWS guidance for timber management would reduce any potential effect on these listed species. Alabama Power continues to consult with USFWS to evaluate timber management practices relative to federally listed species.

11 RECREATION AND LAND USE

11.1 Affected Environment

11.1.1 Skyline

11.1.1.1 Recreation

Recreation use at Skyline was examined during relicensing, is presented in the *Recreation Evaluation Report*, and was characterized based on existing available recreation use data obtained from ADCNR and presented in *Man-Days Hunted* and the *Harvest Estimates Used in Alabama Hunting* (ADCNR 2019 as cited in Kleinschmidt 2020). Both measured the parameters of hunting activity and number of animals harvested and rely on information gathered by the employees of the Skyline WMA. Any hunting activity for any length of time was considered a man-day of hunting pressure. More than one hunt by the same hunter in a single day was still considered one man-day. The data for the Statewide Game Harvest Survey were obtained after each hunting season by contacting a sample of hunters who purchased a hunting license. The information provided by the hunters was used to develop total man-days used for pursuing a given species and the total harvest for that species (ADCNR 2019 as cited in Kleinschmidt 2020). Results of *Man-Days Hunted* and the *Harvest Estimates Used in Alabama Hunting* are provided in Table 11-1.

Table 11-1 Skyline Wildlife Management Area Hunting Data 2016-17 Season through 2018-19 Season

	2016-2017 Season			2017-2018 Season			2018-2019 Season		
Species	**Estimated Man-Days Hunted**	**Estimated Harvest**	**Known Harvest**	**Estimated Man-Days Hunted**	**Estimated Harvest**	**Known Harvest**	**Estimated Man-Days Hunted**	**Estimated Harvest**	**Known Harvest**
Deer	6270	274		6110	229		8003	225	
Turkey	1865	65	51	1710	60	47	700	75	63
Squirrel	600	700		600	700		580	600	
Quail	30	16		30	16		30	15	
Rabbit	550	825		520	745		500	420	
Dove	120	130		95	97		75	80	
Waterfowl	20	15		0	0		30	30	
Raccoon	200	10		200	10		15	15	
Opossum	0	0		0	0		0	0	
Woodcock	18	6		15	4		0	0	
Snipe	0	0		0	0		0	0	
Fox	0	0		0	0		0	0	
Pig	0	0		0	0		0	0	
Trapping	360	31		0	0		0	0	
TOTAL	**10,033**	**2,072**	**51**	**9,280**	**1,861**	**47**	**9,933**	**1,460**	**63**

Source: ADCNR 2019 as cited in Kleinschmidt 2020

11.1.1.2 Land Use

Alabama Power conducted a *Phase I Project Lands Evaluation Study* to identify lands around Lake Harris and Skyline that are needed for Harris Project purposes and to classify these lands (Alabama Power 2020b). Lands to be added to, or removed from, the current Harris Project Boundary and/or be reclassified were identified.

Land use within Skyline is primarily conservatory in nature with most lands designated for wildlife management. During the Phase I Study, Alabama Power evaluated acreage at Skyline to determine availability of suitable Bobwhite Quail (*Colinus virginianus*) habitat. In consultation with ADCNR, Alabama Power evaluated seven sites where Bobwhite Quail are documented to occur to determine if any of these areas had the potential for suitable Bobwhite Quail habitat. Evaluation of the sites, including a qualitative assessment of one site and a site visit, indicated that the areas would not currently support Bobwhite Quail (Alabama Power 2020b).

11.1.2 Lake Harris

11.1.2.1 Recreation

Regional Recreation Facilities and Opportunities

In the region surrounding Lake Harris, there are many reservoirs that provide recreation opportunities. These reservoirs include Martin, Yates, and Thurlow downstream of Lake Harris on the Tallapoosa River; Weiss, Neely Henry, Logan Martin, Lay, Mitchell, and Jordan to the west of Lake Harris on the Coosa River; and West Point Lake located approximately 30 miles southeast of Lake Harris.

A variety of public recreation facilities and opportunities are available within an approximate 50-mile radius of Lake Harris. Opportunities and facilities include over 70 recreational vehicle (RV) parks and campgrounds within 50 miles of Lake Harris with 2 campgrounds within 10 miles, 6 campgrounds within 10 to 25 miles, and 64 campgrounds within 25 to 50 miles (Appendix I). Altogether, these facilities provide over 3,700 RV sites and 550 campsites in the Harris Project Vicinity. Most of these campgrounds are located to the west and northwest of the Harris Project, near Talladega, Alabama, although some are located near Auburn, Alabama, at Lake Martin, and West Point Lake. In addition to the campgrounds, ADCNR manages 15 boat launches within 50 miles of the Harris Project (ADCNR 2016c as cited in Alabama Power and Kleinschmidt 2018).

The Talladega National Forest and Cheaha State Park are located to the northwest of Lake Harris. The Talladega National Forest covers approximately 392,567 acres along the southern edge of the Appalachian Mountains and includes the 7,245-acre Cheaha Wilderness Preserve. Recreational opportunities within Talladega National Forest include hiking, off-road vehicle (ORV) and mountain bike trails, camping, scenic viewing, and hunting opportunities (U.S. Forest Service 2016 as cited in Alabama Power and Kleinschmidt 2018). The 2,799-acre Cheaha State Park is located on the top of Cheaha Mountain, which features the highest point in Alabama. Recreation facilities at the park include hiking and ORV trails, a day use area, cabins and a lodge, campgrounds, and a restaurant (Alabama State Parks 2016 as cited in Alabama Power and Kleinschmidt 2018).

Recreation Facilities and Opportunities in the Lake Harris Project Boundary

Developed Project Recreation Sites

A site inventory[58] of the Project recreation sites indicated that there are 12 Project recreation sites that provide opportunities for recreation on Harris Project lands and waters (Kleinschmidt 2020). Additionally, inventory surveys were completed at Lakeside Marina and Wedowee Marine. These two marinas are included as part of the inventory analysis because of their contribution to recreation activities on Lake Harris. Of these 14 access sites, the majority are considered day-use sites, with only one privately-owned site providing campgrounds and overnight facilities. The majority of the public access sites have paved access and are well-signed. Eleven of the sites are owned and managed by Alabama Power with seven of these partially managed by ADCNR. The three remaining sites are privately owned. Most of the sites are admission free and open year-round. The three privately owned marinas operate on a fee-based system for customers and public users. Among the 12 Project recreation sites within the Harris Project Boundary, over 50 picnic tables were counted. There are two sites that have designated swimming areas and two sites that have playgrounds. There are over 500 parking spaces, 12 boat launches, and 13 sites offer access to a public use fishing or courtesy dock. There are seven on-site restroom facilities; two are newly installed as of fall 2019. One of the sites has a hiking trail (Kleinschmidt 2020). Project recreation sites are listed in Table 11-2 and the 14 recreation sites included in the inventory analysis are provided in Figure 11-1. Table 11-3

[58] The inventory was conducted on October 8 -9, 2019. This information does not include any changes made to the recreation sites in 2020-2021.

provides additional information on the type of amenities associated with each Project recreation site.

Hunting opportunities are available on Project lands near Harris Dam and north along the Tallapoosa River. Alabama Power works with Alabama's Hunting and Fishing Trail for individuals with disabilities to provide accessible hunting sites on portions of these lands near the dam. Additionally, Natural Undeveloped lands, as identified in the Project Land Use Plan (see Section 11.1.2.2), are available for public use, including hiking, picnicking, primitive camping, backpacking, and wildlife observation (Alabama Power and Kleinschmidt 2018).

Table 11-2 Project Recreation Sites

SITE	MANAGEMENT	OWNERSHIP
Big Fox Creek Boat Ramp	Alabama Power/ ADCNR	Alabama Power
Crescent Crest Boat Ramp	Alabama Power	Alabama Power
Flat Rock Park and Fishing Pier	Alabama Power	Alabama Power
Foster's Bridge Boat Ramp	Alabama Power/ ADCNR	Alabama Power
Highway 48 Bridge Boat Ramp	Alabama Power/ ADCNR	Alabama Power
Lee's Bridge Boat Ramp	Alabama Power	Alabama Power
Little Fox Creek Boat Ramp	Alabama Power/ ADCNR	Alabama Power
Lonnie White Boat Ramp	Alabama Power/ ADCNR	Alabama Power
Harris Tailrace Fishing Pier	Alabama Power	Alabama Power
Swagg Boat Ramp	Alabama Power/ ADCNR	Alabama Power
Wedowee Marine South[59]	Private	Alabama Power/Wedowee Marine
R.L. Harris Management Area	Alabama Power/ ADCNR	Alabama Power

Source: Kleinschmidt 2020

[59] Wedowee Marine South is a private facility, but it is within the Harris Project Boundary and parts of it are considered a Project recreation site.

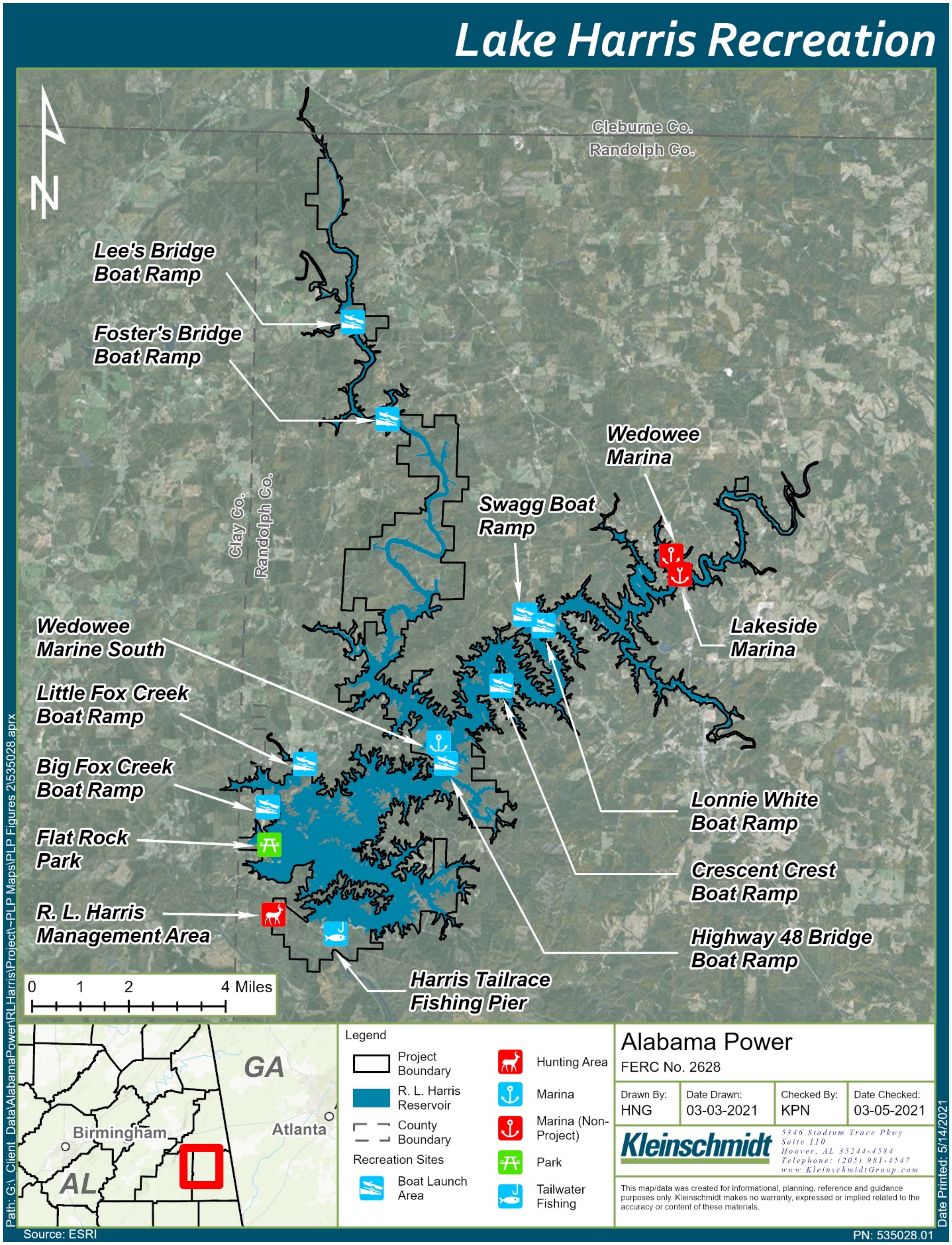


Figure 11-1 Lake Harris Recreation

Table 11-3 Existing Project Recreation Facilities and Amenities

SITE	BARRIER-FREE PARKING	BANK FISHING	BOAT LAUNCH	CAMPGROUND	FISHING PIER	LAUNCHING PIER	RESTROOMS	SHELTER	STORE
Big Fox Creek Boat Ramp			X			X			
Crescent Crest Boat Ramp	X		X			X			
Flat Rock Park	X						X	X	
Foster's Bridge Boat Ramp			X			X			
Highway 48 Bridge Boat Ramp	X		X			X	X		
Lee's Bridge Boat Ramp			X			X			
Little Fox Creek Boat Ramp	X		X			X			
Lonnie White Boat Ramp			X			X			
Harris Tailrace Fishing Pier	X				X		X		
Swagg Boat Ramp			X			X			
Wedowee Marine South	X	X	X			X	X		X
R.L. Harris Management Area								X[60]	

Source: Kleinschmidt 2020

[60] The R.L. Harris Management Area has four "shooting houses" on site. These are used for hunting and are covered structures, identified as a "shelter".

Future Recreation Sites

In addition to the developed Project recreation facilities, Alabama Power designated additional lands within the Harris Project Boundary for future recreation development (Alabama Power 2008a as cited in Alabama Power and Kleinschmidt 2018). These lands are identified as Recreational Use Area No. 2 (approximately 139 acres[61]), Recreational Use Area No. 3 (approximately 75 acres), and Recreation Use Area No. 4 (approximately 68 acres) in the existing Harris Project Land Use Plan. These sites would be developed if additional facilities were determined to be necessary due to future recreational demand and needs. Currently, these lands are managed in accordance with the Harris Project Wildlife Mitigation Plan (Alabama Power 2008a as cited in Alabama Power and Kleinschmidt 2018).

Project Area Recreational Use

Project recreation sites had an estimated 227,358 visitor days in 2019. Highway 48 Bridge and Wedowee Marine South contributed the largest proportions of visitor-days with the highest percentage of utilization, at 84 percent and 79 percent, respectively (Southwick Associates 2020a as cited in Kleinschmidt 2020). Flat Rock Park had the third highest number of recreation days in 2019, although it was only open May 26 through September 15 in 2019 (Southwick Associates 2020a as cited in Kleinschmidt 2020). Percent capacity utilization for each Project recreation site in 2019 is included in Table 11-4.

[61] Wedowee Marine South comprises 20.7 acres of the 139 acres set aside for future recreation use.

Table 11-4 2019 Percent Capacity Utilization by Project Recreation Site

SITE	2019 % CAPACITY UTILIZATION
Big Fox Creek	33%
Crescent Crest	24%
Highway 48 Bridge	84%
Foster's Bridge	40%
Swagg	39%
Little Fox Creek	15%
Lonnie White	29%
Lee's Bridge	20%
Harris Tailrace Fishing Pier	65%
Flat Rock Park	36%
Wedowee Marine South	79%
R.L. Harris Wildlife Mgmt. Area	47%

Source: Southwick Associates 2020a as cited in Kleinschmidt 2020

Recreation Use Policies, Safety, and Communication Procedures

Alabama Power provides information to the public about Lake Harris, Harris Project operations, and Project-related recreation opportunities via the Shorelines website (www.apcshorelines.com), social media platforms (e.g., Facebook and Twitter), a smartphone app, and a toll-free phone number (1-800-LAKES11). Alabama Power's Shorelines website and smartphone app provide general information about Lake Harris, including reservoir elevations, operating schedules, fishing information, lake maps (i.e., showing public use areas, boat launches, fishing pier, and fishing spots), safety information, and a shorelines blog. Individuals can sign up on the Shorelines website to receive emails about lake conditions and operational schedules (Alabama Power 2017a as cited in Alabama Power and Kleinschmidt 2018). Information about lakeside lands preserved and protected by Alabama Power is provided via the Preserves website (https://apcpreserves.com/about/).

The Alabama Marine Police, a division of the Alabama Law Enforcement Agency (ALEA), patrols public waterways and supervises the registration of non-commercial boats and boat operator licensing. The Alabama Marine Police educate the public about boating safety and regulations through various programs and enforce the state boating regulations (Alabama Law Enforcement Agency 2017b as cited in Alabama Power and Kleinschmidt 2018).

Alabama Code, Title 33, Chapter 6A-3.1 prohibits the use of certain vessels on Lake Harris (in addition to Lake Martin on the Tallapoosa River and Weiss Lake on the Coosa River), including: any vessel longer than 30-feet 6-inches; any houseboat; and any vessel longer than 26-feet 11-inches that can exceed 60 miles per hour (AL Code § 9-10B-2.2 2017). Vessels that are used for law enforcement, public safety, search and rescue, scientific research, dam operation or maintenance, or medical vessels are excluded from the restrictions. In addition, sailboats equipped with mast and sails that are dependent on wind for propulsion in the normal course of operation are excluded from the prohibitions (Alabama Marine Police 2009 as cited in Alabama Power and Kleinschmidt 2018).

Woody stumps and debris provide valuable fisheries and aquatic habitat; however, depending on the location of the debris, it can also provide boating safety hazards. If floating debris is identified, Alabama Power notifies the Alabama Marine Police, and it is the responsibility and determination of the Marine Police as to whether a buoy marker is deployed.

Alabama Power protects and manages Harris Project lands for public use opportunities. As a result, Alabama Power only allows for shoreline modifications or bank stabilization in areas of erosion as to preserve as much natural shoreline habitat as possible. The preferred methods of erosion control include natural bank stabilization and rip rap. The use of seawalls is evaluated by Alabama Power personnel on a case-by-case basis. Seawall construction is limited to the existing shoreline for the sole purpose of erosion prevention. Any backfill used must be approved by Alabama Power and placed only to the contour of the natural slope of the existing shoreline. Rip rap must be placed at the toe of any newly constructed seawall. The use of debris, foreign materials, or creosote products is not allowed as a means of shoreline stabilization (Alabama Power and Kleinschmidt 2018).

National Wild and Scenic and State Protected River Segments

No nationally designated wild and scenic or state protected river segments occur within or adjacent to the Harris Project Boundary, nor are there any locations within the Harris Project Boundary that are under study for such designations (Alabama Power and Kleinschmidt 2018).

National Trails and Wilderness Areas

There are no National Trail Systems or Wilderness Areas within the Harris Project Boundary and no lands within the Harris Project Boundary under study for inclusion in the National Trails System or designation as a Wilderness Area. The closest Wilderness Area and National Trail are the Cheaha Wilderness Preserve and the Pinhoti National Recreation Trail, both located within the Talladega National Forest approximately 30 miles northwest of the Harris Project Area (USFS 2016 and Wilderness.net 2016 as cited in Alabama Power and Kleinschmidt 2018).

11.1.2.2 Land Use

Lake Harris is located on the Tallapoosa River in Clay, Cleburne, and Randolph counties, Alabama. The county seat of Randolph County, Wedowee, is located approximately 5-miles east, and the city of Lineville is located approximately 6-miles west of Lake Harris.

The majority of Lake Harris lands are located within Randolph County, with a small portion of Lake Harris lands located in Clay and Cleburne counties. There are 4.9 acres of federal lands within the Lake Harris Project Boundary[62]. These lands are owned by the BLM (Alabama Power and Kleinschmidt 2018). The general region surrounding Lake Harris is primarily rural with forested lands and limited commercial and private residential development.

Predominate land use within all three counties is forested (deciduous and evergreen), followed by pasture/hay.

[62] As illustrated on FERC-approved Exhibit G drawing G-19, FERC No. 2628-106 (158 FERC ¶ 62,074).

Table 11-5 summarizes the percentages of land use by classifications for the counties in which the Lake Harris lands are located. The land use classifications are derived from the National Land Cover Database 2011 created by the Multi-Resolution Land Characteristics (MRLC) (MRLC 2016 as cited in Alabama Power and Kleinschmidt 2018). The data are based on satellite images at a resolution of 98.4 feet and, therefore, provide general major land use categories within Randolph, Clay, and Cleburne counties. Predominate land use within all three counties is forested (deciduous and evergreen), followed by pasture/hay.

Table 11-5 Percentages of Land Use Classifications by Counties in the Lake Harris Project Vicinity

DESCRIPTION[1]	RANDOLPH	CLAY	CLEBURNE
Open Water	3. 0	0. 3	0. 4
Developed, Open Space	3. 7	3. 3	3. 5
Developed, Low Intensity	1. 3	0. 2	0. 6
Developed, Medium Intensity	0. 2	0. 1	0. 1
Developed, High Intensity[2]	0. 1	0. 0	0. 0
Barren Land (Rock/Sand/Clay)	0. 3	0. 3	0. 2
Deciduous Forest	36. 6	46. 5	43. 9
Evergreen Forest	20. 5	27. 0	28. 0
Mixed Forest	0. 4	0. 7	1. 4
Shrub/Scrub	8. 4	5. 6	6. 3
Grassland/Herbaceous	7. 9	6. 9	5. 8
Pasture/Hay	17. 1	7. 7	8. 9
Cultivated Crops[2]	0. 0	0. 0	0. 0
Woody Wetlands	0. 6	1. 2	0. 8
Emergent Herbaceous Wetlands[2]	0. 1	0. 0	0. 0

Source: MRLC 2016 as cited in Alabama Power and Kleinschmidt 2018

[1] For a description of land use types, see http://www.mrlc.gov/nlcd11_leg.php.

[2] For values of 0.0, although present, these areas represent less than 0.1%.

Currently, Alabama Power manages the lands and waters included in the Lake Harris Project Boundary according to the Harris Land Use Plan, which was most recently revised in June 2008 and approved by FERC Order on May 26, 2010. The Harris Land Use Plan describes land use classifications for management of Harris Project lands located within the existing Harris Project Boundary (Table 11-6). Harris Reservoir does not currently have a SMP but does maintain policies that keep shoreline management consistent with other Alabama Power hydro projects. For example, there are shoreline permitting guidelines and public education programs, including encouraging BMPs that minimize the effects of construction on existing resources (Alabama Power and Kleinschmidt 2018).

Table 11-6 Baseline Land Use Designations within the Lake Harris Project Boundary

LAND USE PLAN – LAND USE DESIGNATION	ESTIMATED ACRES WITHIN LAKE HARRIS PROJECT BOUNDARY
Natural Undeveloped (including islands)	2,440
Hunting (near reservoir)	2,707
Recreation (Public Use Area)	874
Prohibited Access	312
Total	6,333[1]

Source: Alabama Power

[1] Includes lands currently subclassified as Quasi-Public; Alabama Power is not proposing to continue subclassifications of Recreation.

This acreage total does not include the scenic easement (to 800.0-feet msl or 50 horizontal feet from 793.0-feet msl, whichever is less, but never less than 795.0-feet msl)

Alabama Power maintains a shoreline permitting program for management of lands within the Lake Harris Project Boundary. Alabama Power provides general guidelines for shoreline permitting, that include:

- Residential shoreline permitting (Alabama Power 2017a as cited in Alabama Power and Kleinschmidt 2018)
- Non-residential use of Lake Harris Project lands and waters (such as public marinas, restaurants, apartments and other rental properties, overnight campgrounds, other commercial businesses) (Alabama Power 2017b as cited in Alabama Power and Kleinschmidt 2018)
- Multiple single-family type dwelling use of Harris Project lands and waters (Alabama Power 2017c as cited in Alabama Power and Kleinschmidt 2018)

All development activities within the Lake Harris Project Boundary must be preapproved and permitted by Alabama Power. The purpose of the shoreline permitting program is to manage development activities and monitor the shoreline areas on a regular basis to preserve the scenic, recreational, and environmental values of Lake Harris.

In 2012, Alabama Power implemented a shoreline compliance program to ensure that shoreline encroachments are resolved and address shoreline permitting, structure identification and assessment, public education, surveillance, and shoreline preservation. Alabama Power files annual reports of progress under the shoreline compliance program with FERC. During 2020, Alabama Power resolved 81 encroachments on Harris Reservoir.[63,64]

As described under the Skyline section, Alabama Power conducted a Phase I Project Lands Evaluation Study to identify lands around Lake Harris and Skyline that are needed for Harris Project purposes and to classify these lands (Alabama Power 2020b). Lands to be added to, or removed from, the current Harris Project Boundary and/or be reclassified were identified and are analyzed in Sections 11.2.

11.1.3 Tallapoosa River Downstream of Harris Dam Recreation

Regional Recreation Facilities and Opportunities

A tailrace fishing platform (Harris Tailrace Fishing Pier) is located just below the Harris Dam and within the Harris Project Boundary[65]. In addition, there are several recreation areas of note located along the Tallapoosa River downstream of Harris Dam (outside the Project boundary), including the Harold Banks Canoe Trail (HBCT). The HBCT contains four access points: Bibby's Ferry, Germany's Ferry, Horseshoe Bend, and Jaybird Landing[66]. Upstream of Bibby's Ferry are two canoe portages located on privately owned land, Malone and Wadley Bridge [67](Kleinschmidt 2020).

Horseshoe Bend is managed by the National Park Service (NPS) and is located downstream approximately 20 miles, or approximately 40 RMs, from Harris Dam. The park preserves the site of the Battle of Horseshoe Bend with the Creek Nation (1813-1814) and encompasses approximately 2,040 acres of mixed hardwood forest along approximately 3.5 miles of the Tallapoosa River. Amenities at the park include a 3-mile-long road tour along the edge of the battlefield, a 2.8-mile-long hiking trail, two picnic areas, a visitor center, and a boat launch area. Recreational opportunities include hiking, boating, fishing (at the boat ramp area only), nature study, and historic/cultural interpretive exhibits and activities at the visitor center (NPS 2017a as cited in Alabama Power and Kleinschmidt

[63] At the Harris Project, "encroachments" may include activities that a property owner begins before receiving a permit. Alabama Power's permitting program started at Harris in 1986 and expanded to the remainder of Alabama Power's hydroelectric projects on the Coosa, Warrior, and Tallapoosa rivers in 1992.
[64] Accession No. 20201223-5282
[65] The tailrace fishing platform is a Project recreation site and is discussed in further detail in Section 11.1.2.1.
[66] Jaybird Landing, as identified in the Martin Dam Project (FERC No. 349) is noted as Jay Bird Creek in the HBCT brochure.
[67] Portions of the sites under private ownership may be positioned on a county or state road right-of-way.

2018). Annual recreation visitation at Horseshoe Bend in 2019 was 45,372 visits, with the greatest use occurring during the month of July (NPS 2021).

The Alabama Scenic River Trail, a designated National Recreation Trail with portions extending along the Coosa River, is located approximately 70 miles south of the Harris Project (National Recreation Trails 2017 as cited in Alabama Power and Kleinschmidt 2018). The Tallapoosa River connects to the Alabama Scenic River Trail; however, since it was added as an expansion to the Alabama Scenic River Trail system, the approximately 200-mile Tallapoosa River segment is not an officially designated National Recreation Trail. The Tallapoosa River provides both riverine and reservoir flatwater boating opportunities (Alabama Newscenter 2014 as cited in Alabama Power and Kleinschmidt 2018). The riverway extends from upstream of Lake Harris and downstream through the riverine reach past Horseshoe Bend. It then reaches Lake Martin and ultimately extends below Yates and Thurlow dams through the downstream reaches to the confluence of the Tallapoosa River with the Coosa River. This is where it joins the Alabama Scenic River Trail (Alabama Scenic River Trail 2017 as cited in Alabama Power and Kleinschmidt 2018). Portage access is available around the Harris, Martin, Yates, and Thurlow Project dams, including the 0.45-mile-long portage near Harris Dam. All the portages, including the one near Harris Dam, are managed by the Alabama Scenic River Trail.

Existing Recreation Use

The *Recreation Evaluation Report* (Kleinschmidt 2020) included areas of the Tallapoosa River (Figure 11-2) which encompasses the HBCT on the Tallapoosa River and two sections of the Tallapoosa River immediately upstream of HBCT (Kleinschmidt 2020). The HBCT includes the section of river from the Bibby's Ferry access point to Jaybird Landing. The HBCT contains four access points: Bibby's Ferry, Germany's Ferry, Horseshoe Bend[68], and Jaybird Landing. The two additional sections of the Tallapoosa River included in the study area are from the County Road 15 bridge in Malone to the Alabama Highway 22 bridge in Wadley, and from Wadley to Bibby's Ferry. The section of river from the Harris Dam to Malone was not part of the overall study, although Malone was sampled intermittently[69] (Kleinschmidt 2020).

[68] Only data regarding the Horseshoe Bend Boat Launch is described in this section.
[69] One access point between Horseshoe Bend and Jaybird Landing (Peters Island) was deemed unusable because it is remote, and a four-wheel drive vehicle is necessary to access it.

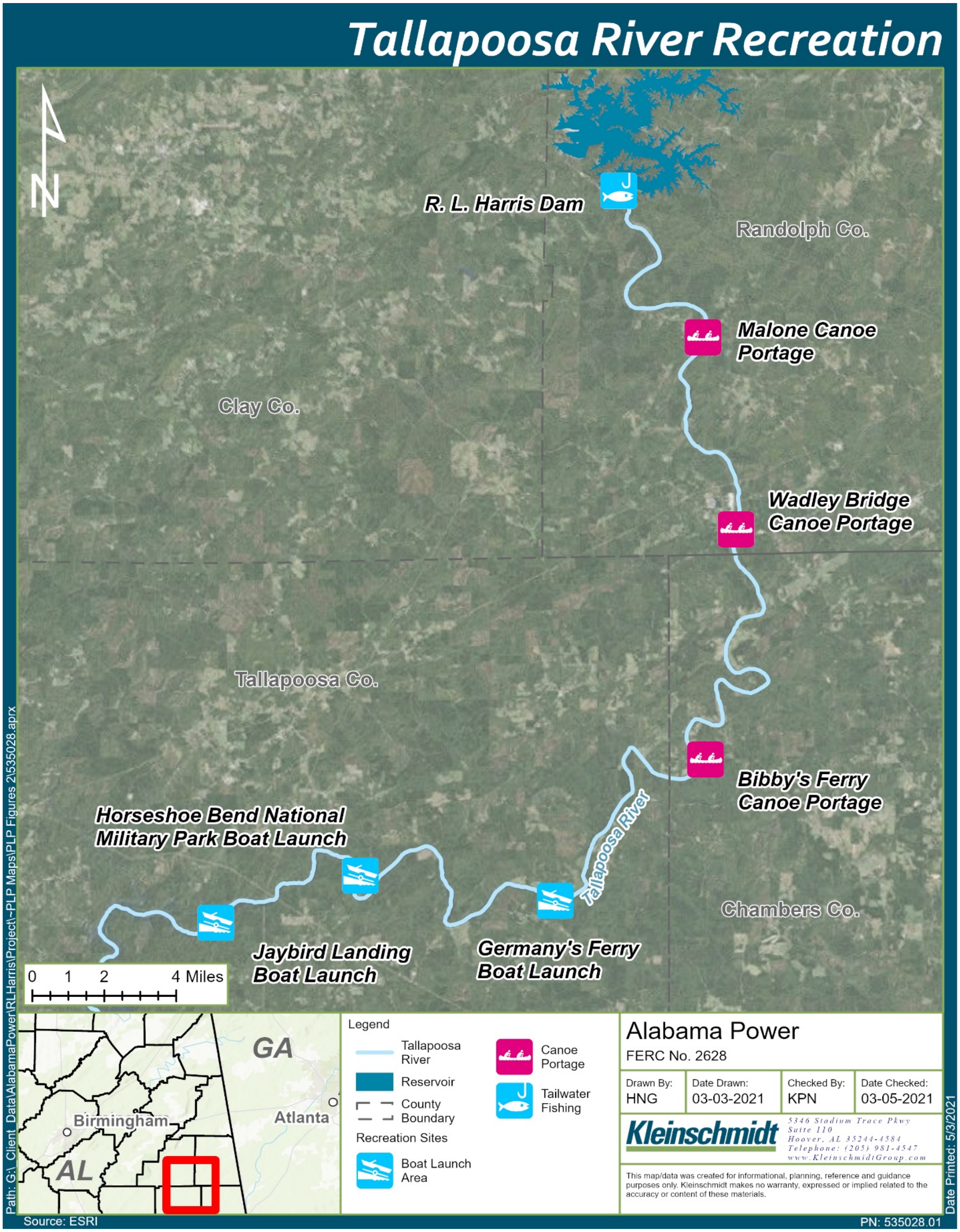


Figure 11-2 Tallapoosa River Recreation

Recreation downstream of Harris Dam on the Tallapoosa River was studied using several methodologies, including public access user counts and surveys, attendance records collected from a river outfitter, downstream landowner surveys, and recreation user surveys (online) (Kleinschmidt 2020).

Data collected during the public access user counts indicated that approximately 70 percent of all Tallapoosa River trips began at Horseshoe Bend, 12.7 percent of trips began at the Germany's Ferry boat launch, and 10.4 percent of trips began at Jaybird Landing (Hunt 2020a as cited in Kleinschmidt 2020). Sixty-one percent of all Tallapoosa River trips ended at Jaybird Landing and 24 percent ended at Horseshoe Bend (Hunt 2020a as cited in Kleinschmidt 2020). Boating and fishing recreation activities during the study period consisted of kayaking (33 percent), kayak fishing (27 percent), shoreline fishing (13 percent), boat fishing (14 percent), canoeing (5 percent), and canoe fishing (5 percent), while swimming, tubing, and recreational boating accounted for only approximately 3 percent of trips (Hunt 2020a as cited in Kleinschmidt 2020).

A river outfitter surveyed during the study provided shuttle and outfitting services for 371 individuals (226 kayak/canoe renters and 145 ferried with his personal vessel). The river outfitter specified that the Tallapoosa River trips ranged from 4 to 6 hours with the average total trip lasting 5 hours. There were 371 visitor-days and 1,855 hours of effort attributed to the river outfitter during the study period, with most of the effort occurring in May, June, and July of 2019 (Hunt 2020a as cited in Kleinschmidt 2020).

According to the public access user surveys, the four most popular activities enjoyed by Tallapoosa River recreation users were swimming (76.29 percent), scenic/wildlife viewing (61.17 percent), kayaking (59.79 percent), and tubing/rafting (52.23 percent). Respondents spent an estimated 14,060 person-days recreating on the Tallapoosa River during 2019. A majority (45 percent) of downstream recreation users indicated they accessed the river from "private property only" (Hunt 2020c as cited in Kleinschmidt 2020).

High satisfaction ratings were received from those recreation users using public access points on the Tallapoosa River below Harris Dam; however, data indicate that a majority (75 percent) of the recreation users would prefer additional downstream access points and over 50 percent of the recreation users prefer improvements to the amenities at the sites on the Tallapoosa River (Hunt 2020a as cited in Kleinschmidt 2020).

Regarding water level and recreation on the Tallapoosa River downstream of Harris Dam, the water level does not appear to have any appreciable effect on recreation. Results from the public access user survey indicated the majority of recreation users found all water levels acceptable (499 cfs to 6,110 cfs) and the recreation effort did not appear to be affected by water level. Results from the downstream landowner survey indicated there was no identifiable optimal flow range for downstream landowners; however, any flow greater than 5,000 cfs was designated unacceptable for river-related recreation (Hunt 2020b as cited in Kleinschmidt 2020).

Land use along the Tallapoosa River downstream of Harris Dam was not evaluated during relicensing. However, most of the land along the Tallapoosa River downstream of Harris Dam is undeveloped forest land. Recreation access areas, farmland, and residential areas are also interspersed along the riverbank, including the towns of Malone and Wadley.

11.2 Environmental Analysis

Alabama Power conducted relicensing studies and associated analyses that pertain to effects on recreation and land use resources. Those analyses are presented in the following reports.

- **Final** *Recreation Evaluation Study Report*
- **Final** *Project Lands Evaluation*
- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*
- *A Botanical Inventory of a 35-Acre Parcel at Flat Rock Park, Blake's Ferry, Alabama*

Table 11-7 includes the proposed operations and PME measures that may affect recreation and land use resources at Skyline, Lake Harris, and the Tallapoosa River downstream of Harris Dam. Not all operations or PME measures apply to each geographic area of the Harris Project; therefore, the analysis of beneficial and adverse effects will be presented accordingly. A complete list of Alabama Power's operations and PME measures is located in Table 5-2.

Table 11-7 Proposed Operations and PME Measures That May Affect Recreation and Land Use

Proposed Operational and PME Measures That May Affect Recreation and Land Use
• Continue operating the Harris Project according to the existing operating curve and flood control procedures • Continue daily peak-load operations • Continue operating in accordance with ADROP to address drought management
• Design, install, operate, and maintain a minimum flow unit to provide a CMF between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam
• Develop and implement a Nuisance Aquatic Vegetation and Vector Control Program
• Implement a WMP for Lake Harris and Skyline ❖ Incorporate timber management into the WMP ❖ Continue to provide hunting opportunities to the public
• Develop and implement a SMP for Lake Harris ❖ Incorporate proposed changes in land use classifications (including reclassifying the botanical area at Flat Rock Park from recreation to natural/undeveloped) ❖ Continue to encourage the use of alternative bank stabilization techniques other than seawalls ❖ Continue implementing the Dredge Permit Program ❖ Continue implementing the Water Withdrawal Policy ❖ Continue implementing a shoreline classification system to guide management and permitting activities ❖ Continue the requirements of a scenic easement for the purpose of protecting scenic and environmental values ❖ Continue the use of a "sensitive resources" designation in conjunction with shoreline classifications on Project lands managed for the protection and enhancement of cultural resources, wetlands, and threatened and endangered species ❖ Continue implementing a shoreline compliance program and shoreline permitting program ❖ Continue to encourage the adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation
• Implement proposed land additions to the Project Boundary and incorporate into Exhibit G
• Implement proposed land removals from the Project Boundary and incorporate into the Exhibit G
• Develop and implement a Recreation Plan ❖ Continue to operate and maintain 11 Project recreation sites ❖ Remove Wedowee Marine South as a Project recreation site and request approval of entire facility as Non-Project Use ❖ Install and maintain recreation (canoe/kayak) access below Harris Dam within the Project Boundary ❖ Provide an additional recreation site on Lake Harris to include a day use park (swimming, picnicking, and boat ramp) ❖ Implement Barrier-Free Evaluation Program at existing recreation sites ❖ Provide a Recreation Plan update to FERC every 10 years

11.2.1 Skyline

Wildlife Management Plan/Timber Management

Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs for Skyline. The WMP would provide a framework for achieving specific wildlife management goals identified in consultation with the ADCNR and USFWS. The WMP would consolidate several management activities currently in place at the Harris Project into a single document. Land management activities at Skyline include timber management and hunting management (Alabama Power 2021a).

Implementation of these management activities would ensure a healthy, mature forest, and would serve to maintain or increase the oak component. These prescriptions would provide and maintain optimal ecological diversity and improved wildlife habitat. It is intended that the management actions at Skyline be a cooperative effort between the Alabama Power Forestry Team and ADCNR (Alabama Power 2021a).

The WMP would address hunting management at Skyline; however, hunting opportunities at Skyline would continue to be managed by ADCNR, including the issuance of permits and maps as well as the determination of regulations such as hunting seasons and bag limits (Alabama Power 2021a).

11.2.2 Lake Harris

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. The existing winter pool drawdown of 8 feet results in some unusable public and private recreational structures during the winter months (December – March). Usability of Harris Reservoir private structures, by structure type, at the existing winter pool level is shown in Table 11-8. Usability of public boat ramps at the lowest possible reservoir elevation are shown in Table 11-9. Public boat ramps that are currently available for use during the winter drawdown would remain useable. During periods of drought, the implementation of ADROP would reduce impacts to lake levels and therefore minimize drought effects on recreation use on Harris Reservoir.

Table 11-8 Usability of Private Structures on Harris Reservoir by Structure Type for Baseline Operations of 785.0-feet MSL

STRUCTURE TYPE	PERCENT OF STRUCTURES THAT ARE USABLE AT WINTER POOL
Boardwalks (n=25)	0.0
Boathouses (n=929)	32.6
Floats (n=393)	25.7
Piers (n=689)	5.4
Wet Slips (n=87)	9.2

Source: Alabama Power and Kleinschmidt 2021a

Table 11-9 Public Boat Ramp Usability at the Lowest Possible Reservoir Elevation

BOAT RAMP	LOWEST RESERVOIR ELEVATION USABLE (FEET MSL)
Big Fox Creek	785.0
Crescent Crest	785.0
Foster's	785.0
Hwy 48 Bridge	785.0
Lee's Bridge	791.5
Little Fox Creek	790.0
Lonnie White*	787.5
Swagg**	790.0

Source: Alabama Power and Kleinschmidt 2021a

***Lonnie White Boat Ramp is frequently used at current winter pool, but larger boats cannot launch, and many boat trailers need to back off the edge of the ramp. ADCNR is currently extending the ramp so that it is fully usable prior to the drawdown of 2021.

****Swagg Boat Ramp ends right at the water's edge during current winter pool but is still in use by some recreators.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam.

The proposed continuous minimum flow would not affect Alabama Power's ability to maintain average lake levels, and therefore, would not affect the ability to use private structures and public boat ramps throughout the year compared to baseline operations (Alabama Power and Kleinschmidt 2021a).

Wildlife Management Plan/Timber Management

Similar to Skyline, Alabama Power proposes to implement a WMP, including specific timber management actions and BMPs at Lake Harris. Project forest lands at Lake Harris would be managed according to the existing all or uneven-aged management systems, with a sawtimber cycle of 20 years and an overall forest rotation of 60 years. Use of herbicides would be considered on stands within the Harris Project forest lands, and such use would be based on conditions and characteristics of the individual stands. Alabama Power would also continue to provide public hunting opportunities on lands located at Lake Harris. The WMP would have a beneficial effect on hunters, particularly by providing hunting opportunities for persons with disabilities near Harris Dam. Alabama Power would continue to plant and maintain greenfields and/or other wildlife openings in the vicinity of the shooting houses annually. Shooting houses, specifically designed to accommodate disabled hunters, as well as road access to the shooting houses would be maintained (Alabama Power 2021a).

Shoreline Management Plan

Alabama Power proposes to develop and implement a SMP for Lake Harris. The SMP would be modeled after other current Alabama Power project SMPs; this would allow uniformity in the way that Alabama Power would manage project shorelines across all their hydroelectric projects. The activities implemented through the SMP are described in Table 11-7 and Table 5-2 would address the items listed below (Alabama Power 2021b).

During the Phase I Project Lands Evaluation, Alabama Power conducted a botanical inventory at Flat Rock Park. Alabama Power proposes to reclassify approximately 57 acres of existing Harris Project lands from recreation to natural/undeveloped due to the presence of the rare Blake’s Ferry Pluton. This classification would further protect the unique habitat in the area that allows for the rare plant species to thrive (Alabama Power 2021b). The reclassification of these lands would not affect recreation lands available at Flat Rock Park, including opportunities for hiking.

In addition, Alabama Power is proposing to reclassify other lands within the Harris Project Boundary. A summary of proposed reclassifications is included in Table 11-10. Recreation lands reclassified as natural/undeveloped would continue to be available for undeveloped recreation purposes such as hiking and primitive camping (Alabama Power 2021b).

Table 11-10 Project Lands Proposed for Reclassification

LAND PARCEL ID	ACREAGE FOR RECLASSIFICATION	CLASSIFICATION CHANGE	REASONS FOR RECLASSIFICATION
RC1	+/-105 acres	Recreation to Natural/ Undeveloped	Currently classified as recreation for the purposes of a future park site; analysis of potential recreation use revealed that property is difficult to access and is located within an area of the lake with limited demand for public recreation opportunities; existing recreation project lands are located immediately upstream of this tract, which provide better access; reclassification to Natural/Undeveloped provides consistency of land use with adjacent project lands and will aid in the protection of the adjacent natural/undeveloped project lands.
RC2	+/-63 acres	Recreation to Natural/ Undeveloped	Currently classified as recreation for the purposes of a future park site; analysis of potential recreation use revealed that property is difficult to access and is located within an area of the lake with limited demand for public recreation opportunities; existing recreation project lands are located immediately upstream of this tract, which provide better access; reclassification to Natural/Undeveloped provides consistency of land use with adjacent project lands and will aid in the protection of the adjacent natural/undeveloped project lands.
RC3	+/-61 acres	Recreation to Natural/ Undeveloped	Added to Harris Project in 1995 for future recreation; however, existing recreation project lands have since been developed and are located immediately downstream of this tract, which provide better access; reclassification to Natural/Undeveloped will aid in the maintenance of the natural aesthetics in the area.

LAND PARCEL ID	ACREAGE FOR RECLASSIFICATION	CLASSIFICATION CHANGE	REASONS FOR RECLASSIFICATION
RC4	+/-28 acres	Recreation to Commercial Recreation	Property contains an existing marina (Wedowee Marine South); Alabama Power's shoreline office is located on this tract; reclassification to commercial recreation will align with existing current use.
RC5	+/-69 acres	Recreation to Natural/ Undeveloped	Added to Harris Project in 1995 for future recreation; however, property has steep terrain with subpar access; existing recreation project lands are located immediately north of this tract, which provide better access; reclassification to Natural/Undeveloped provides consistency of land use with adjacent project lands and will aid in the protection of the adjacent natural/undeveloped project lands.
RC6	+/-5 acres	Prohibited Access to Recreation	Property contains the existing tailrace fishing recreation site; reclassification to recreation will align with existing current use.
RC7	+/-57 acres	Recreation to Natural/ Undeveloped	Property is located adjacent to an existing project recreation site (Flat Rock Park) but is separated by forested land and is not currently used for recreation purposes; property is not designated for future expansion due to proximity of a transmission line corridor and adjacent private development; reclassification to Natural/Undeveloped provides protection of rare botanical species identified during the Flat Rock Botanical Inventories.
RC8	+/-50 acres	Recreation to Natural/ Undeveloped	Property is part of a larger tract originally classified as recreation for the purposes of developing a public recreation site; a project recreation site (Big Fox Creek Boat Ramp) was constructed at the south end of the larger tract and contains adequate acreage for possible future expansion; this remainder of the larger tract is not needed for future recreation purposes; reclassification to Natural/Undeveloped will aid in the maintenance of natural aesthetics and will serve as a buffer zone around the existing public recreation area.

LAND PARCEL ID	ACREAGE FOR RECLASSIFICATION	CLASSIFICATION CHANGE	REASONS FOR RECLASSIFICATION
RC9	+/-80 acres	Recreation to Commercial Recreation	Alabama Power has received numerous inquiries regarding potential campgrounds in this vicinity; reclassification to commercial recreation will provide lands for similar uses; tract is adjacent to area of proposed new day use park.
RC10	+/-100 acres	Hunting to Natural/ Undeveloped	Tract is currently classified as hunting since it is adjacent to the Harris physical disabled hunting area; property is not needed for future expansion of the hunting area; reclassification to Natural/Undeveloped will aid in the maintenance of natural aesthetics and will serve as a buffer zone around the existing disabled hunting area and nearby project lands classified as prohibited access.

Source: Alabama Power 2021b

Land Additions/Removals

Alabama Power proposes to implement land additions and removals to the Project Boundary and incorporate these changes into Exhibit G. Specifically, Alabama Power proposes to remove five parcels of recreation lands and three parcels of natural/undeveloped from the Project and add two parcels of hunting lands, five parcels of natural/undeveloped lands, and one parcel of commercial recreation land to the Harris Project (Alabama Power 2021b). These lands are described in Table 11-11. Approximately 300 acres of lands are proposed to be removed from the Harris Project and FERC jurisdiction and approximately 505 acres are proposed to be added to the Harris Project. Lands proposed for removal no longer serve a Project purpose due to the reasons listed in Table 11-11. Removing these lands would not adversely affect the overall recreation opportunities offered at the Project.

Table 11-11 Project Recreation Lands Proposed for Removal/Addition

Land Parcel ID	Acreage	Add/Remove	Existing or proposed Classification	Reason for Removal/Addition
R1	+/-149 acres	Remove	Natural/ Undeveloped	No project purpose for this parcel; adjacent to existing private development, including improved access road across northeast corner of parcel; not suitable for hunting lands due to its proximity to non-project (private) development; not suitable for recreation due to limited access to the property and location within area of lake with limited demand for public recreation opportunities.
R2	+/- 3 acres	Remove	Recreation	No project purpose for this parcel; small parcel located at the end of an old road; not adjacent to existing project lands or proposed additions to project lands; not suitable for recreation as located within a slough and within an area of the lake with limited demand for public recreation opportunities; nearby recreation project lands already developed; not suitable for hunting lands due to small size; not suitable for natural/undeveloped due to proximity to proposed future developments.
R3	+/- 20 acres	Remove	Recreation	No project purpose; parcel was added to Harris Project in 1995 for use by the Boy Scouts, which never transpired; not suitable for recreation due to its location within an area of the lake with limited access and recreation demand, nearby existing recreation sites with better access; not suitable for hunting lands due to its small size and not adjacent to existing project lands; not suitable for natural/undeveloped due to proximity to proposed future developments.
R4	+/-61 acres	Remove	Natural/ Undeveloped	No project purpose; parcel is located on peninsula, but tip of peninsula is non-project lands; not suitable for natural/undeveloped due to proposed future development of privately-owned tip, which will result in the need to cross project lands will access and utilities; not suitable for recreation due to location within an area of the lake with limited demand for recreational opportunities; not suitable for hunting due to shape of parcel and proximity to private development.

LAND PARCEL ID	ACREAGE	ADD/REMOVE	EXISTING OR PROPOSED CLASSIFICATION	REASON FOR REMOVAL/ADDITION
R5	+/-19 acres	Remove	Recreation	No Project purpose; nearby private development resulting in landowners that need access through Project lands; not suitable for recreation due to its location within area of lake with limited demand for public recreation opportunities; not suitable for natural/undeveloped due to proximity to private development of peninsula; not suitable for hunting due to its small size and proximity to private development.
R6	+/-37 acres	Remove	Natural/ Undeveloped	No project purpose; land locks privately-owned tracts with Project Boundary; not suitable for natural/undeveloped due to proximity to private development of peninsula, which has (and will continue to) result in the need to cross project lands with access roads and utilities; not suitable for recreation due to its location within area of lake with limited demand for public recreation opportunities; not suitable for hunting due to due to proximity to private development.
R7	+/-9 acres	Remove	Recreation	No project purpose; similar to R5 and R6 in its proximity to private development; not suitable for recreation due to its location within area of lake with limited demand for public recreation opportunities; property is not located on shoreline; not suitable for natural/undeveloped due to proximity to private development; not suitable for hunting due to due to its small size and proximity to private development.
R8	+/-2 acres	Remove	Recreation	No project purpose; parcel classified as recreation in 1995 land use plan for potential boat launch; since then, area has been developed with private residential developments that include private boat launches; parcel is not suitable for recreation due access, which is approximately 10-12 miles by county road from the nearest major highway; more accessible public launches have been constructed in general vicinity; parcel is land locked by private ownership; not suitable for natural/undeveloped due to small size and proximity to existing residential developments; not suitable for hunting due to small size and not adjacent to project lands.
A1	+/-64 acres	Add	Hunting	Property fills a “donut hole” within current Project lands classified as hunting lands; Project purpose is hunting.

Land Parcel ID	Acreage	Add/Remove	Existing or proposed Classification	Reason for Removal/Addition
A2	+/-4 acres	Add	Natural/Undeveloped	Small tract adjacent to existing project lands classified as natural/undeveloped; adding tract provides consistency of land use and will aid in the protection of the adjacent natural/undeveloped project lands; Project purpose is Natural/Undeveloped.
A3	+/-2 acres	Add	Commercial Recreation	Parcel is adjacent to large tract of land currently classified as recreation that is proposed to be reclassified as commercial recreation (RC9); adding this tract provides consistency of land use with adjacent property; Project purpose is recreation.
A4	+/-154 acres	Add	Natural/Undeveloped	Parcel is bordered by natural/undeveloped project lands to the north and to the south of this tract; adding tract provides consistency of land use and will aid in the protection of the adjacent natural/undeveloped project lands; Project purpose is Natural/Undeveloped.
A5	+/-261 acres	Add	Hunting	Adjacent to existing project lands classified as hunting lands, which are designated as disabled hunting; portions of this parcel are currently utilized for the disable hunting area; adding tract will provide acreage for future expansion of the disable hunting area if needed; Project purpose is Hunting.
A6	+/-14 acres	Add	Natural/Undeveloped	Adjacent to existing project lands classified as natural/undeveloped; adjacent project lands include birding trail extending from Little Fox Creek public recreation site; adding tract provides consistency of land use and available acreage for future expansion of birding trail; Project purpose is Natural/Undeveloped.
A7	+/6 acres	Add	Natural/Undeveloped	Adjacent to existing project lands classified as natural/undeveloped; adding tract provides consistency of land use and will aid in the protection of the adjacent natural/undeveloped project lands; Project purpose is Natural/Undeveloped.
A8	+/-0.25 acres	Add	Natural/Undeveloped	Two small tips of a peninsula; adjacent portion of peninsula is currently within the Project Boundary and classified as natural undeveloped; adding tracts provides consistency of land use and will aid in the protection of the adjacent natural/undeveloped project lands; Project purpose is Natural/Undeveloped.

Source: Alabama Power 2021b

Nuisance Aquatic Vegetation and Vector Control Program

Alabama Power proposes to develop and implement a Nuisance Aquatic Vegetation and Vector Control Program at Lake Harris. The Program would include: 1) the frequency, timing, and locations, of surveys to identify areas where nuisance aquatic vegetation could create a public health hazard, affect power generation facilities, restrict recreational use, or pose a threat to the ecological balance of Lake Harris; 2) methods for monitoring increases in nuisance aquatic vegetation; 3) methods for controlling nuisance aquatic vegetation and vectors; and 4) a schedule for monitoring. This Program would have a beneficial effect on recreation by allowing for the identification, monitoring, and control of nuisance aquatic vegetation that may restrict or discourage recreational use of the reservoir.

Recreation Plan

Alabama Power evaluated recreation at Lake Harris during relicensing and confirmed that Lake Harris is highly used with overall high levels of satisfaction; however, recreation users did suggest improvements for several recreation sites (Kleinschmidt 2020). Alabama Power proposes to develop and implement a Recreation Plan, to guide recreation decision making over the course of the license. Specifically, the Recreation Plan would discuss continued operations and maintenance at 11 Project recreation sites. Other items in the Recreation Plan are listed below.

- Remove Wedowee Marine South as a Project recreation site and request approval of the entire facility as Non-Project Use.
- Install and maintain recreation (canoe/kayak) access in the tailrace below Harris Dam within the Project Boundary.
- Provide an additional recreation site on Lake Harris to include a day use park (with amenities for swimming, picnicking, and a boat ramp).
- Implement the Barrier-Free Evaluation Program at existing recreation sites.
- Provide a Recreation Plan update to FERC every 10 years.

Providing additional facilities and access at Lake Harris would increase opportunities for recreational users in a variety of activities (day use, boating, fishing) and respond to stakeholder requests for additional Lake Harris recreation access. Developing a Recreation Plan would provide a comprehensive plan for operating and maintaining the existing and proposed facilities and a 10-year update would provide Alabama Power and stakeholders an opportunity to review the recreation use, facility capacity, and future plans for recreation. Removing Wedowee Marine South as a Project recreation site would allow the private owner to continue to operate the marina with facilities that would continue to be available to the public and would be consistent with how other marinas are managed in the Project Boundary. In addition, Alabama Power is proposing to build an additional day use park in the vicinity of Wedowee Marine South that will be a Project recreation site and include amenities for swimming, picnicking, and a boat ramp.

11.2.3 Tallapoosa River Downstream of Harris Dam

Continued Project Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. During high flow events, downstream recreation access areas that are inundated would continue to be inundated under the proposed continued operations. However, because this occurs only during high flow events, the likelihood of recreational users on the river at that time is low.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. In accordance with the FERC-approved Harris Downstream Release Alternatives Study Plan, Alabama Power addressed two questions related to how recreation may be affected by a downstream release from Harris Dam, including:

- Determine how downstream releases affect boating in the Tallapoosa River, from Harris Dam to Horseshoe Bend by correlating data collected from Tallapoosa River users with flow information available for the day/time the user was on the water.
- Use the HEC-RAS model to determine how downstream releases affect boatable flows.

In addition, using HEC-RAS model results, Alabama Power examined the flow depth from Harris Dam to Malone and associated river navigability (Kleinschmidt 2021b).

Regarding user perceptions of flow, during the Recreation Evaluation the majority of recreation users found all water levels acceptable (with river flows ranging from 499 cfs to 6,110 cfs), and the recreation effort did not appear to be affected by flow. Most recreation users were not aware of the Tallapoosa River flow until they arrived to recreate; there was no significant relationship between satisfaction and water level (Kleinschmidt 2020 as cited in Alabama Power and Kleinschmidt 2021b). Therefore, the addition of a continuous minimum flow downstream is not expected to have an effect on user perceptions of flow.

Alabama Power also assessed how the proposed continuous minimum flow would affect boatable days downstream of the Harris Project compared to boatable days under the Green Plan (baseline). Spring and fall have the most variation in the number of boatable days with the most boatable days annually occurring with a continuous minimum flow of 300 cfs (Table 11-12) (Alabama Power and Kleinschmidt 2021b).

Table 11-12 Number of Boatable Days in the Tallapoosa River Below Harris Dam by Season

ALTERNATIVE	WINTER	SPRING	SUMMER	FALL	ANNUAL
GP (baseline)	30	18	23	29	100
150 CMF	29	19	24	37	109
300 CMF	32	15	29	61	137

Source: Alabama Power and Kleinschmidt 2021b
Note: Boatable Days are defined as days (both weekday and weekend) when flows measured at the Wadley gage were between 450 cfs and 2,000 cfs between sunrise and sunset.

The HEC-RAS flow depth analysis conducted between Harris Dam and Malone initially revealed that the minimum flow depth was not less than 1-foot with any of the downstream release alternatives. Boating depth increased incrementally as the continuous minimum flow release increased. However, a 1-foot threshold at any one given point on the river is not an accurate indicator of river navigability. Therefore, an additional depth analysis was performed to compare the change in surface water elevations at cross sections in the river under the various flow alternatives (Alabama Power and Kleinschmidt 2021b).

The 150 cfs continuous minimum flow alternative increased water surface elevation in the immediate tailrace by slightly over 0.25 feet compared to Green Plan (baseline), whereas the 300 cfs continuous minimum flow alternative increased approximately 0.75 feet compared to Green Plan (baseline) (Table 11-13).

Table 11-13 Change in Water Surface Elevation in the Tallapoosa River Downstream of Harris Dam (in Feet) Based on HEC-RAS Model of Downstream Release Alternatives Compared to Green Plan (Baseline)

ALTERNATIVE	MILES BELOW HARRIS DAM									
	0.4	0.6	0.8	1.0	1.5	2.0	2.5	3.0	4.4	6.0
GP (Baseline)	0	0	0	0	0	0	0	0	0	0
150 CMF	0.28	0.28	0.33	0.29	0.31	0.3	0.36	0.48	0.28	0.19
300 CMF	0.72	0.75	0.86	0.79	0.79	0.8	0.94	1.27	0.87	0.86

Source: Alabama Power and Kleinschmidt 2021b

Implementing a continuous minimum flow between 150 cfs and 300 cfs would have a beneficial effect on downstream recreation through additional boatable days, particularly in the fall, and increased river navigability (Alabama Power and Kleinschmidt 2021b).

Recreation Plan

Alabama Power evaluated recreation downstream of Harris Dam during relicensing and determined that recreation users using public access points on the Tallapoosa River downstream of Harris Dam were very satisfied; however, a majority would prefer additional downstream access points and improvements to existing amenities (Kleinschmidt 2020). Therefore, Alabama Power proposes to construct a new recreation access area in the Harris Project tailrace that would include canoe/kayak launch facilities. This additional access would have a beneficial effect by increasing recreational opportunities on the Tallapoosa River.

11.3 Unavoidable Adverse Impacts

11.3.1 Skyline

No unavoidable adverse impacts to recreation and land use at Skyline as a result of Alabama Power's proposal are anticipated.

11.3.2 Lake Harris

Alabama Power's proposal to continue operating the Project according to the existing operating curve would result in a continuation of some shoreline structures and public boat ramps being unusable during the winter pool drawdown. Continued and potentially increased recreation would likely contribute to shoreline erosion due to wind and wave action from boating activities, and public access along the shoreline. Impacts would be minimized and mitigated through shoreline BMPs identified in the SMP.

11.3.3 Tallapoosa River Downstream of Harris Dam

No unavoidable adverse impacts associated with recreation and land use are expected on the Tallapoosa River Downstream of Harris Dam due to Alabama Power's proposal.

12 AESTHETIC RESOURCES

12.1 Affected Environment

12.1.1 Skyline

Lands included in the Skyline area are predominately forested lands with some areas of agriculture. Distant views include rolling forested hills and agricultural lands within the valley. Views within the Skyline area include wooded forests, rock outcroppings, and streams, such as Little Coon Creek, that are characterized by rocky substrates and vegetative riparian areas along the banks (Alabama Power and Kleinschmidt 2018). Figure 12-1, Figure 12-2, and Figure 12-3 provide views within the Skyline area.

Source: Alabama Power and Kleinschmidt 2018

Figure 12-1 Aerial View of Skyline Area

Source: Alabama Power and Kleinschmidt 2018

Figure 12-2 Skyline Area Rock Outcrops

Source: Alabama Power and Kleinschmidt 2018

Figure 12-3 Little Coon Creek

12.1.2 Lake Harris

The Lake Harris Project Area is dominated by Lake Harris and surrounding forested hilly terrain, recreation areas, forested shoreline, areas of shoreline residential development, and Harris Dam and associated Project facilities. Lake Harris provides views of open waterway and coves with vegetated shoreline areas. The tailrace area below Harris Dam has naturally armored banks with exposed bedrock and some riprap lined areas. The northern portion of the Lake Harris Project Area includes the Tallapoosa River and is therefore more riverine in character (Alabama Power and Kleinschmidt 2018). Figure 12-4 through Figure 12-8 provide views of Lake Harris Project facilities, Lake Harris, and the tailrace area below Harris Dam.

Source: Alabama Power and Kleinschmidt 2018

Figure 12-4 Aerial View of Harris Dam and Powerhouse

Source: Alabama Power and Kleinschmidt 2018

Figure 12-5 Aerial View of Lake Harris

Source: Alabama Power and Kleinschmidt 2018

Figure 12-6 Aerial View of Lake Harris Shorelines

Source: Alabama Power and Kleinschmidt 2018

Figure 12-7 Harris Dam Tailrace Area

Source: Alabama Power and Kleinschmidt 2018

Figure 12-8 View of Tailrace Area from Harris Dam

Regional scenic attractions in the Lake Harris Project Vicinity include scenic views from Cheaha State Park and Talladega National Forest, both located approximately 30 miles northwest of Lake Harris in the foothills of the Appalachian Mountains (Alabama Power and Kleinschmidt 2018).

There are two National Scenic Byways located in the Lake Harris Project Vicinity. The 26.4-mile Talladega Scenic Drive provides sweeping views of scenic mountains, rock outcroppings, and small rural towns within the Talladega National Forest (USDOT 2020). The 80-mile Appalachian Highlands Scenic Byway crosses portions of Cleburne, Calhoun, Cherokee, and DeKalb counties and provides scenic views along winding roads surrounded by lush vegetation, unique geologic formations, and historic rural communities (Alabama Scenic Byways 2020).

There are no Wild and Scenic Rivers designated in the Harris Project Boundary or in the Lake Harris Project Vicinity (Alabama Power and Kleinschmidt 2018).

12.1.3 Tallapoosa River Downstream of Harris Dam

The Tallapoosa River begins in Georgia and flows through eastern Alabama, providing miles of navigable waters for public recreation and is characterized by clear water and rocky shoals and provides natural and historic views to paddlers (ASRT 2020) (Figure 12-9 through Figure 12-10). The Alabama Scenic River Trail, a designated National Recreation Trail with portions extending along the Coosa River, is located approximately 70 miles south of the Harris Project (National Recreation Trails 2017 as cited in Alabama Power and Kleinschmidt 2018). There are four dams along the Tallapoosa River with Harris Dam the most downstream. Along the Tallapoosa River downstream of Harris Dam are several recreation areas that provide access to the river including the HBCT. The HBCT includes four access points: Bibby's Ferry, Germanys Ferry; Horseshoe Bend, and Jaybird Landing (Figure 12-11 and Figure 12-12). The public can access and view the Tallapoosa River from these locations.

Source: Kleinschmidt 2020

Figure 12-9 Tallapoosa River Downstream of Harris Dam – View 1

Source: Kleinschmidt 2020

Figure 12-10 Tallapoosa River Downstream of Harris Dam – View 2

Source: Kleinschmidt 2020

Figure 12-11 Bibby's Ferry

Source: Kleinschmidt 2020

Figure 12-12 Jaybird Landing

Downstream of Lake Harris is the scenic Horseshoe Bend (Figure 12-13 and Figure 12-14), the site of the Battle of Horseshoe Bend with the Creek Nation. An overlook of the battlefield, a visitor center, and several miles of walking trails are available at this site.

Source: Kleinschmidt 2020

Figure 12-13 Horseshoe Bend National Military Park – View 1

Source: Kleinschmidt 2020

Figure 12-14 Horseshoe Bend National Military Park – View 2

12.2 Environmental Analysis

FERC did not identify aesthetics as an affected resource in their SD2[70]; therefore, Alabama Power did not conduct any studies specific to aesthetic resources during relicensing. Alabama Power conducted relicensing studies and associated analyses that may pertain to effects on aesthetic resources. Those analyses are presented in the following reports.

- **Final** *Phase 1 Project Lands Evaluation Study Report*

Table 12-1 includes the proposed operations and PME measures that may affect aesthetic resources at Skyline, Lake Harris, and the Tallapoosa River downstream of Harris Dam. Not all operations or PME measures apply to each geographic area of the Harris Project; therefore, the analysis of beneficial and adverse effects will be presented accordingly. A complete list of Alabama Power's operations and PME measures is located in Table 5-2.

Table 12-1 Proposed Operations and PME Measures That May Affect Aesthetic Resources

PROPOSED OPERATIONAL AND PME MEASURES THAT MAY AFFECT AESTHETIC RESOURCES
• Continue operating the Harris Project according to the existing operating curve and flood control procedures • Continue daily peak-load operations • Continue operating in accordance with ADROP to address drought management
• Design, install, operate, and maintain a minimum flow unit to provide a CMF between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam
• Implement a WMP for Lake Harris and Skyline ❖ Incorporate timber management into the WMP
• Develop and implement a SMP for Lake Harris ❖ Incorporate proposed changes in land use classifications (including reclassifying the botanical area at Flat Rock Park from recreation to natural/undeveloped) ❖ Continue implementing a shoreline classification system to guide management and permitting activities ❖ Continue the requirements of a scenic easement for the purpose of protecting scenic and environmental values ❖ Continue the use of a "sensitive resources" designation in conjunction with shoreline classifications on Project lands managed for the protection and enhancement of cultural resources, wetlands, and threatened and endangered species

[70] Accession No. 20181116-3065

12.2.1 Skyline

Wildlife Management Plan/Timber Management

Alabama Power proposes implement a WMP, including specific timber management actions and BMPs that reduce or prevent runoff, erosion, and sedimentation that may impact streams and waterbodies within Skyline.

Alabama Power's proposal to continue timber management as part of the WMP would have a beneficial effect by avoiding large, or total acreages of clear cutting, increasing the overall scenic value of the forested areas.

12.2.2 Lake Harris

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. This proposal would have no effect on aesthetic resources at Lake Harris since no change is proposed. The winter pool drawdown would continue as it is under existing operations; no new shoreline would be exposed, and shoreline currently exposed would not be inundated during the winter drawdown.

Wildlife Management Plan/Timber Management

Similar to Skyline, Alabama Power's proposal to continue timber management as part of the WMP would have a beneficial effect by avoiding large, or total acreages of clear cutting, increasing the overall scenic value of the forested areas.

Shoreline Management Plan

Alabama Power proposes to develop and implement a SMP for Lake Harris. The SMP would be modeled after other current Alabama Power project SMPs; this would allow uniformity in the way that Alabama Power would manage project shorelines across all their hydroelectric projects. Those activities implemented thought the SMP are described in Table 12-1 and Table 5-2.

Existing land use classifications at Lake Harris include recreational use (public use areas), hunting, prohibited access, and natural/undeveloped. Natural/undeveloped lands include lands that remain in an undeveloped state to serve as protective buffer zones around public recreation areas and shoreline areas, preserve natural aesthetic qualities, prevent overcrowding, and protect environmentally sensitive areas. Hiking and primitive camping activities and timber management activities are allowed on lands classified as natural/undeveloped (Alabama Power 2021b). During the Phase I Project Lands Evaluation, Alabama Power identified a need to modify the existing natural/undeveloped classification definition to match the natural/undeveloped lands definition in other Alabama Power SMPs. The SMP would include a modified definition for lands classified as natural/undeveloped, as follows to include Project lands that would remain undeveloped for the following specific Project purposes:

- Protecting environmentally sensitive areas
- Preserving natural aesthetic qualities
- Serving as buffer zones around public recreation areas
- Preventing overcrowding of partially developed shoreline

This classification allows for public hiking trails, nature studies, primitive camping, wildlife management (excluding hunting), and normal forestry management practices. Alabama Power typically owns these lands in fee simple title and manages them for effective protection of associated resource values (Alabama Power 2021b).

Alabama Power would also continue the requirements of a scenic easement for the purpose of protecting scenic and environmental values. Alabama Power maintains a scenic easement at Lake Harris on lands located between the 795-feet msl contour and the 800-feet[71] msl contour. No construction and/or related activity may take place within Alabama Power's scenic easement lands without Alabama Power's prior written authorization. Certain activities are not permitted within Alabama Power's scenic easement lands, including but not necessarily limited to changing the contour of the land; laying/seeding any sod, grass, and/or garden; constructing any habitable structure, fence or well; allowing the presence of any garbage, debris, or other foreign material; removing any tree measuring more than three inches in diameter; and clearing any shrubbery measuring more than 4-feet-tall (Alabama Power 2020).

The SMP would benefit aesthetic resources around Lake Harris through its specific actions included within the natural/undeveloped land use classification and the scenic easement. The natural/undeveloped and scenic easement land use classifications assist in protecting

[71] Or 50 horizontal feet from 793-feet msl, whichever is less, but never less than 795-feet msl.

environmentally sensitive areas and preserve the scenic easement at Lake Harris. Limiting the development and vegetative actions in the scenic easement maintains a more natural, scenic view, resulting in a beneficial effect on aesthetic resources. In addition, aesthetics would be considered as part of the design and construction of new Project recreation sites proposed in the Recreation Plan.

12.2.3 Tallapoosa River Downstream of Harris Dam

Continuous Minimum Flow

Alabama Power's proposal to implement a continuous minimum flow between 150 cfs and 300 cfs would result in a more stable riverine environment downstream of Harris Dam. Consistently wetted riparian areas would improve the scenic quality of the Tallapoosa River downstream of Harris Dam by minimizing or eliminating the occurrences of exposed riverbank during periods of low or no flow, having a beneficial effect on aesthetic resources in the Tallapoosa River.

12.3 Unavoidable Adverse Impacts

12.3.1 Skyline

During timber management activities, there would be short-term adverse aesthetic impacts from timber harvests immediately following these management actions. Implementing timber management actions through the WMP, including replanting and rotation of areas affected, would minimize the overall aesthetic effect.

12.3.2 Lake Harris

Similar to Skyline, during timber management activities around Lake Harris, there would be short-term adverse aesthetic impacts from timber harvests immediately following these management actions. Implementing timber management actions through the WMP including replanting and rotation of areas affected would minimize the overall aesthetic effect. In addition, the revised definition for natural/undeveloped land use classification would continue to preserve aesthetic qualities at the Project and therefore, there would be no unavoidable adverse impacts.

Construction at existing and proposed recreation sites at Lake Harris would result in short-term unavoidable adverse impacts to aesthetics in the immediate recreation area limited to the period of construction. BMPs and closure of the recreation sites during construction would minimize undesirable views and noise from construction.

12.3.3 Tallapoosa River Downstream of Harris Dam

Short-term unavoidable adverse impacts associated with the proposed installation of a minimum flow unit at Harris Dam include an increase in noise and impaired and undesirable views around the powerhouse due to construction. These impacts are temporary during construction periods and would not impact the Harris Project area once construction is complete.

In addition, construction of the new canoe/kayak access area located downstream of the Harris Dam would result in short-term unavoidable adverse impacts to aesthetics in the immediate tailrace area limited to the period of construction.

13 CULTURAL RESOURCES

13.1 Affected Environment

13.1.1 Skyline

13.1.1.1 Discovery Measures and Identified Cultural Resources

An initial review of the Alabama Cultural Resources Online Database, housed at the Office of Archaeological Resources (OAR) and consisting of the National Archaeological Database Bibliography, the Alabama State Site File (ASSF) (OAR 2017 as cited in Alabama Power and Kleinschmidt 2018) and the Alabama Phase I Surveys Website (OAR 2014 as cited in Alabama Power and Kleinschmidt 2018) identified two previous cultural surveys and 141 sites within the Skyline WMA. All 141 sites are listed as undetermined regarding National Register of Historic Places (NRHP) eligibility (Alabama Power and Kleinschmidt 2018). There are also 198 recorded caves in the Skyline Project Boundary.

Alabama Power worked with the State Historic Preservation Office (SHPO), FERC, and applicable tribes to select 29 sites for reassessment at Skyline. The Skyline assessment also included 11 caves and 1.66 miles of discontinuous bluff line. The complete results are presented in "A Cultural Resources Assessment Of Select Sites In The James D. Martin-Skyline Wildlife Management Area As Part Of The Harris Project In Jackson County, Alabama" with the draft HPMP.

13.1.2 Lake Harris

13.1.2.1 Discovery Measures and Identified Cultural Resources

An initial review of the Alabama Cultural Resources Online Database, housed at OAR and consisting of the National Archaeological Database Bibliography, ASSF (OAR 2017 as cited in Alabama Power and Kleinschmidt 2018) and the Alabama Phase I Surveys Website (OAR 2014 as cited in Alabama Power and Kleinschmidt 2018) identified 29 previous cultural surveys and 330 sites[72] within the Lake Harris Project Area.

[72] The 2018 Harris Pre-Application Document identified 16 previous cultural resources surveys and 327 sites within the Lake Harris Project Area. In March 2019, Alabama Power presented stakeholders with a revised list of 330 archeological sites in the Lake Harris Project Area. The "A Cultural Resources Assessment Of Select Sites On The Alabama Power Company Lands In The R.L. Harris Reservoir In Randolph County" report lists 29 previously conducted Phase I surveys within a one-mile radius of the survey area.

From these 330 sites within the Lake Harris Project Area, Alabama Power worked with the SHPO, FERC, and applicable tribes to identify 101 sites[73] in the Lake Harris Project Area for a preliminary assessment. This assessment did not include systematic shovel testing. It was intended to address sites that were originally mis-plotted, that are clearly deflated beyond the potential to retain intact cultural deposits, lay below the winter drawdown and are inaccessible year round, or that have been subjected to alteration that has negated their potential to contain intact cultural deposits (e.g., developed). After the preliminary assessment, a total of 52 sites which appeared to retain integrity were investigated. Results from the investigation of these 52 sites are presented in "A Cultural Resources Assessment of Select Sites on the Alabama Power Company Lands in the R.L. Harris Reservoir in Randolph County" with the draft HPMP.

13.1.3 Tallapoosa River Downstream of Harris Dam

13.1.3.1 Discovery Measures and Identified Cultural Resources

Alabama Power worked with OAR to identify 19 cultural sites in the Tallapoosa River downstream of Harris Dam through Horseshoe Bend[74]. Of the 19 sites in the Tallapoosa River, six are recommended eligible for listing or listed in the NRHP, four are recommended ineligible, and nine have undetermined NRHP eligibility.

Of the 19 sites, a primary point of interest in the area downstream of Harris Dam is the Miller Covered Bridge piers. The Miller Covered Bridge was built in 1908 and was once the longest covered bridge in the United States at 600-feet in length. It has become recognized as a significant cultural resource associated with Horseshoe Bend and, as such, the NPS requested specific consideration of the resource be taken regarding potential impacts from downstream flows. The remnants of the bridge include abutments on the left and right banks of the Tallapoosa River, as well as four stone and masonry piers within the river that are constantly affected by the flow of the river, as the piers stand on the riverbed.

[73] Initially 96 sites were identified for a preliminary assessment, which included sites identified by the Muscogee (Creek) Nation in their August 16, 2019 letter (1Ra32, 1Ra307, 1Ra362, 1Ra381, 1Ra313, 1Ra393, 1Ra394, 1Ra408, 1Ra437, 1Ra438, 1 Ra35, 1 Ra380, 1 Ra401, 1Ra402, 1 Ra403, 1 Ra9 , 1 Ra 11, 1 Ra441). Later the Muscogee (Creek) Nation requested the addition of a few other sites for a total of 101 sites.

[74] One of the 19 downstream sites is located within the Harris Project Boundary, however, many of these resources are on private property and not within Alabama Power's jurisdiction.

13.2 Environmental Analysis

Alabama Power conducted relicensing studies and associated analyses that pertain to effects on cultural resources. Those analyses are presented in the following reports.

- Inadvertent Discovery Plan
- Traditional Cultural Properties Identification Plan
- **Final** *Area of Potential Effects Report*
- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*

Table 13-1 includes the proposed operations and PME measures that may affect cultural resources at Skyline, Lake Harris, and the Tallapoosa River Downstream of Harris Dam. Not all operations or PME measures apply to each geographic area of the Harris Project; therefore, the analysis of beneficial and adverse effects will be presented accordingly. A complete list of Alabama Power's operations and PME measures is located in Table 5-2.

Table 13-1 Proposed Operations and PME Measures That May Affect Cultural Resources

PROPOSED OPERATIONAL AND PME MEASURES THAT MAY AFFECT CULTURAL RESOURCES
• Continue operating the Harris Project according to the existing operating curve and flood control procedures • Continue daily peak-load operations • Continue operating in accordance with ADROP to address drought management
• Design, install, operate, and maintain a minimum flow unit to provide a CMF between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam
• Develop and implement a SMP for Lake Harris ❖ Continue to encourage the use of alternative bank stabilization techniques other than seawalls ❖ Continue implementing a shoreline classification system to guide management and permitting activities ❖ Continue the use of a "sensitive resources" designation in conjunction with shoreline classifications on Project lands managed for the protection and enhancement of cultural resources, wetlands, and threatened and endangered species ❖ Continue implementing a shoreline compliance program and shoreline permitting program ❖ Continue to encourage the adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines, to preserve and improve the water quality of the Project's reservoir, and to control soil erosion and sedimentation
• Finalize and implement a HPMP ❖ Include aspects of the TCP Identification Plan and the IDP ❖ Provisions for training with appropriate Alabama Power personnel on looting. In addition, Alabama Power will explore options for training for indications of looting beyond Alabama Power personnel and/or its contactors. ❖ Include strategies for mitigation for potential adverse effects to historic properties within the Project Area of Potential Effects (APE) ❖ Provisions for the National Register of Historic Places (NRHP) eligibility evaluation of Harris Dam facilities in 2033 ❖ Develop a best management practices brochure (printed and online editions) for managing cultural resources on private lands ❖ Develop mitigation procedures for any adverse effects of Project operations on the Miller Covered Bridge piers, as necessary, after consultation with SHPO and NPS

13.2.1 Skyline

<u>Historic Properties Management Plan</u>

Alabama Power proposes to finalize and implement a HPMP to govern management of historic properties in the Project's Area of Potential Effects (APE) over the term of a new license. Alabama Power consulted with the Alabama Historical Commission (Alabama State SHPO) and the applicable tribes pursuant to Section 106 of the National Historic

Preservation Act (NHPA) (Alabama Power 2020c). The Draft HPMP contains the elements listed below.

- Aspects of the Traditional Cultural Properties (TCP) Identification Plan and the Inadvertent Discovery Plan (IDP)
- Provisions for training with appropriate Alabama Power personnel on looting. In addition, Alabama Power will explore options for training for indications of looting beyond Alabama Power personnel and/or its contractors.
- Strategies for mitigation for potential adverse effects to historic properties within the Project APE.
- Provisions for the NRHP eligibility evaluation of Harris Dam facilities in 2033.
- Provisions to develop a BMP brochure (printed and online editions) for the managing of cultural resources on private lands.

The Draft HPMP would include aspects of the IDP and the TCP Identification Plans, to further ensure protection of historic properties within the APE. Alabama Power's IDP establishes procedures in the event of an inadvertent discovery of any human remains and/or historic properties within the APE (Alabama Power 2020c). These procedures were developed in consultation with the Alabama SHPO, FERC, and applicable tribes (Alabama Power 2020e).

TCPs are defined by the Department of the Interior NPS as a historic property that displays significance "derived from the role the property plays in a community's historically rooted beliefs, customs, and practices" (NPS 2012 as cited in Alabama Power 2020d). Alabama Power's TCP Identification Plan establishes procedures for identifying TCPs in the APE of the Harris Project (Alabama Power 2020c).

Alabama Power began implementing the TCP Identification Plan in April 2020. The HPMP includes strategies for mitigation for potential adverse effects to historic properties. In addition, the HPMP would assist Alabama Power in historic preservation and the management of historic properties at Skyline. Alabama Power plans to file a final HPMP with the FLA.

13.2.2 Lake Harris

Continued Operations (Normal, Flood, Drought)

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. Alabama Power's proposal could potentially result in adverse effects on historic properties from forces such as wind erosion, recreational activities, and vandalism at the same level as occurs under existing operations; therefore, there would be no changes to the effects on historic properties along the shoreline of the Harris Reservoir. The type and level of these effects vary depending on the location, size, and visibility of the historic properties.

Continuous Minimum Flow

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. The proposed continuous minimum flow would not affect Harris Reservoir elevations on average. Therefore, historic properties identified in the Lake Harris Project Boundary would not be affected by Alabama Power's proposed continuous minimum flow.

Shoreline Management Plan

Alabama Power proposes to develop and implement a SMP for Lake Harris. The SMP would benefit historic properties in the Lake Harris Project Boundary through its specific actions included to minimize erosion including continuing to encourage the use of alternative bank stabilization techniques other than seawalls and continuing to encourage the adoption of shoreline BMPs, including BMPs to maintain and preserve naturally vegetated shorelines and to control soil erosion and sedimentation (Alabama Power 2021b). In addition, the SMP would continue the use of a "sensitive resources" designation in conjunction with shoreline classifications on Project lands managed for the protection and enhancement of cultural resources, wetlands, and T&E species. Alabama Power would continue to maintain current GIS data on the locations of shoreline classified as sensitive resources and would continue to require an internal environmental review for any proposed activity in these sensitive areas prior to issuance of any permit.

<u>Historic Properties Management Plan</u>

As noted in Section 13.2.1, Alabama Power proposes to finalize and implement a HPMP to govern management of historic properties in the Project's APE over the term of a new license. The HPMP includes strategies for mitigation for potential adverse effects to historic properties eligible or potentially eligible for the National Register at Lake Harris. In addition, the HPMP includes provisions to determine the NRHP eligibility of the Harris powerhouse and dam. The Harris Dam facilities, completed in 1983, are less than 50 years of age, and, therefore, are not yet eligible for listing to the NRHP. When the Harris Dam facilities reach the minimum age criterion for listing in the NRHP (in 2033), the facilities would be evaluated for significance and determination for NRHP eligibility (NPS 1997 as cited in Alabama Power and Kleinschmidt 2018).

13.2.3 Tallapoosa River Downstream of Harris Dam

<u>Continued Operations (Normal, Flood, Drought)</u>

Alabama Power proposes to continue operating the Harris Project during daily peak-load periods according to the existing operating curve, flood control procedures, and ADROP. Therefore, no change in potential impacts to historic properties in the Tallapoosa River downstream of Harris Dam is expected.

<u>Continuous Minimum Flow</u>

Alabama Power proposes to design, install, operate, and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River below Harris Dam. During the Downstream Release Alternatives analysis, existing information (elevation data [LiDAR], aerial imagery, and topographic data), the HEC-RAS model, and expert opinions were used to qualitatively evaluate the effect of the proposed continuous minimum flow on specific cultural resources.

In addition, Alabama Power commissioned OAR to provide quantitative analysis on the impact of different flows to cultural resources downstream of Harris Dam to Horseshoe Bend. OAR used the flow stage data provided by the HEC-RAS model and LiDAR to produce a three-foot digital elevation model (DEM). OAR then used the DEM to determine cultural resources that are subject to inundation and the downstream alternative releases where fluctuation, wave action, and flowage had the potential to remove sediment and result in various forms of adverse effect. Appendix J (filed as privileged) includes a spreadsheet showing modeled elevation data for each of the 19 cultural resources sites downstream of Harris Dam to Horseshoe Bend and associated maps. The elevation data shows each site under the analyzed flow scenarios and the minimum/maximum site elevation. These elevations were used to show the percent of time each site is underwater with each of the different flows.

The inundation of cultural resources below Harris Dam is considered differently than those above the dam. Cultural resources inundated within the reservoir do not experience the same effects as those along the river channel below the dam where the flow velocity of the river is greater. In the reservoir, inundation can serve as a protective measure for sites, removing them from some potential impacts caused by recreational activity, looting, erosion from exposure, wave action, and fluctuating water levels. However, below the dam, inundation more often results in scouring and removal of overlying protective vegetation and sediments (Alabama Power and Kleinschmidt 2021b).

As presented in the *Draft Downstream Release Alternatives Phase 2 Study Report*, the 19 cultural resource sites on the Tallapoosa River downstream of Harris Dam are inundated 49.4 percent of the time under Green Plan (baseline). Under the proposed continuous minimum flow, 11 of the cultural resources were inundated for a similar amount of time compared to Green Plan (baseline) (Alabama Power and Kleinschmidt 2021b. Inundation compared to Green Plan (baseline) at the eight affected sites only differed by an increase in inundation 0.2 percent of the time at 150 cfs continuous minimum flow and 1.9 percent of the time at 300 cfs continuous minimum flow. This increase in inundation at these eight sites is minimal. Alabama Power's proposal to provide a continuous minimum flow between 150 cfs and 300 cfs would have similar impacts to cultural resources downstream of Harris Dam as those of Green Plan (baseline) operations and would therefore not be expected to cause new or additional adverse impacts to cultural resources. Additional information on flows and the sites downstream of Harris Dam to Horseshoe Bend is presented in Appendix J (filed as "Privileged").

Historic Properties Management Plan

The HPMP would assist Alabama Power in historic preservation and the management of historic properties in the Tallapoosa River downstream of Harris Dam, specifically through developing a BMP brochure for protecting cultural resources on private property. In addition, Alabama Power would develop mitigation procedures for any adverse effects of

Project operations on the Miller Covered Bridge piers, as necessary, after consultation with SHPO and NPS.

13.3 Unavoidable Adverse Impacts

13.3.1 Skyline

The HPMP allows for consideration and appropriate management of effects from Harris Project operations to historic properties. The HPMP, however, does not prevent all adverse impacts to eligible or potentially eligible historic properties. The HPMP includes methods as to how an assessment of effects and resolution to adverse effects on historic properties will be achieved.

13.3.2 Lake Harris

The HPMP allows for consideration and appropriate management of effects from Harris Project operations to historic properties. The HPMP, however, does not prevent all adverse impacts to eligible or potentially eligible historic properties. The HPMP includes methods as to how an assessment of effects and resolution to adverse effects on historic properties will be achieved.

13.3.3 Tallapoosa River Downstream of Harris Dam

The HPMP allows for consideration and appropriate management of effects from Harris Project operations to historic properties. The HPMP, however, does not prevent all adverse impacts to eligible or potentially eligible historic properties. The HPMP includes methods as to how an assessment of effects and resolution to adverse effects on historic properties will be achieved.

14 REFERENCES

Alabama Department of Public Health (AL Department of Public Health). 2020. Alabama Fish Consumption Advisories 2020. URL: https://www.alabamapublichealth.gov/tox/fish-advisories.html. Accessed April 28, 2021.

Alabama Department of Environmental Management (ADEM). 2020a. Alabama Department of Environmental Management 303(d) List. Montgomery, AL. Available online: http://adem.alabama.gov/programs/water/wquality/2020AL303dList.pdf.

Alabama Department of Environmental Management (ADEM). 2018. 2018 Alabama §303(d) List. [Online] URL: http://adem.state.al.us/programs/water/wquality/2018AL303dList.pdf. Accessed May 3, 2021.

Alabama Department of Environmental Management (ADEM) 2017. Final Total Maximum Daily Load (TMDL) For Little Tallapoosa River.

Alabama Power Company (Alabama Power). 2021a. Draft Wildlife Management Plan. R.L. Harris Hydroelectric Project. (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Power Company (Alabama Power). 2021b. Draft Shoreline Management Plan for the R.L. Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Power Company (Alabama Power) 2020a. Initial Study Report for the R. L. Harris Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Power Company (Alabama Power). 2020b. Phase I Project Lands Evaluation Study Report. FERC No. 2628. Alabama Power Company. Birmingham, AL.

Alabama Power Company (Alabama Power). 2020c. Area of Potential Effects (APE) for Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Power Company (Alabama Power). 2020d. Traditional Cultural Property (TCP) Identification Plan for Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Power Company (Alabama Power). 2020e. Inadvertent Discovery Plan (IDP) for Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Power Company and Kleinschmidt Associates (Alabama Power and Kleinschmidt). 2021a. Operating Curve Change Feasibility Analysis Draft Phase 2 Study Report (FERC No. 2628). Alabama Power Company, Birmingham, AL

Alabama Power Company and Kleinschmidt Associates (Alabama Power and Kleinschmidt). 2021b. Downstream Release Alternatives Draft Phase 2 Study Report (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Power Company and Kleinschmidt Associates (Alabama Power and Kleinschmidt). 2021c. R.L. Harris Final Aquatic Resources Study Report (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Power Company and Kleinschmidt Associates (Alabama Power and Kleinschmidt). 2018. Pre-Application Document for the R.L. Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Alabama Scenic Byways. 2020. The Appalachian Highlands Scenic Byway. Available at: https://www.alabamabyways.com/2013/01/01/the-appalachian-highlands-scenic-byway/. Accessed November 5, 2020.

Alabama Scenic River Trail (ASRT). 2020. Tallapoosa-Upper Tallapoosa and Little Tallapoosa Rivers. Available at: https://www.alabamascenicrivertrail.com/rivers/tallapoosa-river/. Accessed November 5, 2020.

Auburn University. 2021. Using Bioenergetics to Address the Effects of Temperature and Flow on Fishes in the Harris Dam Tailrace. Final Report prepared for Alabama Power Company. January 2021.

Center for Business and Economic Research (CBER). 2017. Population Estimates and Projections. University of Alabama. https://cber.cba.ua.edu/edata/est_prj.html. Accessed May 6, 2021.

City-Data. 2007. Sherwood Tennessee. https://www.city-data.com/city/Sherwood-Tennessee.html#b. Accessed March 2021.

Diggs James T, Katie N. Horton, Daniel Spaulding, and David M. Frings. December 2020. A Botanical Inventory of a 35-Acre Parcel at Flat Rock Park, Blakes Ferry, Alabama.

Federal Energy Regulatory Commission (FERC). 2018a. Scoping Document 1 for the R.L. Harris Hydroelectric Project. Washington, DC.

Federal Energy Regulatory Commission (FERC). 2018b. Scoping Document 2 for the R.L. Harris Hydroelectric Project. Washington, DC.

Geological Survey of Alabama (GSA) 2006. Geologic map of Alabama, digital version 1.0: Alabama Geological Survey Special Map 220A [adapted from Szabo, M. W., Osborne, W. E., Copeland, C. W., Jr., and Neathery, T. L., 1988, Geologic map of Alabama (1:250,000): Alabama Geological Survey Special Map 220].

Kleinschmidt Associates (Kleinschmidt). 2021a. R.L. Harris Final Erosion and Sedimentation Study Report (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Kleinschmidt Associates (Kleinschmidt) 2021b. R.L. Harris Final Water Quality Study Report (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Kleinschmidt Associates (Kleinschmidt) 2021c. R.L. Harris Final Threatened and Endangered Species Study Report (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Kleinschmidt Associates (Kleinschmidt) 2020. R.L. Harris Project (FERC No. 2628) Recreation Evaluation Report. Subcontracted with Dr. Kevin Hunt and Southwick Associates. Prepared for Alabama Power Company. July 2020.

National Park Service (NPS). 2021. National Park Service Visitor Use Statistics: Horseshoe Bend NMP (HOBE). Available at https://irma.nps.gov/STATS/Reports/Park/HOBE. Accessed April 28, 2021.

National Wetlands Inventory (NWI) 2021. Available at National Wetlands Inventory (fws.gov). Accessed April 28, 2021

Natural Resources Conservation Service (NRCS). 2016. Web Soil Survey. Available at: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed November 2, 2016.

Neilson, M. 2013. Encyclopedia of Alabama: Cumberland Plateau Physiographic Section. Available at: http://www.encyclopediaofalabama.org/article/h-1301. Accessed November 28, 2016.

O'Neil, P.E. and T.E. Shephard. 2010. Calibration of the Index of Biotic Integrity for the Tennessee Valley Ichthyo region in Alabama. Open-File Report 1004. Geological Survey of Alabama, Tuscaloosa, Alabama.

Tennessee Valley Authority (TVA). 2008. Water Use in the Tennessee Valley for 2005 and Projected Use in 2030. https://www.gsa.state.al.us/downloads/SGAP/Tennessee%20River%20Watershed/USGS%20watersupply_report_to_2030.pdf. Accessed March 2021.

U.S. Census Bureau 2019a. Annual Estimates of the Resident Population for Incorporated Places in Alabama: April 1, 2010 to July 1, 2019. Available: https://www.census.gov/data/tables/time-series/demo/popest/2010s-total-cities-and-towns.html. Accessed October 2020.

U.S. Census Bureau. 2019b. Vintage 2019 Population Estimates. Hytop town, Alabama. 2019 Population Estimates. https://www.census.gov/search-results.html?searchType=web&cssp=SERP&q=Hytop%20town,%20AL. Accessed March 2021.

U.S. Census Bureau. 2019c. Vintage 2019 Population Estimates. Stevenson city, Alabama. https://www.census.gov/search-results.html?searchType=web&cssp=SERP&q=Stevenson%20city,%20AL. Accessed March 2021.

US Department of Transportation (USDOT) 2020. Federal Highway Administration America's Byways: Talladega Scenic Drive. Available at: https://www.fhwa.dot.gov/byways/byways/2057. Accessed November 5, 2020.

APPENDIX A

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

#

150CMF	150 cubic feet per second continuous minimum flow
150CMF+GP	150 cubic feet per second continuous minimum flow + Green Plan
300CMF	300 cubic feet per second continuous minimum flow
300CMF+GP	300 cubic feet per second continuous minimum flow + Green Plan
600CMF	600 cubic feet per second continuous minimum flow
600CMF+GP	600 cubic feet per second continuous minimum flow + Green Plan
800 CMF	800 cubic feet per second continuous minimum flow
800CMF+GP	800 cubic feet per second continuous minimum flow + Green Plan

A

A&I	Agricultural and Industrial
ACFWRU	Alabama Cooperative Fish and Wildlife Research Unit
ACT	Alabama-Coosa-Tallapoosa (River Basin)
ADCNR	Alabama Department of Conservation and Natural Resources
ADEM	Alabama Department of Environmental Management
ADROP	Alabama-ACT Drought Response Operations Plan
Alabama Power	Alabama Power Company
ALEA	Alabama Law Enforcement Agency
ALNHP	Alabama Natural Heritage Program
AMP	Adaptive Management Plan
APE	Area of Potential Effects
ASSF	Alabama State Site File
AWW	Alabama Water Watch

B

BCC	Birds of Conservation Concern
BESS	Battery Energy Storage System
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice

C

°C	Degrees Celsius
Cahaba Consulting	Cahaba Consulting, LLC
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
cfs	Cubic Feet per Second
CMF	Continuous Minimum Flow
COVID-19	Coronavirus Disease 2019
CWA	Clean Water Act
CY	Cubic yards

D

DEM	Digital Elevation Model
DIL	Drought Intensity Level
DSF	Day second feet

E

ECOS	Environmental Conservation Online System
EPRI	Electric Power Research Institute
EPT	Ephemeroptera, Plecoptera, or Trichoptera Orders
ESA	Endangered Species Act

F

°F	Degrees Fahrenheit
F&W	Fish and Wildlife
FERC	Federal Energy Regulatory Commission
FLA	Final License Application

G

GIS	Geographic Information System
GP	Green Plan (baseline)
GPS	Global Positioning System
GSA	Geological Survey of Alabama

H

Harris Dam	R.L. Harris Dam
Harris Project	R.L. Harris Hydroelectric Project
Harris WCM	Harris Water Control Manual
HAT	Harris Action Team
HBCT	Harold Banks Canoe Trail
HDSS	High Definition Stream Survey
HEC-RAS	Hydrologic Engineering Center's River Analysis System
HEC-ResSim	Hydrologic Engineering Center's Reservoir System Simulation
Horseshoe Bend	Horseshoe Bend National Military Park
hp	Horsepower
HPMP	Historic Properties Management Plan

I

IBI	Index of Biological Integrity
IDP	Inadvertent Discovery Plan
ILP	Integrated Licensing Process
IPaC	Information Planning and Conservation
ISR	Initial Study Report

K

Kleinschmidt	Kleinschmidt Associates
kV	Kilovolt
kVA	Kilovolt-amp

L

LiDAR	Light Detection and Ranging
LWF	Limited Warm-water Fishery

M

M&I	Municipal and Industrial
mgd	Million Gallons per Day
mg/L	Milligrams per liter
µg/L	Micrograms per liter
µs/cm	Microsiemens per centimeter

ModGP	Modified Green Plan
MOU	Memorandum of Understanding
MRLC	Multi-Resolution Land Characteristics
msl	Mean Sea Level
MW	Megawatt
MWh	Megawatt Hour

N

NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NPS	National Park Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory

O

OAR	Office of Archaeological Resources
OAW	Outstanding Alabama Water
ORV	Off-road Vehicle
OWR	Office of Water Resources

P

PA	Programmatic Agreement
PAD	Pre-Application Document
PID	Preliminary Information Document
PLP	Preliminary Licensing Proposal
PME	Protection, Mitigation, and Enhancement
PreGP or PGP	Pre-Green Plan
Project	R.L. Harris Hydroelectric Project
PWS	Public Water Supply

R

RCW	Red-cockaded Woodpecker

RM	River Mile
RV	Recreational Vehicle

S

S	Swimming
SD1	Scoping Document 1
SD2	Scoping Document 2
SH	Shellfish Harvesting
SHPO	State Historic Preservation Office
Skyline WMA	James D. Martin-Skyline Wildlife Management Area
SMP	Shoreline Management Plan
SPD	Study Plan Determination

T

T&E	Threatened and Endangered
TCP	Traditional Cultural Properties
TMDL	Total Maximum Daily Load
Trutta	Trutta Environmental Solutions
TVA	Tennessee Valley Authority

U

USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USR	Updated Study Report

W

WCM	Water Control Manual
WMP	Wildlife Management Plan
WSGB	Wedowee Water, Sewer, and Gas Board

APPENDIX B

PROJECT OPERATIONS

1. USACE 2013 MASTER WATER CONTROL MANUAL
2. USACE 2014 FINAL ENVIRONMENTAL IMPACT STATEMENT – UPDATE OF THE WATER CONTROL MANUAL, VOLUME 2: APPENDIX A (I)
3. 2016 REVISED ALABAMA-ACT DROUGHT RESPONSE OPERATIONS PLAN (ADROP)
4. FINAL R.L. HARRIS 2018 DOWNSTREAM FLOW ADAPTIVE MANAGEMENT HISTORY AND RESEARCH REPORT
5. JANUARY 31, 2018 PRESENTATION - ADAPTIVE MANAGEMENT OF DOWNSTREAM FLOWS
6. JANUARY 31, 2018 PRESENTATION - RESERVOIR OPERATIONS ON THE APC HYDRO SYSTEM

1. USACE 2013 MASTER WATER CONTROL MANUAL

US Army Corps of Engineers ®
Mobile District

MASTER WATER CONTROL MANUAL

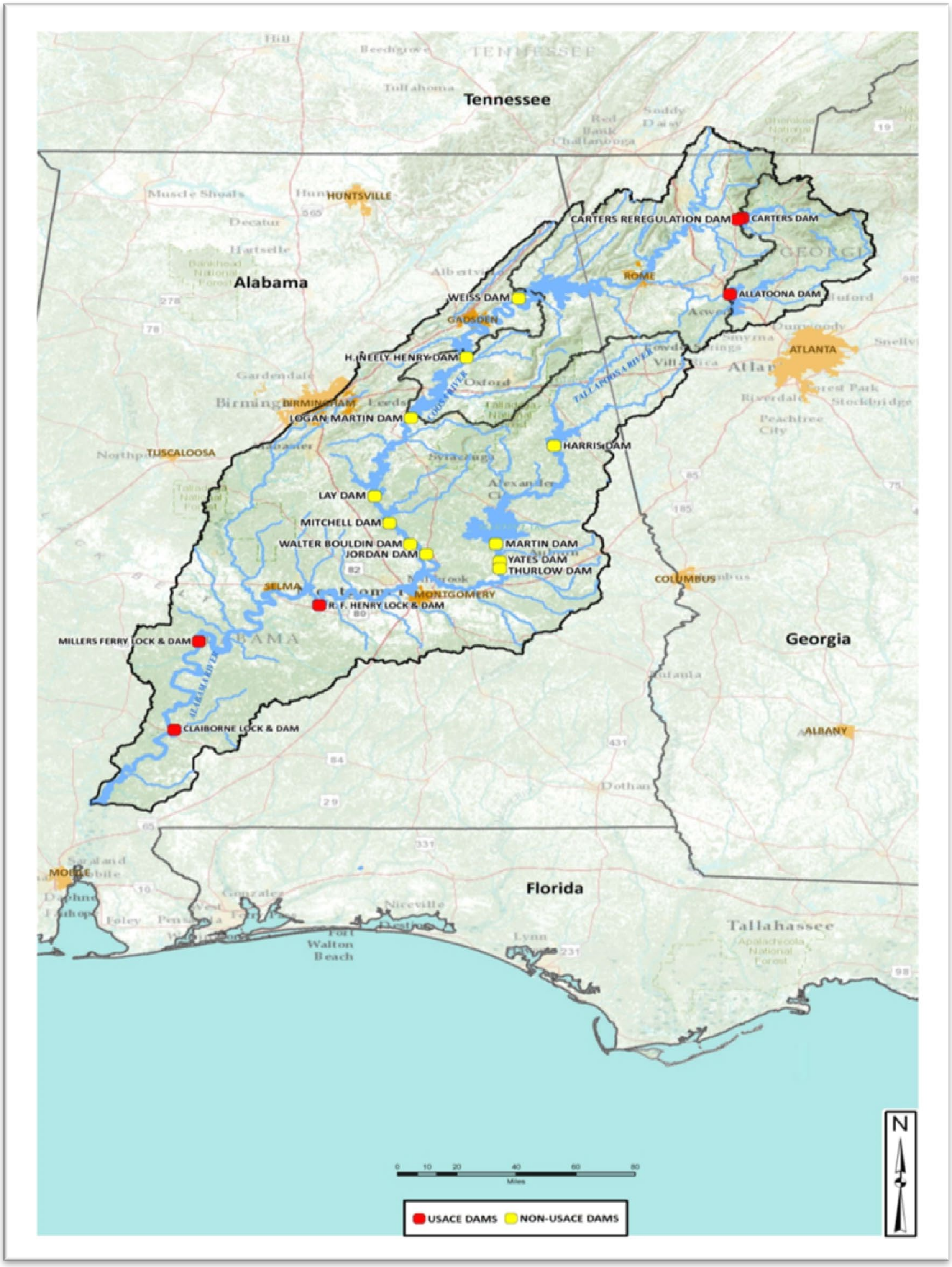
ALABAMA-COOSA-TALLAPOOSA (ACT) RIVER BASIN

ALABAMA, GEORGIA

U.S. ARMY CORPS OF ENGINEERS
SOUTH ATLANTIC DIVISION
MOBILE DISTRICT
MOBILE, ALABAMA

Final Draft

March 2013



ACT River Basin

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in a hard copy binder with loose-leaf form, and only those sections, or parts thereof; requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the manual current. Changes to individual pages must carry the date of revision, which is the Division's approval date.

REGULATION ASSISTANCE PROCEDURES

If unusual conditions arise, contact can be made with the Water Management Section, Mobile District Office at (251) 690-2737 during regular duty hours and (251) 490-9535 during non-duty hours. The individual projects can be reached at the following telephone numbers during regular duty hours:

Allatoona Dam and Lake (Allatoona Powerhouse) - (770) 382-4700

Carters Dam and Lake and Reregulation Dam (Carters Powerhouse) - (706) 334-2640

Robert F. Henry Lock and Dam (Jones Bluff Powerhouse) - (334) 875-4400

Millers Ferry Lock and Dam (Millers Ferry Powerhouse) – (334) 682-9124

Claiborne Lock and Dam (Lock Foreman) – (334) 872-4017 or
(Millers Ferry Powerhouse) – (334) 682-9124.

UNIT CONVERSION

This manual uses the U.S. Customary System of Units (English units). Exhibit A contains a conversion table that can be used for common unit conversions and for unit conversion to the metric system of units.

VERTICAL DATUM

All vertical data presented in this manual are referenced to the project's historical vertical datum, National Geodetic Vertical Datum of 1929 (NGVD29). It is the U.S. Army Corps of Engineers' (Corps) policy that the designed, constructed, and maintained elevation grades of projects be reliably and accurately referenced to a consistent nationwide framework, or vertical datum - i.e., the National Spatial Reference System (NSRS) or the National Water Level Observation Network (NWLON) maintained by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration. The current orthometric vertical reference datum within the NSRS in the continental United States is the North American Vertical Datum of 1988 (NAVD88). The current NWLON National Tidal Datum Epoch is 1983 - 2001. The relationships among existing, constructed, or maintained project grades that are referenced to local or superseded datums (e.g., NGVD29, MSL), the current NSRS, and/or hydraulic/tidal datums, have been established per the requirements of Engineering Regulation (ER) 1110-2-8160 and in accordance with the standards and procedures as outlined in Engineering Manual 1110-2-6056. A Primary Project Control Point (PPCP) has been established at each of the five federal projects and linked to the NSRS. Information on the PPCP, for each project, and the relationship between current and legacy datums are in Exhibit B of each project water control manual appendix.

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PERTINENT DATA
FOR EXISTING RESERVOIR PROJECTS IN THE
ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

Allatoona Dam

Structure type	Gravity concrete
Length	1,250 feet
Maximum height	200 feet
Lake elevation (full summer pool)	840 feet NGVD29
Lake elevation (full winter pool)	823 feet NGVD29
Lake area acres (elev 840)	11,862 acres
Shoreline miles (elev 840)	270 miles
Drainage area	1,122 square miles
Generating capacity (declared)	82.2 MW

Carters Dam

Structure type	Rock fill and earth fill
Length	2,053feet
Maximum height	445 feet
Lake elevation (full summer pool)	1,074 feet NGVD29
Lake elevation (full winter pool)	1,072 feet NGVD29
Lake area acres (elev 1,074)	3,275 acres
Shoreline miles (elev 1,074)	62.7 miles
Drainage area	374 square miles
Generating capacity (declared)	600 MW

Carters Reregulation Dam

Structure type	Gated spillway with rock-fill dikes
Length	2,855 feet
Maximum pool elevation	698 feet NGVD29
Top of dike elevation	703 feet NGVD29
Lake area acres	870 acres
Usable Storage	17,210 acre-feet
Drainage area (local to reregulation pool)	148 square miles
Spillway Gates	4 @ 42 feet long by 36.5 feet high

Robert F. Henry Lock and Dam

Structure type	Gravity concrete and earth fill
Length (earth dikes)	15,290 feet
Length (concrete)	646 feet
Maximum height	105 feet
Lake elevation	126 feet NGVD29
Lake area acres	13,500 acres
Shoreline miles	368 miles
Drainage area	16,233 square miles
Generating capacity (declared)	82 MW

Millers Ferry Lock and Dam

Structure type	Gravity concrete and earth fill
Length (earth dikes)	15,300 feet
Length (concrete)	994 feet

Maximum height	140 feet
Lake elevation	80.8 feet NGVD29
Lake area acres	18,528 acres
Shoreline miles	516 miles
Drainage area	20,637 square miles
Generating capacity (declared)	90 MW

Claiborne Lock and Dam

Structure type	Gravity concrete and earth fill
Length (earth dikes)	2,550 feet
Length concrete)	916 feet
Maximum height	75 feet
Lake elevation	36 feet NGVD29
Lake area acres	6,290 acres
Shoreline miles	204 miles
Drainage area	21,473 square miles
Generating capacity	N/A

R. L. Harris Dam

Structure type	Gravity concrete
Length	1,142 feet
Maximum height	151 feet
Lake elevation	793 feet NGVD29
Lake area acres	10,660 acres
Shoreline miles	271 miles
Drainage area	1,453 square miles
Generating capacity	132 MW

Martin Dam

Structure type	Gravity concrete
Length	2,000 feet
Maximum height	168 feet
Lake elevation	491 feet NGVD29
Lake area acres	40,000 acres
Shoreline miles	700 miles
Drainage area	3,000 square miles
Generating capacity	182 MW

Yates Dam

Structure type	Gravity concrete
Length	1,260 feet
Maximum height	87 feet
Lake elevation	344 feet NGVD29
Lake area acres	1,980 acres
Shoreline miles	40 miles
Drainage area	3,250 square miles
Generating capacity	47 MW

Thurlow Dam

Structure type	Gravity concrete and earth fill
Length (concrete)	1,846 feet

Maximum height	62 feet
Lake elevation	288 feet NGVD29
Lake area acres	585 acres
Drainage area	3,325 square miles
Generating capacity	81 MW

Weiss Dam

Structure type	Gravity concrete and earth fill
Length (earth dikes)	30,506 feet
Length (concrete)	392 feet
Maximum height	126 feet
Lake elevation	564 feet NGVD29
Lake area acres	30,200 acres
Shoreline miles	447 miles
Drainage area	5,273 square miles
Generating capacity	87.75 MW

Neely Henry Dam

Structure type	Gravity concrete and earth fill
Length (earth dikes)	4,100 feet
Length (concrete)	605 feet
Maximum height	104 feet
Lake elevation	508 feet NGVD29
Lake area acres	11,200 acres
Shoreline miles	339 miles
Drainage area	6,600 square miles
Generating capacity	72.9 MW

Logan Martin Dam

Structure type	Gravity concrete and earth fill
Length (earth dikes)	5,464 feet
Length (concrete)	612 feet
Maximum height	97 feet
Lake elevation	465 feet NGVD29
Lake area acres	15,263 acres
Shoreline miles	275 miles
Drainage area	7,700 square miles
Generating capacity	135 MW

Lay Dam

Structure type	Gravity concrete
Length	2,260 feet
Maximum height	129.6 feet
Lake elevation	396 feet NGVD29
Lake area acres	12,000 acres
Shoreline miles	289 miles
Drainage area	9,087square miles
Generating capacity	177 MW

Mitchell Dam

Structure type	Gravity concrete

Length (concrete)	1,277 feet
Maximum height	106 feet
Lake elevation	312 feet NGVD29
Lake area acres	5,850 acres
Shoreline miles	147 miles
Drainage area	9,830 square miles
Generating capacity	170 MW

Jordan Dam

Structure type	Gravity concrete
Length (concrete)	2,066 feet
Maximum height	125 feet
Lake elevation	252 feet NGVD29
Lake area acres	6,800 acres
Shoreline miles	118 miles
Drainage area	10,165 square miles
Generating capacity	100 MW

Bouldin Dam

Structure type	Gravity concrete and earth fill
Length (earth dikes)	10,950 feet
Length (concrete)	228 feet
Maximum height	120 feet
Lake elevation	252 feet NGVD29
Lake area acres	6,800 acres
Shoreline miles	118 miles
Drainage area	10,165 square miles
Generating capacity	225 MW

I - INTRODUCTION

1-01. Authorization. This water control manual is prepared in accordance with the following U.S. Army Corps of Engineers (Corps) Engineering Regulations (ER) and Manuals:

- ER 1110-2-240, *Water Control Management* (8 October 1982). This regulation prescribes policies and procedures to be followed by the Corps in carrying out water control management activities, including establishment of water control plans for Corps and non-Corps projects, as required by federal laws and directives.
- ER 1110-2-241, *Use of Storage Allocated for Flood Control and Navigation at Non-Corps Projects* (24 May 1990). This regulation prescribes the responsibilities and general procedures for regulating reservoir projects for flood risk management or navigation and the user of storage allocated for such purposes. Excepted projects are those owned and operated by the Corps; the International Boundary and Water Commission, United States and Mexico; and those under the jurisdiction of the International Joint Commission, United States and Canada, and the Columbia River Treaty. The intent of this regulation is to establish an understanding among project owners, operating agencies, and the Corps.
- ER 1110-2-1150, *Engineering and Design for Civil Works Projects* (31 August 1999). This regulation defines engineering responsibilities, requirements, and procedures during the planning, design, construction, and operations phases of civil works projects. The regulation provides guidance for developing and documenting quality engineering analyses and designs for projects and products on time and in accordance with project management policy for civil works activities.
- ER 1110-2-1941, *Drought Contingency Plans* (15 September 1981). This regulation provides policy and guidance for preparing drought contingency plans as part of the Corps' overall water control management activities. This directive states the policy that water control managers will continually review and, when appropriate, adjust water control plans in response to changing public needs.
- ER 1110-2-8154, *Water Quality and Environmental Management for Corps Civil Works Projects* (31 May 1995). This regulation establishes a policy for the water quality management program at Corps civil works projects.
- ER 1110-2-8156, *Preparation of Water Control Manuals* (31 August 1995). This regulation standardizes the procedures to be followed when preparing Water Control Manuals (WCM).
- EM 1110-2-3600, *Management of Water Control Systems* (30 November 1987). This manual provides guidance to field offices for managing water control projects or systems authorized by Congress and construct and operated by the Corps. It also applies to certain water control projects constructed by other agencies or entities.

1-02. Purpose and Scope. This basin master water control manual describes the overall water control plan for the Alabama-Coosa-Tallapoosa (ACT) River Basin (referred to as the ACT River Basin or the ACT Basin). The descriptions of the basin, history of development, water control activities, and coordination with others are provided as supplemental information to enhance the knowledge and understanding of the basin water control plan. This manual provides a general reference source for ACT water control regulation. It is intended for use in day-to-day, real-time water management decision making and for training new personnel. The development and execution of the water control plan includes appropriate consideration for efficient water management in conformance with the emphasis on water conservation as a national priority.

1-03. Related Manuals and Reports. This master manual provides general information for the entire ACT River Basin. The following appendices have been prepared for individual federal reservoir projects and non-federal projects within the ACT Basin:

Appendix A - Allatoona Dam and Lake
Appendix B - Weiss Dam and Lake (Alabama Power Company)
(This Water Control Manual is not being updated at this time. See Section 3-05.)
Appendix C - Logan Martin Dam and Lake (Alabama Power Company)
(This Water Control Manual is not being updated at this time. See Section 3-05.)
Appendix D - H. Neely Henry Dam and Lake (Alabama Power Company)
Appendix E - Millers Ferry Lock and Dam and William "Bill" Dannelly Lake
Appendix F - Claiborne Lock and Dam and Lake
Appendix G - Robert F. Henry Lock and Dam and R. E. "Bob" Woodruff Lake
Appendix H - Carters Dam and Lake and Carters Reregulation Dam
Appendix I - R. L. Harris Dam and Lake (Alabama Power Company)

Other pertinent information regarding the ACT River Basin development is contained in operation and maintenance manuals and emergency action plans for each project. Historical, definite project reports and design memoranda also contain useful information.

Prior to the issuance of this manual and the individual water control plans as appendices, the Corps considered the environmental impacts of its revised operations with the preparation of an Environmental Impact Statement (EIS). The EIS was prepared in compliance with the National Environmental Policy Act (1969), Council on Environmental Quality guidelines, and Corps implementing regulations. Access to the final document is available by request from the Mobile District.

1-04. Project Owner. The Allatoona Dam and Lake; Carters Dam and Lake (and Reregulation Dam); Robert F. Henry Lock and Dam and R. E. "Bob" Woodruff Lake; Millers Ferry Lock and Dam and William "Bill" Dannelly Lake; and Claiborne Lock and Dam and Claiborne Lake projects are federally owned projects entrusted to the Corps. There are 11 privately developed dams with powerhouses located in the basin (seven on the Coosa River and four on the Tallapoosa River) that were built and are operated by the Alabama Power Company (APC). The projects in the ACT Basin are listed in Table 1-1.

1 **Table 1-1. Existing Dams in the ACT Basin**

Basin/river/project name	Owner/State/year initially completed	Total Drainage Area (sq mi)	Reservoir Size at Full Pool (acres)	Total storage at Full Pool (ac-ft)	Conservation Storage (ac-ft)	Declared Power Capacity (MW)	Full Pool elevation (ft NGVD29)	Federally authorized purposes of projects
Coosawattee River		*875*						
Carters Dam and Lake	Corps/GA/1974	374	3,275	383,565	141,402	600	1,074	FRM, HP, REC, NAV, WS, WQ, FW
Carters Reregulation Dam	Corps/GA/1974	521	884	19,300	17,210	None	696	
Etowah River		*1,860*						
Hickory Log Creek Dam (on Hickory Log Creek)	Canton, CCMWA/GA/2007	8	411	17,701	17,701	None	1,060	
Allatoona Dam and Lake	Corps/GA/1949	1,122	11,862	367,471	284,580	82.2	840	FRM, HP, NAV, REC, WQ, WS, FW
Thompson-Weinman Dam	Private/GA/early 1900's	1120				0.625 inactive		
Coosa River		*10,270*						
Weiss Dam and Lake	APC/AL/1961	5,273	30,200	306,651 [d]	237,448	87.75 [d]	564	HP, FRM, NAV
H. Neely Henry Dam and Lake	APC/AL/1966	6,600	11,200	121,860 [d]	43,205	72.9 [d]	508	HP, FRM, NAV
Logan Martin Dam and Lake	APC/AL/1964	7,700	15,263	273,500 [d]	108,262	135 [d]	465	HP, FRM, NAV
Lay Dam and Lake	APC/AL/1914	9,087	12.000	262,306 [d]	77,478	177 [d]	396	HP
Mitchell Dam and Lake	APC/AL/1923	9,830	5.850	170,422 [d]	28,048	170 [d]	312	HP
Jordan Dam and Lake	APC/AL/1928	10,165	6,800	235,780 [d]	15,969	100 [d]	252	HP
Walter Bouldin Dam and Lake	APC/AL/1967	10,165	6,800	235,780 [d]	NA	225[d]	252	HP
Tallapoosa River		*4,660*						
Harris Dam and Lake	APC/AL/1982	1,453	10,660	425,503	191,129	132	793	HP, FRM, NAV
Martin Dam and Lake	APC/AL/1926	3,000	40,000	1,623,000	1,183,356	182	491	HP
Yates Dam and Lake	APC/AL/1928	3,250	1,980	53,770	5,976	47	344	HP
Thurlow Dam and Lake	APC/AL/1930	3,325	585	18,461	NA	81	288	HP
Alabama River		*22,800*						
Robert F. Henry Lock and Dam/R.E. "Bob" Woodruff Lake	Corps/AL/1972	16,233	12,510	247,210	36,450	82	125	NAV, REC, HP
Millers Ferry Lock and Dam/William "Bill" Dannelly Lake	Corps/AL/1969	20,637	18,528	346,254	46,704	90	80.8	NAV, REC, HP
Claiborne Lock and Dam and Lake	Corps/AL/1969	21,473	6,290	102,480	NA	None	36	NAV, REC, WQ
Cahaba River		*1,890*						
Purdy Dam and Lake	BWWB/AL/NA	43	990	24,000	NA	None	560	WS

a. As used in this table, the term "federally authorized purposes" includes purposes expressly identified in the project authorizing documents; incidental benefits recognized in project authorizations; and objectives that result from other authorities, such as general authorities contained in Congressional legislation, public law, or non-federal project FERC licenses, for which each listed project is operated. FRM = flood risk management; HP = hydropower; NAV = navigation; REC = recreation; WQ = water quality; WS = water supply; FW = fish and wildlife conservation.

b. NA = not applicable.

c. Source: Federal Storage Reservoir Critical Yield Analyses, Alabama-Coosa-Tallapoosa (ACT) and Apalachicola- Chattahoochee-Flint (ACF) River Basins, USACE, 2010, page B-7.

d. Source: Final Environmental Assessment for Hydropower License, Coosa River Hydroelectric Project—FERC Project No. 2146-111, Alabama and Georgia

e. Declared Power Capacity is defined as the plant's operational capacity declared on a weekly basis to the power marketing agency. The value may vary slightly from week to week depending on factors such as head and cooling capabilities; values shown are the nominal values reported.

1-05. Operating Agency. The Corps, Mobile District operates the five federally owned projects within the ACT Basin. Dam and reservoir project operation and maintenance are under the supervision of Operations Division. Allatoona and Carters fall under the direction of the Operations Project Manager at each Project. The Robert F. Henry, Millers Ferry and Claiborne facilities make up the Alabama River Lakes Project and fall under the direction of the Site Manager located at the Project Office in Haynesville, Alabama. The non-federal projects on the Coosa and Tallapoosa Rivers are owned and operated by APC except for the Hickory Log Creek Project which is owned and operated by the City of Canton and the Cobb County-Marietta Water Authority (CCMWA), and the Purdy Project which is owned and operated by the Birmingham Water Works Board (BWWB).

1-06. Regulating Agencies. Authority for water control regulation of all federal projects and for flood risk management water control regulation of four non-federal APC projects (Weiss, H. Neely Henry, Logan Martin, and Harris) has been delegated to the South Atlantic Division (SAD) Commander. Water control regulation activities for all federal projects and flood management regulation of the four APC projects are the responsibility of the Mobile District, Engineering Division, Water Management Section (Mobile District). APC regulates the four non-federal projects in compliance with the projects' Federal Energy Regulatory Commission (FERC) licenses and in accordance with Corps water control plans for flood management regulation and navigation support. It is the responsibility of the Mobile District to develop water control regulation procedures for the ACT federal projects for all foreseeable conditions and for the flood risk management plan and navigation support for the four authorized APC projects. The regulating instructions presented in the basin water control plan are issued by the Mobile District with approval of SAD. The Mobile District monitors the project for compliance with the approved water control plan and makes water control regulation decisions on the basis of that plan. The Mobile District advises project personnel, on an as needed basis, regarding operational procedures to perform during abnormal or emergency situations.

II - BASIN DESCRIPTION AND CHARACTERISTICS

2-01. General Characteristics. The ACT River Basin, made up of the Coosa, Tallapoosa, and Alabama Rivers and their tributaries, drains northeastern and east-central Alabama, northwestern Georgia, and a small portion of Tennessee. The drainage basin has a maximum length of about 330 miles, an average width of approximately 70 miles, and a maximum width of about 125 miles. The ACT Basin drains an area totaling approximately 22,800 square miles: 17,300 square miles in Alabama; 5,400 square miles in Georgia; and 100 square miles in Tennessee. The ACT Basin and its principal rivers are illustrated in Plate 2-1. Figure 2-1 provides longitudinal views of the Alabama, Coosa, Etowah, and Tallapoosa Rivers, including the locations of dams and reservoirs. The major tributaries within the ACT Basin are shown on Plate 2-2 and listed in Table 2-1.

The Coosa River is formed by the Etowah and Oostanaula Rivers at Rome, Georgia, and flows first westerly, then southwesterly, and finally southerly for a total of 286 miles before joining the Tallapoosa River to form the Alabama River south of Wetumpka, Alabama. The drainage area of the Coosa River is approximately 10,200 square miles. The main tributaries of the Coosa River are its headwater streams, the Etowah and Oostanaula Rivers.

The Etowah River lies entirely within Georgia and is formed by several small mountain creeks which rise on the southern slopes of the Blue Ridge Mountains at an elevation of about 3,250 feet. The Etowah River flows for 150 miles to Rome, Georgia, and has a drainage area of 1,860 square miles, with a maximum width of about 40 miles and a length of about 70 miles. Allatoona Dam and Lake Project is located on the Etowah River upstream of Cartersville, Georgia.

The Oostanaula River is formed by the Coosawattee and Conasauga Rivers at Newtown Ferry, Georgia, and meanders southwesterly through a broad plateau for 47 miles to its mouth at Rome, Georgia. The Carters Dam and Lake Project is located on the Coosawattee River about 27 miles upstream of the confluence of the Coosawattee and Conasauga Rivers.

The Tallapoosa River rises in northwestern Georgia at an elevation of about 1,250 feet, and flows westerly and southerly for 268 miles, joining the Coosa River south of Wetumpka, Alabama. The upper 55 miles of the stream are in Georgia and the lower 213 miles in Alabama. The river drains an area of 4,680 square miles. Projects on the Tallapoosa River include four large hydropower dams owned by the APC; the Harris, Martin, Yates, and Thurlow Dams and Lakes.

The Alabama River is formed by the confluence of the Coosa and Tallapoosa Rivers near Montgomery, Alabama, meandering westerly for about 100 miles to Selma, Alabama, then southwesterly for 214 miles to its mouth near Calvert, Alabama. There are three Corps projects on the Alabama River providing for hydropower and navigation; the Robert F. Henry Lock and Dam, the Millers Ferry Lock and Dam, and the Claiborne Lock and Dam. At low river stages, the effect of the tide in Mobile Bay is noticeable at the juncture of the Alabama and Tombigbee Rivers and up to the Claiborne tailwater. The principal tributaries of the Alabama River are its source streams, the Coosa and Tallapoosa Rivers.

The ACT Basin is approximately 57 percent forested lands, 16 percent pasture and row crops, nine percent shrubland, eight percent developed or built up, seven percent wetlands, and three percent water.

Physiographic provinces and other basin characteristics are addressed in the following paragraphs.

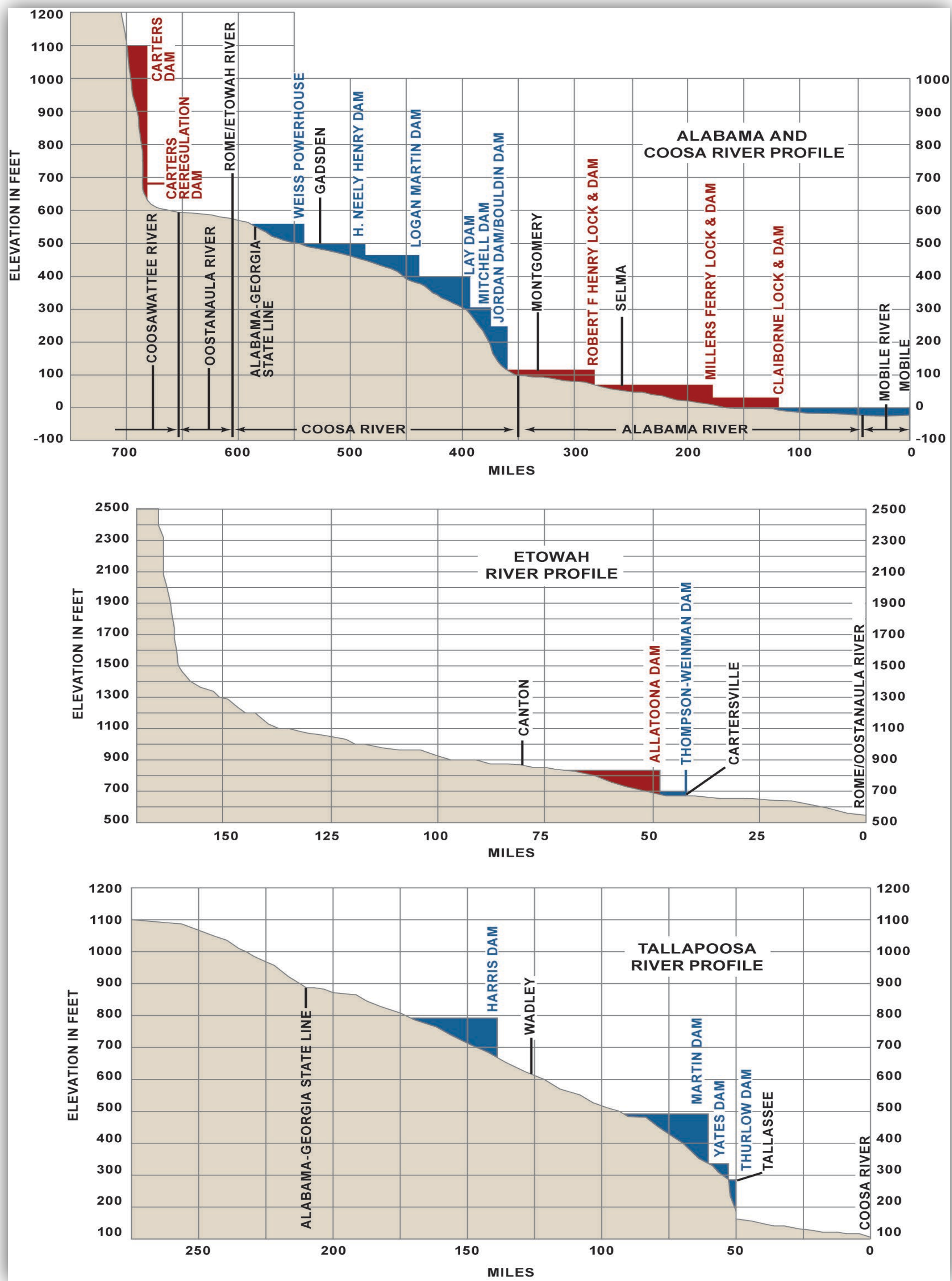


Figure 2-1. Longitudinal Profiles of the Alabama, Coosa, Etowah, and Tallapoosa Rivers

Table 2-1. Tributaries of the ACT Basin

Main Streams and Major Tributaries of the Alabama-Coosa-Tallapoosa River Basin		
Stream	**Drainage Area Square Miles**	**Miles Above Mouth**
Amicalola Creek	92	118
Settingdown Creek	50	105
Shoal Creek	64	72
Little River	215	63
Allatoona Creek	81	48
Pumpkinvine Creek	140	42
Euharlee Creek	180	31
Etowah River	**1860**	**286**
Jacks River	88	69
Sumac Creek	37	42
Coahulla Creek	178	27
Conasauga River	727	47
Ellijay River	92	45
Cartecay River	137	45
Talking Rock Creek	151	23
Coosawattee River	869	47
Sallacoa Creek	245	10
Oothkalooga Creek	59	35
Armuchee Creek	226	10
Oostanaula River	**2160**	**286**
Cedar Creek	208	258
Chattooga River	660	233
Terrapin Creek	286	220
Big Wills Creek	383	173
Big Canoe Creek	263	156
Ohatchee Creek	227	146
Choccolocco Creek	510	116
Kelly Creek	208	97
Talledega Creek	189	88
Yellowleaf Creek	190	78
Waxahatchee Creek	206	56
Weogufka Creek	135	4
Hatchet Creek	515	41
Coosa River	**10200**	**314**
Little Tallapoosa	406	149
Hillabee Creek	190	87
Uphapee Creek	330	44
Tallapoosa River	**4680**	**314**
Autauga Creek	121	284
Catoma Creek	340	282
Cahaba River	1825	198
Pine Barren Creek	363	166
Alabama River	**22781**	**45**

2-02. Topography.

a. Coosa River Basin. The river banks are stable and vary from 25 to 150 feet in height. The width between banks varies from 300 to 500 feet. The Coosa River has a total fall of 454 feet in 286 miles, giving an average slope of 1.59 feet per mile. The steepest slope occurs at the Fall Line in the lower reach. The valley, generally wide, is constricted by low hills at Greensport, Alabama, and the Fort William Shoals and at the existing dams developed by the

APC. In the vicinity of Greensport, the river valley cuts through Beaver Creek Mountain, where the floodplain narrows to less than 0.25 miles wide. During large rainfall events, high stages are built up immediately above this constriction in the floodplain. The floodplain between Rome, Georgia, and Childersburg, Alabama, varies generally from 0.5 to three miles in width with an average width of 12 miles. Between Childersburg and the mouth, the floodplain is narrow, varying from 0.25 to one mile wide with an average width of approximately 0.5 mile.

The Etowah River varies in width from 100 to 300 feet. The river banks are stable and vary in height from 25 to 300 feet. From the headwaters to Dawsonville, Georgia, (about 21 river miles), the Etowah River flows with moderately steep slopes through a hilly section, with a general elevation of about 2,000 feet NGVD29. From Dawsonville, Georgia, to Cartersville, Georgia, (about 85 river miles), the river flows through a flatter section with elevations averaging about 1,000 feet NGVD29. From Cartersville, Georgia to Rome, Georgia, the river flows 44 miles through a low, flat valley. The floodplain, in general, varies from 0.25 to two miles wide. The Etowah River has a fall of 2,690 feet in 150 miles or an average fall of 17.9 feet per mile.

The Oostanaula River is formed by the Coosawattee and Conasauga Rivers at Newtown Ferry, Georgia, and meanders southwesterly through a broad plateau for 47 miles to its mouth at Rome, Georgia. The river has a total drainage area of 2,160 square miles with stable banks from 20 to 60 feet high. The width of the river averages about 250 feet. The width of the floodplain varies from 0.5 to five miles with an average width of about 1.5 miles.

The Coosawattee River is 45 miles long; and has a fall of 650 feet, an average of 14.4 feet per mile. The Conasauga River is 95 miles long; and has a fall of 1,790 feet, an average of 19.2 feet per mile.

b. Tallapoosa River Basin. The Tallapoosa River rises in northwestern Georgia at an elevation of about 1,250 feet NGVD29 and flows westerly and southerly for 268 miles, joining the Coosa River south of Wetumpka, Alabama. North of Tallassee, Alabama, the river cuts through the crystalline rock area and the banks are high and stable. Below Tallassee, the river meanders through the upper regions of the coastal plain and the banks are relatively low. The total fall of the Tallapoosa River is 1,144 feet in 268 miles, giving an average slope of 4.27 feet per mile.

c. Alabama River Basin. The Alabama River floodplain is characterized by valleys varying in width from 0.5 to eight miles, with an average width of approximately three miles. The valleys are formed by low hills which seldom attain an elevation of more than 500 feet. The river falls a total of 106 feet with an average slope of 0.34 foot per mile.

From its source to a point about 150 miles below Selma, Alabama, the banks of the Alabama River are comparatively high, averaging more than 40 feet above mean low water. The width between banks in this reach varies from 500 to 1,000 feet. Below this point the banks become lower until, at the mouth of the river, they are less than 10 feet high. There are numerous bluffs along the river, some reaching over 100 feet in height.

2-03. Geology. Seldom can a greater diversity in topography and geology be found than in the watersheds of the Alabama-Coosa-Tallapoosa Rivers. These three rivers, with their major tributaries, drain five physiographic provinces which range in relief from well over 2,000 feet at the headwater tributaries of the Coosa River to a few feet at the mouth of the Alabama River. Equally diversified are the formations underlying the ACT Basin which ranges from crystalline to unconsolidated sands, marls, and clays of very recent geologic times. The physiographic provinces are shown in Plate 2-3 and described in the following paragraphs.

a. The Blue Ridge Province encompasses only a very small northeastern part of the Coosa drainage basin. The greater part of this province is characterized by irregular divides formed by isolated and poorly connected masses of highly metamorphosed and igneous rocks. The western boundary of this province is determined largely by the extent of over thrust of resistant crystalline rocks on the weaker sedimentary formations of the Valley and Ridge Province. The upper reaches of the Coosawattee and its headwater tributaries lie in this province.

b. Southwestern Appalachian Plateau Province encompasses only a small part of the Coosa Watershed. Little River and the headwaters of Big Wills Creek drain from the Valley Ridge Province. This province is characterized by elevated plateaus on massive and resistant sandstone of the Carboniferous period. The characteristic feature of the plateau is the even persistent skyline formed by the massive Pottsville sandstones which underlie it. The stream courses in the elevated sandstone plateaus are characterized by relatively little relief in their upper reaches. Progressing downstream, however, gorges and deep cuts are common where courses follow strike joints to their junctions with larger streams.

c. Ridge and Valley Province is bounded on the west by the Appalachian Plateau Province on the southwest by the Coastal Plain and on the southeast by the Piedmont Province. The general configuration of the province is that of sub-parallel and broken ridges separated by broad rather low valleys which form the principal stream courses for the Coosa River above Lay Dam and its tributaries below Rome, Georgia. In contrast to the Coastal Plain and Piedmont Provinces, the rocks underlying the Valley and Ridge Province are dominantly well-consolidated sandstones, shales, limestone, dolomites, and variable shales of Paleozoic periods. Of these materials, the most prominent in the area from Lay Dam to Lincoln, Alabama, are massive Cambro-ordovician dolomites. Erratic weathering of these materials in the stream beds, coupled with their universally intense weathering and fracturing valley walls, are considerable obstacles in the selection of suitable dam sites. Geologic conditions improve upstream from Lincoln, Alabama. Above that point, the Coosa River Valley has been incised into strata consisting of alternating shoals of sandstone, limestone, dolomite, and shale.

d. Piedmont Province lies immediately north of the Fall Line and directly east of the Appalachian Valley and Ridge Provinces. The rocks underlying the Piedmont are disorderly, ancient, crystalline, and metamorphic, with no particular conformity to erosional patterns. Vast, gently rolling hills separated by sub-mature valleys of moderate depth are most characteristic. Deep valleys are an exception. Agricultural areas are far more extensive on the uplands than on the valley bottoms. Towards and across the Fall Line a sharper and deeper configuration of valleys is characteristic. A combination of good foundations and general reservoir tightness explains the present development of the Coosa to the Piedmont. Lowermost tributaries of the Coosa River below Lay Dam, and the Etowah and Tallapoosa Rivers are located in this province. The soils consist of kaolinite and halloysite (aluminosilicate clay minerals) and of iron oxides. They result from the intense weathering of feldspar-rich igneous and metamorphic rocks. Such intense weathering dissolves or alters nearly all minerals and leaves behind a residue of aluminum-bearing clays and iron-bearing iron oxides because of the low solubilities of aluminum and iron at earth-surface conditions. Those iron oxides give the red color to the clay-rich soil that has come to be synonymous with central Georgia.

e. The Fall Line is the boundary between the Piedmont and the Southeastern Plains. Its name arises from the occurrence of waterfalls and rapids which developed where the rivers drop off the hard crystalline rocks of the Piedmont onto the more readily eroded sedimentary rocks of the Southeastern Plains. The Fall Line is a boundary of bedrock geology, but it can also be recognized from stream geomorphology. Upstream from the Fall Line, rivers and streams typically have very small floodplains, if any at all, and they do not have well-developed meanders. Within a mile or so downstream from the Fall Line, rivers and streams typically have floodplains or marshes across which they flow, and within three or four miles, they meander. In the ACT Basin, the Fall Line extends from approximately 15 miles southeast of Tuscaloosa, Alabama, southeastwardly to about 20 miles west of Columbus, Georgia. Historically, the rapids of the Fall Line were the head of navigation for river traffic and also provided opportunities to produce hydropower.

f. Southern Coastal Plain Province is bordered on the south by the Gulf Coast, its northern margin being the Fall Line which is the abrupt contact between the older Pre-Cambrian and Paleozoic rocks of the Appalachian Highland and the more recent gently dipping sediments of the Coastal Plain. Relief of this province ranges from 10 to 600 feet, but generally does not exceed 150 feet. The general surface configuration is that of parallel, crescent-shaped belts carved out of alternately hard and soft sediments which underlie the plain. North to south these belts consist first of isolated erosion remnants of harder Cretaceous sandstones protecting softer-underlying sediments of the same period. Immediately south of that is rather massive Selma Chalk that overlies older Cretaceous sands. The average width of this belt is approximately 25 miles. Continuing south, the underlying sediments are largely soft to medium-hard limestone, tough clays and fossiliforous sands. Continuing south, materials range from semi-indurated sands to beds of sandy siltstone, thence lie, the rough poorly-defined limestone hills. The next province seaward is a belt formed by erratic deposits of bright red erosion-resisting sands of the Citronelle formation. The extreme southern margin of the Coastal Plain consists of a series of meadows which lie only a few feet above sea level and is characterized by swamps and distributaries of the principal rivers. Sediments of this province consist of silt, clay, and sand of very recent geologic times. The entire Alabama River lies in the Coastal Plain Province as do all of its tributaries below its source, with the exception of the Cahaba River. The headwaters of the Cahaba River lie in the Valley and Ridge Province. The lower 10 to 20 miles of the Tallapoosa and Coosa Rivers lie in the Coastal Plain. Geologic hazards in the Coastal Plain are sinkholes and coastal erosion. Sinkholes can form in areas of limestone bedrock when subsurface dissolution of rock leads to collapse of the earth surface.

2-04. Sediment. Rivers and streams within the ACT have always carried silt and other particles downstream. The Alabama River is often discolored during high flow periods. In the natural state before dams and other developments, the particulate matter was deposited along the floodplain or carried to Mobile Bay, where it would be subject to the movements of the Gulf of Mexico. The natural process continues but is altered to some degree by development within the basin. The streams in the northern part of the basin, and especially metropolitan Atlanta area, have been severely affected by past and present urban development. Urban development generally increases the peak and volume of rainfall events, which increases the velocity and erosion potential of rainfall runoff. Results are generally a down-cutting and widening of the stream, which creates bank-caving and further erosion.

Other significant sources of sediment within the ACT Basin are agricultural land erosion, unpaved roads, and sliviculture, and variation in land uses that result in conversion of forests to lawns or pastures.

Faster flowing streams can move suspended particles where slower streams will deposit that material. Where dams and reservoirs have been constructed there is a tendency for the current to slow causing particulates to settle on the lake bottom. Farming practices and urbanization have changed the conditions for non-point source pollution. Both the volume and content of sediment material have changed over time. Below Claiborne Dam, the constantly moving siltation alters the navigation channel on a seasonal basis.

Both sedimentation and retrogression ranges have been established to monitor changes in reservoir and downstream channel conditions. They serve as a baseline to measure changes in reservoir volume (sedimentation ranges) and channel degradation (retrogression ranges). Reservoirs tend to slow river flow and accelerate deposition. Irregular releases for peaking power often have an erosive effect downstream. The locations of sedimentation and retrogression ranges are shown in individual appendices.

After ranges have been established, periodic re-surveys occur, and descriptive analyses are performed to determine the level of sedimentation occurring in the main body of the lake and to examine the erosion along the shoreline. Detailed reports are written after each re-survey to determine changes in reservoir geometry. That includes engineering analysis of the range cross-sections to estimate reservoir storage loss by comparing the earlier surveys of the existing ranges. The data provide the ability to compute new area/capacity curves for reservoirs.

Tables 2-2 and 2-3 lists the number of sedimentation and retrogression ranges for each project in the ACT Basin as well as when the surveys were made.

Table 2-2. Sedimentation Ranges

	Year Surveyed	Number of Ranges Surveyed	Total Number of Ranges Established
ALLATOONA	1949	132	132
	1981	34	116
	1983	23	116
	1984	31	116
	1986	28	116
	2009	Hydrographic bathymetric surface	N/A
CARTERS	2009	Hydrographic bathymetric surface	N/A
CARTERS-RR	1973	5	5
	1992	5	5
	2009	Hydrographic bathymetric surface	N/A
R. F. HENRY	1974	17	17
	1982	14	17
	1988	17	17
	2009	Hydrographic bathymetric surface	N/A
MILLERS FERRY	1973	30	30
	1982	16	30
	1988	30	30
	2009	Hydrographic bathymetric surface	N/A
CLAIBORNE	1982	16	16
	2009	Hydrographic bathymetric surface	N/A

Table 2-3. Retrogression Ranges

	Year Surveyed	Number of Ranges Surveyed	Total Number of Ranges Established
ALLATOONA	1950	15	15
	1953	11	15
	1961	12	15
	1962	10	15
	1963	15	15
	1964	15	15
	1965	13	15
	1968	14	15
	1987	18	23
CARTERS	1974	9	
	1987	9	
CLAIBORNE	1972	19	19
	1979	19	19
	1981	19	19

2-05. Climate. The climate of Alabama and Georgia, including all areas associated with the ACT Basin, is classified as humid subtropical and characterized by hot humid summers and cool winters. Significant amounts of precipitation occur in all seasons in most areas. Winter rainfall (and sometimes snowfall) is associated with large storms steering from west to east. Most summer rainfall occurs during thunderstorms and an occasional tropical storm or hurricane. Factors controlling the climate of the ACT River Basin are its geographical position in the southern end of the Temperate Zone, its proximity to the Gulf of Mexico and South Atlantic Ocean, and its range in altitude from almost sea level at the southern end to over 3,000 feet in the Blue Ridge Mountains to the north. The proximity of the warm South Atlantic and the semitropical Gulf of Mexico insures a warm, moist climate. Extreme temperatures range from near 110 degrees Fahrenheit (°F) to values in the teens below zero. Severe cold weather rarely lasts longer than a few days. In the southern end of the basin the average maximum January temperature is 57 °F and the average minimum January temperature is 35 °F.

a. Temperature. Tables 2-4, 2-5, and 2-6 show the average monthly maximum and minimum temperatures for the ACT Basin. The frost-free season varies in length from about 200 days in the northern valleys to about 250 days in the southern part of the basin. All climatic tables have been compiled from online records at the Southeast Regional Climate Center.

Table 2-4. Average Monthly Temperature (°F) for the Northern ACT Basin (max. and min.)

AVERAGE MONTHLY TEMPERATURE FOR NORTHERN ACT BASIN (MAX & MIN)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
BALL GROUND, GA 090603 (3/1947 – 12/2010)	MAX	50.0	50.8	62.4	70.1	75.9	82.1	84.8	85.5	78.9	70.1	62.1	50.4	68.6
	MIN	29.5	29.7	38.5	45.8	54.7	61.4	66.1	66.5	60.3	48.5	39.4	30.9	47.6
ALLATOONA DAM 2, GA 090181 (5/1952–12/2010)	MAX	50.8	54.4	62.7	73.2	79.3	85.8	88.8	88.3	82.1	72.2	62.6	52.3	71.0
	MIN	29.7	32.0	38.6	47.7	56.3	64.2	67.8	67.4	61.6	49.0	39.5	31.7	48.8
ROME, GA 097600 (1/1893-8/2010)	MAX	52.5	56.3	65.2	74.1	81.5	87.7	90.1	89.5	84.7	75.2	63.3	54.0	72.8
	MIN	31.7	33.3	40.2	47.7	56.2	64.2	67.9	67.2	61.1	48.7	38.9	33.1	49.2
GADSDEN STEAM PLANT, AL 013154 (3/1953-12/2010	MAX	51.0	55.9	65.0	74.5	81.4	87.5	90.4	90.1	84.6	74.5	63.7	54.7	72.8
	MIN	30.6	33.6	40.6	49.0	57.4	65.2	69.1	68.2	62.1	49.6	40.0	33.4	49.9
SCOTTSBORO, AL 017304 (10/1891-12/2010)	MAX	51.8	54.9	63.9	72.7	80.8	87.6	90.0	89.6	84.8	74.4	63.0	54.0	72.3
	MIN	30.3	32.4	39.4	46.9	55.4	63.4	67.0	66.0	59.9	47.3	37.4	31.9	48.1
VALLEY HEAD, AL 018469 (1/1893-12/2010)	MAX	50.3	53.5	62.2	71.4	79.3	86.0	88.6	88.4	83.8	73.8	62.2	52.5	71.0
	MIN	28.6	30.0	37.0	44.6	53.3	61.6	65.2	64.4	58.7	46.1	36.1	30.0	46.3
NORTHERN BASIN AVG	MAX	51.1	54.3	63.6	72.7	79.7	86.1	88.8	88.6	83.2	73.4	62.8	53.0	71.4
NORTHERN BASIN AVG	MIN	30.1	31.8	39.1	47.0	55.6	63.3	67.2	66.6	60.6	48.2	38.6	31.8	48.3

Table 2-5. Average Monthly Temperature (°F) for the Middle ACT Basin (max. and min.)

AVERAGE MONTHLY TEMPERATURE FOR MIDDLE ACT BASIN (MAX & MIN)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
WETUMPKA, AL 018859 (1/1893-10/2010)	MAX	60.3	61.9	70.0	77.1	84.9	91.7	92.4	92.0	88.7	79.4	68.5	60.1	77.2
	MIN	37.9	38.7	45.5	51.9	60.4	68.2	70.9	70.6	65.7	54.0	42.9	38.1	53.7
CHILDERSBURG WATER PLAN, AL 011620 (3/1957-12/2010)	MAX	56.5	61.1	69.7	77.9	83.9	89.6	92.1	91.6	86.9	77.9	67.9	59.2	76.2
	MIN	32.4	34.8	41.7	48.9	57.1	64.6	68.3	67.3	61.4	49.0	40.4	34.5	50.0
ROCK MILLS, AL 017025 (6/1938-12/2010)	MAX	55.6	59.3	67.2	76.7	83.8	89.9	91.4	91.1	85.7	76.8	66.4	57.2	75.1
	MIN	30.9	33.1	39.1	46.5	55.0	62.7	66.5	65.7	59.9	46.9	37.4	31.6	47.9
LAFAYETTE, AL 014502 (10/1944-12/2010)	MAX	56.0	60.3	67.9	76.1	82.6	88.5	90.4	90.0	84.9	76.0	66.2	57.6	74.7
	MIN	32.9	35.4	41.7	48.8	57.3	64.2	67.4	66.7	61.3	50.1	40.9	34.1	50.1
TUSCALOOSA OLIVER DAM , AL 018385 (1/1900-12/2010)	MAX	54.8	58.2	66.7	75.3	82.8	89.9	92.0	91.6	87.7	77.6	66.0	56.9	75.0
	MIN	33.1	35.1	42.4	50.3	58.8	66.8	69.9	69.3	63.9	51.5	41.0	35.1	51.4
CENTREVILLE WSMO, AL 011525 (12/1974-12/2010)	MAX	54.2	59.1	67.7	75.3	81.8	88.3	91.0	90.1	85.3	75.5	66.1	57.0	74.3
	MIN	32.0	35.2	41.8	48.5	57.8	65.4	68.9	68.4	62.5	50.0	41.4	34.3	50.5
CALERA 2 SW, AL 011288 (9/1900-12/2010)	MAX	54.5	60.0	67.4	76.7	83.5	89.0	91.7	90.7	86.0	76.6	66.0	58.4	75.0
	MIN	31.1	33.3	41.0	48.0	55.5	63.0	66.9	66.1	61.1	47.8	39.0	33.5	48.9
BESSEMER 3WSW, AL 010764 (2/1977-12/2010)	MAX	54.8	59.6	68.2	76.3	83.3	90.0	92.9	92.5	87.3	76.9	66.9	57.6	75.5
	MIN	31.5	34.6	41.2	48.5	58.0	65.1	69.1	68.2	62.2	49.9	41.0	33.8	50.2
BIRMINGHAM FAA ARPT , AL 010831 (1/1930-12/2010)	MAX	53.9	57.9	65.8	74.6	81.7	88.2	90.5	90.1	85.1	75.6	64.4	55.9	73.6
	MIN	34.3	36.6	43.0	50.7	59.2	66.8	70.3	69.6	63.9	52.1	42.1	36.1	52.1
MIDDLE BASIN AVG	MAX	55.6	59.7	67.8	76.2	83.1	89.5	91.6	91.1	86.4	76.9	66.5	57.8	75.2
MIDDLE BASIN AVG	MIN	32.9	35.2	41.9	49.1	57.7	65.2	68.7	68.0	62.4	50.1	40.7	34.6	50.5

Table 2-6. Average Monthly Temperature (°F) for the Southern ACT Basin (max. and min.)

AVERAGE MONTHLY TEMPERATURE FOR SOUTHERN ACT BASIN (MAX & MIN)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
HIGHLAND HOME, AL 013816 (3/1892-12/2010)	MAX	58.7	61.7	69.2	76.4	83.5	88.9	90.2	89.9	86.4	77.8	67.8	59.9	75.9
	MIN	37.8	39.4	46.1	52.7	60.8	67.3	69.8	69.4	65.2	54.7	45.2	39.1	54.0
MILSTEAD, AL 015439 (7/1902-12/2010)	MAX	57.1	61.1	69.0	75.9	83.3	89.0	91.6	91.3	86.6	77.3	68.6	58.8	75.8
	MIN	33.9	36.5	42.7	49.1	58.7	66.7	70.4	69.5	63.7	51.2	42.6	35.7	51.7
OPELIKA, AL 016129 (3/1957-12/2010)	MAX	55.1	58.7	67.1	75.2	82.1	87.8	90.1	89.6	84.9	75.8	66.8	57.9	74.3
	MIN	31.7	33.6	40.1	47.5	56.0	63.6	67.4	67.1	62.1	49.5	40.5	33.9	49.4
SOUTHERN BASIN AVG	MAX	57.0	60.5	68.4	75.8	83.0	88.6	90.6	90.3	86.0	77.0	67.7	58.9	75.3
SOUTHERN BASIN AVG	MIN	34.5	36.5	43.0	49.8	58.5	65.9	69.2	68.7	63.7	51.8	42.8	36.2	51.7

b. Precipitation. The entire ACT Basin is in a region that ordinarily receives an abundance of precipitation with the average annual rainfall being heavy and well-distributed throughout the year. Winter and spring are the wettest periods and early fall is the driest. Light snow is not unusual in the northern part of the watershed, but it constitutes only a very small fraction of the annual precipitation and has little effect on runoff. Intense flood-producing storms occur mostly in the winter and spring. They are usually of the frontal-type, formed by the meeting of warm, moist air masses from the Gulf of Mexico with the cold, drier masses from the northern regions and can cause heavy precipitation over large areas. The storms that occur in summer or early fall are usually of the thunderstorm type with high intensities over smaller areas. Tropical disturbances and hurricanes can occur producing high intensities of rainfall over large areas. Tables 2-7, 2-8, and 2-9 show the average monthly and annual rainfall for the ACT Basin at the same gage locations as the temperature gages. About half the water that falls as precipitation in the ACT Basin is returned to the atmosphere as evapotranspiration (direct evaporation plus transpiration by plants). Evapotranspiration ranges from about 30 to 42 inches of water per year in the ACT Basin, generally increasing from north to south. Runoff varies monthly and ranges from less than one inch per month to almost four inches per month (or from 15 to 75 percent of precipitation); see Figures 2-10 and 2-11 for monthly values above Rome, Georgia and between Claiborne Dam and Rome, Georgia, respectively. Runoff is greatest in the Blue Ridge Mountains and near the Gulf Coast. All tables were compiled from online records at the Southeast Regional Climate Center.

Table 2-7. Average Monthly Rainfall for the Northern ACT Basin (in inches)

AVERAGE MONTHLY RAINFALL FOR NORTHERN ACT BASIN													
Gage Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
BALL GROUND, GA	5.37	4.96	6.10	4.80	4.30	3.88	4.83	4.18	4.08	3.59	4.29	4.67	55.04
ALLATOONA DAM 2, GA	5.02	4.37	5.29	4.64	4.03	3.61	4.89	3.83	3.98	3.26	3.63	4.24	50.80
ROME, GA	4.99	5.08	5.96	4.54	3.99	4.28	4.83	4.16	3.53	3.01	3.75	4.86	52.99
GADSDEN STEAM PLANT, AL	5.25	4.81	5.84	5.14	4.64	4.08	4.83	3.56	3.70	3.17	4.47	4.71	54.21
SCOTTSBORO, AL	5.41	5.33	6.04	4.81	4.36	4.25	4.74	3.76	3.87	3.01	4.12	5.49	55.17
VALLEY HEAD, AL	5.32	5.13	5.84	4.90	4.39	4.10	5.19	3.91	3.65	3.20	3.97	4.86	54.47
NORTHERN BASIN AVG	5.23	4.95	5.85	4.81	4.29	4.03	4.89	3.90	3.80	3.21	4.04	4.81	53.78

Table 2-8. Average Monthly Rainfall for the Middle ACT Basin (in inches)

AVERAGE MONTHLY RAINFALL FOR MIDDLE ACT BASIN													
Gage Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
WETUMPKA, AL	4.80	5.27	5.98	4.66	3.54	4.19	4.74	4.47	3.46	2.56	3.48	4.94	52.08
CHILDERSBURG WATER PLANT, AL	5.49	5.38	6.27	4.85	4.48	4.21	4.58	3.94	4.17	3.17	4.12	4.85	55.49
ROCK MILLS, AL	5.20	5.09	6.19	4.66	4.01	4.15	5.28	3.91	3.68	2.44	4.16	5.10	53.88
LAFAYETTE, AL	5.29	5.38	6.44	5.10	4.22	3.94	5.49	3.76	3.97	2.86	4.01	4.95	55.40
TUSCALOOSA OLIVER DAM, AL	5.16	5.18	5.95	4.90	4.30	3.94	4.87	3.84	3.16	3.06	4.02	5.06	53.45
CENTREVILLE WSMO, AL	5.51	5.52	6.49	5.00	4.42	4.35	4.94	4.49	4.56	3.32	5.04	4.77	58.40
CALERA 2SW, AL	5.06	5.32	6.50	5.15	4.02	4.15	5.36	4.23	3.76	2.76	3.70	5.09	55.12
BESSEMER 3WSW, AL	5.59	4.90	6.01	4.86	5.17	4.49	5.06	3.70	4.18	3.66	5.11	4.90	57.62
BIRMINGHAM FAA ARPT, AL	5.06	4.83	6.03	4.62	4.43	3.94	5.13	4.18	3.80	3.00	4.12	4.76	53.92
MIDDLE BASIN AVG	5.24	5.21	6.21	4.87	4.29	4.15	5.05	4.06	3.86	2.98	4.20	4.94	55.04

Table 2-9. Average Monthly Rainfall for the Southern ACT Basin (in inches)

AVERAGE MONTHLY RAINFALL FOR SOUTHERN ACT BASIN													
Gage Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
HIGHLAND HOME, AL	4.85	5.17	6.38	4.57	3.81	4.61	5.48	4.61	3.57	2.62	3.90	4.66	54.22
MILSTEAD, AL	4.83	5.09	6.03	4.59	3.87	3.81	5.10	4.13	3.57	2.58	3.74	4.96	52.30
OPELIKA, AL	5.12	5.19	6.82	4.78	3.71	4.32	5.31	3.92	4.06	3.30	4.22	5.05	55.80
SOUTHERN BASIN AVG	4.93	5.15	6.41	4.65	3.80	4.25	5.30	4.22	3.73	2.83	3.95	4.89	54.11

2-06. Storms and Floods.

a. General. Major flood-producing storms over the ACT Basin are usually of the frontal type, occurring in the winter and spring and lasting from two to four days, with their effect on the basin depending on their magnitude and orientation. The axes of the frontal-type storms generally cut across the long, narrow basin. Frequently, a flood in the lower reaches is not accompanied by a flood in the upper reaches or vice versa. Occasionally, a summer storm of the hurricane type, such as the storms of July 1916 and July 1994, will cause major floods over practically the entire basin. However, summer storms are usually of the thunderstorm type with high intensities over small areas producing serious local floods. With normal runoff conditions, from five to six inches of intense and general rainfall are required to produce widespread flooding, but on many of the minor tributaries, three to four inches are sufficient to produce local floods.

b. Principal Storms. During most years, one or more flood events occur in the ACT Basin. However, on occasion, significant storms produce widespread flooding or unusually high river stages. Generalized descriptions of seven historical storms are presented for reference. Those storms are July 1916, December 1919, March 1929, February 1961, July 1994, May 2003, and September 2009. These storms represent both the hurricane and frontal types which produce the greatest floods in this area. Brief descriptions of the storms are given in the following paragraphs.

1) July 1916. The storm of 5 – 10 July 1916 resulted from a tropical hurricane, which formed in the Caribbean Sea and moved northwest across the Gulf of Mexico to enter the United States east of the mouth of the Mississippi River on the evening of 5 July. The disturbance continued inland across western Mississippi, turned eastward on the 7th and from the 8th to the 10th moved northeastward across Alabama. The heavy precipitation covered a remarkably large area. The 9-inch isohyets on the total-storm isohyetal map, shown in Figure 2-2, include practically all of Alabama, the northwestern part of Florida, and large areas in Mississippi and Georgia.

At the center of greatest intensities, the following amounts of precipitation were recorded over three and one-half days: Bonifay, Florida, 24 inches; Robertsdale, Alabama, 22.6 inches; Merrill, Mississippi, 19.9 inches; and Clanton, Alabama, 18.6 inches. The storm produced general flood conditions throughout the southeastern states and, because it occurred during the middle of the growing season, caused enormous damage. Flood stages were exceeded on practically all the streams in the ACT Basin.

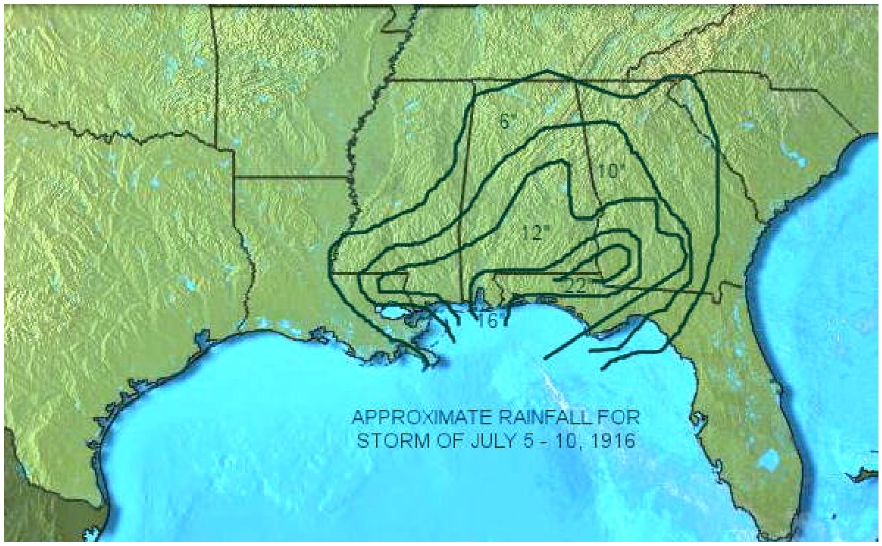


Figure 2-2. Storm of July 1916

2) December 1919. According to U.S. Weather Bureau reports, the storm of 6 – 10 December 1919, was caused by meteorological conditions that were not particularly remarkable, but the sequence in which they developed was the controlling factor. A cyclonic system moved across California and centered over Utah, Oklahoma, and western New Mexico on successive days. A weak cold front was associated with it on the morning of the 7th and extended across Pennsylvania, Maryland, Virginia, and western North Carolina, then became quasi-stationary over northern Georgia, central Alabama, Mississippi, and Louisiana. The front lay in that position the evening of the 9th. An anti-cyclonic system persisted during the period just off the Atlantic Coast, and the circulation set up thereby brought a convergent flow of heavily moisture-laden air from the Gulf region directly over the area. Overrunning and wave development over the initially shallow front brought only moderate precipitation during 6 – 8 December, but a fresh mass of continental, polar air thrust southward on the afternoon of the 8th and on the 9th. The intense convergence about the new development changed the situation to one in which flood-producing rainfall was experienced on 8 – 9 December, and then diminished on the 10th when the front passed eastward. The area of heaviest precipitation extended across southeastern Mississippi, central Alabama, and northern Georgia. The center of greatest rainfall was at Norcross, Georgia, with a total of 12.9 inches. Within the basin, rainfall amounts were recorded as follows: 12.4 inches at Talladega, Alabama; 12.2 inches at Selma, Alabama; and 12.1 inches at Tallassee, Alabama. An isohyetal map of the storm is shown in Figure 2-3.

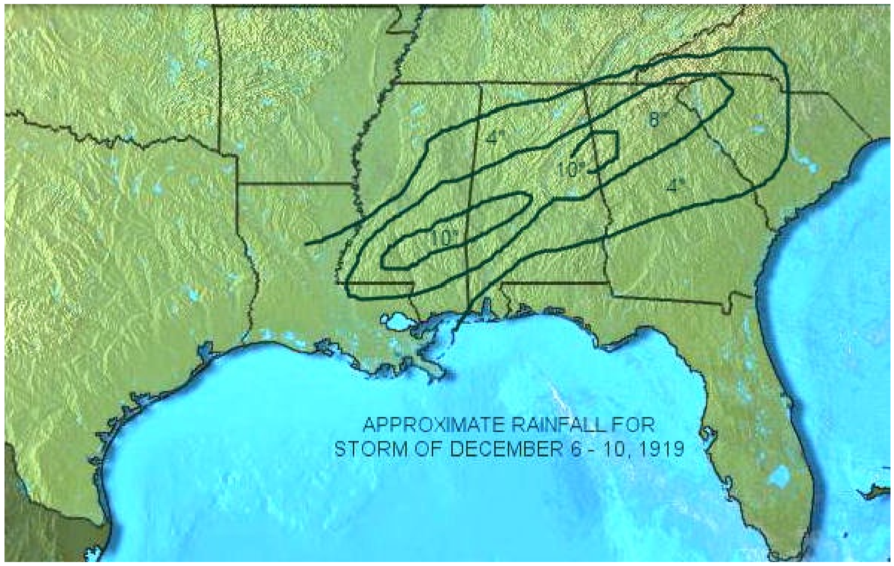


Figure 2-3. Storm of December 1919

3) March 1929. The storm of 11 – 16 March 1929, resulted from a widely extending low-pressure area that developed over eastern Colorado and moved rapidly eastward causing heavy rains, particularly in Alabama and parts of Mississippi, Georgia, and Tennessee. This was one of the greatest storms ever recorded in this country and is outstanding with regard to intensities of precipitation over large areas. The main center was at Elba, Alabama, about 40 miles southeast of the ACT River Basin, with a total of 29.6 inches in three days, of which 20 inches were estimated to have fallen in 24 hours. Other extraordinary amounts for a three-day period were recorded in Alabama in the vicinity of Elba with 20.2 inches at River Falls, 17.4 inches at Ozark, 16.3 inches at Brewton, and 14.2 inches at Newton. The area of intense precipitation included southeastern Mississippi, the southern half of Alabama, northwestern Florida, and southwestern Georgia. In the ACT Basin, the heaviest rainfall occurred in the vicinity of Auburn, Alabama, where a total of 10 inches in three days was recorded. Serious flooding occurred on streams in Georgia, Alabama, and northwest Florida, with many water levels reaching the greatest of record. In the ACT Basin, floods were moderate in the upper portion, becoming progressively more severe downstream, with record stages on the lower Alabama River. An isohyetal map of the storm is shown in Figure 2-4. The four-inch isohyet encompassed the entire ACT Basin.

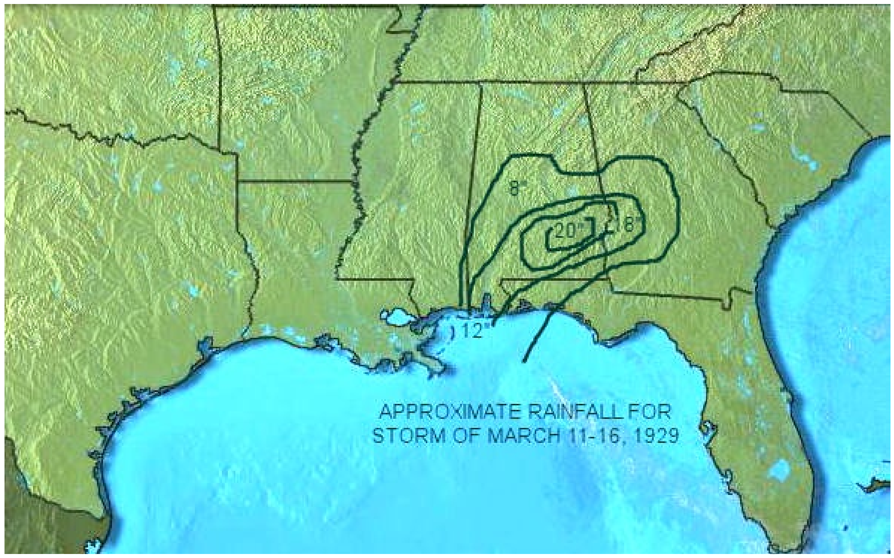


Figure 2-4. Storm of March 1929

4) February 1961. February 1961 was a month of extreme contrasts in the ACT Basin. The month began cold and dry, a continuation of the weather experienced over the area during most of December and January. Some scattered light rains occurred during the first week of February but not nearly enough to overcome the resulting moisture deficit. The drought condition was further intensified by a nine-day period beginning on the 9th that was almost completely devoid of rainfall. Beginning on the 18th, the dry period was abruptly followed by the rainiest eight-day period experienced in Georgia since weather records began. The rains were heaviest in the west central part of the state were both La Grange and West Point recorded more than 17 inches in eight days. More than seven inches fell in both places during a 24-hour period. Most locations northwest of Columbus reported more than eight inches of rain during the eight days. Several areas exceeded 12 inches. It was enough to make it the wettest February since 1929. The heavy rainfall caused flash flooding along many northern Georgia streams with major flooding developing on the Chattahoochee River in the West Point-Columbus area. An isohyetal map of the storm is shown in Figure 2-5.

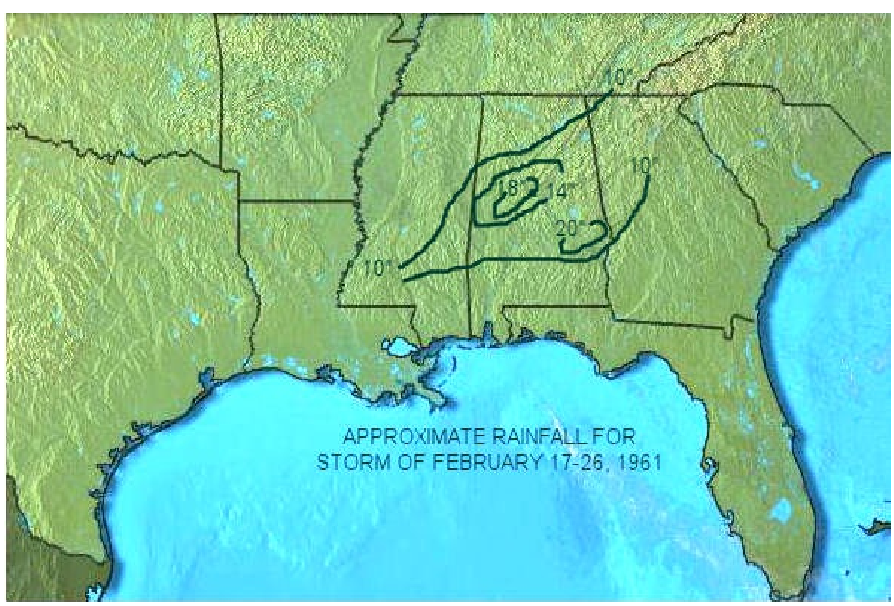


Figure 2-5. Storm of February 1961

5) July 1994. On the afternoon of 30 June 1994, Tropical Storm Alberto formed in the southeastern Gulf of Mexico between the Yucatan Peninsula and the western tip of Cuba. During the first 18 hours, the storm slowly drifted to the west, and then it began a more northwestward course. It continued that course until Saturday, 2 July when the storm began turning northerly. An isohyetal map of the storm is shown in Figure 2-6.

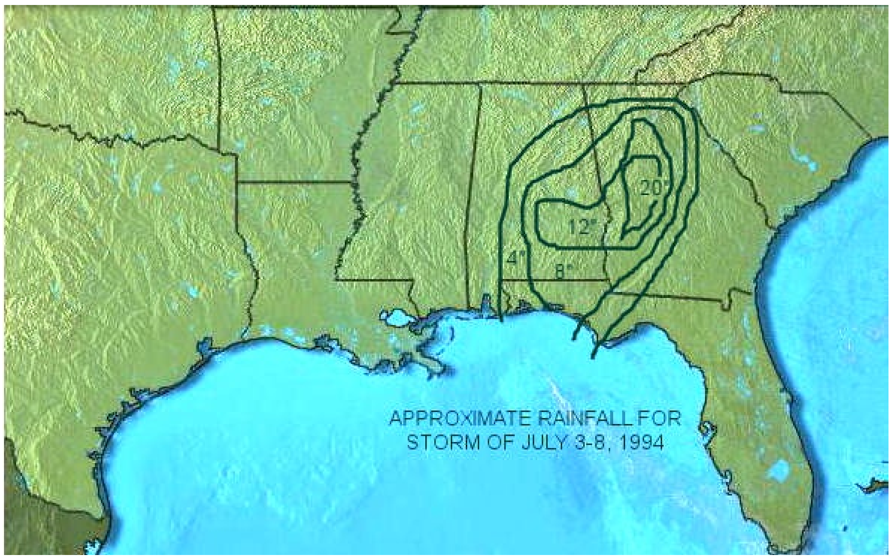


Figure 2-6. Storm of July 1994

Tropical Storm Alberto was near hurricane strength when it made landfall near Ft. Walton Beach, Florida, on Sunday, 3 July. The main threats over portions of Alabama, Florida, and Georgia were heavy rainfall and the possibility of tornados. The upper air patterns (which normally guide storms) were weak. Large areas of high pressure were to the west and the east of the storm. As a result, Tropical Storm Alberto became nearly stationary for several days as it moved over Georgia. Many places reported rainfall totals exceeding 10 inches. Atlanta received 12 - 15 inches, and other locations reported 20 - 26 inches of rainfall. Cuthbert, Georgia, in Randolph County reported 23.87 inches. The greatest flooding occurred in the Flint and Apalachicola Basins.

6) May 2003. Several rounds of thunderstorms occurred over the Morristown, Tennessee, area from 30 April through 4 May. The thunderstorms significantly soaked the ground and raised the level of streams and lakes in the area. On 5 May, a warm front lay across extreme east Tennessee with a cold front over Arkansas. The warm sector of the frontal system with dew point temperatures in the lower 60s (resulting in high atmospheric moisture content) covered most of east Tennessee. A large atmospheric blocking pattern was across the United States, which caused the normal west-to-east progression of weather systems to become nearly stationary.

During a three-day period of 5 – 7 May, heavy rain fell across north and central Georgia, especially in western and extreme northern counties. Some locations such as Troup and southern Meriwether Counties saw almost a foot of rain.

Soils were already saturated from previous rainfall, resulting in rapid rises on many of the small streams in the western half of North and Central Georgia. Many overflowed their banks. One example is in Bartow County where water spilled onto driveways and roads. Record flooding occurred on the Chickamauga near the Tennessee border. Moderate flooding was noted on several other rivers in Georgia. An isohyetal map of the storm is shown in Figure 2-7.

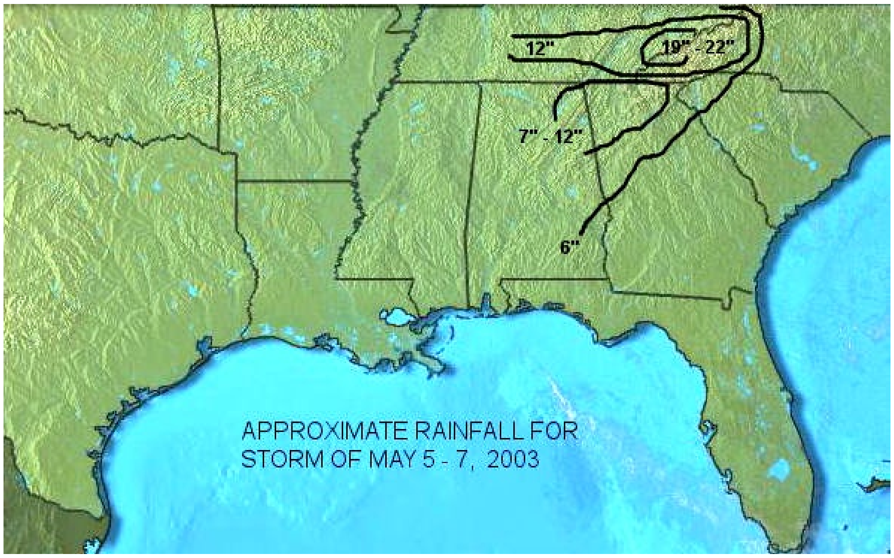


Figure 2-7. Storm of May 2003

7) September 2009. The floods of September 2009 resembled a tropical event but in reality were caused by steady rain for eight days.

During 15 – 18 September 2009, a constant rainfall fell but not in unusual amounts. Most areas had an inch or less on 15 – 16 September and very little on the 18th. By 19 September, the rainfall increased, resulting in three to five inches falling that day.

Rain began falling on the Atlanta area on the 15th, with the National Weather Service (NWS) reporting only 0.04-inch that day at the Hartsfield-Jackson Atlanta International Airport. Additional rain fell throughout the week, with only a trace amount recorded for 18 September. However, a large rain event began to inundate the area on 19 September. The official NWS monitoring station at the Atlanta airport recorded 3.70 inches of rainfall from daybreak to 8 p.m. (more than doubling the previous record for rainfall on that date), while outlying monitoring stations recorded five inches of rainfall in a 13-hour period.

The Governor of Georgia declared a State of Emergency, and requested a disaster declaration from the U.S. Government for 17 counties in Georgia. The counties were Bartow, Carroll, Cherokee, Cobb, Coweta, DeKalb, Douglas, Fulton, Gwinnett, Heard, Newton, Paulding, and Rockdale Counties around Metro Atlanta; Catoosa, Chattooga, and Walker Counties in far northwest Georgia; and Stephens County in northeast Georgia.

According to the United States Geological Survey (USGS), the rivers and streams had magnitudes so great that the odds of it happening were less than 0.2 percent in any given year. In other words, there was less than a one in 500 chance that parts of Cobb and Douglas Counties would experience such flooding. An isohyetal map of the storm is shown in Figure 2-8. A photo of the September 2009 flood near Acworth, Georgia, is shown in Figure 2-9 below.

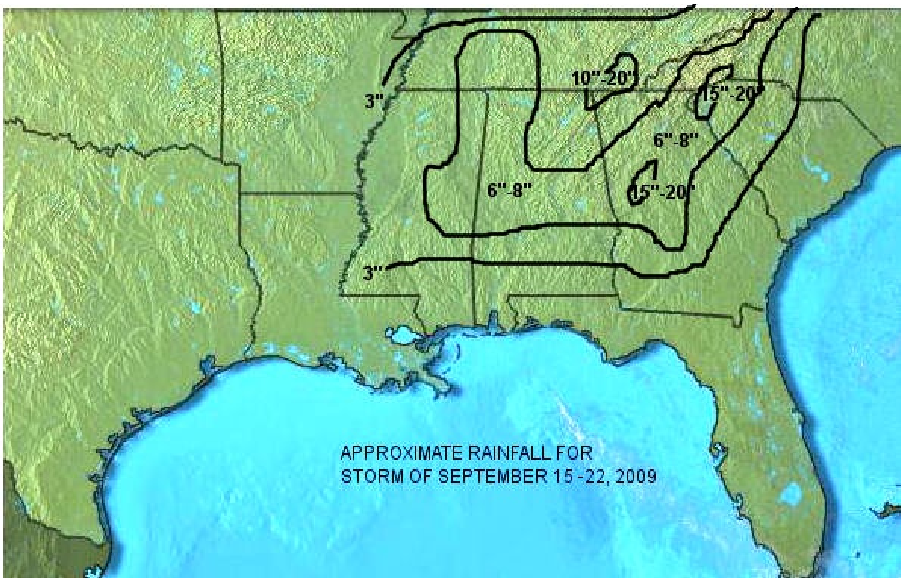


Figure 2-8. Storm of September 2009

Figure 2-9. Flooding near Acworth, Georgia - September 2009

2-07. Runoff Characteristics. Within the ACT Basin, rainfall occurs throughout the year but is less abundant during the August through November time-frame. The amount of rainfall that actually contributes to streamflow varies much more than the rainfall. Several factors such as plant growth, antecedent soil moisture conditions, and the seasonal rainfall patterns contribute to the volume of runoff. Tables 2-10, 2-11, and 2-12 present the mean monthly discharges (MMD) at selected stations throughout the basin. Figures 2-10, and 2-11 divide the basin at Rome, Georgia, and Claiborne, Alabama, to show the different percentages of runoff verses rainfall for the various sections. The mountainous areas exhibit flashier runoff characteristics and somewhat higher percentages of runoff.

Table 2-10. Mean Monthly Flows (cfs) at Selected Gage Stations in the Coosa River Basin

Gage station	Period of record	Discharge (cfs)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
02382500 Coosawattee River at Carters, GA	1976 to 2009	Monthly Mean (MMD)	1,180	1,320	1,620	1,570	1,210	889	828	680	552	591	715	938
		Highest MMD	2,384	4,651	4,861	4,004	2,455	1,596	2,247	1,536	972	1,852	2,008	2,527
		(Year)	(1978)	(1990)	(1990)	(1977)	(2003)	(2003)	(1976)	(2003)	(2004)	(1989)	(1977)	(2004)
		Lowest MMD	250	247	248	296	425	327	328	332	299	224	222	248
		(Year)	(2008)	(2008)	(2008)	(2008)	(1988)	(2008)	(1988)	(2008)	(1998)	(1998)	(1998)	(2007)
02394000 Etowah River at Allatoona Dam above Cartersville, GA	1976 to 2009	Monthly Mean (MMD)	2,080	1,890	2,210	2,220	1,990	1,480	1,540	1,300	1,220	1,500	2,020	2,120
		Highest MMD	4,710	5,187	6,533	5,520	5,321	3,463	4,028	3,524	2,464	5,880	5,316	5,447
		(Year)	(1993)	(1996)	(1990)	(1976)	(1980)	(2003)	(2005)	(1984)	(2004)	(1989)	(1977)	(1983)
		Lowest MMD	322	306	493	360	445	541	430	423	399	448	635	339
		(Year)	(2008)	(2008)	(2002)	(1988)	(2007)	(2007)	(1986)	(1986)	(1986)	(1986)	(2007)	(2007)
02397000 Coosa River near Rome, GA	1976 to 2009	Monthly Mean (MMD)	8,660	9,370	11,400	9,580	6,980	4,560	4,430	3,280	3,110	3,610	5,180	6,780
		Highest MMD	16,950	31,130	29,220	24,630	23,490	11,700	14,470	9,360	8,013	15,440	14,130	18,640
		(Year)	(1993)	(1990)	(1990)	(1977)	(2003)	(1989)	(2003)	(1984)	(2004)	(1989)	(1977)	(1983)
		Lowest MMD	1,951	2,912	3,115	2,262	1,485	1,338	1,341	1,337	1,410	1,097	1,395	1,533
		(Year)	(2008)	(2000)	(1988)	(2007)	(2007)	(2007)	(1986)	(2007)	(1999)	(2007)	(2007)	(2007)

Table 2-11. Mean Monthly Flows (cfs) at Selected Gage Stations in the Tallapoosa River Basin

Gage station	Period of record	Discharge (cfs)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
02414500 Tallapoosa River at Wadley, AL	1984 to 2009	Monthly Mean (MMD)	3,090	4,210	4,690	2,440	2,560	1,790	1,930	1,380	1,140	1,240	2,090	2,450
		Highest MMD	6,757	10,890	13,270	5,162	14,320	4,819	7,058	4,331	3,180	5,599	6,246	8,336
		(Year)	(1993)	(1990)	(1990)	(2005)	(2003)	(2003)	(2005)	(1984)	(2004)	(1995)	(1992)	(1983)
		Lowest MMD	299	1,607	1,294	542	380	520	527	383	320	234	185	220
		(Year)	(2008)	(1986)	(1988)	(1986)	(2007)	(1986)	(1988)	(2007)	(1990)	(1986)	(2007)	(2007)
02418500 Tallapoosa River below Tallassee, AL	1984 to 2009	Monthly Mean (MMD)	5,210	6,260	6,120	3,630	3,770	3,490	3,330	2,810	2,600	2,750	4,350	5,380
		Highest MMD	10,510	18,060	22,970	8,202	18,630	13,350	13,230	9,205	6,153	9,145	8,831	12,920
		(Year)	(1993)	(1990)	(1990)	(1998)	(2003)	(1989)	(2003)	(1984)	(2009)	(1995)	(1995)	(1983)
		Lowest MMD	404	651	613	432	381	1,336	814	638	923	681	488	407
		(Year)	(2008)	(2008)	(2007)	(2007)	(1988)	(1985)	(1988)	(2007)	(1986)	(1986)	(2007)	(2007)

Table 2-12. Mean Monthly Flows (cfs) at Selected Gage Stations in the Alabama and Cahaba River Basins

Gage station	Period of record	Discharge (cfs)	Month Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
02420000 Alabama River near Montgomery , AL	1976 to 2009	Monthly Mean (MMD)	23,400	35,000	42,700	36,300	23,300	14,700	14,200	10,300	10,500	11,300	17,600	25,700
		Highest MMD	38,250	101,100	107,200	127,200	79,410	59,320	47,100	33,200	27,710	23,940	42,870	74,420
		(Year)	(2009)	(1990)	(1990)	(1979)	(2003)	(1989)	(2003)	(1984)	(2009)	(1979)	(2004)	(1983)
		Lowest MMD	6,098	12,400	10,510	6,186	4,681	4,513	4,929	4,210	4,113	3,646	2,430	2,294
		(Year)	(2008)	(2009)	(2007)	(2007)	(1986)	(1986)	(2008)	(1988)	(1986)	(2007)	(2007)	(2007)
02428400 Alabama River at Claiborne Lake lock and dam near Monroeville, AL	1976 to 2009	Monthly Mean (MMD)	46,500	53,100	64,800	48,600	27,600	18,000	15,200	12,200	11,700	14,800	21,000	32,300
		Highest MMD	90,120	126,000	145,000	147,600	62,250	62,470	59,580	44,030	37,580	49,420	65,300	93,480
		(Year)	(1993)	(1990)	(1990)	(1979)	(1980)	(1989)	(1989)	(1984)	(2009)	(1995)	(1992)	(1983)
		Lowest MMD	7,846	12,820	15,700	9,125	6,083	5,029	4,495	4,575	4,592	4,152	3,653	2,937
		(Year)	(2008)	(2009)	(2007)	(2007)	(2007)	(2007)	(2008)	(2007)	(2007)	(2007)	(2007)	(2007)
02425000 Cahaba River near Marion Junction, AL	1976 to 2009	Monthly Mean (MMD)	4,110	4,920	5,950	4,770	2,550	1,670	1,530	943	1.190	1,030	1,660	2,650
		Highest MMD	10,450	15,960	14,970	17,100	9,466	5,504	6,661	2,348	6,530	3,394	5,588	10,360
		(Year)	(1998)	(1990)	(1980)	(1979)	(2003)	(2003)	(2005)	(2003)	(2009)	(1995)	(2004)	(1983)
		Lowest MMD	816	1,324	1,333	645	461	304	399	278	305	302	313	408
		(Year)	(1981)	(2000)	(2007)	(1986)	(2007)	(2007)	(2008)	(2007)	(2000)	(2000)	(2008)	(2007)

Note: For the Montgomery gage, no data were available for water years 1991 through 2001.

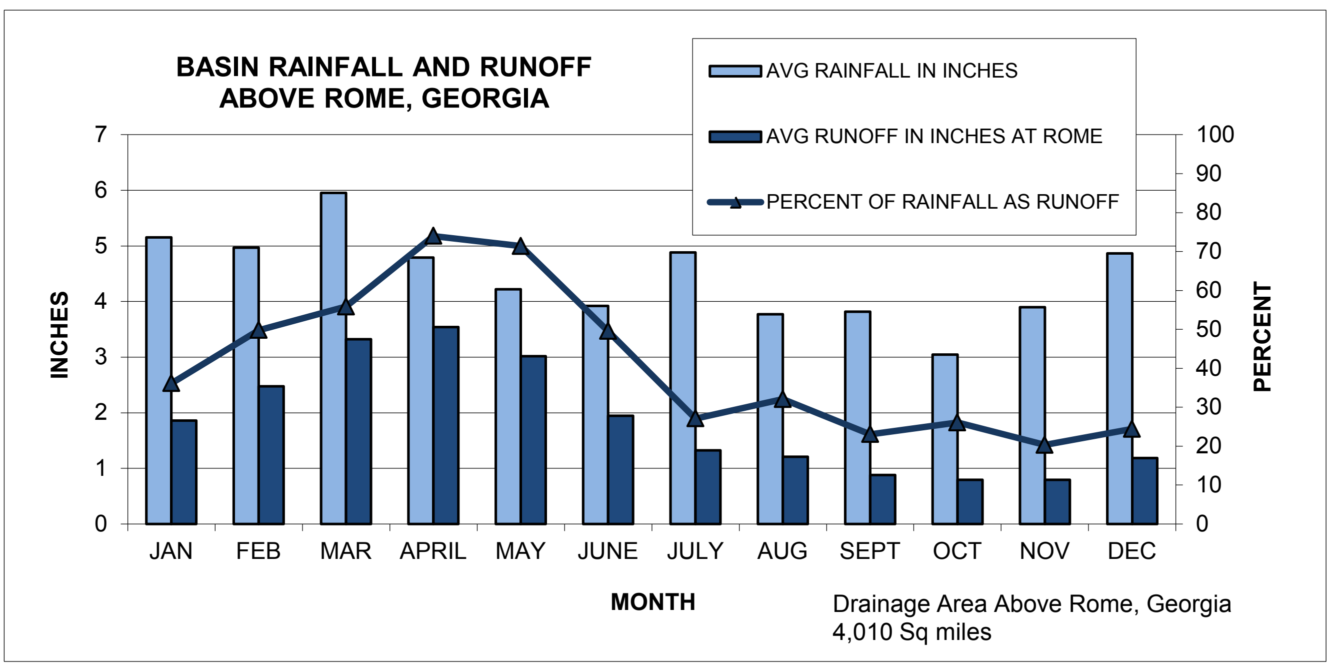


Figure 2-10. Basin Rainfall and Runoff Above Rome, Georgia

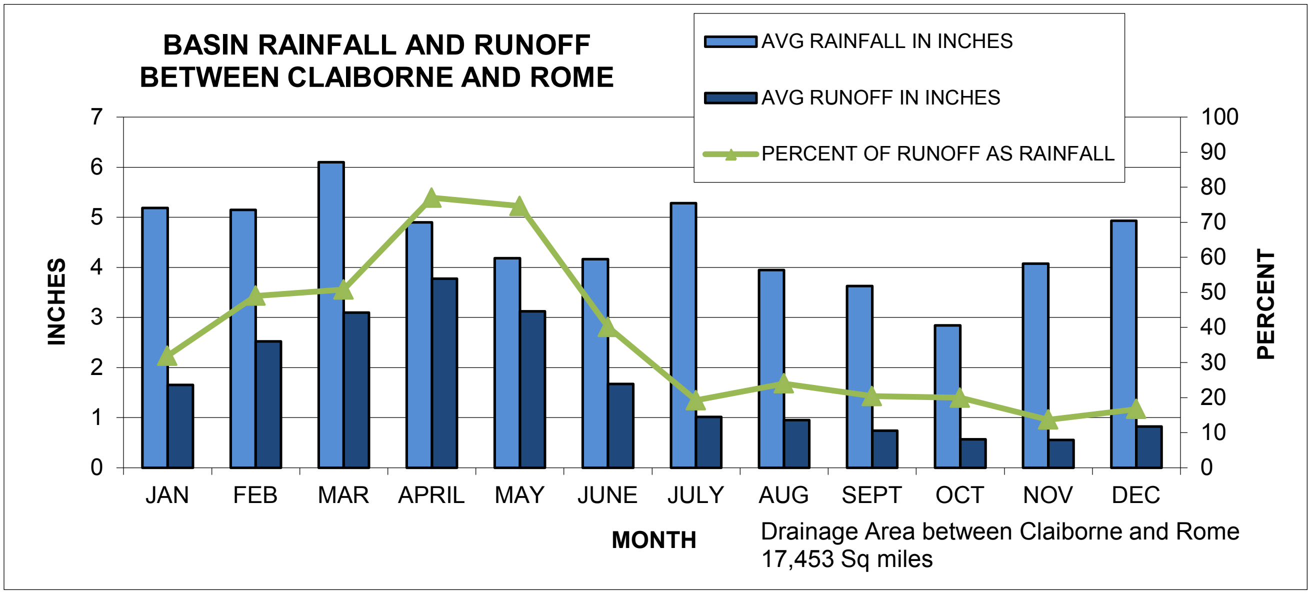


Figure 2-11. Basin Rainfall and Runoff Between Claiborne, Alabama and Rome, Georgia

2-08. Water Quality. Trends in water quality since the passage of the Clean Water Act in 1972 show improvement. An unpublished study to evaluate trends in water quality data collected by Alabama Department of Environmental Management (ADEM) from 1974 to 1998 indicates that overall total phosphorus, total suspended solids, and nitrate concentrations have improved. The USGS described water quality trends in a report published in 2009, entitled *Trends in Water Quality in the Southeastern United States, 1973* – 2005. This report included four sampling sites located in the ACT Basin: Alabama River at Claiborne, Alabama; Oostanaula River at Rome, Georgia; Etowah River at Canton, Georgia; and Etowah River at Hardin Bridge Road near Euharlee, Georgia. This investigation indicated an increasing trend in pH and specific conductance and a decreasing trend in nitrogen, phosphorus, and suspended sediments. Of course, these general trends may be different at specific site locations. Today, the focus of regulatory agencies is eutrophication in lakes and reservoirs, suspended sediment, nonpoint sources of pollution, and fecal coliform bacteria. Several total maximum daily loads (TMDLs) have been developed in the ACT Basin. TMDLs are developed for waterbodies to identify sources of impairment, the necessary reductions to sources, and methods to implement the reductions. The following paragraphs address water quality in the ACT Basin by the major rivers, the Coosa River, the Tallapoosa River, and the Alabama River.

a. Coosa River Basin. The upper part of the Coosa River Basin lies in Georgia and is impacted by growth from the metro Atlanta region. The Georgia Department of Natural Resources (GDNR) lists 1,127 miles of streams in the Coosa River Basin as not supporting their designated uses in the 2012, 305(b)/303(d) Integrated Report. Two segments in Allatoona Lake and two segments in Carters Lake do not support their designated uses (all nutrient related issues). Urban runoff and high Polychlorinated biphenyl (PCB) concentrations in fish are the most commonly cited problems. The three major tributaries of the Coosa River in Georgia have commercial fishing bans and fish consumption guidance because of PCBs. Alabama lists 136 miles of streams and 1,561 acres (Lay Lake) in the Coosa River Basin that do not support their designated uses (2012 report). In Georgia, 49 tributaries to the mainstem waterbodies are identified as biologically impaired from sedimentation. Fecal coliform bacteria, elevated nutrients, and metals are the principal parameters that are named for exceeding criteria.

At Carters Lake, two segments (Coosawattee River embayment and U.S. Woodring Branch/mid-lake) are listed in Georgia's 2012 Integrated Report as impaired for chlorophyll *a* and Phosphorus. Carters Lake does experience strong thermal stratification, and dissolved oxygen levels are reduced in the hypolimnetic zone during late summer. The reregulation pool downstream of the main lake serves as a buffer to improve water quality and flow condition downstream of the dam.

At Allatoona Lake, two segments (Little River embayment and Etowah River arm) are listed in Georgia's 2012 Integrated Report as impaired for chlorophyll *a*. The mid-lake and dam forebay portions of Allatoona Lake meet all designated water use criteria. The reservoir is transitioning from mesotrophic to eutrophic because of the influx of phosphorus nutrients. Phosphorus has increased in the reservoir and its tributaries because of increases in urban lands and broiler and beef cattle production. Dissolved oxygen levels in the tailwaters of Allatoona Dam drop below four mg/L during the summer and through early fall, and can reach as low as one mg/L.

Further down the Coosa River Basin, gravel mining, feedlots, cropland erosion, and hydroelectric power production are sources for organic enrichment and low concentrations in the basin. The Coosa River is generally more enriched in nutrients (nitrogen and phosphorus) than the Tallapoosa River. In 1990, a statewide ban on high phosphate detergents in Georgia was implemented to aid the phosphorus reduction process for all water in Georgia and further downstream.

For the APC projects in the Coosa River Basin (Weiss, Neely Henry, Logan Martin, Lay, Mitchell, and Jordan), the reservoirs are relatively shallow in depth and do not experience thermal stratification, although dissolved oxygen levels can still become depressed in lower portions of the reservoir. During the late summer, when APC releases water for hydropower generation, dissolved oxygen levels are often less than four mg/L in the deeper portions of the reservoirs. The dissolved oxygen levels in the reservoir tailwaters have occasionally violated water quality criteria, with violations typically occurring less than seven percent of the time (APC 2009).

The six APC project reservoirs form a continuous slackwater system on the Coosa River, which prevents significant reaeration in the reservoir tailwaters, with the exception of the Weiss tailwater. Aeration systems are in place on several of the reservoir dams (Logan Martin, Lay, Mitchell, Jordan, Harris, Martin, Yates), and APC has plans to install aeration measures on the Weiss and Neely Henry developments. This installation, along with continued and improved operation of the aeration systems should ensure that dissolved oxygen standards are met in the tailwaters of the APC reservoirs.

Five of the six APC reservoirs have been listed on the Alabama 303(d) list from PCB contamination, nutrient and organic enrichments, and pH and dissolved oxygen violations. TMDLs were completed in 2008 for Logan Martin, Neely Henry, Lay, Mitchell, and Weiss Lake to address the pH, nutrient, and organic enrichment violations. High levels of nutrient concentrations have increased eutrophication in the lakes.

b. <u>Tallapoosa River Basin</u>. Georgia has identified 121 miles of streams that do not support their designated uses (GADNR 2012) and seven stream segments as biologically impaired from sedimentation. A TMDL has also been developed for fecal coliforms. Alabama has identified 146 miles of streams in the Tallapoosa River Basin that do not support their designated uses (ADEM, 2012). ADEM's 2012 Section 303(d) list identifies Yates, Thurlow, and Martin Lakes are impaired due to mercury; and Yates Lake is also impaired due to high level of Organics.

Gravel mining, feedlots, and cropland erosion are major sources for nonpoint pollution in the Tallapoosa River.

c. Alabama River Basin. Within the Tallapoosa River Basin, Alabama has identified 147 miles of streams and 5,427 acres in Claiborne Lake that do not support their designated uses (ADEM, 2012). Claiborne Lake is impaired due to mercury and high organic levels. Logging and mining activities are major causes for impairments in the basin. Water quality indicators such as dissolved oxygen and biochemical oxygen demand have shown trends indicative of degrading conditions. Similar impairments, including high concentrations of metals and low pH values attributed to mining activities are found in the Cahaba River Basin. The Cahaba River Basin has 125 miles of streams that do not support their designated uses (ADEM, 2012).

2-09. Channel and Floodway Characteristics. Channel characteristics vary greatly throughout the basin from the steep, narrow, flashy Etowah and Coosawattee Rivers in the rocky strata in the upper reaches of the Blue Ridge Mountains, to the 1,000 foot-wide, meandering Alabama River below the Claiborne Lock and Dam.

a. Coosa River. The river banks are stable and vary from 25 to 150 feet in height. The width between banks varies from 300 to 500 feet. The Coosa River has a total fall of 454 feet in 286 miles, giving an average slope of 1.59 feet per mile. The steepest slope occurs at the Fall Line in the lower reach. The Coosa River at Wetumpka, Alabama is shown in Figure 2-12.

Figure 2-12. Coosa River at Wetumpka, Alabama

The main tributaries of the Coosa River are its headwater streams, the Etowah and Oostanaula Rivers. The Etowah River flows for 150 miles to Rome with a maximum width of about 40 feet and a length of about 70 miles. The Etowah River has a fall of 2,690 feet in 150 miles or an average fall of 17.9 feet per mile. The Oostanaula River is formed by the Coosawattee and Conasauga Rivers at Newtown Ferry, Georgia, and has a relatively flat slope of one foot per mile. The Coosawattee River is 45 miles long; and has a fall of 650 feet, an average of 14.4 feet per mile.

b. Tallapoosa River. The Tallapoosa River rises in northwestern Georgia at an elevation of about 1,250 feet NGVD29, and flows westerly and southerly for 268 miles, joining the Coosa River south of Wetumpka, Alabama. North of Tallassee, Alabama, the river cuts through the crystalline rock area and the banks are high and stable. Below Tallassee, the river meanders through the upper regions of the Coastal Plain and the banks are relatively low. The total fall of the Tallapoosa River is 1,144 feet in 268 miles, giving an average slope of 4.27 feet per mile. The Tallapoosa River at Tallassee, Alabama, is shown in Figure 2-13.

Figure 2-13. Tallapoosa River at Tallassee, Alabama

c. Alabama River. The Alabama River is formed by the confluence of the Coosa and Tallapoosa Rivers near Montgomery, Alabama, and meanders through the Coastal Plain westerly for about 100 miles to Selma, Alabama. From there it flows southwesterly 214 miles to its mouth near Calvert, Alabama. The floodplain is characterized by valleys varying in width from 0.5 to 8 miles, with an average width of approximately three miles. The river falls a total of 106 feet with an average slope of 0.34 foot per mile. At low stages, the effect of the tide in Mobile Bay is noticeable at the juncture of the Alabama and Tombigbee Rivers.

Figure 2-14. Alabama River at Dixie Landing

From its source to a point about 150 miles below Selma, Alabama, the banks of the Alabama River are comparatively high, averaging more than 40 feet above mean low water. The width between banks in this reach varies from 500 to 1,000 feet. Below this point the banks become lower until, at the mouth of the river, they are less than 10 feet high. There are numerous bluffs along the river, some of them over 100 feet high. The Alabama River at Dixie Landing, Alabama, is shown in Figure 2-14.

2-10. Economic Data. The ACT Basin drains approximately 22,800 square miles in parts of Tennessee, Georgia, and Alabama and covers 32 counties in Alabama, 18 counties in Georgia, and two counties in Tennessee. Water resources in the ACT Basin have been managed to serve a variety of purposes, including navigation, hydroelectric power, flood risk management, water supply, water quality, and recreation. Such water resources also provide important habitat for fish and wildlife.

Population in the southern states has increased dramatically since the 1940s. Figures 2-15 and 2-16 show the increase in housing density in the ACT Basin.

According to the U.S. Census Bureau, the population in the ACT Basin is 5,050,376 people (2006). The population has more than doubled in the region over the past 50 years. About 60 percent of the population in the ACT Basin resides in Alabama with the remainder in Georgia. While the overall percentage of population is larger in Alabama, the compound annual growth rate over the past 40 years averages about three percent for the Georgia portion of the basin compared to less than one percent for the Alabama portion. The overall annual growth rate for the ACT Basin is 1.28 percent for 1960 through 2006.

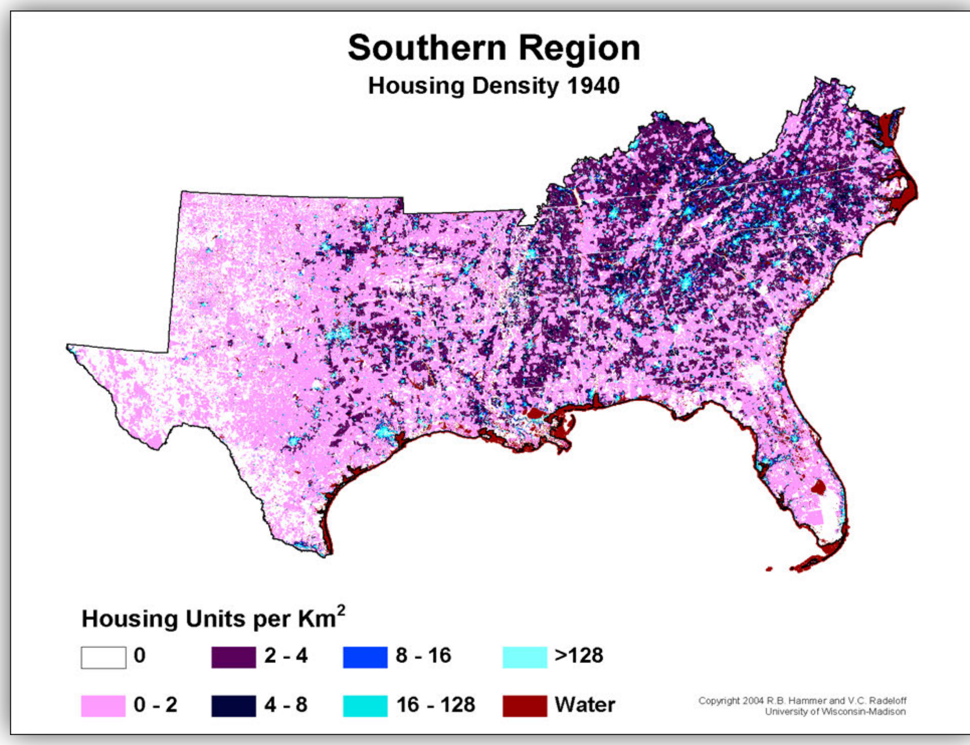


Figure 2-15. Houses per Kilometer in 1940

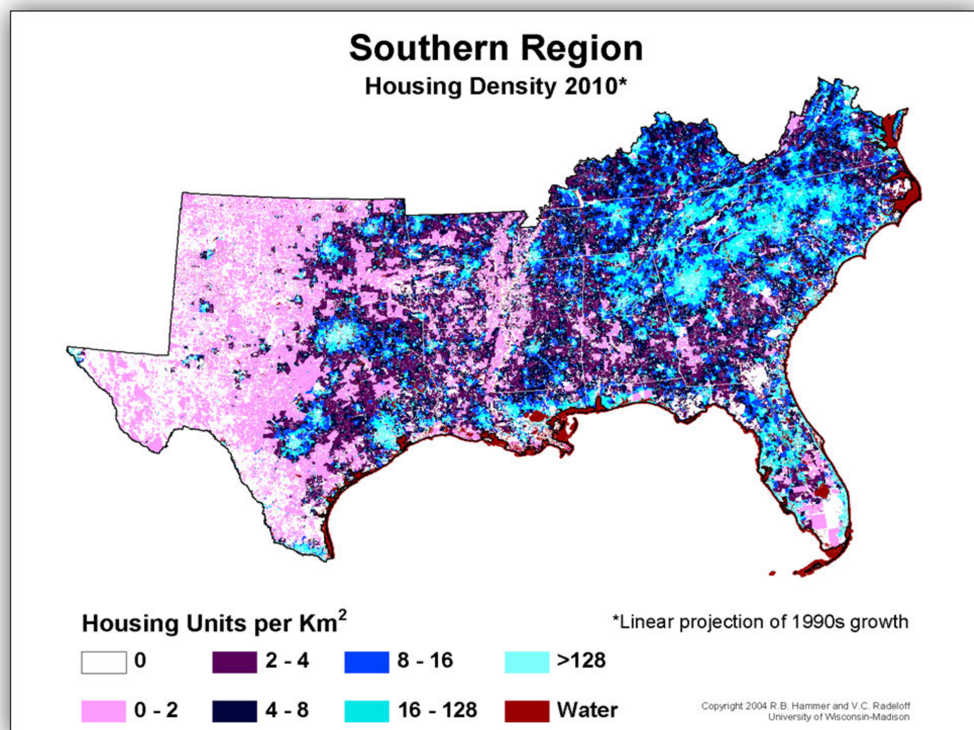


Figure 2-16. Houses per Kilometer in 2010

2-11. Land Use. ACT Basin land use data were compiled from the USGS 2001 National Land Cover Database (NLCD) which was specifically developed to provide consistent land use coverage for the United States. The NLCD land cover uses are categorized as water, developed, barren land, forested land, shrubland, cultivated herbaceous or planted (i.e., agricultural), and wetlands. The overall proportions of the land cover categories in the ACT Basin are illustrated in Figure 2-17, and the acreage associated with the land cover categories are summarized in Table 2-13.

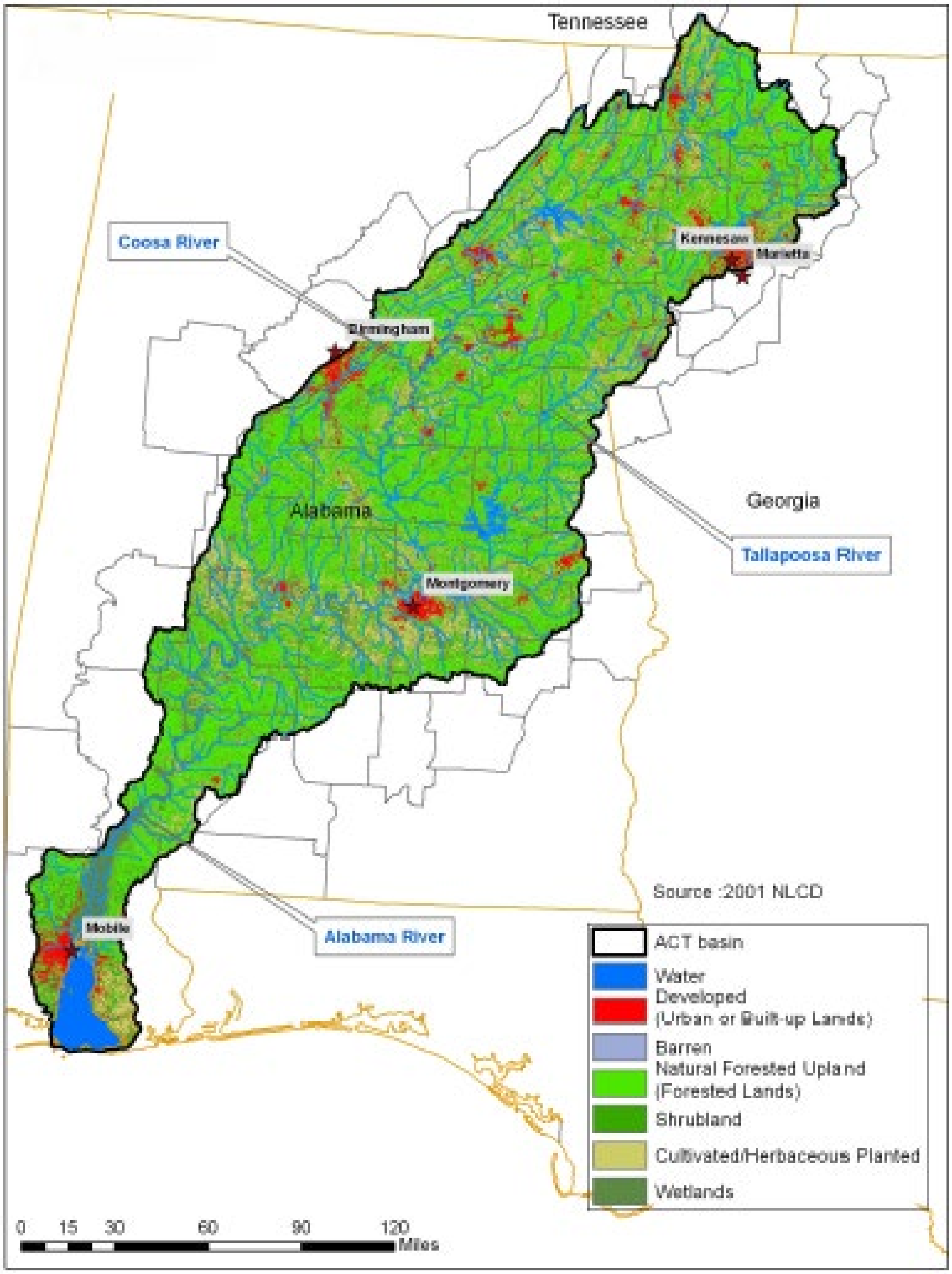


Figure 2-17. Land Use in the ACT Basin

Table 2-13. ACT Basin Land Use

	Acres	Percent of total acreage
Water	563,381	3.6%
Developed (urban or built-up land)	1,254,156	8.0%
Barren	73,980	0.5%
Natural forested upland (forested lands)	8,887,586	56.6%
Shrubland	1,439,520	9.2%
Cultivated herbaceous/planted	2,444,589	15.6%
Wetlands	1,030,440	6.6%
Total - ACT Basin	15,693,652	100.0%

Source: USGS NLCD 2001

As listed in Table 2-13, water covers approximately 563,400 acres or almost four percent of the ACT Basin. Developed land is urban or built-up land that consists of residential, commercial, industrial, and recreational land use. Developed land accounts for more than 1.25 million acres or eight percent of the ACT Basin land use. The largest developed areas in the ACT Basin are Kennesaw and Marietta, Georgia (considered suburbs of the Atlanta metropolitan area), which are in the northern portion of the ACT Basin, south of Allatoona Lake; Birmingham, Alabama (Alabama's largest city), in the west-central portion of the ACT Basin; Montgomery, Alabama (the capital of Alabama), in the east-central portion of the ACT Basin along the Alabama River; and Mobile, Alabama, at the southern end of the ACT Basin on Mobile Bay. Barren land consists of areas of bedrock, desert pavement, sand dunes, strip mines, gravel pits, and other accumulations of earthen material and covers approximately 73,980 acres or less than one percent of land in the ACT Basin.

The forested category of land use consists of deciduous forest (tree species that shed foliage in response to seasonal change), evergreen forest (tree species that maintain their foliage all year), and mixed forest. Forested land is the predominant land use in the ACT Basin and accounts for more than 8.8 million acres or almost 57 percent of land use.

Shrubland includes areas dominated by shrubs, young trees, or trees stunted from environmental conditions. Shrubland accounts for more than 1.4 million acres or about nine percent of the ACT Basin land.

Cultivated herbaceous or planted land is the second most predominant land use in the ACT Basin, accounting for more than 2.4 million acres or about 16 percent of land use. Cultivated herbaceous land consists of grazing land and herbaceous vegetation areas not subject to intensive management such as tilling. Cultivated planted land consists of all land being actively tilled for the production of annual crops such as corn, soybeans, vegetables, tobacco, cotton, and perennial woody crops such as orchards and vineyards.

Wetlands consist of palustrine and estuarine emergent wetlands and account for more than one million acres or almost seven percent of ACT Basin land. Palustrine wetlands are inland wetlands that lack flowing water, are non-tidal, and include inland marshes, swamps, bogs, and floodplains. Estuarine wetlands are coastal wetlands that are tidal and consist of vegetated and non-vegetated brackish and saltwater marshes, shoals, flats, estuaries, bays, and sounds.

2-12. Water Use. The ACT Basin rivers and lakes are a major source of water supply by many cities, industries, and farms for wastewater dilution, municipal water supply, fish and wildlife propagation, hydropower generation, and recreational boating and fishing. Tables 2-14 and 2-

15 describe the primary water demands in the ACT Basin. Overall, the most significant water use within the ACT Basin is thermoelectric power generation (73 percent in Georgia and 72 percent in Alabama). Public water supply represents about 20 percent in Georgia and 13 percent in Alabama. Tables 2-16 and 2-17 summarize specific municipal and industrial (M&I) surface water withdrawals in the ACT Basin for Georgia and Alabama, based on data from 2005. Table 2-18 provides a summary of permitted surface water withdrawals for M&I uses in the ACT Basin in Georgia (GAEPD 2009). Surface water withdrawal permits are required by Georgia law for withdrawals in excess of 100,000 gallons per day. No similar permit requirement exists for Alabama.

Table 2-14. Surface Water Use - ACT Basin (Georgia, 2005) (mgd)

ACT Basin	USGS Hydrologic Unit Code (HUC)	Public supply	Industrial	Irrigation	Livestock	Thermo-electric	Total for Georgia
Georgia Portion		154.78	32.49	11.31	16.18	573.92	788.98
% of Total		19.6%	4.1%	1.4%	2.1%	72.8%	100%

Table 2-15. Surface Water Use - ACT Basin (Alabama, 2005) (mgd)

ACT subbasin	USGS Hydrologic Unit Code (HUC)	Public supply	Industrial	Irrigation	Livestock	Thermo-electric	Total, by subbasin
Upper Coosa	03150105	2.12	0	3.10	0.40	0	5.62
Middle Coosa	03150106	33.24	65.83	7.91	0.87	142.68	250.53
Lower Coosa	03150107	10.96	0.89	5.10	0.35	812.32	829.62
Upper Tallapoosa	03150108	0.90	0	0.15	0.40	0	1.45
Middle Tallapoosa	03150109	19.09	0	0.52	0.32	0	19.93
Lower Tallapoosa	03150110	38.22	2.23	4.22	0.28	0	44.95
Upper Alabama	03150201	10.40	30.63	3.84	0.84	4.14	49.85
Cahaba	03150202	52.90	0	3.49	0.25	0	56.64
Middle Alabama	03150203	0	21.04	1.73	0.48	0	23.25
Lower Alabama	03150204	0	54.61	0.64	0.02	0	55.27
Total - By Use Category		167.83	175.23	30.70	4.21	959.14	1337.11
% of Total		12.6%	13.1%	2.3%	03%	71.7%	100%

Table 2-16. M&I Surface Water Withdrawals in the ACT Basin (Georgia)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa River Basin (Georgia)			
Coosa (Conasauga)	Dalton Utilities	Whitfield	35.38
Coosa (Conasauga)	City of Chatsworth	Murray	1.26
Coosa (Coosawattee)	Ellijay-Gilmer County Water System	Gilmer	3.12
Coosa (Coosawattee)	City of Fairmount	Gordon	0.06
Coosa (Oostanaula)	City of Calhoun	Gordon	9.10
Coosa (Etowah)	Big Canoe Corporation	Pickens	0.48
Coosa (Etowah)	City of Jasper	Pickens	1.00
Coosa (Etowah)	Bent Tree Community	Pickens	0.07
Coosa (Etowah)	Lexington Components Inc. (Rubber)	Pickens	0.01
Coosa (Etowah)	Etowah Water and Sewer Authority	Dawson	1.50
Coosa (Etowah)	Town of Dawsonville	Dawson	0.10
Coosa (Etowah)	City of Canton	Cherokee	2.83
Coosa (Etowah)	Cherokee County Water System	Cherokee	15.81
Coosa (Etowah)	Gold Kist, Inc.	Cherokee	1.94
Coosa (Etowah)	City of Cartersville	Bartow	13.26
Coosa (Etowah)	New Riverside Ochre Company, Inc. (Chemicals)	Bartow	1.67
Coosa (Etowah)	Gerdau AmeriSteel US, Inc. – Cartersville Steel Mill (Primary metals)	Bartow	0.16
Coosa (Etowah)	Georgia Power Co – Plant Bowen	Bartow	38.92
Coosa (Etowah)	CCMWA	Bartow	44.42
Coosa (Upper Coosa)	City of Lafayette	Walker	1.20
Coosa (Upper Coosa)	City of Summerville	Chattooga	2.05
Coosa (Upper Coosa)	Mount Vernon Mills – Riegel Apparel Division (Textiles)	Chattooga	2.74
Coosa (Oostanaula)	City of Cave Spring (Domestic/Commercial)	Floyd	0.30
Coosa (Etowah / Oostanaula)	City of Rome	Floyd	9.98
Coosa (Upper Coosa)	Floyd County Water System	Floyd	2.57
Coosa River Basin (Georgia)			
Coosa (Upper Coosa)	Inland Rome Inc. (Paper)	Floyd	25.74
Coosa (Upper Coosa)	Georgia Power Co - Plant Hammond	Floyd	535.00
Coosa (Upper Coosa)	Polk County Water Authority	Polk	2.22
Coosa (Etowah)	Vulcan Construction Materials	Polk	0.09
Tallapoosa River Basin (Georgia)			
Tallapoosa (Upper)	City of Bremen	Haralson	0.32
Tallapoosa (Upper)	Haralson County Water Authority	Haralson	2.05
Tallapoosa (Upper)	City of Bowdon	Carroll	0.75
Tallapoosa (Upper)	Southwire Company	Carroll	0.09
Tallapoosa (Upper)	City of Carrollton	Carroll	5.37
Tallapoosa (Upper)	City of Temple	Carroll	0.26
Tallapoosa (Upper)	City of Villa Rica	Carroll	0.58
Tallapoosa (Upper)	Carroll County Water System	Carroll	4.08

Table 2-17. M&I Surface Water Withdrawals in the ACT Basin (Alabama)

Basin (sub-basin)	Withdrawal by	County	Withdrawal (mgd)
Coosa River Basin (Alabama)			
Coosa (Upper)	Centre Water Works & Sewer Board	Cherokee	1.19
Coosa (Upper)	Piedmont Water Works & Sewer Board	Calhoun	0.93
Coosa (Middle)	Jacksonville Water Works & Sewer Board	Calhoun	1.34
Coosa (Middle)	Anniston Water Works & Sewer Board	Calhoun	0.08
Coosa (Middle)	Fort Payne Water Works Board	De Kalb	8.10
Coosa (Middle)	Goodyear Tire and Rubber Company	Etowah	9.87
Coosa (Middle)	Gadsden Water Works & Sewer Board	Etowah	14.86
Coosa (Middle)	Alabama Power Co – Gadsden Steam Plant	Etowah	142.68
Coosa (Middle)	SIC 32 – Unnamed Stone, Glass, Clay, and/or Concrete Products	St. Clair	3.49
Coosa (Middle)	Talladega/Shelby Water Treatment Plant	Talladega	6.44
Coosa (Middle)	Talladega County Water Department	Talladega	0.81
Coosa (Middle)	Talladega Water Works & Sewer Board	Talladega	1.62
Coosa (Middle)	Bowater Newsprint, Coosa Pines Operation	Talladega	52.47
Coosa (Lower)	Sylacauga Utilities Board	Talladega	3.25
Coosa (Lower)	SIC 22 – Unnamed Textile	Talladega	0.89
Coosa (Lower)	Goodwater Water Works & Sewer Board	Coosa	0.46
Coosa (Lower)	Alabama Power Co – E.C. Gaston Plant	Shelby	812.32
Coosa (Lower)	Clanton Waterworks & Sewer Board	Chilton	1.79
Coosa (Lower)	Five Star Water Supply	Elmore	5.46
Tallapoosa River Basin (Alabama)			
Tallapoosa (Upper)	Heflin Water Works	Cleburne	0.51
Tallapoosa (Upper)	Wedowee Gas, Water, and Sewer	Randolph	0.39
Tallapoosa (Middle)	Roanoke Utilities Board	Randolph	1.29
Tallapoosa (Middle)	Clay County Water Authority	Clay	1.87
Tallapoosa (Middle)	Lafayette	Chambers	0.53
Tallapoosa (Middle)	Central Elmore Water & Sewer Authority	Elmore	4.83
Tallapoosa (Middle)	Alexander City Water Department	Tallapoosa	10.57
Tallapoosa (Lower)	West Point Home, Inc	Lee	2.23
Tallapoosa (Lower)	Opelika Water Works Board	Lee	2.61
Tallapoosa (Lower)	Auburn Water Works Board	Lee	5.75
Tallapoosa (Lower)	Tallassee	Tallapoosa	1.98
Tallapoosa (Lower)	Tuskegee Utilities	Macon	2.71
Tallapoosa (Lower)	Montgomery Water Works & Sewer Board	Montgomery	25.17
Alabama River Basin			
Alabama (Upper)	Montgomery Water Works & Sewer Board	Montgomery	10.40
Alabama (Upper)	International Paper	Autauga	30.63
Alabama (Upper)	Southern Power Co – Plant E. B. Harris	Autauga	4.14
Alabama (Cahaba)	Birmingham Water Works & Sewer Board	Shelby	52.90
Alabama (Middle)	International Paper – Pine Hill	Wilcox	21.04
Alabama (Lower)	Alabama River Pulp Company	Monroe	54.61

Table 2-18. Permitted Water Users in ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa River Basin (Georgia)—upstream counties to downstream counties						
Coosa	Dalton Utilities - Conasauga R	155-1404-01	Whitfield	Conasauga River	49.400	40.300
Coosa	Dalton Utilities - Mill Creek	155-1404-02	Whitfield	Mill Creek	13.200	7.500
Coosa	Dalton Utilities - Coahulla Cr	155-1404-03	Whitfield	Coahulla Creek	6.000	5.000
Coosa	Dalton Utilities - Freeman Springs	155-1404-04	Whitfield	Freeman Springs	2.000	1.500
Coosa	Dalton Utilities - River Road	155-1404-05	Whitfield	Conasauga River	35.000	18.000
Coosa	Chatsworth Water Works Commission	105-1405-01	Murray	Holly Creek	1.100	1.000
Coosa	Chatsworth Water Works Commission	105-1405-02	Murray	Eton Springs	1.800	1.800
Coosa	Chatsworth Water Works Commission	105-1409-01	Murray	Carters Lake	2.550	2.300
Coosa	Chatsworth, City of	105-1493-02	Murray	Coosawattee River	2.200	2.000
Coosa	Ellijay, City of - Ellijay R	061-1407-01	Gilmer	Ellijay River	0.550	0.450
Coosa	Ellijay - Gilmer County W & S Authority	061-1408-01	Gilmer	Cartecay River	4.000	4.000
Coosa	Calhoun, City of	064-1411-03	Gordon	Big Spring	7.000	6.000
Coosa	Calhoun, City of	064-1412-01	Gordon	City Of Calhoun Spring	0.638	0.537
Coosa	Calhoun, City of	064-1492-02	Gordon	Oostanaula River	6.200	3.000
Coosa	Calhoun, City of	064-1493-01	Gordon	Coosawattee River	18.000	16.000
Coosa	Jasper, City of	112-1417-02	Pickens	Long Swamp Creek	1.000	1.000
Coosa	Bent Tree Community, Inc.	112-1417-03	Pickens	Chestnut Cove Creek and unnamed creek	0.250	0.230
Coosa	Bent Tree Community, Inc.	112-1417-04	Pickens	Lake Tamarack	0.250	0.230
Coosa	Big Canoe Utilities Company, Inc.	112-1417-05	Pickens	Lake Petit	1.000	1.000
Coosa	Big Canoe Utilities Company, Inc.	112-1417-06	Pickens	Blackwell Creek	2.650	2.650
Coosa	Etowah Water & Sewer Authority	042-1415-01	Dawson	Etowah River	5.500	4.400
Coosa	Cherokee County Water & Sewerage Auth	028-141601	Cherokee	Etowah River	43.200	36.000
Coosa	Gold Kist, Inc	028-1491-03	Cherokee	Etowah River	5.000	4.500
Coosa	Canton, City of	028-1491-04	Cherokee	Etowah River	23.000	18.700
Coosa	Canton, City of (Hickory Log Creek)	028-1491-05	Cherokee	Etowah River	39.000	39.000
Coosa	Bartow County Water Department	008-1411-02	Bartow	Bolivar Springs	0.800	0.800
Coosa	Adairsville, City of	008-1412-02	Bartow	Lewis Spring	5.100	4.100
Coosa	New Riverside Ochre Company, Inc.	008-1421-01	Bartow	Etowah River	5.000	5.000
Coosa	New Riverside Ochre Company, Inc.	008-1421-02	Bartow	Etowah River	6.000	6.000
Coosa	Emerson, City of	008-1422-02	Bartow	Moss Springs	0.630	0.500

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa	Gerdau AmeriSteel US, Inc. – Cartersville Steel Mill	008-1423-01	Bartow	Pettit Creek	2.000	1.500
Coosa	Baroid Drilling Fluids, Inc.	008-1423-02	Bartow	Etowah River	3.400	2.500
Coosa	Cartersville, City of	008-1423-04	Bartow	Etowah River	26.420	23.000
Coosa	Georgia Power Co. - Plant Bowen	008-149101	Bartow	Etowah River	520.000	85.000
Coosa	CCMWA	008-1491-05	Bartow	Allatoona Lake	86.000	78.000
Coosa	Cartersville, City of	008-1491-06	Bartow	Allatoona Lake	21.420	18.000
Coosa	La Fayette, City of - Dry Creek	146-1401-01	Walker	Dry Creek	1.000	0.900
Coosa	La Fayette, City of - Big Spring	146-1401-02	Walker	Big Spring	1.650	1.310
Coosa	Mount Vernon Mills - Riegel Apparel Div.	027-1401-03	Chattooga	Trion Spring	9.900	6.600
Coosa	Summerville, City of	027-1402-02	Chattooga	Raccoon Creek	3.000	2.500
Coosa	Summerville, City of	027-1402-04	Chattooga	Lowe Spring	0.750	0.500
Coosa	Mohawk Industries, Inc.	027-1402-05	Chattooga	Chattooga R./ Raccoon Cr.	4.500	4.000
Coosa	Oglethorpe Power Corp.	057-1402-03	Floyd	Heath Creek	3,838.000	3,030.000
Coosa	Floyd County - Brighton Plant	057-1414-02	Floyd	Woodward Creek	0.800	0.700
Coosa	Cave Spring, City of	057-1428-06	Floyd	Cave Spring	1.500	1.300
Coosa	Floyd County	057-1428-08	Floyd	Old Mill Spring	4.000	3.500
Coosa	Berry Schools, The (Berry College)	057-1429-01	Floyd	Berry (Possum Trot) Reservoir	1.000	0.700
Coosa	Inland-Rome Inc.	057-1490-01	Floyd	Coosa River	34.000	32.000
Coosa	Georgia Power Co. - Plant Hammond	057-1490-02	Floyd	Coosa River	655.000	655.000
Coosa	Rome, City of	057-1492-01	Floyd	Oostanaula & Etowah R	18.000	16.400
Coosa	Rockmart, City of	115-1425-01	Polk	Euharlee Creek	2.000	1.500
Coosa	Vulcan Construction Materials, L.P.	115-1425-03	Polk	Euharlee Creek	0.200	0.200
Coosa	Cedartown, City of	115-1428-04	Polk	Big Spring	3.000	2.600
Coosa	Polk County Water Authority	115-1428-05	Polk	Aragon, Morgan, Mulco Springs	1.600	1.100
Coosa	Polk County Water Authority	115-1428-07	Polk	Deaton Spring	4.000	4.000
Tallapoosa River Basin (Georgia)						
Tallapoosa	Haralson County Water Authority	071-1301-01	Haralson	Tallapoosa River	3.750	3.750
Tallapoosa	Bremen, City of	071-1301-02	Haralson	Beech Creek & Bremen Reservoir (Bush Creek)	0.800	0.580
Tallapoosa	Bowdon, City of Indian	022-1302-01	Carroll	Indian Creek	0.400	0.360
Tallapoosa	Southwire Company	022-1302-02	Carroll	Buffalo Creek	2.000	1.000
Tallapoosa	Villa Rica, City of	022-1302-04	Carroll	Lake Paradise & Cowens Lake	1.500	1.500
Tallapoosa	Carrollton, City of	022-1302-05	Carroll	Little Tallapoosa River	12.000	12.000
Tallapoosa	Bowdon, City of Lake Tysinger	022-1302-06	Carroll	Lake Tysinger	1.000	1.000

III - GENERAL HISTORY OF BASIN

3-01. Authorization for Federal Development. Federal participation in developing the ACT River Basin began in 1870, when Congress assigned to the Corps the task of investigating and reporting on the practicability of improving the Coosa River for navigation. The River and Harbor Act of 14 August 1876 authorized the original project for improving the Coosa River from Rome, Georgia, to Childersburg, Alabama, by open-channel work and the construction of locks and dams. The River and Harbor Act of 19 September 1890 extended the authorization to include the improvement of the Coosa River from Childersburg, Alabama, to Wetumpka, Alabama, by the construction of locks and dams. Subsequent Acts between 1892 and 1902 modified various features of the project. The River and Harbor Act of 3 March 1909 provided for an examination and survey of the entire Alabama drainage basin to determine whether storage reservoirs could be utilized for the advantage of navigation and power. The report was printed as House Document No. 253, 63rd Congress, 1st Session, and recommended large storage reservoirs and 15 locks and dams between Gadsden, Alabama, and Wetumpka, Alabama, on the Coosa River.

Under various Acts for the improvement of the Coosa River, five locks and six dams were built between Rome, Georgia, and Childersburg, Alabama. Walls, floor, and a sill were also built for a lock at Wetumpka, Alabama. Dam number 4, near Lincoln, Alabama, was completed in 1886. Locks and Dams numbers 1, 2, and 3, near and below Greensport, Alabama, were completed in 1890. Work on the Wetumpka Lock was completed in 1892. The uppermost Lock and Dam at Mayo’s Bar, located 7.5 miles below Rome, Georgia, was completed in 1913. Lock number 4 was completed in 1914, and Dam number 5 was completed in 1917. The fixed-crest dams were constructed of rock fill or rock-filled crib except for a concrete ogee weir section in Dam number 5. Lock number 4 and the Wetumpka Lock were made 280 feet long by 52 feet wide, with seven and eight feet minimum depth over the sills. The other locks were 176 feet long by 40 feet wide, with a 3.25 to 6.0 feet minimum depth over the sills.

In addition to the construction of those locks and dams, open-channel work was carried on from 1877 to 1920 between Rome, Georgia, and Lock number 4, with the objective of maintaining a channel depth of four feet at low water; but the work was not continuous and the whole length of the project was not completed. Commerce on the Coosa River was local due to no outlet to the Gulf of Mexico or even below Dam number 5, which was built across the river without a lock. The developments served a useful purpose as river transportation to Rome, Georgia, and were active until the advent of roads and railroads caused river traffic to practically disappear. The development became inadequate for modern navigation and deteriorated through lack of use. Much of the original construction has been removed or covered by later development.

Initial improvement of the Alabama River was also for navigation and was authorized by the River and Harbor Act of 18 June 1878, which provided for open-channel work to maintain a low-water depth of four feet on the-Alabama River and the Coosa River to Wetumpka, Alabama. The River and Harbor Act of 13 July 1892, increased the authorized depth to six feet, but subsequent Acts reduced it again to four feet. Work was begun in 1875 and consisted of dredging, snagging, and contraction works below Montgomery, Alabama, and snagging above Montgomery, Alabama.

Other early projects to maintain navigation by open-channel work were initiated between 1874 and 1884 on the Oostanaula and the Coosawattee Rivers between Rome, Georgia, and Carters Hill, Alabama, on the Tallapoosa River from the mouth to Tallassee, Alabama, and on the Cahaba River from the mouth to Centerville, Alabama. These projects carried little traffic and were soon abandoned.

The first comprehensive report on the optimum use of the water resources of the basin was prepared by the Corps in 1934, and was printed as House Document No. 66, 74th Congress, 1st session (308 Report). It presented a long-range plan for the ultimate complete development of the waterways of the system in the coordinated interests of navigation, flood risk management, hydroelectric power, and other beneficial uses of water. The plan contemplated: (1) five, low-lift dams with locks on the Alabama River and one hydropower dam with lock on the Coosa River at Wetumpka, Alabama; (2) a nine-foot depth for navigation from the Mobile Harbor to Jordan Dam, the lowermost of APC's three dams on the Coosa River; (3) locks in Jordan, Mitchell, and Lay Dams; (4) seven additional dams on the Coosa River, all with locks and four with power plants, to carry nine feet of navigation depth to Rome, Georgia.; and (5) four dams on tributary streams, three with power installations and the fourth to store water for opportune release as needed by power plants downstream.

The report concluded that, although the overall plan proposed would likely be economically justified in whole or in part as the basin developed in the future, the only feature then justified was a system of levees to protect the Fourth Ward at Rome, Georgia, from periodic inundation by floodwaters of the Oostanaula and Coosa Rivers. That improvement was authorized by Congress in the Flood Control Act of 1936 and was completed by the Corps in 1940 at a federal cost of $367,000. The project was turned over to the City of Rome, Georgia, for maintenance and operation. This levee continues under Rome's control with periodic federal inspection to ensure eligibility in PL 84-99.

The Corps provided two small local flood risk management projects under special authorities. Flood work at Collinsville, Alabama, on Little Wills Creek, authorized by the War Department Civil Appropriations Act of 19 July 1937, was completed in 1939 at a federal cost of $71,100. Channel improvement of the Cahaba River for a 29-mile reach below Centerville, Alabama, was completed in 1940, at a cost of $50,000, under the general allotment for snagging provided for by the Flood Control Act of 1939. Both improvements were turned over to local interests for maintenance and operation.

As a result of continued rapid expansion of economic activities in the valley, four reviews of the previous comprehensive report were assigned to the Corps by Congressional directives between 1936 and 1939. A single combined report was proposed in response to all four authorizations. However, pending completion of the full report, two interim reports were submitted covering especially urgent improvements for flood risk management; one at Prattville, Alabama, and the other to provide additional flood risk management at and in the vicinity of Rome, Georgia, by constructing a combination flood risk management and power dam and reservoir on the Etowah River above Rome, Georgia.

The work at Prattville, Alabama, on Autauga Creek, was authorized by the Flood Control Act of 1941 and was completed in 1944 at a federal cost of $649, 300. The improvement was turned over to local interests for maintenance and operation.

The dam and reservoir on the Etowah River (Allatoona Project) was authorized by the Flood Control Act of 1941. World War II delayed commencement of construction on the project until 1946. The project was essentially complete in 1950 at a cost of $32,000,000. The project is described in detail in Appendix A – Allatoona Dam and Lake Water Control Manual.

The Corps also provided a flood risk management project on Black Creek at Gadsden, Alabama, which was authorized in September 1950, under provisions of Section 205 of the Flood Control Act of 1948, as amended, and completed in December 1951.

In view of the rapid expansion of economic activities in the valley in the late 1930's, and in response to outstanding Congressional directives calling for review of earlier comprehensive reports to determine whether any change in previous recommendations was desirable in the light of changed conditions, the Secretary of War in 1941 submitted to Congress an interim report of the Corps printed as House Document No. 414, 77th Congress. That report outlined a comprehensive plan for ultimate development of the basin's water resources to be accomplished step-by-step over a period of years, with the development to be in accordance with plans being prepared by the Chief of Engineers. For initiation and partial accomplishment of the plan, an expenditure of $60,000,000 was recommended for approval for the construction of navigation and power dams on the lower river system (at and below Howell Shoals site). That project was federally adopted in the River and Harbor Act of 2 March 1945 (Public Law 14, 79th Congress), with the specific item reading as follows:

Alabama-Coosa River, Alabama: Initial and ultimate development of the Alabama-Coosa River and tributaries for navigation, flood control, power development, and other purposes, as outlined in House Document numbered 414, Seventy-seventh Congress, is hereby authorized substantially in accordance with the plans being prepared by the Chief of Engineers with such modifications thereof from time to time as in the discretion of the Secretary of War and the Chief of Engineers may be advisable for the purpose of increasing the development of hydroelectric power; and that for the initiation and accomplishment of the ultimate plan appropriations are authorized in such amounts as Congress may from time to time determine to be advisable, the total of such appropriations not to exceed the sum of $60,000,000. The aforesaid authorization and approval shall include authorities for all powerhouses, power machinery, and appurtenances found to be desirable by the Secretary of War upon the recommendation of the Chief of Engineers and the Federal Power Commission.

After the end of the war, the review of the comprehensive plan was resumed by the Corps. Several public hearings were held by the District Engineer at key points throughout the basin to afford those interested the opportunity to voice their desires. The comprehensive plan set forth in House Document No. 414, 77th Congress, was modified and expanded to make fuller use of the water resources of the basin, particularly for flood risk management and the production of hydroelectric power.

The Chief of Engineers in a report submitted on 15 October 1941, and printed as House Document No. 414, 77th Congress, 1st Session, recommended a general plan for the development of the basin. Congress authorized the initial and partial accomplishment of this plan in the River and Harbor Act of 2 March 1945 (Public Law 14, 79th Congress). Planning studies for the initially authorized projects on the Alabama River (to provide navigation facilities with the maximum hydroelectric power feasible) began in 1945.

A site selection report for the entire Alabama River was submitted on 10 December 1945, which determined that the overall project for the Alabama River should consist of dredging in the lower river, and navigation locks and dams at Claiborne, Millers Ferry, and Jones Bluff upstream, with hydropower plants at Millers Ferry and Jones Bluff.

On 28 June 1954, the 83rd Congress, 2nd Session, enacted Public Law (P.L.) 436, which suspended the authorization under the River and Harbor Act of 2 March 1945, insofar as it concerned federal development of the Coosa River for the generation of electric power, in order to permit development by private interests under a license to be issued by the Federal Power Commission. The law stipulates that the license shall require provisions for flood risk management storage and for future navigation. It further states that the projects shall be operated for flood risk management and navigation in accordance with reasonable rules and regulations of the Secretary of the Army.

On 2 December 1955, the APC submitted an application to the Federal Power Commission (FPC) for a license for development of the Coosa River in accordance with the provisions of P.L. 436. The development proposed by the APC, designated in the application as APC Project No. 2146; included plans for the Leesburg Dam (later renamed Weiss Dam), a dam at old Lock 3 (renamed H. Neely Henry Dam), and the Kelly Creek Dam (renamed Logan Martin Dam).

3-02. Planning and Design. The authorizations for developing the federal projects in the ACT Basin provided for the specific multiple purposes of flood risk management, hydropower, and navigation. During the planning stages, each project was designed to fulfill its authorized purposes and to form an integrated, mutually interrelated system that will make the most complete practicable use of the water resources in the basin.

a. <u>Allatoona Dam</u>. Early planning and design for the Allatoona Dam and Reservoir presented a multi-purpose project for hydropower, navigation and flood risk management. Construction was authorized in the Flood Control Act of 18 August 1941, now known as Public Law No. 228, 77th Congress, 1st session, H. R. 4911. In December 1941, the District Engineer submitted to the Chief of Engineers a report entitled "Definite Project Report, Allatoona Dam and Reservoir, Etowah River, in the Alabama-Coosa River Basin, Georgia", and work was initiated on plans and specifications. This report described a project with total storage of 722,000 acre-feet with the top of the flood risk management pool at 860 feet NGVD29. This total storage was allocated as 212,000 acre-feet for flood risk management storage between elevations 848 and 860 feet NGVD29, 456,000 acre-feet for conservation storage between elevations 788 and 848 feet NGVD29, and 54,000 acre-feet for inactive “dead” storage below elevation 788 feet NGVD29.

b. <u>Carters Dam</u>. Early studies limited the location of a project on the Coosawattee River to the reach between miles 26 and 35. The possibilities of a single dam, two dams and a single dam with a long tunnel to develop the full head in the reach, as well as the possibility of pumped storage were investigated. Design Memorandum No. 5, "General Design", dated 22 July 1963, presented plans for a dam at mile 26.8 on the Coosawattee River. Maximum and minimum power pools would be at elevations 1072 and 1022 feet NGVD29 respectively and maximum flood risk management pool would be at elevation 1099. This project would have a powerhouse containing two 52,000-kilowatt (kW) units.

Approval for installation of 250,000 kW of generating capacity at Carters Dam on the Coosawattee River together with a reregulation dam to limit power discharges to the downstream channel capacity was given by the Secretary of the Army on 25 July 1964. Revisions to the project were described in the supplement to Design Memorandum No. 5, submitted 30 September 1964. This plan provided for an intake structure for two powerhouse units. Subsequently, major modifications of the plan were authorized which increased the number of turbine units at the project to four, with two being pumped storage units. Design Memorandum No. 22, dated July 1968, was prepared to present the design considerations involved with the addition of the two units.

c. <u>Robert F. Henry, Millers Ferry, and Claiborne Locks and Dams</u>. The 308 Report contemplated five navigation dams on the Alabama River. A resolution of the Committee on Commerce, U. S. Senate, adopted 18 January 1939, requested a review to determine the advisability of constructing reservoirs on the Alabama-Coosa Rivers and tributaries for development of hydroelectric power and improvement for navigation. The Chief of Engineers, in a report submitted on 15 October 1941, and printed as House Document No. 414, 77th Congress, 1st Session recommended a general plan for the development of the basin.

Congress authorized in the River and Harbor Act of 2 March 1945 (Public Law 14, 79th Congress) the initial and partial accomplishment of this plan.

Planning studies for the initially authorized projects on the Alabama River to provide navigation facilities with the maximum hydroelectric power feasible began in 1945. A site selection report for the entire Alabama River was submitted on I0 December 1945, which determined that the overall project for the Alabama River should consist of dredging in the lower river, and navigation dams and locks at Claiborne, Millers Ferry and Jones Bluff upstream with power plants added to the latter two projects. Design Memorandums for the three projects were developed between 1963 and 1971 which described the particular features for each project.

3-03. Construction of Federal Projects. Allatoona Dam was the first of the existing, Federal Government reservoir projects in the ACT River Basin. Allatoona was authorized in 1941, but due to delays during World War II, the dam was not completed until 1949. The reservoir was slowly filled and normal operation began in June 1950. The project reached full conservation pool (840 feet NVGD) on April 3, 1951.

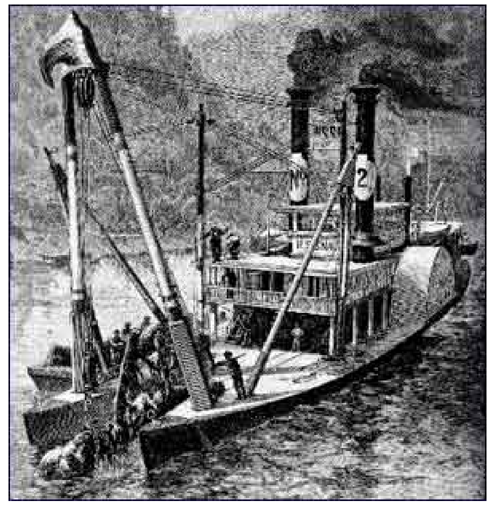


Figure 3-1. Early snag boat

Millers Ferry Lock and Dam construction began in 1964, and was completed in May 1970. Hydropower production began in 1970.

Claiborne Lock and Dam construction began in 1964, and was completed in May 1970.

Robert F. Henry Lock and Dam (Jones Bluff Lock and Dam) construction began in 1966 and was officially opened to navigation in April 1972. Hydropower production began in 1975.

At Carters Dam, the first construction contract was awarded in 1962, and construction of the main dam, the reregulation dam, and the powerhouse was completed in 1975. The conventional generating units were declared commercially available in 1975, and the pump turbine units became commercially available in 1977.

3-04. Related Projects. In addition to the five Corps projects in the basin, there are 11 dams owned by the APC mostly in the vicinity of the Fall Line, to take advantage of the steep vertical gradient in the area. Six of the projects, three on the Coosa River and three on the Tallapoosa River were constructed between 1914 and 1931. The Corps has no flood risk management responsibility or authority for these six projects which include Martin, Yates, Thurlow, Lay, Mitchell and Jordan. A second phase of development occurred in the 1950-1960 time period with the construction of five additional projects. Four of these projects were constructed on the Coosa River and one project was constructed on the Tallapoosa River. The Corps has a flood risk management responsibility and authority at four of these projects (Weiss, H. Neely Henry, Logan Martin, and Harris) under P.L. 83-436.

3-05. Modifications to Regulations. Section 3-02 describes some of the early planning criteria for the federal reservoirs. Early planning recognized that full development of the basin would create a system of reservoirs where downstream projects would be affected by upstream storage; therefore some system-wide regulation would be necessary to insure the integrity of each project purpose.

With the development of the Alabama River for navigation, see Figure 3-1 for an example of an early snag boat, came the necessity to provide more dependable channel depths provided by river flows. Requirements were developed to insure adequate weekly and three-day releases from the upstream projects into the Alabama River. Storage in R. E. "Bob" Woodruff and William "Bill" Dannelly Lakes is used to regulate the flows on a daily basis. Different required flow volumes have been used in the past and it is likely that additional adjustments to the required flows will be made in the future.

Early design for the three locks and dams prescribed run-of-river regulation plans. One foot of storage was to be used to regulate unsteady inflows and this storage is commonly referred to as "pondage". However, this regulation plan was abandoned once the generators were placed online. The power production was sold and scheduled as peaking energy with several hours of production followed by complete shutdown. This mode of operation contributes to unsteady flows and stages in the river and is responsible for the lowest recorded flow at Claiborne. Regulation techniques are used at Claiborne Lock and Dam to help smooth out downstream flows.

Modifications to water control operations in the ACT Basin have largely been documented in the revised Master Water Control Manual Appendices prepared for each of the five federal projects in the basin and the four APC Projects with flood risk management responsibilities. Appendix A for Allatoona Dam and Lake was prepared in March 1952 and revised in August 1962, December 1993, and XXXX 2013. Appendix B for Weiss Dam and Lake was prepared in October 1965 and revised in 2009. The 2009 revision was administrative in nature and did not make substantial changes to the operation of the project. Appendix C for Logan Martin Dam and Lake was prepared in January 1968. Appendix D for H. Neely Henry Dam and Lake was prepared in January 1979 and revised in XXXX 2013. Appendix E for Millers Ferry Lock and Dam was prepared in December 1990 and revised in XXXX 2013. Appendix F for Claiborne Lock and Dam was prepared in October 1993 and revised in XXXX 2013. Appendix G for Robert F. Henry Lock and Dam was prepared in March 1999 and revised in XXXX 2013. Appendix H for Carters Dam and Lake (and Reregulation Dam) was prepared in July 1979 and revised in XXXX 2013. Appendix I for Harris Dam and Lake was prepared in December 2003 and revised in XXXX 2013.

Over the span of years since 1950 when the Corps reservoirs in the ACT Basin began to become operational, changes in needs and conditions in the basin have influenced certain modifications to the regulation of the projects. The following describe the major factors influencing modifications to project regulation that have occurred in the basin.

a. <u>Metro Atlanta Population Growth</u>. The significant population growth in the Metropolitan Atlanta area, and to a lesser degree in Montgomery, Alabama, has resulted in increased water demands for M&I water supply, for additional flows in the river to better maintain water quality and aquatic life, and for higher pool levels to support recreational needs. Concerns associated with flooding also increase with increases in population.

b. <u>In re Tri-State Water Rights Litigation</u>. In 1989, proposals by the Corps to reallocate storage to M&I water supply at Carters Lake and Allatoona Lake, and by Georgia to develop a regional reservoir in the Tallapoosa River Basin near the Alabama state line (West Georgia Regional Reservoir) caused controversy among various federal agencies, the States of Alabama and Florida, and various water user groups. A final Water Supply Reallocation Report and final Environmental Assessment were prepared for the Carters Lake and Allatoona Lake proposals and submitted to SAD for approval in August 1991. Alabama filed a lawsuit against the Corps in June 1990 to halt those proposed actions. As a result of the litigation, the proposed revisions to the ACT Basin Water Control Manual were deferred during party negotiations. After many attempts at reaching a negotiated settlement failed, including a comprehensive study, compact negotiations, and court-ordered mediation, the lawsuit before the U. S. District Court for the Northern District of Alabama (N.D. AL) proceeded. The Federal Defendants filed motions to dismiss the majority of the litigation based on a decision by the 11th Circuit concerning the Apalachicola-Chattahoochee-Flint River Basin, In re MDL-1824 Tri-State Water Rights Litigation, 644 F.3d 1160 (11th Cir. 2011). On 3 July 3 2012, the N.D. AL Court dismissed all counts of primary complaints except one regarding the permitting of the Hickory Log Creek Reservoir, which is still pending.

c. Hydropower. The Southeastern Power Administration (SEPA) negotiates contracts for the sale of power from the Corps hydropower projects in accordance with the Flood Control Act of 1944. Under the provisions of the Act, the Corps determines the amount of energy available at the ACT projects each week and advises SEPA of the amount available, and SEPA arranges the sale. In the early years, power generation was conducted at each hydropower project for a set number of hours per day as long as sufficient water was in conservation storage to accommodate the hydropower operation. In dry years, conservation storage was depleted at some projects to the point that release requirements for other project purposes could not be met. In 1989 a system of action zones was developed and implemented to guide operations at Allatoona Lake. As a result, power generation demands have been balanced between the projects weekly to enhance long-term generating capability of the entire system and to provide for the needs of other project purposes in the system.

d. Fish Spawn Operations. The Corps' South Atlantic Division Regulation DR 1130-2-16 (31 May 2010) and Mobile District Draft Standard Operating Procedure (SOP) 1130-2-9 (February 2005) were developed to address lake regulation and coordination for fish management purposes. The SOP specifically applies to the Allatoona Project and addresses procedures necessary to gather and disseminate water temperature data and manage lake levels during the annual fish spawning period between March and May, primarily targeted at largemouth bass. The major goal of the operation is to not lower the lake level more than six inches in elevation during the reproduction period to prevent stranding or exposing fish eggs.

Minimum flow requirements of 240 cubic feet per second (cfs) below the Allatoona and Carters Projects for water quality purposes also support fish and wildlife conservation downstream of the projects, particularly during periods of extremely dry weather.

Even though the remaining Corps reservoirs in the ACT Basin (Woodruff, Dannelly, and Claiborne Lakes) do not have specific water management procedures directed at fish and wildlife conservation, they do conduct natural resource management activities to improve fishery conditions and support healthy sport fisheries. The pools are maintained at fairly constant levels, except during floods when high inflows cause reservoir levels to rise due to the limited storage capacity at each project. Relatively stable pools during the spring spawning season are beneficial to the production of crappie, largemouth and smallmouth bass, shellcracker, warmouth, and sunfishes.

3-06. Principal Regulation Problems. The following describe the principal regulation problems that exist at the Corps projects in the ACT Basin.

a. Allatoona Dam. The initial regulation plan called for evacuation of flood waters stored above the conservation pool as soon as practicable by releasing at rates not to exceed the downstream bankfull capacity estimated at 12,000 cfs. However, through actual operating experience, particularly the April 1964 flood, the channel capacity below Allatoona Dam was reevaluated and the defined stream capacity was reduced from 12,000 cfs to 9,500 cfs. A survey and real estate appraisal was made to determine the acreage involved and the cost of acquiring easements to permit emptying releases up to 12,000 cfs. This higher release rate, which would expedite the evacuation of flood storage, would be necessary to permit operation of the power plant at full capacity if the third generating unit was installed. Until such easements are acquired, flood storage will continue to be emptied at a maximum rate of 9,500 cfs.

b. Carters Dam and Reregulation Dam. There is a head limitation, difference between headwater and tailwater, for the main dam of 395 feet that can impact the ability to pump-back during major flood events.

The swelling and fracturing of the concrete in the Reregulation Dam, caused by “alkali aggregate reaction”, has resulted in the weakening of the bridge across the spillway which is used to support the crane that places the stoplogs in the spillway gates. Also, displacement of the abutment and one of the monoliths has resulted in caution regarding fully raising the spillway gates. The spillway bridge has been cut to allow for expansion and concrete expansion is monitored.

The previous problem of a lack of action zones within the conservation storage to better distribute the storage during dry periods has been rectified with the current revision of the regulation manual.

c. Robert F. Henry Lock and Dam. Full discharge capacity of the spillway is 124,500 cfs (elevation 125.0 feet NGVD29), the equivalent of a 1.5-year recurrence interval. Flows above these levels are not impacted or impeded by project operations.

There is a head limitation at the project, difference between headwater and tailwater, of 47 feet.

Due to low flow vibrations, gates 1-3 are not used until all the gates can be opened to step five, which corresponds to a tailwater elevation of 98 feet NGVD29.

d. Millers Ferry Lock and Dam. Full discharge capacity of the spillway is 185,500 cfs (elevation 80.8 feet NGVD29), the equivalent of a 15-year recurrence interval. Flows above these levels are not impacted or impeded by project operations. There is also a head limitation of 48 feet at the project.

e. Claiborne Lock and Dam. Full discharge capacity of the spillway is 67,111 cfs (elevation 36.0 feet NGVD29), not including the flow over the fixed crest spillway the equivalent of a 1.5-year recurrence interval. Flows above these levels are not impacted or impeded by project operations. There is also a head limitation of 30 feet at the project.

IV - DESCRIPTION OF PROJECTS

4-01. Location. The Coosa River is formed by the Etowah and Oostanaula Rivers at Rome, Georgia, and flows first westerly, then southwesterly, and finally southerly for a total of 286 miles before joining the Tallapoosa River to form the Alabama River. The Etowah River lies entirely within Georgia and is formed by several small mountain creeks which rise on the southern slopes of the Blue Ridge Mountains at an elevation of about 3,250 feet. The Etowah River flows for 150 miles to Rome, Georgia. The Oostanaula River is formed by the Coosawattee and Conasauga Rivers at Newtown Ferry, Georgia, and meanders southwesterly through a broad plateau for 47 miles to its mouth at Rome, Georgia. The Tallapoosa River rises in northwestern Georgia at an elevation of about 1,250 feet, and flows westerly and southerly for 268 miles, joining the Coosa River south of Wetumpka, Alabama. The upper 55 miles of the stream are in Georgia and the lower 213 miles in Alabama. The Alabama River is formed by the confluence of the Coosa and Tallapoosa Rivers near Montgomery, Alabama, meandering westerly for about 100 miles to Selma, Alabama, then southwesterly for 214 miles to its mouth near Calvert, Alabama. Suburbs of Atlanta extend into the upper portions of the basin with extensive development in the Allatoona region. Farther downstream is Rome, Georgia. Birmingham, Alabama is on the western edge of the basin and Montgomery, Alabama is located on the Alabama River below the confluence of the Coosa and Tallapoosa Rivers.

4-02. Purpose. Federal plans for the ACT River Basin further the goal of coordinating existing development and any future development to form a mutually interrelated system. The intention is to make the most complete practicable use of water resources. Federal interest in the ACT River Basin dates back to 1870, when Congress assigned the Corps the task of investigating and reporting on the practicability of improving the Coosa River for navigation. Subsequent River and Harbor Acts provided for the initiation of construction of a series of multipurpose impoundments on the system to meet the purposes of navigation, flood risk management, and hydropower. Other project purposes of the projects include water quality, recreation, water supply, and fish and wildlife. Modifications of those plans have resulted in the completion of five federal dams, one on the Etowah River, one on the Coosawattee River, and three on the Alabama River. In addition, authorizations of those modified plans included flood risk management and navigation at four non-federal hydropower projects; three on the Coosa River and one on the Tallapoosa River.

4-03. Physical Components. Plate 2-1 present the locations of the major dam projects in the ACT River Basin, and Figure 2-1 in Chapter II presents a profile view of the river and reservoir developments. A brief summary of the key features of each project are provided below. Details of the physical components of each project are provided in the project appendices.

4-04. Overview. The ACT Basin extends approximately 330 miles from northwest Georgia to the mouth of the Alabama River, where it joins the Tombigbee River to form the Mobile River. The total drainage area of the ACT Basin is approximately 22,800 square miles. Plate 4-1 shows the drainage areas associated with the ACT projects. The Corps operates five projects in the ACT Basin; Allatoona Dam and Lake, Carters Dam and Lake and Carters Reregulation Dam, Robert F. Henry Lock and Dam and R. E. "Bob" Woodruff Lake, Millers Ferry Lock and Dam and William "Bill" Dannelly Lake, and Claiborne Lock and Dam and Lake. APC owns and operates four projects with federal flood risk management and navigation authorizations; Weiss Dam and Lake, H. Neely Henry Dam and Lake, and Logan Martin Dam and Lake on the Coosa River and Harris Dam and Lake on the Tallapoosa River. APC also owns and operates six other projects which have no similar Corps flood risk management authorization as their construction preceded P.L. 83-436. These include Martin, Yates and Thurlow on the Tallapoosa River and Jordan/Bouldin on the Coosa River.

Of the 16 reservoirs (considering Jordan Dam and Lake and Bouldin Dam as one reservoir and Carters Lake and Carters Reregulation Dam as one reservoir), Lake Martin on the Tallapoosa River has the greatest amount of storage, containing over 48 percent of the conservation storage in the ACT Basin. Allatoona Lake, R.L. Harris Lake, Weiss Lake, and Carters Lake are the next four largest reservoirs in terms of storage (see Table 4-1 and Figure 4-1). Thurlow and Purdy Lakes are not included because of their negligible storage capacity relative to the other projects. Each reservoir is discussed individually below. APC controls 77 percent of the available conservation storage; federal projects (Robert F. Henry Lock and Dam, Millers Ferry Lock and Dam, Allatoona Lake, and Carters Lake) control 23 percent. The two most upstream Corps reservoirs, Allatoona Lake and Carters Lake, account for 18 percent of the total basin conservation storage.

Table 4-1. ACT Basin Conservation Storage Percent by Acre-Feet

Project	Conservation Storage (acre-feet)	Percentage
*Allatoona	284,580	11.7%
*Carters	141,402	5.8%
**Weiss	237,448	9.8%
**H. Neely Henry	43,205	1.8%
**Logan Martin	108,262	4.5%
Lay	77,478	3.2%
Mitchell	28,048	1.2%
Jordan/Bouldin	15,969	0.7%
**Harris	191,129	7.9%
Martin	1,183,356	48.7%
Yates	5,976	0.2%
*R.F. Henry	36,450	1.9%
*Millers Ferry	46,704	2.6%
Total	**2,400,007**	**100.0%**

Note: * = federal (Corps) project ** = APC projects with Corps flood risk management authorizations

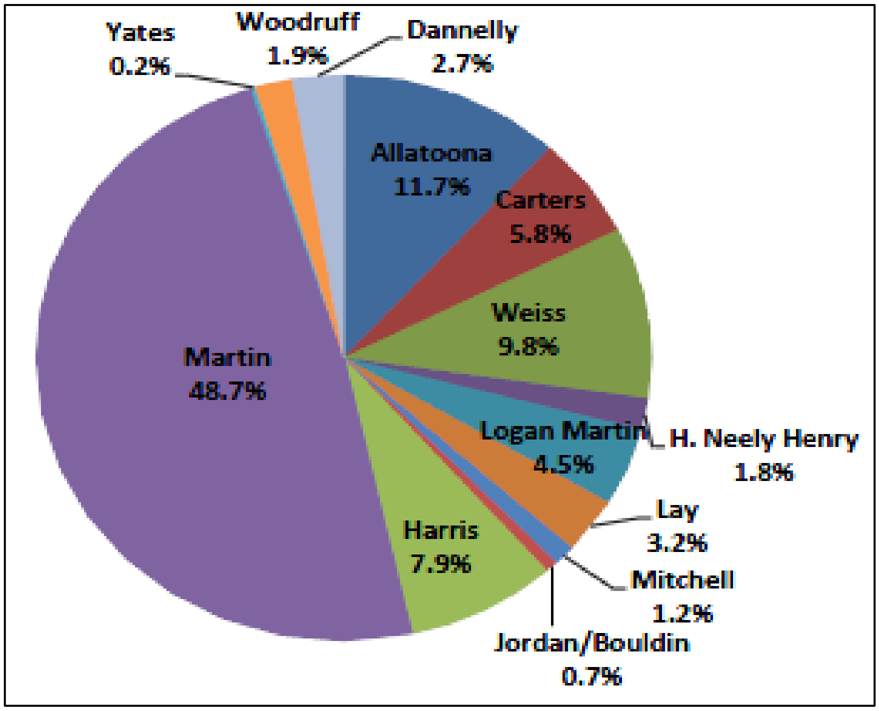


Figure 4-1. ACT Basin Reservoir Conservation Storage (Percent of Total Conservation Storage by Project)

a. Etowah River. The Etowah River, with a drainage area of 1,860 square miles, joins the Oostanaula River at Rome, Georgia, to form the Coosa River. The Allatoona Dam and Lake Project is located on the Etowah River upstream of Cartersville, Georgia. It is a multiple-purpose Corps project placed in operation in 1950. Allatoona Lake provides approximately 12 percent of the basin's conservation storage.

b. Coosawattee River. The Coosawattee River, with a drainage area of 869 square miles, is 45 miles long; and joins the Conasauga River at Newton Ferry, Georgia, to form the Oostanaula River. The Carters Dam and Lake and Carters Reregulation Dam Project is located on the Coosawattee River at river mile 27. This project consists of an earth fill main dam, and a downstream reregulation dam and reservoir that accommodate pump-back operation. Carters Lake provides approximately six percent of the basin's conservation storage.

c. Oostanaula River. From its source at the confluence of the Coosawattee and Conasauga Rivers at Newtown Ferry, Georgia, the Oostanaula River meanders southwesterly through a broad plateau for 47 miles to its mouth at Rome, Georgia. Its total drainage area is 2,160 square miles.

d. Coosa River. The Coosa River, with a drainage area of 10,200 square miles, is formed by the Etowah and Oostanaula Rivers at Rome, Georgia. The river flows 286 miles to its mouth, 11 miles below Wetumpka, Alabama, where it joins the Tallapoosa River to form the Alabama River. There are existing improvements on the Coosa River for flood risk management and hydropower and an abandoned navigation project. There is a flood risk management improvement project at Rome, Georgia, consisting of a levee system along the Coosa and Oostanaula Rivers. APC has built six reservoirs on the Coosa River (Weiss, H. Neely Henry, Logan Martin, Lay, Mitchell, and Jordan-Bouldin) which provide a total of approximately 23 percent of the basin's conservation storage (10, 4, 4, 3, 1, and 1 respectively). Weiss, Logan Martin, and Neely Henry Projects have flood risk management provisions and are further described in Appendices B, C, and D to this manual.

e. Tallapoosa River. The Tallapoosa River, with a drainage area of 4,680 square miles, rises in northwestern Georgia at an elevation of about 1,250 feet, and flows westerly and southerly for 268 miles, joining the Coosa River south of Wetumpka, Alabama. There are four projects on the Tallapoosa River, all owned by the APC. The projects are Harris Dam, Martin Dam, Yates Dam, and Thurlow Dam. Martin, Yates, and Thurlow Dams are located on the lower end of the Tallapoosa River near the Fall Line, and develop a total head of 293 feet. Martin provides approximately 48 percent of the basin's conservation storage. Yates and Thurlow are essentially run-of-river projects with little storage. Harris Dam is located in the headwater area and provides about eight percent of the basin's conservation storage. Harris Dam also provides flood risk management and is described in Appendix I to this manual.

f. Alabama River. The Alabama River, with a total drainage area of 7,940 square miles (excluding the Coosa and Tallapoosa Rivers tributary areas), is formed by the confluence of the Coosa and Tallapoosa Rivers near Wetumpka, Alabama, and meanders for 314 miles where it joins the Tombigbee River near Calvert, Alabama, to form the Mobile River. There are three Corps projects on the Alabama River. The projects are the Robert F. Henry Lock and Dam and R. E. "Bob" Woodruff Lake, the Millers Ferry Lock and Dam and William "Bill" Dannelly Lake, and the Claiborne Lock and Dam and Lake. Robert F. Henry and Millers Ferry Projects provide two and three percent of the basin's conservation storage respectively. Claiborne is a run-of-river project with essentially no conservation storage available.

4-05. Federal Dams.

a. Carters Dam and Carters Reregulation Dam. The Corps' Carters Lake and Carters Reregulation Dam on the Coosawattee River is a multipurpose project that provides flood risk management, hydropower, navigation, water supply, water quality, fish and wildlife conservation, and recreation. The project consists of a rock fill dam and earth fill saddle dikes having a total length of 2,053 feet. The dam rises 445 feet above the streambed. Power installation consists of two conventional 140,000-kW generators and two reversible 160,000-kW pump-turbine units (declared values). The reregulation dam is 208 feet long and has a crest elevation of 662.5 feet NGVD29. The drainage area above the main dam is 374 square miles. The drainage area above the reregulation dam is 521 square miles, which includes the 148 square mile drainage area of Talking Rock Creek. The Carters Project is a pumped-storage peaking facility. Water is released from Carters Lake, flows through the penstock, and generates power as it is discharged to the reregulation dam pool. The Corps generates power at Carters Lake only a few hours each weekday, when demand for electricity is greatest. When demand for electricity is low, usually during the night or on weekends, the pump-turbines are reversed to pump water back up from the reregulation pool to Carters Lake. Water is then available again for hydropower generation in the next peak use period, and Carters Lake is maintained at its optimal power generation level. The reregulation dam serves two purposes: as a lower pool for the pumped storage operation and to reregulate peaking flows from Carters Lake to provide a more stable downstream flow.

Carters Lake has a total storage capacity of 472,756 acre-feet at elevation 1,099 feet NGVD29. Of that, 141,402 acre-feet are usable for power generation, 89,191 acre-feet are reserved for flood risk management, and 242,163 acre-feet are inactive storage. The minimum conservation pool elevation is 1,022 feet NGVD29, and the maximum conservation pool elevation is 1,074 feet NGVD29 in the summer and 1,072 feet NGVD29 in the winter. Carters Lake has a surface area of 3,275 acres at elevation 1,074 feet NGVD29. The normal year-round operating range for the reregulation pool is 677 to 698 feet NGVD29. The Carters Reregulation Dam provides a seasonal varying minimum continuous flow under normal conditions to the Coosawattee River for downstream fish and wildlife benefits. The minimum flow requirement of the project is 240 cfs. The total generating capacity of the project is 600 MW (declared value). As expected with a peaking/pumped storage operation, both Carters Lake and the reregulation pool experience frequent elevation changes. Typically, water levels in Carters Lake vary no more than one to two feet per day. The reregulation pool will likely reach a normal maximum of 696 feet NGVD29 and a minimum level of 677 feet NGVD29 at least once during the course of the week. Levels can rise more than that during flooding events, however, as the lake captures and retains flood flows. Carters Dam is further described in Appendix H. The project is shown in Figure 4-2.

Figure 4-2. Carters Dam

b. Allatoona Dam. The Corps' Allatoona Dam on the Etowah River creates the 11,860 acres Allatoona Lake. Authorized by the Flood Control Act of 1941 (P.L. 77-228, 55 Stat 638), Allatoona Dam and Lake is a multipurpose project that provides flood risk management, navigation, hydropower, recreation, water supply, water quality, and fish and wildlife conservation. In 2008 nearly seven million visitors were reported at Allatoona Lake. The project consists of a gravity-type concrete dam 1,250 feet long having a top elevation of 880 feet NGVD29. Power installation consists of two 40,000-kW generators and a 2,200-kW service unit (declared values). The lake has a flood risk management storage capacity of 302,576 acre-feet and conservation storage of 284,580 acre-feet. A minimum flow of about 240 cfs is continuously released through a small unit, which generates power while providing a constant flow to the Etowah River downstream, for water quality purposes. Allatoona's major flood risk management areas downstream are Cartersville, Kingston, and Rome, Georgia. Allatoona Dam is further described in Appendix A. The project is shown in Figure 4-3.

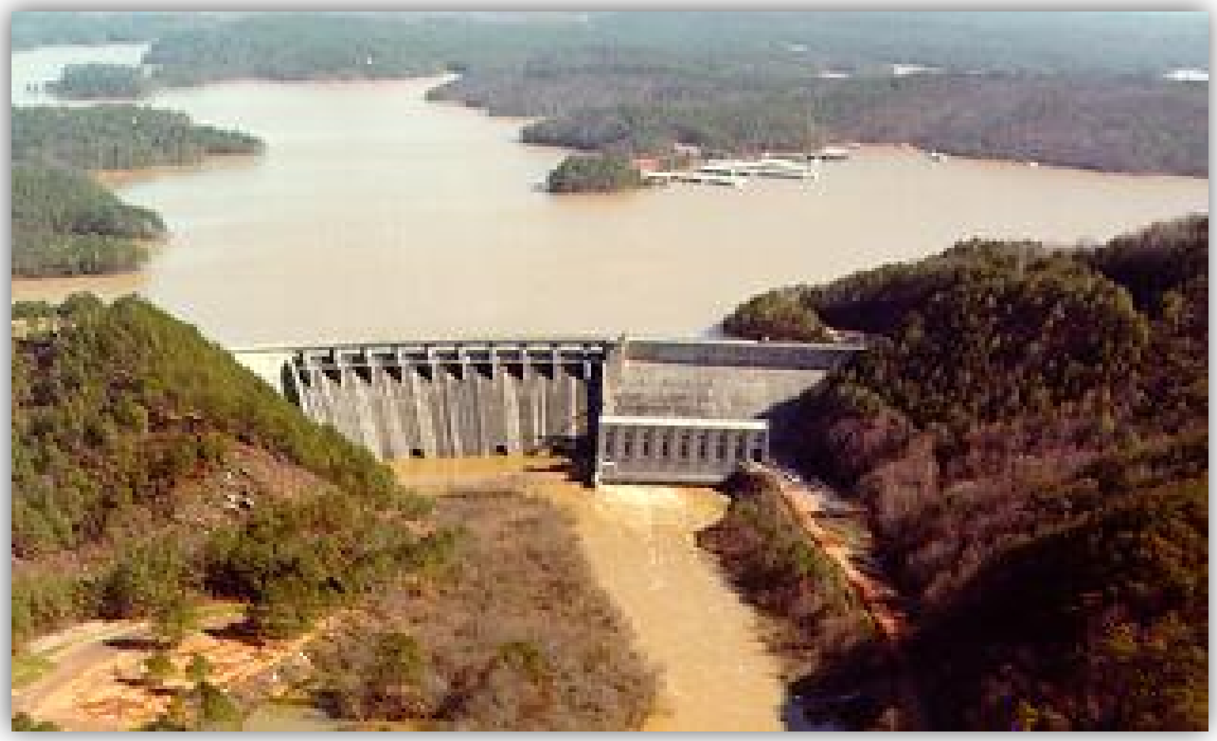


Figure 4-3. Allatoona Dam

c. Robert F. Henry Lock and Dam. Robert F. Henry Lock and Dam. (R. E. “Bob” Woodruff Lake) is located on the Alabama River in south central Alabama, 236.3 miles above the mouth and approximately 15 miles east-southeast of Selma, Alabama. The project is a multipurpose project providing hydropower, navigation, recreation, and fish and wildlife conservation. The drainage area above Robert F. Henry Lock and Dam is 16,233 square miles. The project consists of a gravity-type concrete dam, gated spillway, and a single-lift lock. Earth dikes extend approximately 2,661 feet on the right overbank and 12,639 feet on the left overbank. Power installation consists of four 20,500-kW generators (declared value). Public Law 97-383, dated December 22, 1982, changed the name of the project from Jones Bluff Lock and Dam to Robert F. Henry Lock and Dam. The powerhouse retained the name Jones Bluff Powerhouse. Robert F. Henry Lock and Dam Project is further described in Appendix G. The lock provides a maximum lift of 47.0 feet. The project is shown in Figure 4-4. .

d. Millers Ferry Lock and Dam. Millers Ferry Lock and Dam is located 133 miles above the mouth of the Alabama River in the southwestern part of Alabama, about 10 miles northwest of Camden, Alabama, and 30 miles southwest of Selma, Alabama. The dam and the lower 25 miles of the reservoir are in Wilcox County and the upper 80 miles of the reservoir is in Dallas County. The drainage area above the dam is 20,637 square miles. The project is a multipurpose project providing hydropower, navigation, recreation, and wildlife mitigation. The project consists of a concrete gravity-type dam with a gated spillway, supplemented by earth dikes, a navigation single-lift lock and a powerhouse with a single tainter gate adjacent to the powerhouse for debris bypass. Power installation includes three 30,000-kW generators (declared value). In December 1970, P.L. 91-583 changed the name of the lake to William "Bill" Dannelly Reservoir. The lock provides a maximum lift of 48.8 feet. Millers Ferry Lock and Dam Project is further described in Appendix E. The project is shown in Figure 4-5.

Figure 4-4. Robert F. Henry Lock and Dam

Figure 4-5. Millers Ferry Lock and Dam

e. Claiborne Lock and Dam. Claiborne Lock and Dam is located about 72.5 miles above the mouth of the Alabama River in the southwestern part Alabama. Most of the reservoir is in Monroe and Wilcox Counties. The Claiborne Project is primarily a navigation structure. The reservoir provides navigation depths upstream and the dam reregulates peaking power releases from Millers Ferry. Other project purposes include recreation, water quality, and fish and wildlife conservation. The project consists of concrete gravity-type dam with both a gated spillway section and a free overflow section, supplemented by earth dikes, and a navigation single-lift lock. The lock provides a maximum lift of 30.0 feet. Claiborne Lock and Dam is further described in Appendix F. The project is shown in Figure 4-6.

Figure 4-6. Claiborne Lock and Dam

4-06. Non-Federal Dams. Between 1914 and 1931, the Alabama Power Company constructed three hydropower dams on the Coosa River and three on the Tallapoosa River. These plants are located to take advantage of the comparatively steep river slopes along the Fall Line. These projects are: Jordan Dam, Mitchell Dam and Lay Dam on the Coosa River; and Thurlow Dam, Yates Dam, and Martin Dam on the Tallapoosa River.

A second phase of development occurred during the 1950s and 1960s with the construction of five additional reservoir projects. Four of these projects; Weiss, Neely Henry, Logan Martin and Bouldin Dams are located on the Coosa River. One project, Harris Dam is located in the upper part of the Tallapoosa Basin.

These projects are briefly described in the following paragraphs. They are listed in Table 1-1, and their locations are shown on Figure 2-1 in Chapter II.

a. R.L. Harris Dam. R.L. Harris Dam is the newest of the APC hydroelectric developments in the ACT Basin, with construction completed in 1982. The dam is located on the Tallapoosa River at river mile 139.1. The reservoir extends up both the Tallapoosa and the Little Tallapoosa Rivers, and is contained in Randolph and Clay Counties. Harris Lake covers about 10,660 acres and has a drainage area of 1,453 square miles. Generating capacity at the project is 132,000 kW. Under P.L. 89-789, the operation and maintenance of R.L. Harris Dam is subject to the rules and regulations of the Secretary of the Army in the interest of navigation and flood risk management. Additional information on this project can be found in Appendix I. The project is shown in Figure 4-7.

Figure 4-7. R. L. Harris Dam

b. Martin Dam. The Cherokee Bluffs was a perfect place to construct the first of four dams on the Tallapoosa River. When it was completed in 1927, the Martin Dam created the world's largest man-made body of water at that time. The dam is located on the Tallapoosa River, 11 miles north of the Town of East Tallassee. The project has a maximum head of 146 feet and a drainage area of 3,000 square miles. The reservoir formed by this dam impounds approximately 1,623,000 acre-feet, of which 1,275,000 acre-feet, corresponding to a drawdown of 60 feet, is available for power storage. By virtue of this vast storage, the reservoir is capable of regulating a large percentage of the flow of the Tallapoosa River. The spillway is equipped with 20 – 16’ x 30' gates and the generating capacity is 182,000 kW. The project is shown in Figure 4-8.

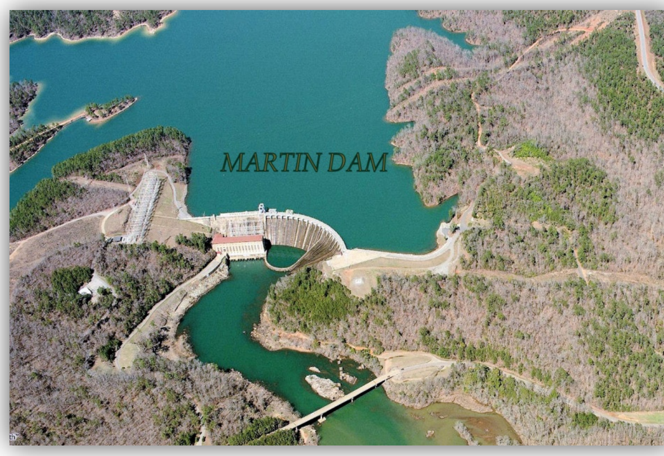


Figure 4-8. Martin Dam

c. Yates Dam. Yates Dam is located on the Tallapoosa River, three miles north of Tallassee and about nine miles below Martin Dam. The drainage area is 3,250 square miles. This project is a result of raising an old mill dam in

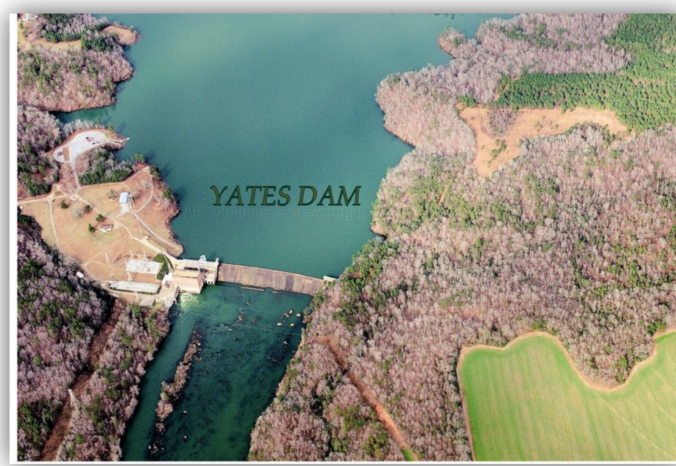


Figure 4-9. Yates Dam

1928 which had a head of 36 feet. The reservoir covers 1,980 acres and the plant retains a constant head of 55 feet when in full operation, using only the water regulated by Martin Dam and the flow of the tributaries between the two projects. The spillway is uncontrolled. The work of raising the original dam allowed more effective use of regulated flow from Martin Dam. The project is shown in Figure 4-9 on the previous page.

d. Thurlow Dam. Thurlow Dam is located on the Tallapoosa River at the Town of East Tallassee, three miles below Yates Dam. The drainage area is 3,325 square miles. The reservoir covers approximately 585 acres. No storage is available for pondage and the plant operates on regulated flows from Martin Dam and runoff from the intervening area. The present dam, completed in 1931, is superimposed on an old power dam which had a head of 56 feet. The plant has a constant head of 92 feet when in full operation. The spillway crest is provided with five-foot semi-automatic flash boards. Generating capacity at the project is 81,000 kW. The project is shown in Figure 4-10.

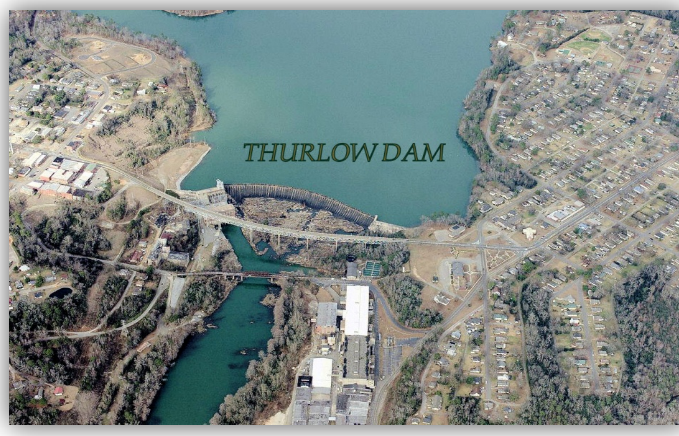


Figure 4-10. Thurlow Dam

e. Weiss Dam. Weiss Dam was part of APC's second phase of construction in the ACT Basin. That phase further developed the Coosa River in the late 1950s and the 1960s. Weiss Dam was completed in June 1961. The project is located on the Coosa River at mile 226, about 50 miles upstream from Gadsden, Alabama. The reservoir extends about 52 miles upstream to Mayo's Bar, Georgia, and is contained in Cherokee County, Alabama and Floyd County, Georgia. Weiss is a multiple-purpose project for hydropower, flood risk management, and navigation. Under P.L. 83-436, the operation and maintenance of Weiss Dam is subject to the rules and regulations of the Secretary of the Army in the interest of navigation and flood risk management. The project was designed for the future installation of a navigation lock. Weiss Dam and Powerhouse are separated by about three miles, across one of the meanders of the Coosa River. The dam was constructed in the main river and a channel was excavated across the meander. This allows the power plant to release water farther downstream. The generating capacity is 87,750 kW. Additional details are provided in Appendix B. The project is shown in Figure 4-11.

Figure 4-11. Weiss Dam

f. <u>H. Neely Henry Dam</u>. H. Neely Henry Dam is located on the Coosa River at mile 148, about 27 miles downstream from Gadsden, Alabama. The reservoir extends about 78 miles upstream to Weiss Dam, and is contained in St. Clair, Calhoun, Etowah and Cherokee Counties. The project was completed in 1966. H. Neely Henry is a multipurpose project with hydropower, flood risk management and navigation. Under P.L. 83-436, the operation and maintenance of H. Neely Henry is subject to the rules and regulations of the Secretary of the Army in the interest of navigation and flood risk management. The project was designed for the future installation of a navigation lock. The generating capacity is 72,900 kW. Additional information is provided in Appendix D. The project is shown in Figure 4-12.

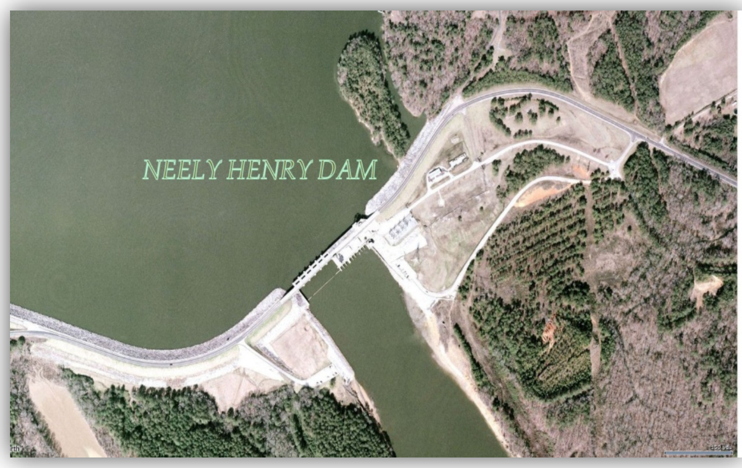


Figure 4-12. H. Neely Henry Dam

g. <u>Logan Martin Dam</u>. Logan Martin Dam is located on the Coosa River at mile 99.5, about 13 miles upstream from the City of Childersburg, Alabama. The reservoir, extends upstream about 48 miles to the H. Neely Henry Dam, and is contained in Talladega, St. Clair and Calhoun Counties. The powerhouse is located on the west side, or right bank, of the river.

Construction began in July 1960, and the dam and spillway were completed in July 1964. Filling of the reservoir commenced in early July 1964, reaching an operating level of 460 feet NGVD29 on 22 July 1964. Power generation began in August 1964. Under P.L. 83-436, the operation and maintenance of Logan Martin is subject to the rules and regulations of the Secretary of the Army in the interest of navigation and flood risk management. The generating capacity is 135,000 kW. Greater detail is provided in Appendix C. The project is shown in Figure 4-13.

Figure 4-13. Logan Martin Dam

h. Lay Dam. Lay Dam is located on the Coosa River, 13 miles east of Clanton, Alabama. Construction was started in March 1910 and completed in April 1914. This is a run-of-river plant with a gross static head of 70 feet. The drainage area above the dam is 9,087 square miles. The reservoir covers approximately 12,000 acres and to some extent regulates the minimum flow overnight and on weekends. The spillway is equipped with 26 – 14' x 30' gates. The generating capacity is 177,000 kW. The project is shown in Figure 4-14.

Figure 4-14. Lay Dam

i. Mitchell Dam. In 1921, the FPC granted APC a license to construct a dam across the Coosa River near Clanton, Alabama, downstream from Lay Lake. Construction of Mitchell Dam, APC's second hydroelectric plant, was completed in August 1923. Mitchell Dam is a run-of-river project with a gross static head of 67 feet. Drainage area above the dam is 9,830 square miles. The reservoir covers an area of approximately 5,850 acres. The spillway has 26 - 15' x 30' gates and extends practically the entire length of the dam. A unique feature of the new powerhouse, which was completed in 1985, is a 1,140-foot floating trash boom that deflects trash from the powerhouse intakes. The generating capacity is 170,000 kW. The project is shown in Figure 4-15.

Figure 4-15. Mitchell Dam

j. Jordan Dam. Jordan Dam is located on the Coosa River, eight miles north of Wetumpka, Alabama. Construction was started in June 1926, and completed in January 1929. It is a run-of-river plant with a gross static head of 100 feet. Drainage area above the dam is 10,160 square miles, and the reservoir covers approximately 4,900 acres. The spillway has 17 – 18' x 30' gates. Forty years later, a second dam was constructed on Jordan Lake, Walter Bouldin Dam. The generating capacity is 100,000 kW. The project is shown in Figure 4-16.

Figure 4-16. Jordan Dam

k. Walter Bouldin Dam. Walter Bouldin Dam was the last dam built as part of APC's efforts to develop the Coosa River. Bouldin Dam has the largest generating capacity of Alabama Power's 14 hydro facilities (11 in the ACT Basin). It is unusual in design because it was built on a canal. The generating capacity is 225,000 kW. The project is shown in Figure 4-17.

Figure 4-17. Bouldin Dam

4-07. **Real Estate Acquisition**. Land acquisitions and flowage easements were established for each project. A more complete real estate acquisition description is included in the individual appendices for each project.

4-08. Public Facilities. The Corps has developed and maintains public use recreation areas along the shoreline of each project it owns. The public use areas include overlook sites, campgrounds, boat launch facilities, day use parks, and rest rooms. Some areas have been leased to other agencies and local communities. Detailed information regarding the Corps public use areas is available at the Operations Project Management offices for each project. A summary of public facilities is included in the individual appendices for each project.

4-09. Economic Data. The ACT River Basin drains areas of southeastern Tennessee, northwest Georgia and diagonally across Alabama from the northeast to the southwest corner of the state. The basin includes a total of 45 impacted counties: 28 in Alabama and 17 in Georgia. The 17 counties in Georgia are located on the Tallapoosa and Coosa River Basins. In Alabama, eight of the counties are in the Tallapoosa River Basin, eight are on the Coosa River Basin and the remaining 12 counties are on the Alabama and Cahaba Rivers.

The ACT River Basin is largely rural, containing a relatively small number of cities with populations greater than 25,000 persons scattered throughout the basin. The predominate land uses are developed land, agricultural land, forests and timber and water.

a. Population. The 2010 population of the 45 counties composing the ACT River Basin totaled 4,282,163 persons. Approximately 62 percent of the population resides in the Alabama portion of the basin, and 38 percent is in the Georgia portion. Table 4-2 shows the total 2010 population and the 2009 per capita income for each of the three ACT sub-basins.

Table 4-2. Population and Per Capita Income

River Basin	2010 Population	2009 Per capita Income
Alabama	1,468,946	$20,857
Coosa	2,305,260	$21,970
Tallapoosa	507,957	$19,620
Total	**4,282,163**	
Source: U.S. Census Bureau, 2010		

There are nine cities with populations greater than 25,000 persons in the ACT River Basin. Table 4-3 lists the major cities in the basin and the 2010 population for each.

Table 4-3. Major Cities

City, State	2010 Population
Auburn, Alabama	53,380
Birmingham , Alabama	212,237
Gadsden, Alabama	36,856
Hoover, Alabama	81,619
Montgomery, Alabama	201,568
Prattville, Alabama	33,960
Vestavia Hills, Alabama	34,033
Dalton, Georgia	33,128
Rome, Georgia	36,303

b. Agriculture. The ACT River Basin contains approximately 22,500 farms averaging 172 acres per farm. In 2005, the area produced about $1.6 billion in farm products sold and a total farm income of more than $604.5 million. Agriculture in the ACT River Basin consists primarily of livestock which account for approximately 72 percent of the value of farm products sold, while row crops account for approximately 23 percent of products sold. Table 4-4 contains agricultural production information and farm earnings for each of the river sub-basins in the ACT River Basin.

Table 4-4. Farm Earnings and Agricultural Production

						% Sold from	
River Basin	**2005 Farm Earnings ($1,000)**	**Number of Farms**	**Total Farm Acres (1,000)**	**Average Acres per Farm**	**Value of Farm Products Sold ($1,000)**	**Crops**	**Livestock**
Alabama	$72,189	5,164	1,521	117	$199,000	31.85%	68.15%
Coosa	$393,293	13,050	1,482	303	$1,132,000	16.43%	79.22%
Tallapoosa	$139,042	4,330	892	235	$330,000	20.75%	69.25%
Total	**$604,524**	**22,544**	**3,895**	**172**	**$1,661,000**	**23.01%**	**72.21%**
Source: U.S. Census Bureau, County and City Data Book: 2007							

c. Industry. The leading industrial sector in the ACT River Basin that provides non-farm employment are wholesale and retail trade, services and manufacturing. The remaining non-farm employment is provided by construction, finance, insurance, real estate, transportation and public utilities. In 2005, the basin contained 4,460 manufacturing establishments that provided about 253,000 jobs with total earnings of more than $14.2 billion. Additionally, the value added by the area manufactures totaled approximately $23.7 billion. Table 4-5 contains information on the manufacturing activity for each of the river sub-basins in the ACT River Basin.

Table 4-5. Manufacturing Activity

River Basin	No. of Manufacturing Establishments	Total Manufacturing Employees	Total Earnings ($1,000)	Value Added by Manufactures ($1,000)
Alabama	1,337	68,384	$4,321,899	$6,337,733
Coosa	2,730	154,619	$8,430,260	$14,738,364
Tallapoosa	393	30,215	$1,438,354	$2,653,361
Total	**4,460**	**253,218**	**$14,190,513**	**$23,729,458**
Source: U.S. Census Bureau, County and City Data Book: 2007				

d. Flood Damages. Within the ACT Basin, Allatoona Lake provides important flood risk management storage with spillway capacities sufficient to discharge floods with return intervals of 500 years. According to the Draft Environmental Impact Statement, Water Allocation for the Allatoona-Coosa-Tallapoosa River Basin Appendices Volume 2, September 1998, the floodplain downstream of Allatoona Dam consists of 1,132 residential structures, nine public structures and 189 commercial structures. The tax assessor's appraised residential structure values total approximately $65,804,000. Residential content values have a floodplain total value of approximately $29,149,000. Allatoona floodplain public structures had a total value of $847,000. The respective structures ranged in value from a $35,000 utility building to a $150,000 sewage treatment facility. Public Structure inventory and equipment values total $169,000 and $741,000, respectively. The floodplain tax appraised commercial structures had a total value of $213, 691,000. Commercial structure values range from a $10,000 office building to a $119 million industrial plant. Commercial structure inventory and equipment values total $25,066,000 and $54,389,000, respectively. All estimated values are in 1997 dollars. Table 4-6 displays the floodplain value data downstream of Allatoona Dam broken out by residential, public and commercial structure and content value.

Table 4-6. Allatoona Dam Floodplain Value Data

	Structure ($)	Content ($)	Inventory ($)	Equipment ($)
Residential	65,804,000	29,149,000	-	-
Public	847,000	-	169,000	741,000
Commercial	213,691,000	-	25,066,000	54,389,000
Total	**$280,342,000**	**$29,149,000**	**$25,235,000**	**$55,130,000**

The Corps' Water Management Office has developed an annual damage reduction summary that estimates the flood damages prevented by Allatoona and Carters Projects. Flood damages prevented have not been calculated for the Alabama Power Company Projects. Table 4-7 shows the Allatoona and Carters flood damages prevented by year from 1986 - 2009.

Table 4-7. Flood Damages Prevented by Allatoona and Carters Projects

Year	Flood Damages Prevented*		
	Allatoona	**Carters**	**Total**
1986	$0	$0	$0
1987	$2,626,000	$0	$2,626,000
1988	$0	$0	$0
1989	$0	$0	$0
1990	$14,620,100	$219,000	$14,839,100
1991	$0	$22,900	$22,900
1992	$142,580	$0	$142,580
1993	$0	$13,000	$13,000
1994	$0	$20,100	$20,100
1995	$433,046	$20,100	$453,146
1996	$33,200	$22,300	$55,500
1997	$0	$0	$0
1998	$628,127	$0	$628,127
1999	$0	$0	$0
2000	$0	$0	$0
2001	$0	$0	$0
2002	$0	$0	$0
2003	$21,706,008	$0	$21,706,008
2004	$11,002,375	$0	$11,002,375
2005	$20,033,559	$0	$20,033,559
2006	$0	$0	$0
2007	$0	$0	$0
2008	$0	$0	$0
2009	$32,666,192	$8,800	$32,674,992
2010	$20,330,262	$285,400	$20,615,662
2011	$18,354,891	$28,300	$18,383,191

*Dollar values not adjusted for inflation

V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01. Hydrometeorological Stations.

a. Facilities. Management of water resources requires continuous, real-time knowledge of hydrologic conditions. The Mobile District contracts out the majority of basin data collection and maintenance to the USGS and NWS through cooperative stream gaging and precipitation network programs. The USGS, in cooperation with other federal and state agencies, maintains a network of real-time gaging stations throughout the ACT Basin. Those stations continuously collect various types of data including stage, flow, and precipitation. The data are stored at the gage location and are transmitted to orbiting satellites. Figure 5-1 shows a typical encoder with wheel tape housed in a stilling well used for measuring river stage or lake elevation. Figure 5-2 shows a typical precipitation station, with rain gage, solar panel, and GOES antenna for transmission of data. The gage locations are discussed further in Chapter VI related to hydrologic forecasting.

Reservoir project data are obtained through each project's Supervisory Control and Data Acquisition (SCADA) system and provided to the Mobile District both daily and in real-time.

Figure 5-1. Typical Encoder with Wheel Tape for Measuring the River Stage or Lake Elevation in a Stilling Well

Figure 5-2. Typical Field Installation of a Precipitation Gage

Through the Corps-USGS Cooperative stream gage program, the Mobile District and the USGS operate and maintain stream gages throughout the ACT Basin. Corps personnel, in addition to APC and the NWS, also maintain precipitation gages at locations throughout the ACT Basin.

Plate 5-1 shows the location of rainfall and stream gage stations used to monitor conditions in the ACT Basin. Tables 5-1 and 5-2 list the stations along with pertinent information.

Table 5-1. Rainfall Reporting Network (Upper ACT)

Station	Latitude		Longitude		Elevation	Operating Agency	Agency ID	Type*
	Degrees	Minutes	Degrees	Minutes	NGVD			
Etowah River Basin								
Cleveland	34	36	83	46	1570	NWS	92006	Non-Recording
Dahlonega	34	32	83	59	1430	NWS	92475	Non-Recording
Amicacola	34	33	84	15	1350	COE	AMIG1	Recording
Wahsega	34	38	84	5	1600	COE	WAHG1	Recording
Mountaintown	34	46	84	32	1520	COE	MTNG1	Recording
Dawsonville	34	25	84	7	1370	NWS	92578	Recording
Jasper 1 NNW	34	29	84	27	1465	NWS	94648	Non Recording
Ball Ground	34	21	84	23	1175	NWS	90603	Non Recording
Waleska	34	19	84	33	1100	NWS	99077	Non Recording
Canton	34	14	84	30	870	COE	CTNG1	Recording
Woodstock	34	7	84	31	1055	NWS	99524	Non Recording
Allatoona Dam	34	9	84	43	832	COE	CVLG1	Recording
Allatoona Dam 2	34	10	84	44	975	NWS	90181	Non Recording
Carters Dam	34	36	84	40	852	COE	CTRG1	Recording
Cartersville #2	34	10	84	47	730	NWS	91670	Non Recording
Dallas 7NE	33	59	84	45	1100	NWS	92485	Recording
Taylorsville	34	5	84	59	710	NWS	98600	Non Recording
Kingston	34	14	84	56	720	NWS	94854	Non Recording
Oostanaula River Basin								
Dalton	34	46	84	57	720	NWS	92493	Non Recording
Chatsworth 2	34	46	84	47	765	NWS	91863	Recording
Ellijay	34	42	84	29	1300	NWS	93115	Non Recording
Carters 1 WSW	34	33	84	42	740	NWS	91657	Non Recording
Fairmont	34	26	84	42	735	NWS	93295	Non Recording
Resaca	34	34	84	57	650	NWS	97430	Non Recording
Adairsville 5 SE	34	21	84	56	720	NWS	90044	Non Recording
Curryville 3W	34	27	85	6	650	NWS	92429	Non Recording
Rome WSO Arpt	34	21	85	10	637	NWS	93801	Recording
Rome	34	15	85	10	610	NWS	97600	Non Recording
Coosa River Basin								
Summerville	34	29	85	22	780	NWS	98436	Non Recording
Lafayette 4SSSW	34	38	85	18	890	NWS	94941	Recording
Cedartown	34	1	85	15	785	NWS	91732	Recording

Table 5-1 (continued). Rainfall Reporting Network (Middle ACT)

Station	Latitude		Longitude		Elevation	Operating Agency	Agency ID	Type*
	Degrees	Minutes	Degrees	Minutes	NGVD			
Coosa River Basin								
Menlo	34	28	85	29		APCO		Recording
Valley Head	34	34	85	37	1040	NWS	18469	Recording
Fort Payne	34	27	85	43	934	NWS	13046	Recording
Collbran	34	23	85	46		APCO		Non Recording
Gaylesville	34	0	85	33		APCO		Non Recording
Jamestown	34	23	85	34		APCO		Non Recording
Leesburg	34	11	85	46	589	NWS	14627	Non Recording
Weiss Dam	34	8	85	48		APCO		Non Recording
Attalla	34	2	86	5		APCO		Non Recording
Collinsville	34	16	85	52		APCO		Recording
Rock Run	34	3	85	28		APCO		Recording
Gadsden	34	1	86	0	570	NWS	13154	Non Recording
Gadsden Power Co.	34	1	85	58		APCO		Non Recording
Ashville	33	48	86	19		APCO		Recording
Ashville 4W	33	51	86	20	590	NWS	10377	Non Recording
H. Neely Henry Dam	33	47	86	3		APCO		Non Recording
Jacksonville 1NW	33	49	85	47	610	NWS	14209	Non Recording
Anniston FAA Arpt	33	35	85	51	599	NWS	10272	Non Recording
DeArmanville	33	36	85	45		APCO		Recording
Logan Martin Dam	33	25	86	20		APCO		Non Recording
Sylacauga 4 NE	33	12	86	12	490	NWS	17999	Recording
Childersburg	33	17	86	22	480	NWS	11615	Non Recording
Jordan Dam	32	37	86	15	290	NWS	14306	Non Recording
Tallapoosa River Basin								
Embry	33	52	84	59	1200	NWS	93147	Recording
Carrollton	33	36	85	5	995	NWS	91640	Recording
Bremen	34	43	85	0	1400	APCO		Recording
Heflin	33	59	85	36	950	NWS	13775	Recording
Hightower	33	32	85	24	1175	NWS	13842	Recording
Newell	33	26	85	27	1100	APCO		Recording
Harris Dam	33	15	85	38	858	APCO		Recording

Table 5-1 (continued). Rainfall Reporting Network (Lower ACT)

Station	Latitude		Longitude		Elevation	Operating Agency	Agency ID	Type*
	Degrees	Minutes	Degrees	Minutes	NGVD			
Alabama and Cahaba River Basins								
Billingsley	32	40	86	43	445	NWS	10823	Non Recording
Mathews	32	16	86	0	190	NWS	15172	Non Recording
Montgomery WSO	32	18	86	24	221	NWS	15547	Recording
Autaugaville 3N	32	28	86	41	200	NWS	10440	Non Recording
Robert F. Henry L&D	32	19	86	47	146	COE	TYLAD	Recording
Plantersville 2SSE	32	37	86	54	230	NWS	16508	Non Recording
Selma	32	25	86	0	147	NWS	17366	Non Recording
Palmerdale	33	45	86	39	720	NWS	16246	Non Recording
Pinson	33	41	86	41	608	NWS	16478	Non Recording
Cahaba Heights	33	25	86	44	461	NWS	11220	Non Recording
Oak Mtn. St. Park	33	20	86	45	660	NWS	16000	Non Recording
Helena	33	16	86	50	480	NWS	13781	Non Recording
Calera	33	6	86	45	530	NWS	11288	Non Recording
Montevallo	33	6	86	52	410	NWS	15537	Non Recording
West Blocton	33	7	87	8	500	NWS	18809	Non Recording
Centreville 6 SW	32	52	87	14	456	NWS	11525	Non Recording
Thorsby Ex. Stn	32	53	86	42	680	NWS	18209	Recording
Marion 7NE	32	42	87	16	172	NWS	15112	Recording
Perryville	32	36	87	9	500	NWS	16362	Non Recording
Suttle	32	32	87	11	145	NWS	17963	Non Recording
Marion Junction 2NE	32	28	87	13	200	NWS	15121	Non Recording
Millers Ferry L&D	32	6	87	25	115	NWS	15420	Recording
Uniontown	32	27	87	31	280	NWS	18446	Non Recording
Alberta	32	14	87	25	175	NWS	10140	Recording
Camden 3NW	32	2	87	19	235	NWS	11301	Non Recording
Pine Apple	31	52	86	59	250	NWS	16436	Non Recording
Thomasville	31	55	87	44	405	NWS	18178	Recording
Whatley	31	39	87	43	170	NWS	18867	Non Recording
Claiborne L&D	31	37	87	33	50	NWS	11690	Recording
Frisco City 3SSW	31	23	87	25	275	NWS	13105	Non Recording

***The "type" of gage indicates if rainfall is collected and transmitted electronically (recording) or read by a human observer and transmitted by that observer to the appropriate agency (non-recording).**

Table 5-2. ACT Basin Stream Gage Reporting Network

Stream Gage Reporting Network (data in feet)							
Name	**USGS Station ID**	**Gage Zero**	**Flood Stage**	**Record High**	**Date of Record**	**Record Low**	**Date of Record**
CANTON	2392000	844.6	16	26.7	1/1/1946	0.2	10/27/2009
ALLATOONA RES	2393500	0		861.2	4/1/1964	809.3	12/1/1954
CARTERSVILLE	2393500	650.8	18	30.4	1/1/1946	3.8	10/1/1949
KINGSTON	2395000	610		31	12/19/2009	4	10/3/2009
ELLIJAY	2380500	1216		20.7	3/1/1951	0.9	8/1/1986
CARTERS DAM	2381400	0		1099.2	4/1/1977	1056.4	11/1/1984
TALKING ROCK	2382200	893.7		15.7	7/3/2009		
CARTERS REREG U	2382400	0		699.4	4/1/1977	667	6/1/1983
CARTERS 411	2382500	650.7		30.6	11/3/2009		
REDBUD (PINE CHAPEL)	2383500	616.2		34.2	3/1/1951		
ETON	2384500	672.6		20.5	3/1/1994	2	7/1/1986
TILTON	2387000	622.3		30.2	3/1/1951	2.1	7/1/1986
RESACA	2387500	604.1	22	34.6	3/1/1951	0.5	9/3/2009
ROME at US 27	2388525	561.7	25	34.5	1/1/1947	2.4	8/1/1986
MAYO BAR	2397000	553.1		37	1/1/1947	10.8	9/1/1986
WEISS (LEESBURG)	2399500	0	567	570.9	4/1/1979	556.3	1/1/1970
GADSDEN	2400500	486	25	31.1	4/1/1936		
NEELY HENRY DAM	N/A	0		508.5	10/1/1966	499.9	4/1/1966
LOGAN MARTIN DAM	N/A	0	467	475.3	4/1/1977	458.3	10/1/1972
CHILDERSBURG	2407000	382.5	402	412.8	2/1/1961	7.5	4/1/1975
LAY U	N/A	0		396.5	4/1/1979		
MITCHELL DAM	N/A	0		316.6	4/1/1979		
JORDAN/BOULDIN DAMS	N/A	0					
WETUMPKA	2411600	113.5	45	57.9	4/1/1938	2.5	8/25/2009
HARRIS U	N/A	0					
WADLEY	2411600	599.9	13	37.3	5/3/2009	2	10/1/1954
MARTIN DAM	N/A	0		490.7	4/1/1979	452	6/1/1941
THURLOW DAM	N/A						
YATES DAM	N/A						
MILSTEAD	2419500	153.8	40	54	12/3/2009	-5.9	9/1/1977
TALLAPOOSA	2419890	129.1	25	42.1	3/1/1990	0.1	10/1/1978
MONTGOMERY	2419988	103.3	35	58.1	2/1/1961	-4	9/25/2009
CATOMA CREEK	2421000	151	20	29.8	3/1/1990	1.4	8/1/1986
R.F. HENRY L&D	2421350	0		136.7	3/1/1990	121.8	11/1/1978
SELMA	2423000	61.8	45	58.4	3/1/1961	-3	8/18/2009
CENTREVILLE	2424000	180.7	23	37.8	7/16/2009	-0.4	10/3/2009
MARION JUNCTION	2425000	86.7	36	43.8	2/1/1961	0.8	9/1/1954
MILLERS FERRY L&D	2427505	0		83.2	3/1/1990		
CLAIBORNE L&D	2428400	0		56.6	3/1/1990		
CHOCTAW BLUFF	2429540	0		31.5	3/1/1990		

b. Reporting. The Mobile District operates and maintains a Water Control Data System (WCDS) for the Mobile District that integrates large volumes of hydrometeorological and project data so the basin can be regulated to meet the operational objectives of the system. The WCDS, in combination with the new Corps Water Management System (CWMS), together automate and integrate data acquisition and retrieval to best meet all Corps water management activities.

Data are collected at Corps sites and throughout the ACT Basin through a variety of sources and integrated into one verified and validated central database. The basis for automated data collection at a gage location is the Data Collection Platform (DCP). The DCP is a computer microprocessor at the gage site. The DCP has the capability to interrogate sensors at regular intervals to obtain real-time information (e.g., river stage, reservoir elevation, water and air temperature, and precipitation). The DCP then saves the information, performs simple analysis of it, and then transmits the information to a fixed geostationary satellite. DCPs transmit real-time data at regular intervals to the Geostationary Operational Environmental Satellite (GOES) System operated by the National Oceanic and Atmospheric Administration (NOAA). The GOES Data Collection System (DCS) sends the data directly down to the NOAA Satellite and Information Service in Wallops Island, Virginia. The data are then re-broadcast over a domestic communications satellite (DOMSAT). The Mobile District operates and maintains a Local Readout Ground Station (LRGS), which collects the DCP-transmitted, real-time data from the DOMSAT. Figure 5-3 depicts a typical schematic of how the system operates.

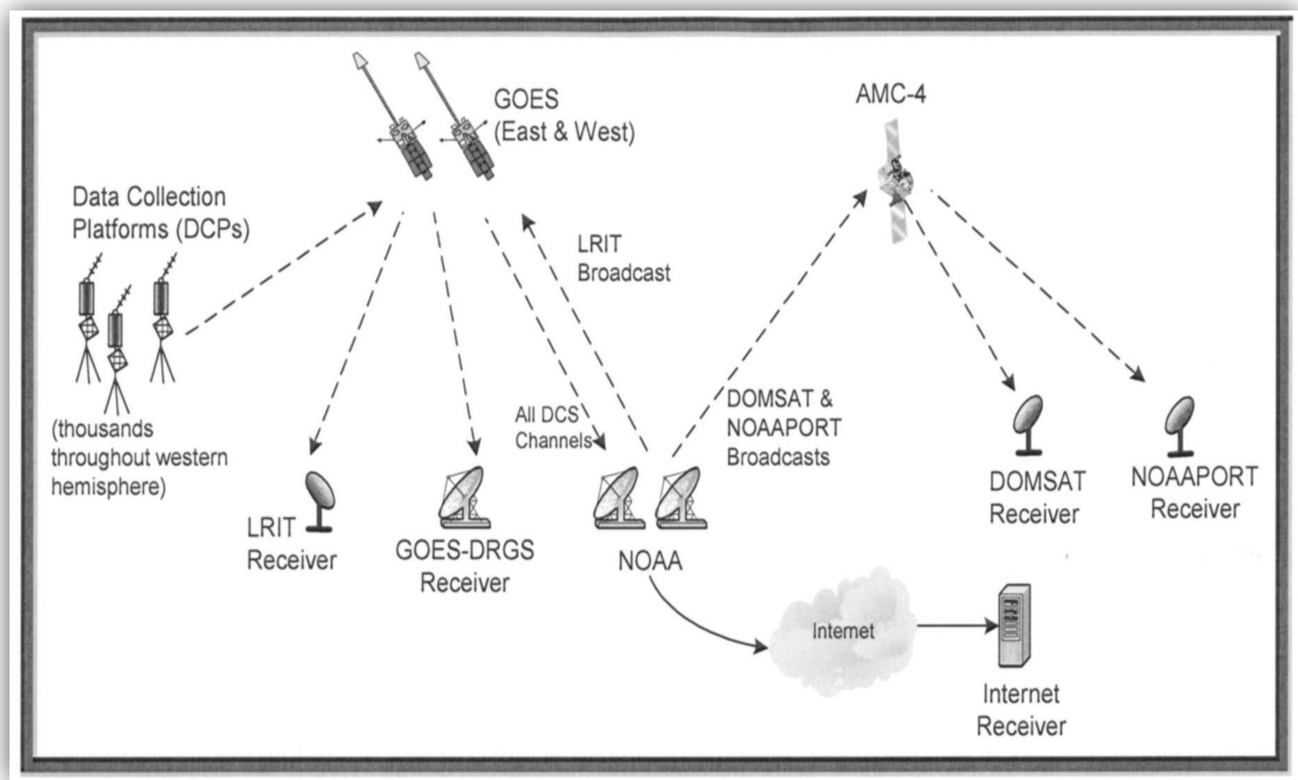


Figure 5-3. Typical Configuration of the GOES System

Typically, reporting stations log 15-minute data that are transmitted hourly. A few remaining gages report every four hours, but they are being transitioned to the hourly increment. All river stage and precipitation gages equipped with a DCP and GOES antenna are capable of being part of the reporting network.

Other reservoir project data are obtained directly at a project and are collected through each project's Supervisory Control and Data Acquisition (SCADA) System. The Mobile District downloads the data both daily and hourly through the Corps server network.

c. Maintenance. Maintenance of data reporting equipment is a cooperative effort among the Corps, the USGS, and the NWS. The USGS, in cooperation with other federal and state agencies, maintains a network of real-time DCP stream gaging stations throughout the ACT Basin. The USGS is responsible for the supervision and maintenance of the real-time DCP gaging stations and the collection and distribution of streamflow data. In addition, the USGS maintains a systematic measurement program at the stations so the stage-discharge relationship for each station is current. Through cooperative arrangements with the USGS, discharge measurements at key ACT Basin locations are made to maintain the most current stage-discharge relationships at the stations. The NWS also maintains precipitation data for the FC-13 precipitation network. For Corps-maintained facilities in the ACT, gages are typically visited six to eight times a year to validate stage, flow, and accuracy of gage equipment.

If gages appear to be out of service, the following agencies can be contacted for repair:

U.S. Army Corps of Engineers, Mobile District, 109 St. Joseph Street, Mobile, Alabama 36602-3630. Phone: (251) 690-2737 Web: http://water.sam.usace.army.mil

USGS Georgia Water Science Center, 3039 Amwiler Road, Suite 130, Atlanta, Georgia 30022-5803. Phone: (770) 903-9100 Web: http://ga.water.usgs.gov

USGS Alabama Water Science Center, 75 Technacenter Drive, Montgomery, Alabama 36117
Phone: (334) 395-4120 Web: http://al.water.usgs.gov

NWS Southern Region, 819 Taylor Street, Room 10E09, Fort Worth, Texas 76102
Phone: (817) 978-1100 Web: http://www.srh.noaa.gov/

5-02. Water Quality Stations. Water quality monitoring by the Corps in the ACT Basin is limited to one station located in the Allatoona tailrace which reports temperature, ph, dissolved oxygen, and conductivity. In most cases, other federal and state agencies maintain water quality stations for general water quality monitoring in the ACT Basin. In addition, some real-time water quality parameters are collected at several stream gage locations maintained by the USGS.

5-03. Sediment Stations. The Corps does not maintain sediment stations in the ACT Basin.

5-04. Recording Hydrologic Data. The WCDS/CWMS is an integrated system of computer hardware and software packages readily usable by water managers and operators as an aid for making and implementing decisions. An effective decision support system requires efficient data input, storage, retrieval, and capable information processing. Corps-wide standard software and database structure are used for real-time water control. Time series hydrometeorological data are stored and retrieved using HEC Data Storage System (DSS) databases and programs.

To provide the data needed to support proper analysis, a DOMSAT Receive Station (DRS) is used to retrieve DCP data from gages throughout the ACT Basin. The DRS equipment and software then receives the DOMSAT data stream, decodes the DCPs of interest and reformats the data for direct ingest into a HEC-DSS database.

Most reservoir data are transmitted in hourly increments for inclusion in daily log sheets that are retained indefinitely. Gage data are transmitted in increments of 15 minutes, one hour, or other time intervals. Reservoir data are examined and recorded in water control models every morning (or other times when needed). The data are automatically transferred to forecast models.

Automated timed processes also provide provisional real-time data needed for supporting real-time operational decisions. Interagency data exchange has been implemented with the USGS and NWS Southeast River Forecast Center (SERFC). A direct link to the SERFC is maintained to provide real-time products generated by NWS offices. Information includes weather and flood forecasts and warnings, tropical storm information, NEXRAD radar rainfall, graphical weather maps and more. Likewise, a direct link to USGS gages in the field allows for direct downloading of USGS data to Corps databases.

5-05. Communication Network. The global network of the Corps consists of private, dedicated, leased lines between every Division and District office worldwide. These lines are procured through a minimum of two General Services Administration approved telephone vendors, and each office has a minimum of two connections, one for each vendor. The primary protocol of the entire Corps network is Ethernet. The reliability of the Corps' network is considered a command priority and, as such, supports a dedicated 24-hours-per-day Network Operations Center. The use of multiple telephone companies supplying the network connections minimizes the risk of a one cable cut causing an outage for any office. Such redundancy, plus the use of satellite data acquisition, makes for a very reliable water control network infrastructure.

The Mobile District has a critical demand for emergency standby for operation of the ACT Basin and to ensure data acquisition and storage remain functional. Water Management must be able to function in cases of flooding or other disasters, which typically are followed by the loss of commercial electricity. The WCDS/CWMS servers and LRGS each have individual UPS (uninterruptable power supply), and a large UPS unit specifically for the portion of Mobile District Office in which Water Management resides to maintain power for operational needs.

5-06. Communication With Project.

a. Regulating Office With Project Office. The Water Management Section is the regulating office for the Corps' projects in the ACT Basin. Daily routine communication between the Water Management Section and project offices occur thru electronic mail, telephone, and facsimile. Daily hydropower generation schedules are issued by SEPA. During normal conditions on weekends, hydropower generation schedules can be sent out on Friday to cover the weekend period of project regulation, but it can change if deemed appropriate. If loss of network communications occurs, orders can be given via telephone.

During critical reservoir regulation periods and to assure timely response, significant coordination is often conducted by telephone between the project office and the Water Management Section. That direct contact assures that issues are completely coordinated and concerns by both offices are presented and considered before final release decisions are made.

The Chief of the Water Management Section is generally available by cell phone during critical reservoir operation periods.

b. Between Project Office and Others. Each reservoir project office is generally responsible for local notification and for maintaining lists of those individuals who require notification under various project regulation changes. In addition, the project office is responsible for notifying the public including project recreation areas, campsites, and other facilities that could be affected by various project conditions.

5-07. Project Reporting Instructions. In addition to automated data, project operators maintain record logs of gate position, water elevation, and other relevant hydrological information including inflow and discharge. That information is stored and available to the Water Management Section through the Corps' network. Operators have access to Mobile District Water Managers via email, land line and cell phone and notify the Water Management Section if changes in conditions occur. Unforeseen or emergency conditions at the project that require unscheduled manipulations of the reservoir should be reported to the Mobile District as soon as possible.

If the automatic data collection and transfer are not working, projects are required to fax or email daily or hourly project data to the Mobile District. Water Management staff will manually input the information into the database. In addition, Mobile District Power Projects must verify pool level gauge readings each week, in accordance with *Standard Operating Procedure, Weekly Verification of Gauge Readings, Mobile District Power Projects* dated 19 February 2008, and CESAD SOP 1130-2-6 dated 21 July 2006. Those procedures require that powerhouse operators check the accuracy of pool monitoring equipment by verifying readings of the equipment against gage readings at each plant. That information is logged into the Official Log upon completion and furnished to the master plant. A Trouble Report to management communicates any discrepancies with the readings. Operations Division, Hydropower Section will be notified by electronic mail when verification is complete. The e-mail notification will include findings of the verification.

Project personnel or the Hydropower Section with Operations Division, or both, are responsible for requesting any scheduled system hydropower unit outages in excess of two hours. The Water Management Section out-of-service times are reported back to Water Management Section upon completion of outages. Forced outages are also reported with an estimated return time, if possible. Any forced or scheduled outages causing the project to miss scheduled water release targets must be immediately reported to the Water Management Section and to SEPA. In such cases, minimum flow requirements can be met through spill or sluicing or both.

5-08. Warnings. During floods, dangerous flow conditions or other emergencies, the proper authorities and the public must be informed. In general flood warnings are coupled with river forecasting. The NWS has the legal responsibility for issuing flood forecast to the public and that agency will have the lead role for disseminating the information. For emergencies involving the project, the operator on duty should notify the Water Management Section, Operations Division, and the Power Project Manager at the project. A coordinated effort among those offices and the Corps, Mobile District's Emergency Management Office will develop notifications to make available to local law enforcement, government officials, and emergency management agencies.

VI - SYSTEM HYDROLOGIC FORECASTS

6-01. General. Reservoir operations are scheduled by the Water Management Section in accordance with forecasts of reservoir inflow and pool stages. The NWS's River Forecast Center prepares river forecasts for the general public and for use by the Corps. In addition, the Water Management Section maintains the capability to prepare forecasts for District use only. Knowledge of total basin inflows affects reservoir regulation decisions. Flow requirements at the lower end of the basin, below Claiborne Lock and Dam, are determined by conditions in the basin. The observed outflows of upstream projects on the Coosa and Tallapoosa Rivers provide an estimate of future flows and requirements in the Alabama River. Authorized navigation functions require knowledge of river depths (or stages) throughout the Alabama River. During stable flow conditions, accurate forecasts permit relatively uniform releases into the Alabama River. The Corps has developed techniques to conduct forecasting in support of the regulation of the ACT Basin. In addition, the Corps has a strong cooperative relationship with APC and with the NWS SERFC and the USGS to help maintain accurate data and forecast products to aid in making the most prudent water management decisions. The regulation of multipurpose projects requires scheduling actual releases on the basis of observed inflows and planning forecasted releases based on both observed and forecasted hydrologic events throughout the basin. During both normal and below-normal runoff conditions, releases through the power plants are scheduled on the basis of water availability, to the extent reasonably possible, during peak periods to enhance revenue returned to the Federal Government. The release level and schedules are dependent on current and anticipated hydrologic events. The most efficient use of water is always a goal, especially during the course of a hydrologic cycle when below-normal streamflow is occurring. Reliable forecasts of reservoir inflow and other hydrologic events that influence streamflow are critical to efficiently regulate the ACT Basin.

a. Role of Corps. The Water Management Section maintains real-time observation of reservoir, river, and weather conditions in the Mobile District. The Water Management Section makes reservoir level, outflow, inflow, and hydropower forecasts for all the federal projects and tailwater forecasts at Claiborne. Observation of real-time stream conditions provides guidance of the accuracy of the forecasts. The Corps maintains contact with the SERFC to receive forecast and other data as needed. Daily operation of the ACT Basin during normal, flood-damage reduction, and drought conservation regulation requires accurate, continual short-range and long-range elevation, streamflow, and river-stage forecasting. Those short-range inflow forecasts are used as input in computer model simulations so that project forecast release determinations can be optimized to achieve the regulation objectives. Actual release determinations are made based on observed pool elevation, inflow, and river stage data. The Water Management Section continuously monitors the weather conditions occurring throughout the ACT Basin and the forecasts issued by the NWS. Whenever possible, the NWS weather and hydrologic forecasts are used for planning purposes. The Water Management Section develops forecasts that are used to meet the regulation objectives of the Corps reservoirs. Daily, the Water Management Section develops seven-day forecasts for inflow, project releases, pool elevation, and hydropower generation. The Water Management Section prepares five-week inflow and reservoir elevation forecasts weekly on the basis of rainfall estimates and historical observed data in the basin. Those projections assist in making water management decisions and providing project staff and the public trends based on the current hydrology and operational goals of the period. In addition, the Water Management Section provides weekly hydropower generation forecasts based on current power plant capacity, latest hydrological conditions, and system water availability.

b. Role of Other Agencies. The NWS is responsible for all preparation and public dissemination of forecasts relating to precipitation, temperatures, and other meteorological elements related to river level, weather, and weather-related forecasting in the ACT Basin. The Water Management Section uses the NWS as a key source of information for weather forecasts. The meteorological forecasting provided by the NWS is considered critical to the Corps' water resources management mission. The 24- and 48-hour Quantitative Precipitation Forecasts (QPFs) are invaluable in providing guidance for forecasted project release estimates. The use of precipitation forecasts and subsequent runoff relates to planning forecasted release decisions.

1) The NWS is the federal agency responsible for preparing and issuing streamflow and river-stage forecasts for public dissemination. That role is the responsibility of the SERFC co-located in Peachtree City, Georgia, with the Peachtree City Weather Forecast Office (WFO). The SERFC is responsible for supervising and coordinating streamflow and river-stage forecasting services provided by the NWS WFO in Peachtree City, Birmingham, and Mobile. The SERFC routinely prepares and distributes five-day streamflow and river-stage forecasts at key gaging stations along the Etowah, Coosawattee, Coosa, Tallapoosa, and Alabama Rivers during periods of above normal rainfall. In addition, the SERFC provides a revised regional QPF based on local expertise beyond the NWS Hydrologic Prediction Center QPF. The SERFC also provides the Water Management Section with flow forecasts for selected locations upon request.

2) The Corps and SERFC have a cyclical procedure for providing forecast data between federal agencies. As soon as reservoir release decisions have been planned and scheduled for the proceeding days, the release decision data are sent to the SERFC. Taking release decision data coupled with local inflow forecasts at forecast points along the ACT Basin, the SERFC can provide inflow forecasts into Corps projects. Having revised inflow forecasts from the SERFC, the Corps has up-to-date forecast data to estimate the following day's release decisions. The Water Management Section monitors observed conditions and routinely adjust release decisions based on observed data.

6-02. Flood Condition Forecasts. The NWS has the primary responsibility to issue flood forecasts to the public. The Water Management Section and APC use the forecasts as much as possible for regulating the system for flood risk management. The Water Management Section monitors observed conditions and adjusts release decisions based on observed data. The Corps also provides a link to the NWS website so that the Water Management Section and the public can obtain this vital information in a timely fashion. The information is relayed to affected county emergency management officials. When hydrologic conditions exist so that all or portions of the ACT Basin are considered to be flooding, existing Corps streamflow and short- and long-range forecasting runoff models are run on a more frequent, as-needed basis. Experience demonstrates that the sooner a significant flood event can be recognized and the appropriate release of flows scheduled, an improvement in overall flood risk management can be achieved. Consequently, the Corps and the SERFC constantly run models and examine data to include QPF's, "water on the ground", rainfall/runoff relationships, timing of peaks, and other appropriate data. The selected operation is made on all data available and the perceived quality of such data. System storage that has accumulated from significant rainfall events must be evacuated following the event and as downstream conditions permit to provide effective flood risk management. Flood risk management carries the highest priority during significant runoff events that pose a threat to human health and safety. The accumulation and evacuation of storage for the authorized purpose of flood risk management is accomplished in a manner that will prevent, as much as possible, flows exceeding those that will cause flood damage downstream. During periods of significant basin flooding, the frequency of contacts between the Water Management Section and SERFC staff are increased to allow a complete interchange of available data on which the most reliable forecasts and subsequent project regulation can be based.

6-03. Conservation Purpose Forecasts. The ACT Basin is typically regulated for normal or below normal runoff conditions. Therefore, the majority of the forecasting and runoff modeling simulation is for conservation regulation decisions. Whenever possible, the NWS weather and hydrologic forecasts are used. Because the NWS is the Federal agency responsible for the preparing and issuing streamflow and river-stage forecasts, the Water Management Section uses SERFC forecasted inflows for general conservation forecasts. When needed, the Water Management Section has developed a Corps' Hydrologic Modeling System (HMS) streamflow forecasting model at several reaches along the ACT Basin for additional guidance relative to projected reservoir inflow. In addition, the Water Management Section provides weekly hydropower generation forecasts on the basis of current power plant capacity, latest hydrological conditions, and system water availability. Property owners, fishermen, recreation enthusiasts, and developers use weekly elevation forecasts for a variety of purposes.

6-04. Long-Range Forecasts. During normal conditions, the current long-range outlook produced by the Corps is a five-week forecast. For normal operating conditions, a forecast longer than that incorporates a greater level of uncertainty and unreliability. In extreme conditions, three-month and six-month forecasts can be produced on the basis of observed hydrology and comparative percentage hydrology inflows into the ACT Basin. One-month and three-month outlooks for temperature and precipitation produced by the NWS Climate Prediction Center are used in long-range planning for prudent water management of the ACT Basin.

6-05. Drought Forecasts. Various products are used to detect the extent and severity of basin drought conditions. One key indicator is the U.S. Drought Monitor. The Palmer Drought Severity Index is also used as a drought reference. However, the index requires detailed data and cannot reflect an operation of a reservoir system. The State Climatologists also produce a Lawn and Garden Index, which gives a basin-wide ability to determine the extent and severity of drought. The runoff forecasts developed for both short- and long-range periods reflect drought conditions when appropriate. There is also a heavy reliance on latest El Nino Southern Oscillation (ENSO) forecast modeling to represent the potential effects of La Nina on drought conditions and spring inflows. Long-range models are used with greater frequency during drought conditions to forecast potential effects on reservoir elevations, ability to meet minimum flows, and water supply availability. A long-term, numerical model, Extended Streamflow Prediction developed by the NWS provides probabilistic forecasts of streamflow and reservoir stages on the basis of historical rainfall, streamflow, and soil moisture. Extended Streamflow Prediction results are used in projecting possible future drought conditions. Other parameters and models can indicate a lack of rainfall and runoff and the degree of severity and continuance of a drought. Models using data of previous droughts or a percent of current to mean monthly flows with several operational schemes have proven helpful in planning. Other parameters are the ability of the various lakes to meet the demands placed on storage, the probability that lake elevations will return to normal seasonal levels, basin streamflows, basin groundwater table levels, and the total available storage to meet hydropower marketing system demands.

VII - SYSTEM WATER CONTROL PLAN

7-01. General Objectives. Many factors must be evaluated in determining project or system reservoir regulation procedures, including project requirements, time of year, climate conditions and trends, downstream needs, the amount of water remaining in storage, all to meet the authorized purposes of the projects. Various interests and project conditions must be continually considered and balanced when making water control decisions for the basin and individual projects. The water control plan seeks to equitably meet the needs of all project purposes of the ACT Basin. Project purposes and basic parameters guiding water management activities at each of the Corps projects in the ACT Basin are discussed below. This master water control plan summarizes general project water control regulation and management objectives at Corps projects in the basin from the perspective of the authorized project purposes. Individual project appendices to this master manual provide specific guidance and instructions for each project.

7-02. Constraints. Individual project physical project constraints and limitations are addressed in each project specific appendix.

7-03. Overall Plan for Water Control. The Corps operates six dams in the ACT Basin (in downstream order): Carters and Carters Reregulation on the Coosawattee River, Allatoona on the Etowah River, Robert F. Henry, Millers Ferry and Claiborne on the Alabama River. Carters and Allatoona Dams have multi-purpose storage reservoirs. Woodruff (R. F. Henry) and Dannelly (Millers Ferry) Lakes have small conservation storage capacities to regulate hydropower production. Claiborne Lock and Dam is a run-of-river project without any appreciable conservation storage; however, regulation techniques are used at Claiborne to help smooth downstream flows. In addition, the Corps has federal authority for flood risk management regulation at four APC projects; Weiss Dam and Lake, H. Neely Henry Dam and Lake, and Logan Martin Dam and Lake on the Coosa River and R. L. Harris Dam and Lake on the Tallapoosa River. The Corps also has the federal responsibility to ensure adequate water control regulation to support navigation on the Alabama River.

Principal purposes for which the federal projects in the ACT Basin are operated consist of flood risk management, hydropower, navigation, fish and wildlife conservation, recreation, water supply, and water quality. Flood risk management, hydropower, and navigation were purposes specifically cited in the original authorizations of the ACT Basin projects. Functions such as recreation, water quality, water supply, and fish and wildlife conservation are considered purposes under general legislation (Flood Control Act of 1944, P.L. 89-72, and P.L. 85-624). Each of the legally authorized project purposes is considered when making water control regulation decisions, and the decisions affect how water is stored and released from the projects.

ACT Basin water control regulation considers all project functions and accounts for the full range of hydrologic conditions, from flood to drought. In general, to provide the authorized project purposes, flow must be stored during wetter times of each year and released from storage during drier periods of each year. Traditionally, that means that water is stored in the upstream storage lakes during the spring and released for authorized project purposes in the summer and fall months. Some authorized project purposes such as lakeside recreation, water supply, and lake fish spawn are achieved by retaining water in the lakes, either throughout the year or during specified periods of each year. The flood risk management purposes at certain reservoirs require drawing down reservoirs in the fall through winter months to store possible flood waters.

Because actions taken at the upstream portion of the basin affect conditions downstream, the ACT projects (including APC projects) are operated in a coordinated manner to the maximum extent possible rather than as a series of individual, independent projects. Balancing water control actions to meet each of the project purposes varies between the individual projects and time of year. Water Management considers the often-competing purposes and makes water control decisions accordingly. When possible, the Corps manages reservoir water control regulation to complement and accommodate those purposes. For example, flood waters are evacuated to the greatest extent practicable through the powerhouse turbines to produce electricity. In addition to specific authorized purposes for which the projects are operated, over the years a variety of activities (industrial and municipal water supply, in-stream recreation, water quality, and the like) have become dependent on the operational patterns of the projects. The Corps considers these needs when regulating the federal projects in an attempt to meet all authorized purposes, while continuously monitoring the total system water availability to ensure that project purposes can at least be minimally satisfied during critical drought periods. This water management strategy does not prioritize any project function, but seeks to balance all project authorized purposes. The intent is to maintain a balanced use of conservation storage rather than to maintain the pools at or above certain predetermined elevations. However, in times of high-flow conditions, flood risk management regulation will supersede all other project functions. At all times, the Corps seeks to conserve the water resources entrusted to its regulation authority.

The individual project water control plans for the ACT Basin projects prescribe regulation guide curves and action zones to facilitate the water control regulation for both of the major Corps storage projects in the ACT Basin; Allatoona Lake (Figure 7-1) and Carters Lake (Figure 7-2) and for the four APC projects with federal flood management and navigation support requirements. The guide curve for each federal project defines the top of conservation storage water surface elevation. Water management regulation decisions strive to maintain the pool elevation at the top of conservation elevation or at the highest elevation possible while meeting project purposes. Normally, the pool elevation will be lower than the top of conservation guide curve as available conservation storage is utilized to meet project purposes except when storing flood waters or when conservative lake level regulation is performed for drought conditions within the project watershed during the winter-spring refill period. For example, the full conservation pool at Allatoona is elevation 840, but about 80% of the time in August the pool has been below 840. The water control plan also establishes action zones within the conservation storage for Allatoona and Carters. The action zones are used to manage the lakes at the highest level possible within the conservation storage pool while balancing the needs of all authorized purposes with water conservation as a national priority used as a guideline. The actions zones at Allatoona and Carters provide water control regulation guidance to meet this water conservation plan while balancing the use of available conservation storage to meet the project purposes. A general description of each zone for Allatoona and Carters are described in general terms below:

a. Lake Allatoona Action Zones.

Zone 1: While Allatoona is in Zone 1, the project conditions are likely to be normal to wetter than normal during the late summer and fall months. Most likely, other projects in the basin and within the federal hydropower system will be in similar condition. Full consideration will be given to meeting hydropower demand by typically providing up to four hours of peak generation. Peak generation could exceed four hours based on various factors or activities, such as, maintenance and repair of turbines; emergency situations such as a drowning or chemical spill; drawdowns because of shoreline maintenance; drought operations; increased or decreased hydropower demand; and other circumstances.

Zone 2: While Allatoona is in Zone 2, a reduced amount of peaking generation will be provided to meet system hydropower demand. The typical peak generation schedule will provide up to three hours of peak generation. Peak generation could exceed three hours based on various factors or activities, such as, maintenance and repair of turbines; emergency situations such as a drowning or chemical spill; draw-downs because of shoreline maintenance; drought operations; increased or decreased hydropower demand; and other circumstances.

Zone 3: Zone 3 at Allatoona will typically indicate drier than normal conditions or impending drought conditions. Careful, long range analyses and projections of inflows, pool levels, and upstream and downstream water needs will be made when pool levels are in Zone 3. While in Zone 3 during the months of Jan-Apr, a reduced amount of peaking generation will be provided to meet system hydropower demand while making water control regulation decisions to ensure refilling the reservoir to elevation 840 feet NGVD29 by 1 May. Should drier than normal hydrologic conditions exist or persist, the reduced peak generation will continue until the reservoir level rises to a higher action zone. The typical peak generation schedule will provide up to two hours of peak generation. Peak generation could exceed two hours based on various factors or activities, such as, maintenance and repair of turbines; emergency situations such as a drowning or chemical spill; draw-downs because of shoreline maintenance; drought operations; increased or decreased hydropower demand; and other circumstances.

Zone 4: Allatoona Lake elevations in Zone 4 indicate severe drought conditions. Careful, long range analyses and projections of inflows, pool levels, and upstream and downstream water needs will be made when pool levels are in Zone 4. Peak generation will typically be suspended. Small unit continuous operation will continue in order to maintain the 240 cfs minimum flow release.

b. Carters Lake Action Zones.

Zone 1: Hydrologic conditions are likely to be normal to wetter than normal. Within Zone 1, a seasonally variable release will be made from the Reregulation Dam.

Zone 2: Hydrologic conditions are likely to indicate severe drought conditions. Careful, long range analyses and projections of inflows, pool levels, and upstream and downstream water needs will be made when pool levels are in Zone 2. The seasonally-varying minimum flow is suspended, and a continuous minimum flow of 240 cfs is released from the Reregulation Dam.

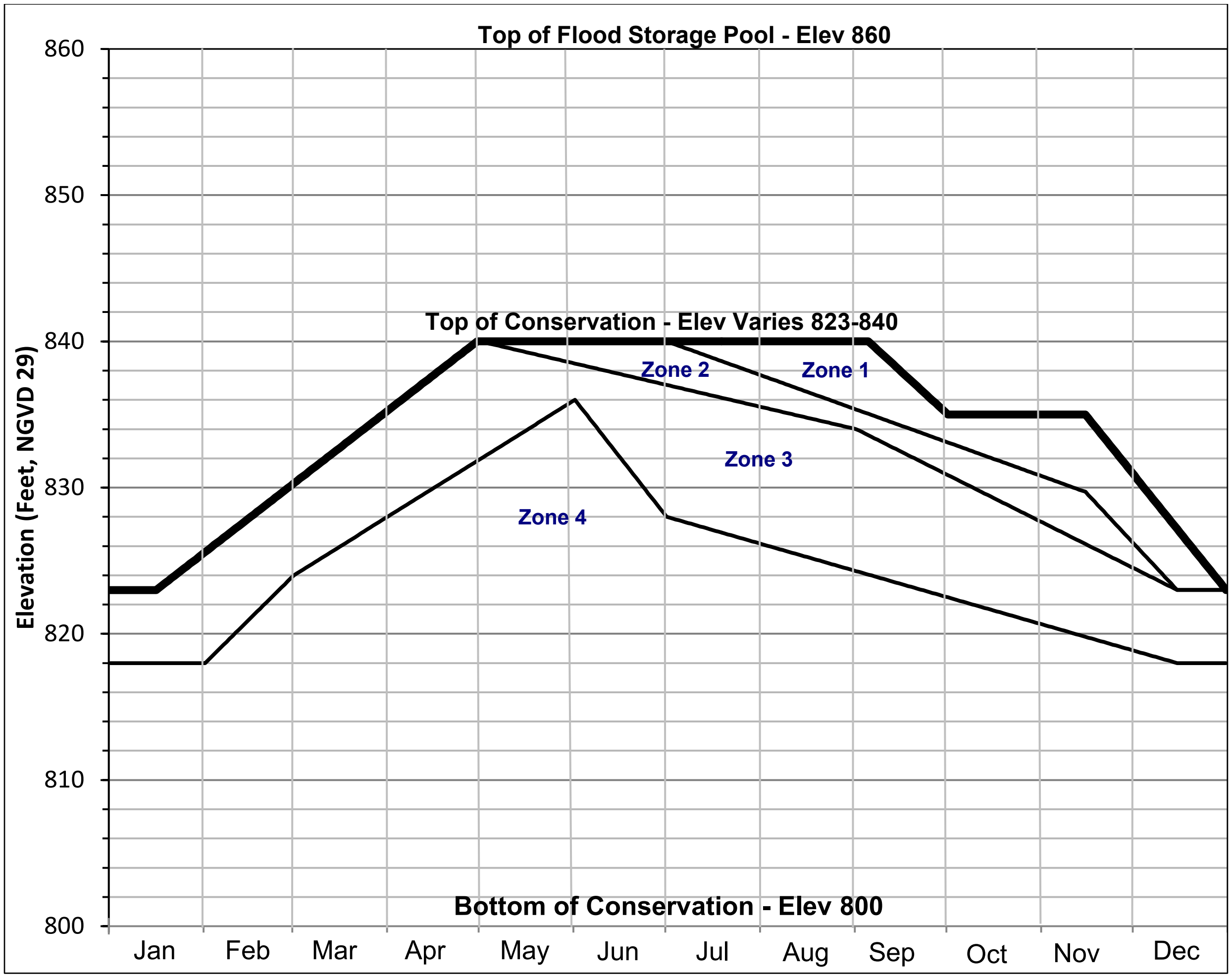


Figure 7-1. Allatoona Lake Water Control Regulation Guide Curve and Action Zones

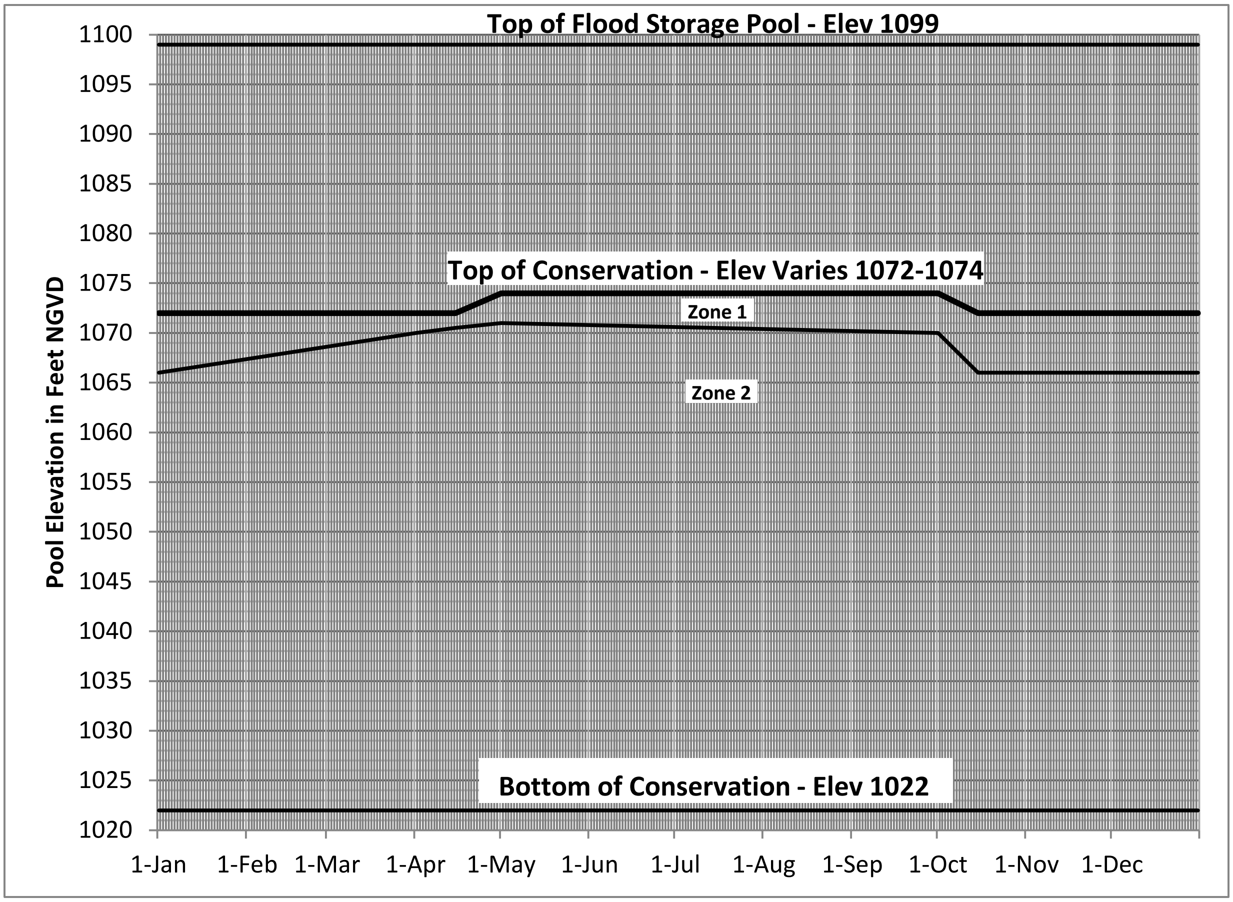


Figure 7-2. Carters Lake Water Control Guide Curve and Action Zones

The action zones were based on the ability of the reservoirs to refill (considering hydrology, watershed size, and physical constraints of each reservoir), recreation effects and hazard levels. Other factors or activities might cause the lakes to operate differently than the action zones described. Examples of the factors or activities include exceptional flood damage reduction measures; fish spawn operations; maintenance and repair of turbines; emergency situations such as a drowning or chemical spill; draw-downs because of shoreline maintenance; drought recovery; increased or decreased hydropower demand; and other circumstances.

APC has two additional guide curves; the drought contingency curve and the operating inactive curve. The drought contingency curve is used to trigger drought operation at the project and is a component of the Low Composite Storage Trigger. The operational inactive curve reflects the level of storage required to support an APC system limit for 12 hours of hydropower generation needed for system reliability. While these curves are not labeled as action zones, they have a similar purpose.

7-04. Standing Instructions to Damtender. During normal operations, the powerhouse operators will operate the COE Projects in accordance with the daily hydropower schedule. Any deviation from the schedule must come through the Water Management Section. Normally, flood control instructions are issued by the Water Management Section in the Mobile District Office. However, if a storm of flood-producing magnitude occurs and all communications are disrupted between the Mobile District and the powerhouse operators, the operators will follow detailed instructions provided in the "Standing Instructions to the Damtender for Water Control" exhibit found in the individual project manuals.

7-05. Flood Management. The objective of flood management regulation on the ACT System is to store excess flows thereby reducing downstream river levels below flood stage and producing no higher stages than would otherwise occur naturally. Whenever flood conditions occur, flood management to reduce flood damages takes precedence over all other project functions. Of the five Corps reservoirs, only Allatoona and Carters were designed with space to store flood waters. Flood management regulation for those projects are described in each project water control manual, Appendices A and H, respectively. Annual drawdown of reservoir storage is 17 feet at Allatoona and two feet at Carters in the fall through winter to provide additional storage capacity to protect life and property downstream of the projects. Robert F. Henry and Millers Ferry Projects have no storage dedicated for flood management and, along with the Claiborne Project, essentially pass inflows during high flow conditions. The operation of four APC dams (Weiss, Logan Martin, and H. Neely Henry on the Coosa and Robert L. Harris on the Tallapoosa) are subject to rules and regulations in the interest of flood management reduction and navigation as described in individual water control manuals for those projects, Appendices B, C, D, and I, respectively.

The timing, magnitude and location of flood peaks in the ACT System is of considerable importance in determining the effectiveness of reservoir flood management regulation and the degree to which such regulation can be coordinated. During a flood event, excess water above normal pool elevation, or guide curve, should be evacuated through the use of the turbines and spillways in a manner consistent with other project needs as soon as downstream waters have begun to recede so that releases from the reservoirs do not increase the height of flooding downstream. Under certain instances, induced surcharge operations will be required to assure project integrity. During induced surcharge operations, flows may increase the height of flooding levels downstream.

7-06. Recreation. All the Corps lakes have become important recreational resources. The five Corps projects in the basin account for 110,595 total acres of land and water. A wide variety of recreational opportunities is provided at the lakes including boating, fishing, picnicking, sightseeing, water skiing, and camping. The reservoirs support popular sport fisheries, some of which have achieved national acclaim for trophy-size catches of largemouth bass. Recreation benefits are maximized at the lakes by maintaining full or nearly full pools during the primary recreation season of May to September. In response to meeting other authorized project purposes, lake levels can and do decline during the primary recreation period, particularly during drier than normal years.

Allatoona Lake fluctuates significantly during the year, and the fluctuations can be even more extreme during periods of extremely dry weather. During peak recreation season, generally Memorial Day through Labor Day, the Corps considers recreational needs at the Allatoona Lake project in making water management decisions. The Corps has developed a series of threshold impact elevations that serves as a guide to understanding the recreational effects of water management decisions

Although the Carters pool level typically fluctuates on a weekly basis, Carters Lake is designed to operate at a relatively stable pool level throughout the year under normal conditions (conservation pool level at elevation 1,074 feet NGVD29 during the summer and 1,072 feet NGVD29 during the winter). However, the pool level can drop significantly below those elevations under extremely dry conditions. In such cases, the use of water-related recreation facilities can be adversely affected. While these effects are considered in water management decisions at the project, the Carters Lake water control plan does not contain specific threshold impact elevations to guide water management decisions.

R.E. "Bob" Woodruff, William "Bill" Dannelly, and Claiborne Lakes all have water-based recreation facilities. The lakes all have relatively stable pools except during flooding events. Water management activities for these run-of-river reservoirs are limited and have no measurable effect on recreational use.

When pool levels must be lowered, the rates at which the drawdowns occur are as steady as possible.

7-07. Water Quality. Minimum flows of 240 cfs are released from Allatoona Dam to maintain downstream water quality. The minimum continuous release from Allatoona Dam and Lake is accomplished by operating the small turbine-generator unit continuously. If the small unit is out of service, one of the sluice gates will be opened to ensure that a minimum flow of 240 cfs is released from the dam. Releases can also be made over the spillway to maintain minimum flows.

At Carters, a 240 cfs water quality minimum flow is maintained at all times from continuous minimum releases from the reregulation dam spillway. When Carters is in Zone 1, seasonal varying flows for downstream fish and wildlife purposes provides additional water quality benefits.

Robert F. Henry and Millers Ferry Lock and Dam projects are not regulated with specific water quality discharge requirements. However, flows from these projects are used downstream to help provide the 7Q10 flow of 6,600 cfs below Claiborne Dam. Several industries on the Alabama River also depend on releases from these projects for their water use needs. Whenever flow below Claiborne recedes to the 6,600 cfs level, conditions are closely monitored so that adequate warning can be given to water users if it is necessary to reduce the flows even further in response to extremely dry conditions. As projections indicate that drought conditions could intensify and that further flow reductions might be required, the ACT Basin Drought Contingency Plan (DCP) and the WCMs for the Robert F. Henry and Millers Ferry Lock and Dam projects prescribe a process for notification of, and coordination with, state and federal agencies and affected industries along the river.

7-08. Fish and Wildlife.

a. Fish Spawning. Fish and wildlife conservation is an authorized purpose of the reservoirs in the ACT Basin in accordance with P.L. 85-64 (Fish and Wildlife Coordination Act of 1958). All the Corps reservoirs in the ACT Basin support important fisheries and are operated accordingly, consistent with other project purposes. In addition to fishery management, such operations include aquatic plant control and waterfowl management activities. The various projects in the basin have specific operations for fish and wildlife conservation, which are described in the individual reservoir regulation manuals for the projects.

The Corps' South Atlantic Division Regulation SADR 1130-2-16 (31 May 2010) and Mobile District Draft Standard Operating Procedure (SOP) 1130-2-9 (February 2005) were developed to address lake regulation and coordination for fish management purposes. The SOP specifically applies to the Allatoona Dam and Lake Project in the ACT Basin and addresses procedures necessary to gather and disseminate water temperature data and manage lake levels during the annual fish spawning period between March and May, primarily targeted at largemouth bass. The major goal of the operation is to not lower the lake level more than six inches in elevation during the reproduction period to prevent stranding or exposing fish eggs.

Continuous minimum flow requirements of 240 cfs below Allatoona Dam and the seasonal varying minimum flow release from Carters Reregulation Dam support fish and wildlife conservation downstream of the projects, particularly during periods of extremely dry weather. APC's flow target of 4,640 cfs at Montgomery, Alabama (at the headwaters of the R.E. "Bob" Woodruff Lake), while principally intended to support downstream navigation and water quality needs, also provides sustained flows for fish and wildlife conservation.

While each of the remaining Corps reservoirs in the ACT Basin (R.E. "Bob" Woodruff, William "Bill" Dannelly, and Claiborne Lakes) conduct natural resource management activities to improve fishery conditions, they do not have specific water management procedures directed at fish and wildlife conservation. The impoundments support a healthy sport fishery. The pools are maintained at fairly constant levels, except during floods when high inflows cause reservoir levels to rise. The relatively stable pool during the spring spawning season is beneficial to the production of crappie, largemouth and smallmouth bass, shellcracker, warmouth, and sunfishes. However, because of the regulation of the project for navigation and hydropower, it might not be possible to maintain the optimum conditions for fish spawning that can be accomplished at other projects.

b. Fish Passage. If flow conditions allow from March through May, the Corps can operate the locks on the Alabama River to facilitate downstream to upstream passage of Alabama shad and other migratory species. There can be slight differences in the locking technique each year. However, in general two fish locking cycles are performed each day between 8 a.m. and 4 p.m. - one in the morning and one in the afternoon. The operation consists of opening the lower lock gates and getting fish into the lock in one of three ways; transporting them into the lock by boat, using attraction flows to entice the fish into the lock, or leaving the lower gate open for a period before a lockage and allowing the fish to move in without an attraction flow. Once the fish are in the lock (or assumed to be in the lock), the downstream doors are closed. The lock is filled to the lake elevation, and the upper gates are opened. Studies are ongoing to determine the most appropriate technique and timing for the locks, but the number of lock cycles per day will not change.

7-09. Water Supply. The City of Chatsworth, Georgia, has a storage contract with the Corps for 818 acre-feet (expected yield of 2.0 mgd) at Carters Lake for water supply. The City of Cartersville, Georgia, and CCMWA have contracts with the Corps for 6,371 acre-feet (expected yield of 16.76 mgd) and 13,140 acre-feet (expected yield of 34.5 mgd) respectively, from Allatoona Lake. Water storage contracts are based on daily water withdrawals and the amount of storage (in acre-feet) required to provide these withdrawals. Water supply storage accounting is a systematic accounting record to track valid storage users when the lake is in the conservation pool. Users get a proportion of any inflow and any losses as well as measured use. To assure that one contracted water user is not encroaching on the rights of other contracted users. This accounting is especially critical during drought. A component of the accounting is to notify users of the need for conservation measures or the need for additional water supply sources, when available water supply storage drops below 30%. Formula used to calculate water supply storage: Ending Storage – Beginning Storage + Inflow Share – Loss Share – User's Usage. The conservation pool is drawn down as water usage exceeds inflow. The entire pool is drawn down and the individual accounts are also drawn down at different rates based on their usage. Users will be notified on a weekly base once the storage account drops below 30%. Details regarding contract storage accounting to monitor withdrawals are described in the project water control plans contained in Appendix A (Allatoona) and Appendix H (Carters).

Minimum flows associated with Corps and APC projects in the ACT Basin (240 cfs from Allatoona; seasonal varying minimum flow from Carters; target flows at Montgomery, Alabama, from APC projects; and 6,600 cfs 7Q10 flow below Claiborne Dam) are generally associated with water quality, fish and wildlife conservation, and navigation needs in the system. However, the minimum flows also support water supply needs of users throughout the system.

7-10. Hydroelectric Power. The ACT Basin is in the southern sub-region of the Southeastern Electrical Reliability Corporation (SERC, formerly the Southeastern Electrical Reliability Council) and the larger North American Electrical Reliability Council. The southern sub-region of the SERC consists of five smaller control areas that are each individually managed by Alabama Electric Cooperative, Oglethorpe Power Corporation, South Mississippi Electrical Power Association, Walton Electric Membership Corporation, and the Southern Company. Southern Company's APC Division is the primary private operator in the ACT Basin. Through the Department of Energy's Southeast Power Administration (SEPA), the federal power plants provide power to more than 300 power preference customers throughout the southeastern United States. Hydroelectric power generation is achieved by passing flow releases to the maximum extent possible through the turbines at each project, even when making releases to support other project purposes.

The Corps operates four hydropower peaking plants in the ACT Basin. The Jones Bluff Power Project (Robert F. Henry Lock and Dam) and Millers Ferry Power Project (Millers Ferry Lock and Dam) on the Alabama River work together with a combined generating capacity of 172 MW (declared value) in supporting peak hydropower demand and other project purposes. The Allatoona Powerhouse at Allatoona Dam has an installed generating capacity of 82.2 MW (declared value). Carters Dam is operated as a peaking plant and pump storage plant. This plant consists of two dams and reservoirs, Carters Dam and Lake and Carters Reregulation Dam. During peak loading hours, water is released from Carters Lake to the reregulation pool generating energy. When demand is low and energy is relatively cheap, energy is purchased to pump water back into the Carters Lake from the reregulation pool. This plant has a total generating capacity of 600 MW (declared value). Each project's water control plan for hydropower is described in the individual project water control manual appendices.

Eleven non-Corps projects, located on the Tallapoosa and Coosa Rivers, owned and operated by APC. The APC power plants have a combined installed generating capacity of approximately 1410 MW. APC regulates its hydropower projects on the Coosa and Tallapoosa Rivers in accordance with those projects respective licenses from FERC. The Corps receives a data summary report and forecast hydro release data electronically each morning to aid in the water control regulation and hydropower scheduling of the downstream Corps power projects on the Alabama River. This information is also updated during the day if conditions warrant.

Because Robert F. Henry and Millers Ferry do not have the ability to store appreciable amounts of inflow, these projects are operated as run-of-river with pondage power plants. Hydroelectric power operation occurs as the projects receive increased inflows as a result of hydropower releases from upstream projects. Under normal and dryer conditions, hydropower generation at these projects is not continuous. While operating as a run-of-river facility, generation may occur several hours a day, seven days per week, followed by hours of non-generation. During high flow events, these projects will operate around the clock with 24-hour power generation. As the project head decreases, the generation capacity of the units will decrease until it becomes inefficient to operate the hydropower units. At that time, the units will be shutdown, and all releases will be made through the spillway.

Peaking plants provide electricity during the peak demand periods of each day and week. Hydroelectric power peaking involves increasing the discharge for a few hours each day to near the full capacity of one or more of the turbines. Typically, the Allatoona and Carters power projects provide generation each day for five days a week at plant capacity throughout the year to support the hydropower demand, as long as their respective lake levels are in Zone 1 and drought operations have not been triggered. For example, demand for peak hydroelectric power at Allatoona Dam typically occurs on weekdays from 5:00 a.m. to 9:00 a.m. and from 3:00 p.m. to 10 p.m. between 1 October and 1 March, and on weekdays from 1:00 p.m. to 7:00 p.m. between 1 April and 30 September. This typical amount of generation represents releases that normally meet water demands within the system and provide the capacity specified in marketing arrangements. During dry periods, as the lake levels drop below Zone 1, hydroelectric power generation is reduced proportionally as pool levels decline during extreme low flow conditions. Peak generation could be eliminated or limited to conjunctive releases during severe drought conditions.

In addition to hydroelectric power generation being governed by action zone, there are also physical limitations that factor into the power generation decisions. Scheduled and unscheduled unit outages occur throughout the year affecting the ability to release flow through some or all the turbines.

7-11. Navigation. Navigation is an important use of water resources in the ACT Basin. The Alabama River, from Montgomery downstream to the Mobile area, provides an important navigation route for commercial barge traffic, serving as a valuable regional economic resource. A minimum flow is required to ensure usable water depths to support navigation. Congress has authorized continuous navigation on the river, when sufficient water is available. The three Corps locks and dams on the Alabama River and a combination of dredging, river training works, and flow augmentation together support navigation depths on the river. The lack of regular dredging and routine maintenance has led to inadequate depths at times in the Alabama River navigation channel.

When supported by maintenance dredging, ACT Basin reservoir storage, and hydrologic conditions, adequate flows will provide a reliable navigation channel. In so doing, the goal of the water control plan is to ensure a predictable minimum navigable channel in the Alabama River for a continuous period that is sufficient for navigation use. Achieving this goal is dependent on receiving adequate funding for dredging activities. Figure 7-3 shows the effect of dredging on flow requirements for different navigation channel depths during normal hydrologic conditions (1992 - 1994). As shown on Figure 7-3, pre-dredging conditions exist between November and April; dredging occurs between May and August; and post-dredging conditions exist from September through October, until November rainfall causes shoaling to occur somewhere along the navigation channel.

A 9-foot-deep by 200-foot-wide navigation channel is authorized on the Alabama River to Montgomery, Alabama. When a 9.0-foot channel cannot be met, a shallower 7.5-foot channel would still allow for light loaded barges moving through the navigation system. A minimum depth of 7.5 feet can provide a limited amount of navigation. Under low flow conditions, even the 7.5-foot depth has not been available at all times.

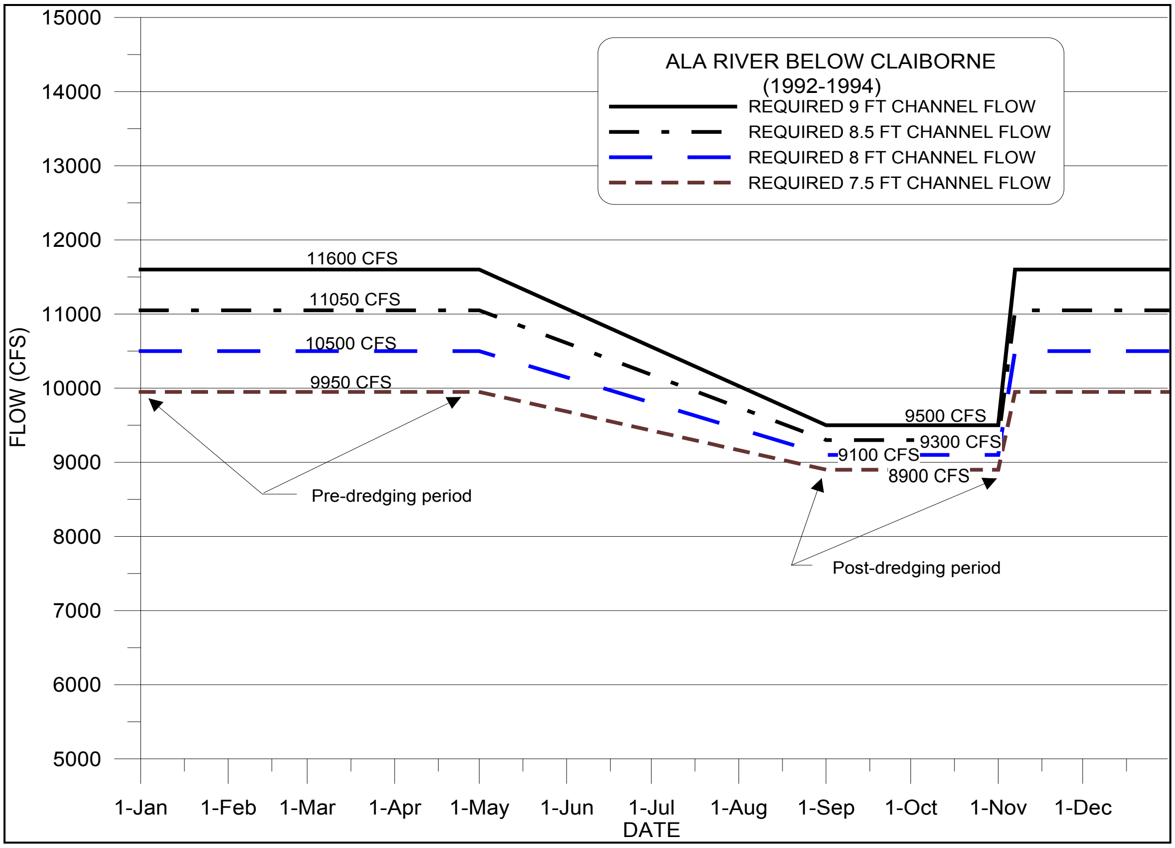


Figure 7-3. Flow-Depth Pattern (Navigation Template) During Normal Hydrologic Conditions (1992–1994)

Allatoona Dam and Carters Dam, while originally authorized to support downstream navigation, are not regulated for navigation purposes because they are distant from the navigation channel, and any releases for that purpose would be captured and reregulated by APC reservoirs downstream. Downstream navigation in the Alabama River benefits indirectly from the operation of the Allatoona and Carters Projects for the other authorized purposes. Flow releases from upstream APC projects have a direct influence on flows needed to support navigation depths on the lower Alabama River. Flows for navigation are most needed in the unregulated part of the lower Alabama River below Claiborne Lock and Dam. When flows are available, Robert F. Henry, Millers Ferry, and Claiborne are regulated to maintain stable pool levels, coupled with the necessary channel maintenance dredging, to support sustained use of the authorized navigation channel and to provide the full navigation depth of 9 feet. When river conditions or funding available for dredging of the river indicates that project conditions (9-foot channel) will probably not be attainable in the low water season, the three Alabama River projects are operated to provide flows for a reduced project channel depth as determined by surveys of the river. APC operates it reservoirs on the Coosa and Tallapoosa Rivers (specifically flows from their Jordan, Bouldin, and Thurlow (JBT) projects) to provide a minimum navigation flow target in the Alabama River at Montgomery, Alabama. The monthly minimum navigation flow targets are shown in Table 7-1. However, flows may be reduced if conditions warrant in accordance with the navigation plan memorandum of understanding between the Corps and APC (Exhibit B). Additional intervening flow or drawdown discharge from the Robert F. Henry and Millers Ferry projects must be used to provide a usable depth for navigation and/or meet the 7Q10 flow of 6,600 cfs below Claiborne Dam. However, the limited storage afforded in both

Table 7-1. Monthly Navigation Flow Target in CFS

Month	9.0-ft target below Claiborne Lake (from Navigation Template) (cfs)	9.0-ft Jordan, Bouldin, Thurlow goal (cfs)	7.5-ft target below Claiborne Lake (from Navigation Template) (cfs)	7.5-ft Jordan, Bouldin, Thurlow goal (cfs)
Jan	11600	9280	9950	7,960
Feb	11600	9280	9950	7,960
Mar	11600	9280	9950	7,960
Apr	11600	9280	9950	7,960
May	11100	8880	9740	7,792
Jun	10600	8480	9530	7,624
Jul	10100	8080	9320	7,456
Aug	9600	7680	9110	7,288
Sep	9100	7280	8900	7,120
Oct	9100	7280	8900	7,120
Nov	11600	9280	9950	7,960
Dec	11600	9280	9950	7,960

the Robert F. Henry and Millers Ferry reservoirs (R.E. “Bob” Woodruff Lake and William “Bill” Dannelly Lake, respectively) can only help meet the 6,600 cfs level at Claiborne Lake for a short period. As local inflows diminish or the storage is exhausted, a lesser amount would be released depending on the amount of local inflows. Table 7-2 and Figure 7-4 show the required basin inflow for a 9.0-foot channel; Table 7-3 and Figure 7-5 show the required basin inflow for a 7.5-foot channel.

During low-flow periods, it is not always possible to provide the authorized 9-foot deep by 200-foot-wide channel dimensions. In recent years, funding for dredging has been reduced resulting in higher flows being required to provide the design navigation depth. In addition, recent droughts in 2000 and 2007 had a severe impact on the availability of navigation depths in the Alabama River.

Historically, navigation has been supported by releases from storage in the ACT Basin. Therefore, another critical component in the water control plan for navigation involves using an amount of storage from APC storage projects similar to that which has historically been used, but in a more efficient manner. The plan does not include flow requirements from Allatoona and Carters Lakes because, as explained earlier, they are not regulated specifically for navigation.

The ACT Basin navigation regulation plan is based on storage and flow/stage/channel depth analyses using basin inflows and average storage usage by APC (e.g., navigation operations would not be predicated on use of additional storage) during normal hydrologic conditions. Under that concept, the Corps and APC make releases that support navigation when basin inflows meet or exceed seasonal targets for either the 9.0-foot or 7.5-foot channel templates. Triggers are also identified (e.g., when basin inflow are less than required natural flows) to change operational goals between the 9.0-foot and 7.5-foot channels. Similarly, basin inflow triggers are identified when releases for navigation are suspended and only 7Q10 (4,640 cfs) releases would occur. During drought operations, releases to support navigation are suspended until system recovery occurs as defined in the ACT Basin Drought Contingency Plan (Exhibit C).

Table 7-2. Basin Inflow above APC Projects Required to meet a 9.0-Foot Navigation Channel

Month	APC navigation Target (cfs)	Monthly historic storage usage (cfs)	Required basin inflow (cfs)
Jan	9,280	–994	10,274
Feb	9,280	–1,894	11,174
Mar	9,280	–3,028	12,308
Apr	9,280	–3,786	13,066
May	8,880	–499	9,379
Jun	8,480	412	8,068
Jul	8,080	749	7,331
Aug	7,680	1,441	6,239
Sep	7,280	1,025	6,255
Oct	7,280	2,118	5,162
Nov	9,280	2,263	7,017
Dec	9,280	1,789	7,491

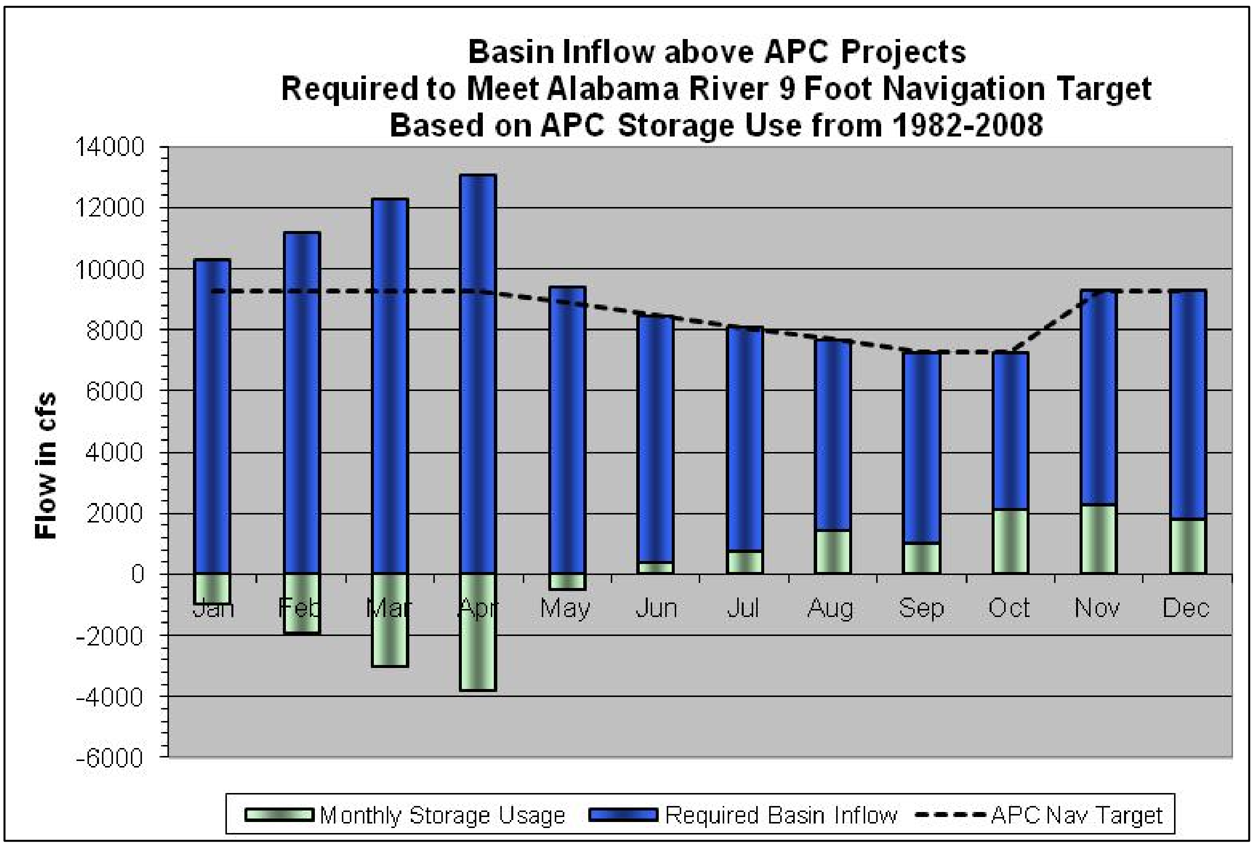


Figure 7-4. Flow Requirements from Rainfall (or Natural Sources) and Reservoir Storage to Achieve the JBT Goal for Navigation Flows for a 9-Foot Channel

Table 7-3. Basin Inflow above APC Projects Required to meet a 7.5-Foot Navigation Channel

Month	APC navigation Target (cfs)	Monthly historic storage usage (cfs)	Required basin inflow (cfs)
Jan	7,960	–994	8,954
Feb	7,960	–1,894	9,854
Mar	7,960	–3,028	10,988
Apr	7,960	–3,786	11,746
May	7,792	–499	8,291
Jun	7,624	412	7,212
Jul	7,456	749	6,707
Aug	7,288	1,441	5,847
Sep	7,120	1,025	6,095
Oct	7,120	2,118	5,002
Nov	7,960	2,263	5,697
Dec	7,960	–994	8,954

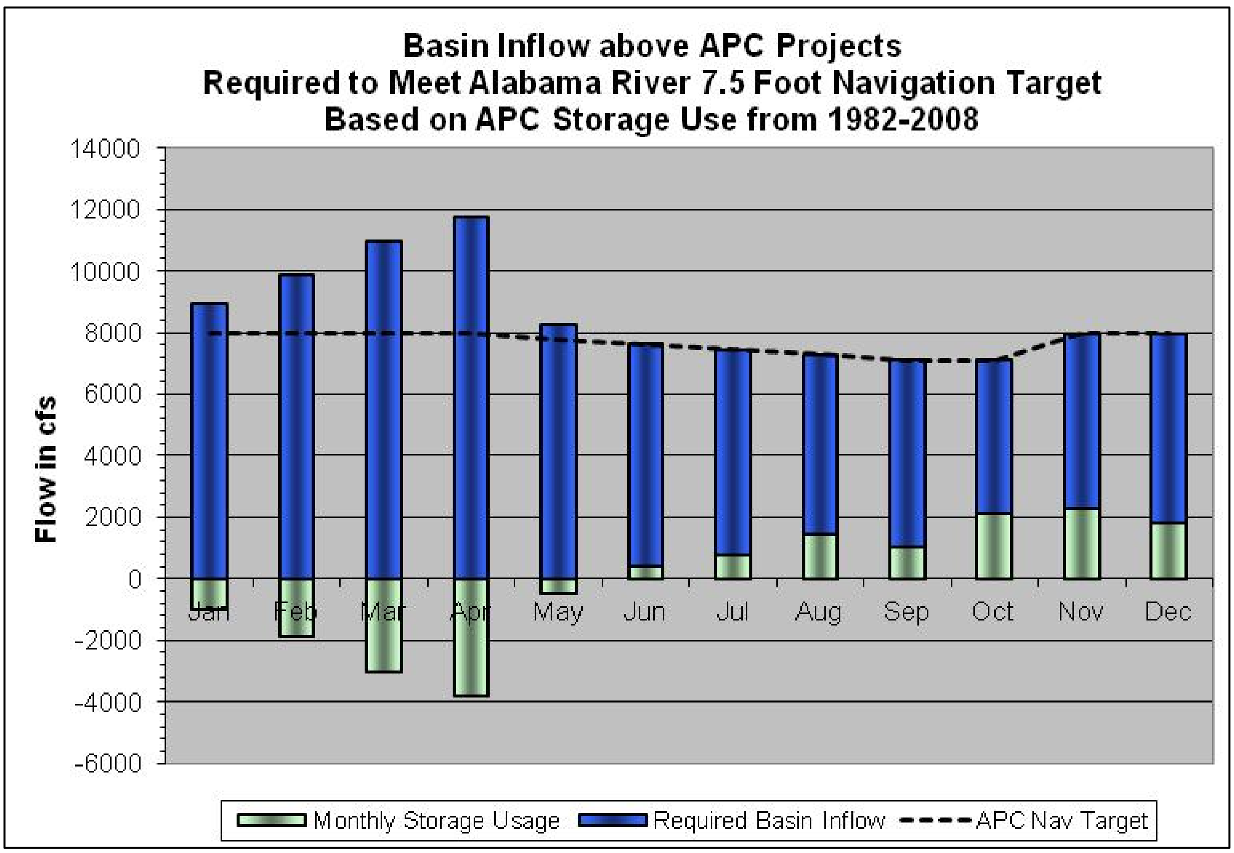


Figure 7-5. Flow Requirements from Rainfall (or Natural Sources) and Reservoir Storage to Achieve the JBT Goal for Navigation Flows for a 7.5-Foot Channel

In the event that the Mobile District Water Management Section (EN-HW) determines upcoming reductions in water releases may impact the available navigation channel depth, they shall contact the Black Warrior/Tombigbee - Alabama/Coosa Project Office (OP-BA), and the Mobile District Navigation Section (OP-TN), to coordinate the impact. EN-HW shall provide the Claiborne tailwater gage forecast to OP-BA and OP-TN. Using this forecast and the latest available project channel surveys, OP-BA and OP-TN will evaluate the potential impact to available navigation depths. Should this evaluation determine that the available channel depth is adversely impacted, OP-BA and OP-TN will work together, providing EN-HW with their determination of the controlling depth. Thereafter, OP-BA and OP-TN will coordinate the issuance of a navigation bulletin. The notices will be issued as expeditiously as possible to give barge owners, and other waterway users, sufficient time to make arrangements to light load or remove their vessels before action is taken at upstream projects to reduce flows. The bulletin will be posted to the Mobile District Navigation website at

http://navigation.sam.usace.army.mil/docs/index.asp?type=nn

Although special releases will not be standard practice, they could occur for a short duration to assist maintenance dredging and commercial navigation for special shipments if basin hydrologic conditions are adequate. The Corps will evaluate such requests on a case by case basis, subject to applicable laws and regulations and the basin conditions.

7-12. Drought Contingency Plans. In accordance with ER 1110-2-1941, Drought Contingency Plans, dated September 15, 1981, an ACT Basin Drought Contingency Plan (DCP) has been developed to implement water control regulation drought management actions. The following information provides a summary of the DCP water control actions for the ACT Basin projects. Figure 7-6 provides a general schematic of the ACT Basin Drought Plan.

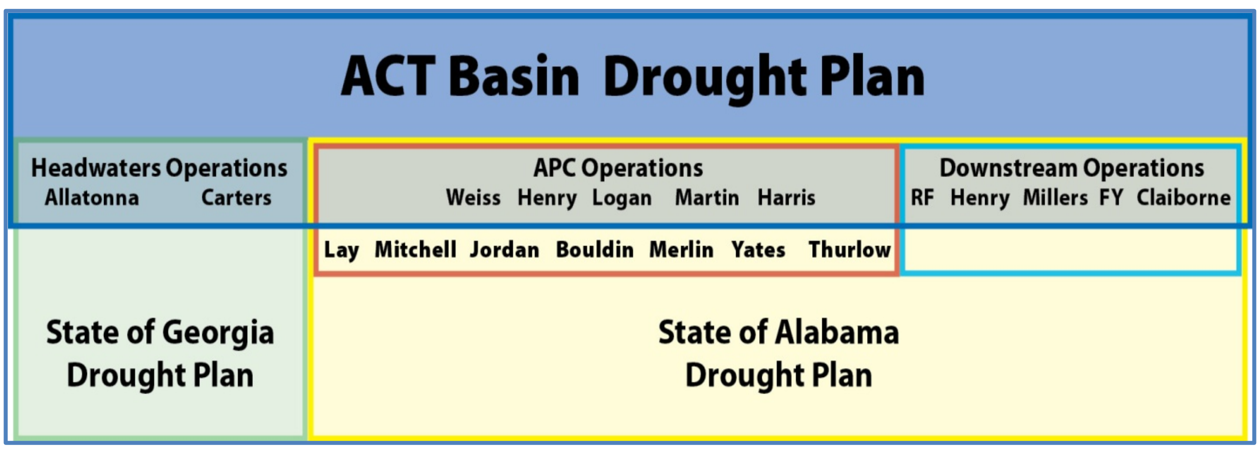


Figure 7-6. Schematic of the ACT Basin Drought Plan

The ACT Basin Drought Plan defines monthly minimum flow requirements for the Coosa, Tallapoosa, and Alabama Rivers as a function of a Drought Intensity Level (DIL) and time of year. Such flow requirements are daily averages. The key features of the drought plan are described in detail in Exhibit C - Drought Contingency Plan. The ACT Basin Drought Plan is activated when one or more of the following drought triggers occur: (1) basin inflow trigger; (2) composite conservation storage trigger in APC reservoirs; and (3) state line flow trigger. Drought management actions would become increasingly more austere when two triggers occur (Drought Level 2) or all three occur (Drought Level 3). The combined occurrences of the drought triggers determine the DIL. Table 7-4 lists the three drought operation intensity levels applicable to APC projects. Table 7-5 schematically depicts the ACT Basin Drought Plan matrix.

Drought management measures for ACT Basin-wide drought regulation consists of three major components:

- Headwater regulation at Allatoona Lake and Carters Lake in Georgia
- Regulation at APC projects on the Coosa and Tallapoosa Rivers
- Regulation at Corps projects downstream of Montgomery on the Alabama River

The headwater regulation component includes water control actions in accordance with established action zones, minimum releases, and hydropower generation releases. Regulation of APC projects will be in accordance with Table 7-5 in which the drought response will be triggered by one or more of three indicators - state line flows, basin inflow, or composite conservation storage.

Table 7-4. ACT Basin Drought Intensity Levels

Drought Intensity Level (DIL)	Drought Level	No. of Triggers Occurring
DIL 1	Moderate Drought	1
DIL 2	Severe Drought	2
DIL 3	Exceptional Drought	3

1

Table 7-5. ACT Basin Drought Management Matrix

<table>
<tr><th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th colspan="2">Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="4">Drought Level Response[a]</td><td colspan="13">DIL 0 - Normal Operations</td></tr>
<tr><td colspan="13">DIL 1: Low Basin Inflows or Low Composite or Low State Line Flow</td></tr>
<tr><td colspan="13">DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite or Low State Line Flow)</td></tr>
<tr><td colspan="13">DIL 3: Low Basin Inflows + Low Composite + Low State Line Flow</td></tr>
<tr><td rowspan="4">Coosa River Flow[b]</td><td colspan="3">Normal Operation: 2,000 cfs</td><td colspan="2">4,000 (8,000)</td><td colspan="2">4,000 – 2,000</td><td colspan="6">Normal Operation: 2,000 cfs</td></tr>
<tr><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">4,000 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">Jordan 2,000 +/-cfs</td></tr>
<tr><td colspan="3">Jordan 1,800 +/-cfs</td><td colspan="3">2,500 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">Jordan 1,800 +/-cfs</td></tr>
<tr><td colspan="3">Jordan 1,600 +/-cfs</td><td colspan="4">Jordan 1,800 +/-cfs</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="2">Jordan 1,800 +/-cfs</td><td>Jordan 1,600 +/-cfs</td></tr>
<tr><td rowspan="4">Tallapoosa River Flow[c]</td><td colspan="13">Normal Operations: 1200 cfs</td></tr>
<tr><td colspan="4">Greater of: 1/2 Yates Inflow or
2 x Heflin Gage(Thurlow releases > 350 cfs)</td><td colspan="6">1/2 Yates Inflow</td><td colspan="3">1/2 Yates Inflow</td></tr>
<tr><td colspan="4">Thurlow 350 cfs</td><td colspan="6">1/2 Yates Inflow</td><td colspan="3">Thurlow 350 cfs</td></tr>
<tr><td colspan="7">Maintain 400 cfs at Montgomery WTP
(Thurlow release 350 cfs)</td><td colspan="3">Thurlow 350 cfs</td><td colspan="3">Maintain 400 cfs at Montgomery WTP (Thurlow release 350 cfs)</td></tr>
<tr><td rowspan="4">Alabama River Flow[d]</td><td colspan="13">Normal Operation: Navigation or 7Q10 flow</td></tr>
<tr><td colspan="4">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="6">7Q10 - Montgomery (4,640 cfs)</td><td colspan="3">Reduce: Full – 4,200 cfs</td></tr>
<tr><td colspan="5">3,700 cfs (20% 7Q10 Cut) - Montgomery</td><td colspan="5">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="3">Reduce: 4,200 cfs-> 3,700 cfs Montgomery (1 week ramp)</td></tr>
<tr><td colspan="4">2,000 cfs
Montgomery</td><td colspan="3">3,700 cfs
Montgomery</td><td colspan="3">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="3">Reduce: 4,200 cfs -> 2,000 cfs Montgomery (1 month ramp)</td></tr>
<tr><td rowspan="4">Guide Curve Elevation</td><td colspan="13">Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
</table>

a. Note these are base flows that will be exceeded when possible.
b .Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow flows are based on continuous +/- 5% of target flow: flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates.
d. Alabama River flows are 7-Day Average Flow.

2

7-13. Flood Emergency Action Plans. The Corps is responsible for developing Flood Emergency Action Plans for the ACT System. The plans are included in the Operations and Maintenance Manuals for each system project. Example data available are emergency contact information, flood inundation information, and so on.

7-14. Other. Other considerations than just serving the authorized project purposes must be served from the basin as needed. For example, adjustments are made to system regulation at times for downstream construction, to aid in rescue or recovery from drowning accidents; for environmental studies; or for cultural resource investigation.

7-15. Deviation from Normal Regulation. Water management inherently involves adapting to unforeseen conditions. The development of water control criteria for the management of water resource systems is carried out throughout all phases of a water control project. The water control criteria are based on sound engineering practice utilizing the latest approved models and techniques for all foreseeable conditions. There may be further refinements or enhancements of the water control procedures, in order to account for changed conditions resulting from unforeseen conditions, new requirements, additional data, or changed social or economic goals. However, it is necessary to define the water control plan in precise terms at a particular time in order to assure carrying out the intended functional commitments in accordance with the authorizing documents (EM 1110-2-3600 Management of Water Control Systems). Adverse impacts of the water control plan may occur due to unforeseen conditions. When this occurs, actions will be taken within applicable authority, policies, and coordination to address these conditions when they occur through the implementation of temporary deviations to the water control plan, such as interim operation plans. Such deviations may require additional environmental compliance prior to implementation.

The Corps is occasionally requested to deviate from the water control plan. Prior approval for a deviation is required from the Division Commander except as noted in subparagraph a. Deviation requests usually fall into the following categories:

a. Emergencies. Examples of some emergencies that can be expected at a project are drowning and other accidents, failure of the operation facilities, failure of another ACT project, chemical spills, treatment plant failures, and other temporary pollution problems. Water control actions necessary to abate the problem are taken immediately unless such action would reasonably be expected to create equal or worse conditions. The Mobile District will notify the Division office as soon as practicable.

b. Unplanned Deviations. Unplanned instances can create a temporary need for deviations from the normal regulation plan. Unplanned deviations may be classified as either major or minor but do not fall into the category of emergency deviations. Construction accounts for many of the minor deviations and typical examples include utility stream crossings, bridge work, and major construction contracts. Minor deviations can also be necessary to carry out maintenance and inspection of facilities. The possibility of the need for a major deviation mostly occurs during extreme flood events. Requests for changes in release rates generally involve periods ranging from a few hours to a few days, with each request being analyzed on its own merits. In evaluating the proposed deviation, consideration must be given to impacts on project and system purposes, upstream watershed conditions, potential flood threat, project condition, and alternative measures that can be taken. Approval for unplanned deviations, either major or minor, will be obtained from the Division Office by telephone or electronic mail prior to implementation.

c. Planned Deviations. Each condition should be analyzed on its merits. Sufficient data on flood potential, lake and watershed conditions, possible alternative measures, benefits to be expected, and probable effects on other authorized and useful purposes, together with the district recommendation, will be presented by letter or electronic mail to the Division office for review and approval.

7-16. Rate of Release Change. Gradual changes are important when releases are being decreased and downstream conditions are very wet, resulting in saturated riverbank conditions. The Corps acknowledges that a significant reduction in project releases over a short period can result in some bank sloughing, and release changes are scheduled accordingly when a slower rate of change does not significantly affect downstream flood risk. Overall, the effect of project regulation on streambank erosion has been reduced by the regulation of the project because higher peak-runoff flows into the project are captured and metered out more slowly.

VIII - EFFECT OF WATER CONTROL PLAN

8.01. General. ACT Basin multi-purpose reservoir and navigation projects have produced major effects on the basin's water and land resources and have provided significant local, regional, and national benefits. The following generally describe the effects and benefits produced by the federal water control regulation conducted in the ACT Basin.

The impacts of the *ACT Master Water Control Manual* and its Appendices have been fully evaluated in an Environmental Impact Statement (EIS) that was published on (date). A Record of Decision (ROD) for the action was signed on (date). During the preparation of the EIS, a review of all direct, secondary and cumulative impacts was made. As detailed in the EIS, the decision to prepare the Water Control Manual and the potential impacts was coordinated with Federal and State agencies, environmental organizations, Indian tribes, and other stakeholder groups and individuals having an interest in the basin. The ROD and EIS are public documents and references to their accessible locations are available upon request.

8.02. Flood Management. One of the major benefits of the water control regulation in the ACT System is flood management for the purpose of flood risk management benefits. During most years, one or more flood events occur in the ACT Basin. While most of the events are of minor significance, on occasion, major storms produce widespread flooding or unusually high river stages.

Carters Lake provides flood risk management benefits to the rich farm lands along the Coosawattee and Oostanaula Rivers and to the areas of Resaca, Georgia, and Rome, Georgia. Peak flood stages are reduced as far downstream as Rome, Georgia, about 72 river miles downstream from the project. Flood risk management regulation at Allatoona Dam and Lake reduces peak stages of the Etowah River below the dam downstream to its confluence with the Oostanaula River at Rome. Releases of stored flood waters would not be made until the Rome stage falls below flood stage, except in extreme floods to protect the integrity of the dams. Except for large floods, such as the March 1990 event, the Allatoona Lake flood storage can usually be evacuated in several weeks. Flood level reductions at Rome are primarily effected by operations at Allatoona Dam. Carters Lake usually provides for incidental flood stage reductions at Rome. Allatoona Lake controls about 28 percent of the total combined drainage area of the Etowah and Oostanaula Rivers at Rome (4,010 square miles), and Carters Lake controls about nine percent of that area. The evacuation of flood storage from Allatoona Lake and Carters Lake is coordinated so that the combined discharges will not cause or aggravate flooding at Rome. As a general rule, the flood inflows into Allatoona Lake will be stored longer than the Carters Lake flood inflows because Allatoona Lake has a larger flood storage capacity and a shorter routing time to Rome. Flood regulation at the Allatoona and Carters Projects also assists in the flood risk management regulation at Weiss Lake on the Coosa River by reducing the inflows into that project during flood events. The extent to which the Allatoona and Carters Projects can manage flood risk from a storm depends on the initial conditions, the rainfall distribution and movement, storm centering, and flood characteristics. General area storms tend to be better managed because the local runoff below Allatoona Dam will have flowed through Weiss Lake before the flood evacuation releases are required at Allatoona Dam.

8-03. Flood Emergency Action Plans. The Mobile District is responsible for developing Flood Emergency Action Plans for the ACT System. Individual Flood Emergency Action Plans have been developed for each of the system dams. The plans are presented in the individual project manuals in Appendices A through I. The plans are for use in coordination with the Mobile District Water Management Section during a flood emergency or for guidance if that communication with the District is lost. The plans are intended to serve only as temporary guidance for operating a project in an emergency until Mobile District staff can assess the results of real-time hydrologic model runs and issue more detailed instructions to project personnel. The benefits of Flood Emergency Action Plans are to minimize uncertainties in how to operate a project in a flood emergency, to facilitate quick action to mitigate the adverse impacts of a flood event, and to provide for emergency action exercises to train operating personnel on how to respond in an actual emergency flood situation.

8-04. Recreation. The Corps lakes in the ACT Basin are important recreational resources, providing significant economic and social benefits for the region and the nation. The five Corps projects in the basin contain more than 235,000 total acres of land and water, most of which are available for public use. A wide variety of recreational opportunities are provided at the lakes including boating, fishing, hunting, camping, picnicking, water skiing, and sightseeing. Mobile District rangers and other project personnel conduct numerous environmental and historical educational tours and presentations, as well as water safety instructional sessions each year for the benefit of area students and project visitors. The reservoirs support popular sport fisheries, some of which have achieved national acclaim for trophy-size catches of largemouth bass. Allatoona Lake is one of the most visited Corps lakes in the United States. Table 8-1 displays visitor days at Corps projects from FY 2003 through FY 2011. Allatoona Lake has the highest number of visitor days each year.

Table 8-1. ACT Corps Project Visits

	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011
Alabama River Lakes	3,758,863	3,121,828	3,160,605	3,251,704	3,107,910	3,094,869	3,502,623	3,455,705	3,487,877
Allatoona Lake	5,942,789	5,650,029	5,663,215	6,129,733	6,431,973	6,929,550	5,281,347	6,245,913	6,004,769
Carters Lake	566,310	536,863	561,237	547,745	538,337	431,529	622,962	598,878	700,251

The effects of the ACT Basin water control operations on recreation facilities and use at the projects are described as impact lines - Initial Impact Line, Recreation Impact Line, and Water Access Limited Line. The impact lines are defined as pool elevations with associated effects on recreation facilities and exposure to hazards within each lake. The first impact level is generally characterized by marginal effects on designated swimming areas, increased safety awareness regarding navigation hazards, minimal effects on Corps boat ramps, and minimal effects on private marina and dock owners. More substantial impacts begin to occur at the second and third impact levels. Recreation impact levels at the Corps reservoir projects in the ACT Basin are described further in the individual project water control manual appendices. The following are general descriptions of each impact line:

1). Initial Impact Line - Reduced swim areas, some recreational navigation hazards are marked, boat ramps are minimally affected, a few private boat docks are affected.

2) Recreation Impact Line - All swim areas are unusable, recreational navigation hazards become more numerous, boat ramps significantly affected, 20 percent of private boat docks affected.

3) Water Access Impact Line - Most water-based recreational activities are severely restricted, most boat ramps are unusable, navigation hazards become more numerous, 50 percent of private boat docks affected.

8-05. Water Quality. Water control regulation of the ACT projects is not performed to meet specific water quality standards. However, the objective of water quality sustainability of the ACT River Basin mainstem streams is a goal through specific continuous minimum releases and other incidental releases that provide benefits to water quality in the basin. Water releases made during hydropower generation from Allatoona Dam provide Etowah River flows beneficial for downstream water uses. Allatoona Dam and Carters Reregulation Dam provide benefits to water quality by providing continuous minimum flow releases. At Allatoona Dam, the small turbine-generator is run continuously to provide a 240 cfs minimum discharge from the dam. At Carters Reregulation Dam, spillway releases provide a continuous minimum release of 240 cfs for downstream water quality benefits. Seasonal varying minimum environmental flow releases provide additional water quality benefits. Although there are no minimum flow provisions downstream of Robert F. Henry and Millers Ferry Dams on the Alabama River, flows from these projects are used downstream to help provide the 7Q10 flow of 6,600 cfs below Claiborne Dam. Several industries on the Alabama River have designed effluent discharges on the basis of these flows along the Alabama River.

8-06. Fish and Wildlife. Minimum flow requirements of 240 cfs below the Allatoona Lake and Carters Lake projects for water quality purposes also support fish and wildlife conservation downstream of the projects, particularly during periods of extremely dry weather. In addition, the seasonal varying environmental minimum flow targets below Carters Reregulation Dam provide benefits to downstream fish and wildlife and their habitat. APC’s minimum flow targets at Montgomery, Alabama (at the headwaters of the R.E. “Bob” Woodruff Lake), while principally intended to support downstream navigation, also provides sustained flows for water quality needs, fish and wildlife conservation and environmental flow benefits for threatened and endangered species and their critical habitat.

a. Fish Spawning. The water control plan for Allatoona improves the ability to maintain steady reservoir pool levels during the spring fish spawning period. When climatic conditions preclude a favorable operation for fish spawning, the Corps consults with the state fishery agencies and the USFWS on balancing needs in the system and minimizing the effects of fluctuating lake levels. Water control regulation for fish spawning helps to increase the population of fish in the lake.

b. Fish Passage. When Alabama River and project conditions allow, the Corps operates the locks on the Alabama River from March through May to facilitate downstream to upstream passage of Alabama shad and other migratory species. While there can be slight differences in the locking technique each year, generally two fish locking cycles are performed each day between 8 a.m. and 4 p.m.; one in the morning and one in the afternoon. The fish passage operations provide the benefit of allowing the fish to migrate upstream for spawning.

8-07. Water Supply. While the Corps does not operate the ACT System specifically for M&I water supply, the water control regulation of the ACT projects provides both direct and incidental benefits for M&I water supply uses along the mainstem rivers. Municipalities draw water from the rivers and reservoir pools for their water supplies. Industrial plants, such as pulp and paper mills, use water in their production processes. Recreation-related businesses, such as country clubs, use water to irrigate golf courses. Various state and county parks use water for irrigation and water supply. In many ways, such water uses support local jobs and contribute to the economy. M&I water supply withdrawals in the ACT Basin outside the federal projects are limited by applicable state-issued water withdrawal permits and to the available flows of water in the rivers that are largely incidental to the Corps and APC water control regulation.

8-08. Hydroelectric Power. Hydropower generation by the ACT Basin hydropower plants provide direct benefits to a large segment of the basin's population in the form of relatively low-cost power and the annual return of revenues to the Treasury of the United States. Hydropower plays an important role in meeting the electrical power demands of the region. The projects provide peaking power generation, i.e., power is generated during the hours that the demand for electrical power is highest. Table 8-2 displays generation over the past several years at federal projects in the ACT Basin. The ACT Basin hydropower projects, along with 20 other hydropower dams in the southeastern United States, compose the SEPA service area. Hydroelectric power generated at the Corps dams in the ACT Basin is sold by SEPA to a number of cooperatives and municipal power providers, referred to as preference customers. Hydroelectric power is one of the cheaper forms of electrical energy, and it can be generated and supplied quickly as needed in response to changing demand.

Table 8-2. ACT Federal Project Power Generation (MWh)

	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011
Alabama River Power Projects	465,864	627,148	571,701	826,003	708,004	885,777	633,618	464,458	444,314	645,867	660,838	506,146
Allatoona Dam	80,418	116,857	76,417	203,245	120,092	223,257	92,795	71,453	50,541	100,222	174,927	86,790
Carters Dam	413,225	387,964	385,928	380,276	481,001	434,571	434,088	484,652	535,959	577,565	610,566	544,692

The projects with hydropower capability provide three principal power generation benefits:

1) Hydropower helps to ensure the reliability of the electrical power system in the SEPA service area by providing dependable capacity to meet annual peak power demands. For most plants, that condition occurs when the reservoir is at its maximum elevation. Dependable capacity at hydropower plants reduces the need for additional coal, gas, oil, or nuclear generating capacity.

2) The projects provide a substantial amount of energy at a small cost relative to thermal electric generating stations, reducing the overall cost of electricity. Hydropower facilities reduce the burning of fossil fuels, thereby reducing air pollution.

3) Hydropower has several valuable operating characteristics that improve the reliability and efficiency of the electric power supply system, including efficient peaking, a rapid rate of unit unloading, and rapid power availability for emergencies on the power grid.

8-09. Navigation. The Alabama River from Montgomery, Alabama, downstream to the Mobile, Alabama, area provides a navigation route for commercial barge traffic, cruising yachters, recreational power boaters and paddlers serving as a valuable regional economic resource. A minimum flow is required to ensure usable water depths to support navigation. Congress has authorized continuous navigation on the river, when sufficient water is available. There are three locks and dams on the Alabama River, and a combination of dredging, river training works, and flow augmentation from upstream storage projects, which together support navigation depths on the river.

The Alabama River is a terminus on the inland waterway system. It is accessed by the Black Warrior Tombigbee Waterway and Mobile Harbor and the Gulf Intracoastal Waterway

(GIWW). Its major value as a water transportation resource is its ability to carry traffic to and from inland waterway points in Mississippi, Louisiana, and Texas. The bulk of the traffic on the Alabama River is linked to resources originating along the river, which makes barge transportation essential and convenient for moving these resources. As shown on Tables 8-3 and 8-4, the use of the ACT System for navigation declined from 2000 to 2010.

Table 8-3. Alabama River System Navigation – Tons per Year

Alabama River System (Transported Tons by Calendar Year)											
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
All Commodities	39,719	52,245	68,645	118,050	72,324	141,749	46,215	31,194	62,664	117,278	3,050
Crude Materials, Inedible, Except Fuels	39,675	40,450	54,760	117,250	68,181	141,047	45,900	27,650	62,564	117,278	
Primary Manufactured Goods						22					
Manufactured Equip. & Mach.	44	10,695	13,885	300	4,143	680	315	3,544	100		3,050
Waste Material		1,100									
Unknown or Not Elsewhere Classified				500							

Table 8-4. Alabama River System Navigation – Lockages/Vessels per Year

Alabama River System (Lockages/Vessels by Calendar Year)

Calendar Year	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Total Lockages (#)	344	366	317	254	399	299	240	259	218	233	155
Total Vessels (#)	481	512	418	334	583	358	342	334	263	265	199

Because of river bends and shoaling at the bends, typical tow size is a four-barge tow, except during very low water conditions when tow sizes can be reduced to two barges. Coast Guard regulations restrict tow widths to one-half of the 200-foot channel width. Those restrictions, however, would still allow most GIWW tows to navigate the Alabama River without breaking up tows.

Flows for navigation are most needed in the unregulated part of the lower Alabama River below Claiborne Lock and Dam. When flows are available, Claiborne Lock and Dam is operated to provide the full navigation depth of nine feet. When river conditions or funding available for dredging of the river indicates that project conditions (9-foot channel) will probably not be attainable in the low water season, the dam is operated to provide flows for a reduced project channel depth as determined by surveys of the river. In recent years funding for dredging has been cut resulting in higher flows being required to provide the design navigation depth. In addition to annual seasonal low flow impacts, droughts have a severe impact on the availability of navigation depths in the Alabama River.

A 9-foot-deep by 200-foot-wide navigation channel is authorized on the Alabama River to Montgomery, Alabama. A minimum depth of 7.5 feet can provide a limited amount of navigation. Under low flow conditions, even the 7.5-foot depth has not been available at all times. Over the period from 1976 to 1993, based upon river stage, the 7.5-foot navigation channel was available 79 percent of the time and the 9-foot navigation channel was available 72 percent of the time. Since 1993, the percentage of time that these depths have been available has declined further. Full navigation channel availability on the Alabama River is dependent upon seasonal flow conditions and channel maintenance. The ACT Basin water control plan will provide a 9-foot channel depth annual availability approximately 90 percent of the time in January and over 50 percent of the time in September. A 7.5-foot channel, based upon river stage, is expected approximately 90 percent of the time in January and 56 percent of the time in September. Because of higher flows in the winter and spring, channel availability is much higher from December through May.

Figure 8-1 depicts the historic annual channel depth availabilities for the Alabama River below Claiborne Lock and Dam, based upon river stage, computed for 1970 - 2007.

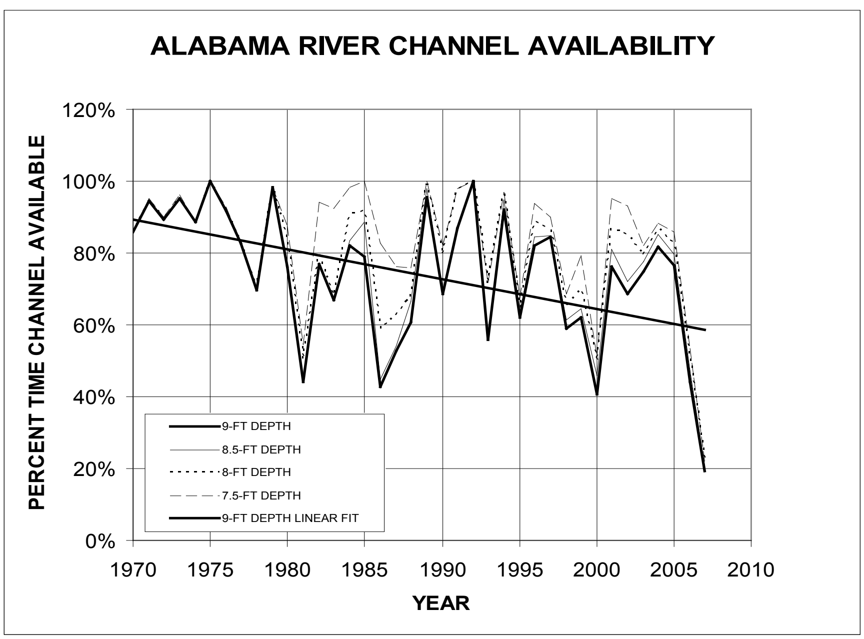


Figure 8-1. Alabama River Channel availability from 1970 to 2007

Extreme high-flow conditions also limit availability of the project for commercial navigation, principally related to the ability to use the navigation locks at the three locks and dams on the Alabama River. Those conditions are temporary and far more short term (usually lasting no more than a few days) than low-water limitations resulting from extended periods of drought and low basin inflows. At Robert F. Henry Lock and Dam, use of the navigation lock is discontinued when the tailwater below the dam reaches elevation 131.0 feet NGVD29. That elevation equates to a flow of about 156,000 cfs, which occurs on average about once every three years. At Millers Ferry Lock and Dam, use of the navigation lock is discontinued when the tailwater below the dam reaches elevation 81.0 feet NGVD29. That tailwater elevation equates to a flow of about 220,000 cfs, which occurs on average about once every 18 years. At Claiborne Lake, use of the navigation lock is temporarily discontinued when the tailwater below the dam reaches elevation 47.0 feet NGVD29. That tailwater elevation equates to a flow of about 130,000 cfs, which occurs on average about once every 1.8 years.

8-10. Drought Contingency Plans. The ACT Basin DCP increases the Corps' and APC's water control regulation capability to respond to droughts in a timely manner under current administrative, legislative, or other constraints. Provisions are included for coordinating with appropriate federal, state, and local stakeholders during the occurrence of drought conditions.

The importance of DCPs has become increasingly obvious as more demands are placed on the water resources of the basin. During low-flow conditions, the system might not be able to fully support all project purposes. The ACT Basin DCP includes methods for identifying drought conditions; includes measures to be used to respond to and mitigate the effects of drought conditions; and helps minimize the effect of drought on the ACT Basin water resources.

IX – SYSTEM WATER CONTROL MANAGEMENT

9-01. Responsibilities and Organization. Responsibilities for developing and monitoring water resources and the environment in the ACT Basin are shared by many agencies in the Federal and State Governments. Some of the federal agencies include the Corps, U.S. Environmental Protection Agency (EPA), National Park Service, U.S. Coast Guard, U.S. Geological Survey (USGS), U.S. Department of Energy, U.S. Department of Agriculture, U.S. Fish and Wildlife Service (USFWS), and National Oceanic and Atmospheric Administration (NOAA). In addition to the federal agencies, each State has agencies involved in the basin. They include the Georgia Environmental Protection Division (GAEPD) for the State of Georgia, and the Alabama Office of Water Resources (OWR) for the State of Alabama.

a. U.S. Army Corps of Engineers. Authority for water control regulation of the federally authorized reservoir projects in the ACT Basin has been delegated to the SAD Commander. The responsibility for water control regulation activities has been entrusted to the Mobile District, Engineering Division, Water Management Section (Mobile District). Water control actions for each project are regulated in a system-wide, balanced approach to meet the federally authorized purposes. The Water Management Section is required to developing water control regulation procedures for the ACT Basin projects for all foreseeable conditions and to jointly develop flood management and navigation support procedures for non-federal projects when that responsibility has been entrusted to the Secretary of the Army through their authorizing legislation or license. The Mobile District monitors the projects for compliance with the approved water control plan. In accordance with the water control plan, the Mobile District performs water control regulation activities that include daily declarations of water availability for hydropower generation and other purposes; daily and weekly reservoir pool elevation and release projections; weekly river basin status reports; tracking composite conservation storage and projections; determining and monitoring basin inflow; managing flood risk management operations and regulation; and coordinating with other District elements, APC, and basin stakeholders. When necessary, the Mobile District instructs the project operator regarding normal water control regulation procedures and emergencies, such as flood operations. The federal projects are tended by operators under direct supervision of a powerhouse superintendant and operations project manager. The Mobile District communicates directly with the powerhouse operators and with other project personnel as necessary. The Mobile District is also responsible for collecting historical project data and disseminating water control information, such as, historical data, lake level and flow forecasts, and weekly basin reports within the agency; to other federal, state, and local agencies; and to the general public.

b. Other Federal Agencies

1) National Weather Service (NWS). The NWS is the federal agency in NOAA that is responsible for weather warnings and weather forecasts. With support from the Corps-NWS Cooperative Gaging Program, the NWS forecast offices, along with the Southeast River Forecast Center (SERFC), maintain a network of rainfall and flood reporting stations throughout the ACT Basin. NWS continuously provides current weather conditions and forecasts. The SERFC prepares river forecasts for many locations throughout the ACT Basin and provides the official flood stage forecasts along the ACT Rivers. Often, the SERFC prepares predictions on the basis of *what if scenarios*, such as Quantitative Precipitation Forecasts (QPFs). The QPF is a prediction of the spatial precipitation across the United States and the region. The Corps, NWS, and SERFC share information regarding rainfall, project data, and streamflow forecasts. In addition, the NWS provides information on hurricane forecasts and other severe weather

conditions. They monitor drought conditions and provide the information to the public. The National Integrated Drought Information System is being developed for the ACT Basin. Its web portal will provide a single source of information regarding drought conditions by sharing information gathered from the NOAA Climate Prediction Center, the Corps, state agencies, universities, and other pertinent sources of data through the drought portal.

2) U.S. Geological Survey (USGS). The USGS is an unbiased, multi-disciplinary science organization that focuses on biology, geography, geology, geospatial information, and water. The agency is responsible for the timely, relevant, and impartial study of the landscape, natural resources, and natural hazards. Through the Corps-USGS Cooperative Gaging program, the USGS maintains a comprehensive network of gages in the ACT Basin. The USGS Water Science Centers in Georgia and Alabama publish real-time reservoir levels, river and tributary stages, and flow data through the USGS National Water Information System (NWIS) Web site. The Mobile District uses the USGS to operate and maintain project water level gaging stations at each federal reservoir to ensure the accuracy of the reported water levels.

3) Southeastern Power Administration (SEPA). SEPA was created in 1950 by the Secretary of the Interior to carry out the functions assigned to the Secretary by the Flood Control Act of 1944. In 1977, SEPA was transferred to the newly created U.S. Department of Energy. SEPA, headquartered in Elberton, Georgia, is responsible for marketing electric power and energy generated at reservoirs operated by the Corps. The power is marketed to nearly 500 preference customers in Georgia, Florida, Alabama, Mississippi, southern Illinois, Virginia, Tennessee, Kentucky, North Carolina, and South Carolina.

a. The objectives of SEPA are to market electricity generated by the federal reservoir projects, while encouraging its widespread use at the lowest possible cost to consumers. Power rates are formulated using sound financial principles. Preference in the sale of power is given to public bodies and cooperatives, referred to as preference customers. SEPA does not own transmission facilities and must contract with other utilities to provide transmission, or *wheeling* services, for the federal power.

b. SEPA's responsibilities include the negotiation, preparation, execution, and administration of contracts for the sale of electric power; preparation of repayment studies to set wholesale rates; the provision, by construction, contract or otherwise, of transmission and related facilities to interconnect reservoir projects and to serve contractual loads; and activities pertaining to the operation of power facilities to ensure and maintain continuity of electric service to its customer.

c. SEPA schedules the hourly generation schedules for each federal project within the system at the direction of the Corps on the basis of daily and weekly water volume availability declarations.

4) U.S. Fish and Wildlife Service (USFWS). The USFWS is a bureau within the Department of the Interior whose mission is working with others to conserve, protect and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The USFWS is the responsible agency for the protection of threatened and endangered species in accordance with the Endangered Species Act. The USFWS also coordinates with other federal agencies under the auspices of the Fish & Wildlife Coordination Act. The Corps Mobile District coordinates water control actions and management with USFWS in accordance with both laws.

c. State Agencies

1) Alabama. The Alabama Office of Water Resources (OWR) administers programs for river basin management, river assessment, water supply assistance, water conservation, flood mapping, the National Flood Insurance Program and water resources development. Further, OWR serves as the State liaison with federal agencies on major water resources related projects, conducts any special studies on instream flow needs, and administers environmental education and outreach programs to increase awareness of Alabama's water resources.

a. The Alabama Department of Environment Management (ADEM) Drinking Water Branch works closely with more than 700 water systems in Alabama that provide safe drinking water to four million citizens.

b. The Alabama Chapter of the Soil & Water Conservation Society fosters the science and the art of soil, water, and related natural resource management to achieve sustainability.

c. The Alabama Department of Conservation and Natural Resources has jurisdiction over both freshwater and saltwater fisheries in the state.

2) Georgia. The Department of Natural Resources (GADNR) has statewide responsibilities for the management and conservation of Georgia's natural and cultural resources. Within GADNR, the Georgia Environmental Protection Division (GAEPD) conducts water resource assessments to determine a sound scientific understanding of the condition of the water resources, in terms of the quantity of surface water and groundwater available to support current and future in-stream and off-stream uses and the capacity of the surface water resources to assimilate pollution. Regional water planning councils in Georgia prepare recommended Water Development and Conservation Plans. Those regional plans promote the sustainable use of Georgia's waters through the selection of an array of management practices, to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens. Georgia Wildlife Resources Division protects non-game and endangered wildlife in the state.

d. Alabama Power Company (APC). APC is an electric utility headquartered in Birmingham, Alabama. It is the second largest of four electric utilities owned and operated by the Southern Company, one of the Nation's largest producers of electricity. APC is an investor-owned, tax-paying public utility serving more than 1.3 million customers in the southern two-thirds of Alabama. Its hydroelectric generating plants encompass several lakes on the Tallapoosa, Coosa, and Black Warrior Rivers. The utility also has coal, oil, natural gas, nuclear and cogeneration plants in various parts of Alabama. In addition to generating electricity, the waters surrounding the plants offer recreational opportunities for Alabama residents and visitors.

e. Stakeholders. Many nonfederal stakeholder interest groups are active in the ACT Basin. The groups include lake associations, M&I water users, navigation interests, environmental organizations, and other basin-wide interests groups. Coordinating water management activities with the interest groups, Federal and State agencies, and others is accomplished as required on an ad-hoc basis and on regularly scheduled water management teleconferences when needed to share information regarding water control regulation actions and gather stakeholder feedback. Table 9-1 lists state and federal agencies and active stakeholders in the ACT Basin that have participated in the ACT Basin water management teleconferences and meetings associated with the 2007-2009 drought. Federal and State political representatives also participated in the teleconferences. The ACT stakeholder teleconferences were held from 11 July 2007 to 14 April 2010.

Table 9-1. ACT Basin Water Management Teleconference Stakeholder Participants

State of Alabama	Others
Office of Governor	AL Rivers Alliance
AL OWR (Office of Water Resources)	Alabama Power Company
AL DEM (Department of Environmental Management	Alabama Forestry Association
AL DCNR (Department of Conservation and Natural Resources)	ARC (Atlanta Regional Commission)
AL DECA (Department of Economic and Community Affairs	Alabama Municipal Electric Association
	Alabama Pulp and Paper
	Bartow County GA
	City of Cartersville, GA
	City of Ellijay, GA
	City of Rome, GA
State of Georgia	Cobb County GA
Office of Governor	CCMWA (Cobb County – Marietta Water Authority)
GA DNR	Coosa-Alabama River Improvement Assoc
GA EPD	International Paper
	Lake Martin Homeowners Association
Federal Agencies	Mead Westvaco
EPA	MEAG Power
FERC - Atlanta	Metro Atlanta Chamber of Commerce
FERC - DC	Mobile Area Water and Sewer Service
NPS (Chattahoochee Nat Recreational Area)	Montgomery Water Works and Sanitary Sewer Board
SEPA	Oglethorpe Power Company
US Coast Guard	Pine Hill Water Department
	SeFPC (Southeastern Federal Power Customers)
USFWS-AL	Southern Company
USFWS-GA	Victoria Harbour Marina
USGS-AL	Weyerhaeuser Corp.
USGS-GA	

9-02. Local Press and Corps Bulletins. The local press consists of periodic publications in or near the ACT Basin. Montgomery and Atlanta have some of the larger daily papers. The papers often publish articles related to the rivers and streams. Their representatives have direct contact with the Corps through the Public Affairs Office. In addition, they can access the Corps Web pages. The Corps and the Mobile District publish e-newsletters regularly which are made available to the general public via email and postings on various websites. Complete, real-time information is available at the Mobile District's Water Management homepage http://water.sam.usace.army.mil/. The Mobile District Public Affairs Office issues press releases as necessary to provide the public with information regarding Water Management issues and activities.

9-03. Framework for Water Management Changes. Continued increases in the use of water resources demand constant monitoring and evaluating reservoir regulations and reservoir systems to ensure their most efficient use. Also, special interest groups often request modifications of the basin water control manual or project specific water control plans which could impact project purposes. Therefore, within the constraints of Congressional authorizations and engineering regulations, the water control plan and operating techniques are often reviewed to see if improvements are possible without violating authorized project functions. This review can result in a revision to the basin manual or to the project specific, water control plans. When deemed appropriate, temporary deviations to the water control plan, as discussed in 7-15 “Deviation from Normal Regulation”, can be implemented to provide the most efficient regulation while balancing the multiple purposes of the ACT Basin-wide System and individual projects.

EXHIBIT A

UNIT CONVERSIONS

EXHIBIT A
UNIT CONVERSIONS

AREA CONVERSION

UNIT	m^2	km^2	Ha	in^2	ft^2	yd^2	mi^2	ac
1 m^2	1	10^{-6}	10^{-4}	1550	10.76	1.196	3.86×10^{-7}	2.47×10^{-4}
1 km^2	10^6	1	100	1.55×10^9	1.076×10^7	1.196×10^6	0.3861	247.1
1 ha	10^4	0.01	1	1.55×10^7	1.076×10^7	1.196×10^4	3.86×10^{-3}	2,471
1 in^2	6.45×10^{-4}	6.45×10^{10}	6.45×10^{-8}	1	6.94×10^{-3}	7.7×10^{-4}	2.49×10^{-10}	1.57×10^7
1 ft^2	.0929	9.29×10^{-8}	9.29×10^{-6}	144	1	0.111	3.59×10^{-8}	2.3×10^{-5}
1 yd^2	0.8361	8.36×10^{-7}	8.36×10^{-5}	1296	9	1	3.23×10^{-7}	2.07×10^{-4}
1 mi^2	2.59×10^6	2.59	259	4.01×10^9	2.79×10^7	3.098×10^6	1	640
1 ac	4047	0.004047	0.4047	6.27×10^6	43560	4840	1.56×10^{-3}	1

LENGTH CONVERSION

UNIT	cm	m	Km	in.	ft	yd	mi
cm	1	0.01	0.0001	0.3937	0.0328	0.0109	6.21×10^{-6}
m	100	1	0.001	39.37	3.281	1.094	6.21×10^{-4}
km	10^5	1000	1	39,370	3281	1093.6	0.621
in.	2.54	0.0254	2.54×10^{-5}	1	0.0833	0.0278	1.58×10^{-5}
ft	30.48	0.3048	3.05×10^{-4}	12	1	0.33	1.89×10^{-4}
yd	91.44	0.9144	9.14×10^{-4}	36	3	1	5.68×10^{-4}
mi	1.01×10^5	1.61×10^3	1.6093	63,360	5280	1760	1

FLOW CONVERSION

UNIT	m^3/s	m^3/day	l/s	ft^3/s	ft^3/day	ac-ft/day	gal/min	gal/day	mgd
m^3/s	1	86,400	1000	35.31	3.05×10^6	70.05	1.58×10^4	2.28×10^7	22.824
m^3/day	1.16×10^{-5}	1	0.0116	4.09×10^{-4}	35.31	8.1×10^{-4}	0.1835	264.17	2.64×10^{-4}
l/s	0.001	86.4	1	0.0353	3051.2	0.070	15.85	2.28×10^4	2.28×10^{-2}
ft^3/s	0.0283	2446.6	28.32	1	8.64×10^4	1.984	448.8	6.46×10^5	0.646
ft^3/day	3.28×10^{-7}	1233.5	3.28×10^{-4}	1.16×10^{-5}	1	2.3×10^{-5}	5.19×10^{-3}	7.48	7.48×10^{-6}
ac-ft/day	0.0143	5.451	14.276	0.5042	43,560	1	226.28	3.26×10^5	0.3258
gal/min	6.3×10^{-5}	0.00379	0.0631	2.23×10^{-3}	192.5	4.42×10^{-3}	1	1440	1.44×10^{-3}
gal/day	4.3×10^{-8}	3785	4.38×10^{-4}	1.55×10^{-6}	11,337	3.07×10^{-6}	6.94×10^{-4}	1	10^{-6}
mgd	0.0438		43.82	1.55	1.34×10^5	3.07	694	10^6	1

VOLUME CONVERSION

UNIT	liters	m^3	in^3	ft^3	gal	ac-ft	million gal
liters	1	0.001	61.02	0.0353	0.264	8.1×10^{-7}	2.64×10^{-7}
m^3	1000	1	61,023	35.31	264.17	8.1×10^{-4}	2.64×10^{-4}
in^3	1.64×10^{-2}	1.64×10^{-5}	1	5.79×10^{-4}	4.33×10^{-3}	1.218×10^{-8}	4.33×10^{-9}
ft^3	28.317	0.02832	1728	1	7.48	2.296×10^{-5}	7.48×10^{6}
gal	3.785	3.78×10^{-3}	231	0.134	1	3.07×10^{-6}	10^{6}
ac-ft	1.23×10^{6}	1233.5	75.3×10^{6}	43,560	3.26×10^{5}	1	0.3260
million gallon	3.785×10^{6}	3785	2.31×10^{8}	1.34×10^{5}	10^{6}	3.0684	1

COMMON CONVERSIONS

1 million gallons per day (MGD) = 1.55 cfs
1 day-second-ft (DSF) = 1.984 acre-ft
1 cubic foot per second of water falling 8.81 feet = 1 horsepower
1 cubic foot per second of water falling 11.0 feet at 80% efficiency = 1 horsepower
1 inch of depth over one square mile = 2,323,200 cubic feet
1 inch of depth over one square mile = 0.737 cubic feet per second for one year

EXHIBIT B

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

USACE AND APC MEMORANDUM OF UNDERSTANDING

EXHIBIT C

ALABAMA-COOSA-TALLAPOOSA (ACT) RIVER BASIN

DROUGHT CONTINGENCY PLAN

DROUGHT CONTINGENCY PLAN

FOR

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

ALLATOONA DAM AND LAKE
CARTERS DAM AND LAKE
ALABAMA POWER COMPANY COOSA RIVER PROJECTS
ALABAMA POWER COMPANY TALLAPOOSA RIVER PROJECTS
ALABAMA RIVER PROJECTS

U.S. Army Corps of Engineers

South Atlantic Division

Mobile District

June 2011

DROUGHT CONTINGENCY PLAN

FOR THE

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

I – INTRODUCTION

1-01. Purpose of Document. The purpose of this Drought Contingency Plan (DCP) is to provide a basic reference for water management decisions and responses to water shortage in the Alabama-Coosa-Tallapoosa (ACT) River Basin induced by climatological droughts. As a water management document it is limited to those drought concerns relating to water control management actions for federal U.S. Army Corps of Engineers (Corps) and Alabama Power Company (APC) dams. This DCP does not prescribe all possible actions that might be taken in a drought situation due to the long-term nature of droughts and unique issues that may arise. The primary value of this DCP is in documenting the overall ACT Basin Drought Management Plan for the system of Corps and APC projects; in documenting the data needed to support water management decisions related to drought regulation; and in defining the coordination needed to manage the ACT project's water resources to ensure that they are used in a manner consistent with the needs which develop during a drought. This DCP addresses the water control regulation of the five Corps impoundments and the APC Coosa and Tallapoosa projects (Table 1) in regard to water control regulation during droughts. Details of the drought management plan as it relates to each project and its water control regulation during droughts are provided in the water control plan within the respective project appendix to the ACT Basin Master Water Control Manual.

II – AUTHORITIES

2-01. Authorities. The following list provides the policies and guidance that are pertinent to the development of drought contingency plans and actions directed therein.

A. ER 1110-2-1941, "Drought Contingency Plans", dated 15 Sep 1981. This regulation provides policy and guidance for the preparation of drought contingency plans as part of the Corps of Engineers' overall water management activities.

B. ER 1110-2-8156, "Preparation of Water Control Manuals", dated 31 Aug 1995. This document provides a guide for preparing water control manuals for individual water resource projects and for overall river basins to include drought contingency plans.

C. ER 1110-2-240, "Water Control Management", dated 8 Oct 1982. This regulation prescribes the policies and procedures to be followed in water management activities including special regulations to be conducted during droughts. It also sets the responsibility and approval authority in development of water control plans.

D. EM 1110-2-3600, "Management of Water Control Systems", dated 30 Nov 1987. This guidance memorandum requires that the drought management plan be incorporated into the project water control manuals and master water control manuals. It also provides guidance in formulating strategies for project regulation during droughts.

Table 1. Reservoir impoundments within the ACT River Basin

River/Project Name	Owner/State/ Year Initially Completed	Total storage at Top of Conservation Pool (summer) (acre-feet)	Conservation Storage (acre-feet)	Percentage of ACT Basin Conservation Storage (%)
Coosawattee River				
Carters Dam and Lake	Corps/GA/1974	383,565	141,402	6
Carters Reregulation Dam	Corps/GA/1974	17,460	15,980	1
Etowah River				
Allatoona Dam and Lake	Corps/GA/1949	367,471	284,580	12
Coosa River				
Weiss Dam and Lake	APC/AL/1961	306,651	237,448	10
H. Neely Henry Dam and Lake	APC/AL/1966	121,860	43,205	2
Logan Martin Dam and Lake	APC/AL/1964	273,500	108,262	4
Lay Dam and Lake	APC/AL/1914	262,306	77,478	3
Mitchell Dam and Lake	APC/AL/1923	170,422	28,048	1
Jordan Dam and Lake	APC/AL/1928	235,780	15,969	1
Walter Bouldin Dam	APC/AL/1967	235,780	NA	--
Tallapoosa River				
Harris Dam and Lake	APC/AL/1982	425,503	191,129	8
Martin Dam and Lake	APC/AL/1926	1,623,000	1,183,356	49
Yates Dam and Lake	APC/AL/1928	53,770	5,976	0.2
Thurlow Dam and Lake	APC/AL/1930	18,461	NA	--
Alabama River				
Robert F. Henry Lock and Dam/R.E. "Bob" Woodruff Lake	Corps/AL/1972	247,210	36,450	2
Millers Ferry Lock and Dam/William "Bill" Dannelly Lake	Corps/AL/1969	346,254	46,704	3
Claiborne Lock and Dam and Lake	Corps/AL/1969	102,480	NA	--

III – DROUGHT IDENTIFICATION

3-01. Definition. Drought can be defined in different ways - meteorological, hydrological, agricultural, and socioeconomic. In this DCP, the definition of drought used in the *National Study of Water Management During Drought* is used:

> "Droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or streamflow."

That definition defines drought in terms of its impact on water control regulation, reservoir levels, and associated conservation storage. Water management actions during droughts are intended to balance the water use and water availability to meet water use needs. Because of hydrologic variability, there cannot be 100 percent reliability that all water demands are met. Droughts occasionally will be declared and mitigation or emergency actions initiated to lessen the stresses placed on the water resources within a river basin. Those responses are tactical measures to conserve the available water resources (USACE 2009).

3-02. Drought Identification. There is no known method of predicting how severe or when a drought will occur. There are, however, indicators that are useful in determining when conditions are favorable: below normal rainfall; lower than average inflows; and low reservoir levels, especially immediately after the spring season when rainfall and runoff conditions are normally the highest. When conditions indicate that a drought is imminent, the Corps Water Management Section (WMS) and APC will increase the monitoring of the conditions and evaluate the impacts on reservoir projects if drought conditions continue or become worse for 30-, 60-, or 90-day periods. Additionally, WMS and APC will determine if a change in operating criteria would aid in the total regulation of the river system and if so, what changes would provide the maximum benefits from any available water.

Various products are used to detect and monitor the extent and severity of basin drought conditions. One key indicator is the U.S. Drought Monitor available through the U.S. Drought Portal, www.drought.gov. The National Weather Service (NWS) Climate Prediction Center (CPC) also develops short-term (6- to 10-day and 8- to 14-day) and long-term (1-month and 3-month) precipitation and temperature outlooks and a U.S. Seasonal Drought Outlook, which are useful products for monitoring dry conditions. The Palmer Drought Severity Index is also used as a drought reference. The Palmer index assesses total moisture by using temperature and precipitation to compute water supply and demand and soil moisture. It is considered most relevant for non-irrigated cropland and primarily reflects long-term drought. However, the index requires detailed data and cannot reflect an operation of a reservoir system. The state climatologists also produce a Lawn and Garden Index, which gives a basin-wide ability to determine the extent and severity of drought conditions. The runoff forecasts developed for both short- and long-range periods reflect drought conditions when appropriate. There is also a heavy reliance on the latest El Niño Southern Oscillation (ENSO) forecast modeling to represent the potential effects of La Niña on drought conditions and spring inflows. Long-range models are used with greater frequency during drought conditions to forecast potential effects on reservoir elevations, ability to meet minimum flows, and water supply availability. A long-term, numerical model, Extended Streamflow Prediction, developed by the NWS, provides probabilistic forecasts of streamflow and reservoir stages on the basis of climatic, streamflow, and soil moisture. Extended Streamflow Prediction results are used in projecting possible future drought conditions. Other parameters and models can indicate a lack of rainfall and runoff and the degree of severity and continuance of a drought. For example, models using data of previous droughts or a percent of current to mean monthly flows with several operational schemes have proven helpful in forecasting reservoir levels for water management planning purposes. Other parameters considered during drought management are the ability of the various lakes to meet the demands placed on storage, the probability that lake elevations will return to normal seasonal levels, basin streamflows, basin groundwater table levels, and the total available storage to meet hydropower marketing system demands.

3-03. Historical Droughts. Drought events have occurred in the ACT Basin with varying degrees of severity and duration. Five of the most significant historical basin wide droughts occurred in 1940-1941, 1954-1958, 1984-1989, 1999-2003, and 2006-2009. The 1984 to 1989 drought caused water shortages across the basin in 1986. This resulted in the need for the Corps to make adjustments in the water management practices. Water shortages occurred again from 1999 through 2002 and during 2007 through 2008. The 2006 to 2009 drought was the most devastating recorded in Alabama and western Georgia. Precipitation declines began in December 2005. These shortfalls continued through winter 2006-07 and spring 2007, exhibiting the driest winter and spring in the recorded period of record. The Corps and APC had water levels that were among the lowest recorded since the impoundments were constructed. North Georgia received less than 75 percent of normal precipitation (30-year average). The drought reached peak intensity in 2007, resulting in a D-4 Exceptional Drought Intensity (the worst measured) throughout the summer of 2007.

3-04. Severity. Water shortage problems experienced during droughts are not uniform throughout the ACT River Basin. Even during normal, or average, hydrologic conditions, various portions of the basin experience water supply problems. The severity of the problems are primarily attributed to the pattern of human habitation within the basin; the source of water utilized (surface water vs. ground water); and the characteristics of the water resources available for use. During droughts, these problems can be intensified. A severe drought in the basin develops when a deficiency of rainfall occurs over a long time period and has a typical duration of 18 to 24 months. The number of months of below normal rainfall is more significant in determining the magnitude of a drought in the basin than the severity of the deficiency in specific months. However, the severity of the rainfall deficiency during the normal spring wet season has a significant impact on the ability to refill reservoirs after the fall/winter drawdown period. Another confounding factor which influences droughts in the basin is the variability of rainfall over the basin, both temporarily and spatially.

IV – BASIN AND PROJECT DESCRIPTION

4-01. Basin Description. The headwater streams of the Alabama-Coosa-Tallapoosa (ACT) River Basin rise in the Blue Ridge Mountains of Georgia and Tennessee and flow southwest, combining at Rome, Georgia, to form the Coosa River. The confluence of the Coosa and Tallapoosa Rivers in central Alabama forms the Alabama River near Wetumpka, Alabama. The Alabama River flows through Montgomery and Selma and joins with the Tombigbee River at the mouth of the ACT Basin to form the Mobile River about 45 miles above Mobile, Alabama. The Mobile River flows into Mobile Bay at an estuary of the Gulf of Mexico. The total drainage area of the ACT Basin is approximately 22,800 square miles: 17,300 square miles in Alabama; 5,400 square miles in Georgia; and 100 square miles in Tennessee. A detailed description of the ACT River Basin is provided in the ACT Master Water Control Manual, Chapter II – Basin Description and Characteristics.

4-02. Project Description. The Corps operates five projects in the ACT Basin: Allatoona Dam and Lake on the Etowah River; Carters Dam and Lake and Reregulation Dam on the Coosawattee River; and Robert F. Henry Lock and Dam, Millers Ferry Lock and Dam, and Claiborne Lock and Dam on the Alabama River. Claiborne is a lock and dam without any appreciable water storage behind it. Robert F. Henry and Millers Ferry are operated as run-of-river projects and only very limited pondage is available to support hydropower peaking and other project purposes. APC owns and operates eleven hydropower dams in the ACT Basin: seven dams on the Coosa River and four dams on the Tallapoosa River. Figure 1 depicts the percentage of conservation storage of each project in the ACT Basin. Figure 2 shows the project locations within the basin. Figure 3 provides a profile of the basin and each project.

A. **General.** Of the 16 reservoirs (considering Jordan Dam and Lake and Bouldin Dam as one reservoir and Carters Lake and Carters Reregulation Dam as one reservoir), Lake Martin on the Tallapoosa River has the greatest amount of storage, containing over 48 percent of the conservation storage in the ACT Basin. Allatoona Lake, R.L. Harris Lake, Weiss Lake, and Carters Lake are the next four largest reservoirs in terms of storage. APC controls approximately 77 percent of the available conservation storage; Corps projects (Robert F. Henry Lock and Dam, Millers Ferry Lock and Dam, Allatoona Lake, and Carters Lake) control 23 percent. The two most upstream Corps reservoirs, Allatoona Lake and Carters Lake, account for 18 percent of the total basin conservation storage.

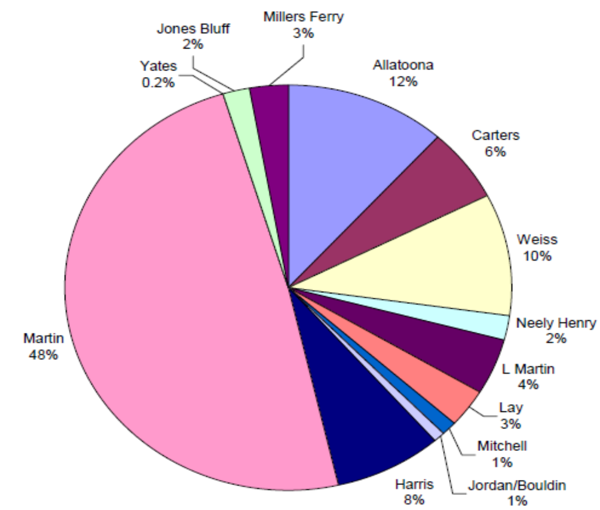


Figure 1. Alabama-Coosa-Tallapoosa River Basin Percent Conservation Storage

Figure 2. Alabama-Coosa-Tallapoosa River Basin Project Location Map

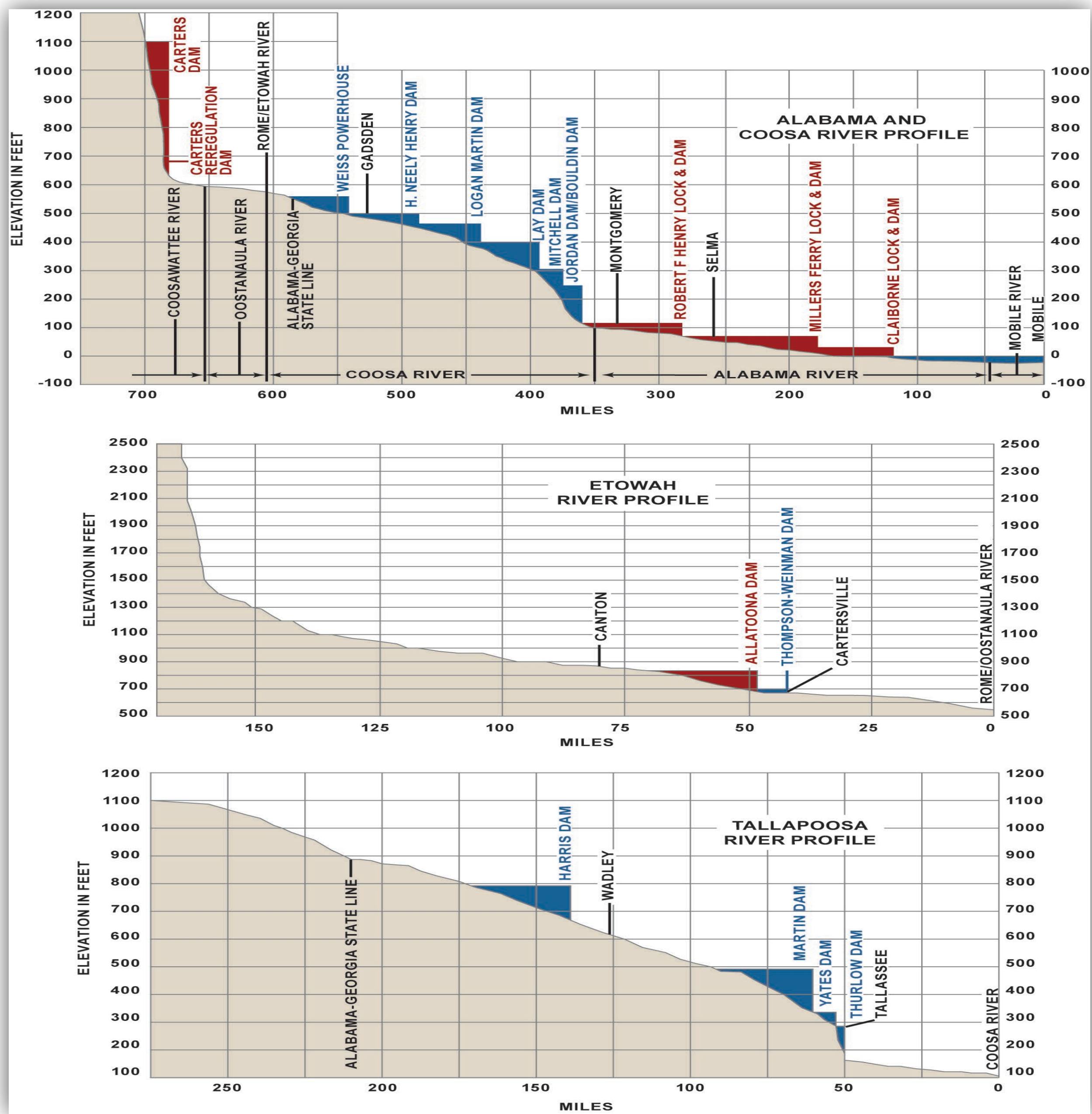


Figure 3. Alabama-Coosa-Tallapoosa River Basin Profile Map

B. **Allatoona Dam and Lake**. The Corps' Allatoona Dam on the Etowah River creates the 11,862 acres Allatoona Lake. The project's authorization, general features, and purposes are described in the Allatoona Dam and Lake Water Control Manual. The Allatoona Lake top of conservation pool is elevation 840 feet NGVD29 during the late spring and summer months (May through August); transitions to elevation 835 feet NGVD29 in the fall (October through mid-November); transitions to a winter drawdown to elevation 823 feet NGVD29 (1-15 January); and refills back to elevation 840 feet NGVD29 during the winter and spring wet season as shown in the water control plan guide curve (Figure 4). However, the lake level may fluctuate significantly from the guide curve over time, dependent primarily upon basin inflows but also influenced by project operations, evaporation, withdrawals, and return flows. A minimum flow of about 240 cfs is continuously released through a small unit, which generates power while providing a constant flow to the Etowah River downstream. Under drier conditions when basin inflows are reduced, project operations are adjusted to conserve storage in Allatoona Lake while continuing to meet project purposes in accordance with four action zones as shown on Figure 4.

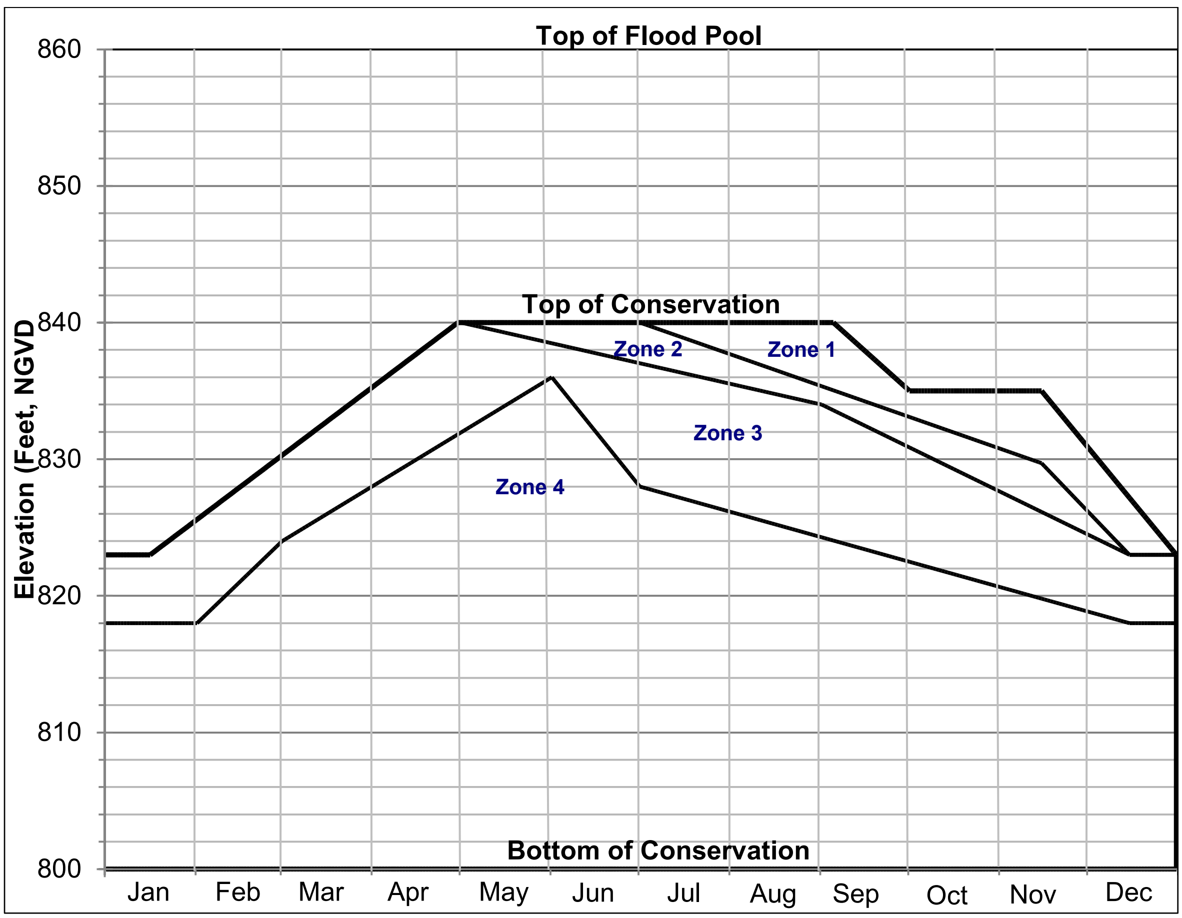


Figure 4. Allatoona Lake Guide Curve and Action Zones

C. **Carters Dam and Lake and Reregulation Dam**. Carters Lake is formed by Carters Dam, a Corps' reservoir on the Coosawattee River in northwest Georgia upstream of Rome, Georgia. The Carters project is a pumped-storage peaking facility that utilizes a Reregulation Dam and storage pool in conjunction with the main dam and lake. The project's authorization, general features, and purposes are described in the Carters Dam and Lake and Regulation Dam water control manual. The Carters Lake top of conservation pool is elevation 1074 feet NGVD29 from May through September transitioning to elevation 1072 feet NGVD29 from mid October through mid April as shown in the water control plan guide curve (Figure 5). As expected with a peaking/pumped storage operation, both Carters Lake and the reregulation pool experience frequent elevation changes. Typically, water levels in Carters Lake vary no more than 1 to 2 feet per day. The reregulation pool will routinely fluctuate by several feet (variable) daily as the pool receives peak hydropower discharges from Carters Lake and serves as the source for pumpback operations into Carters Lake during non-peak hours. The reregulation pool will likely reach both its normal maximum elevation of 696 feet NGVD29 and minimum elevation of 677 feet NGVD29 at least once each week. However, the general trend of the lake level may fluctuate significantly from the guide curve over time, dependent primarily upon basin inflows but also influenced by project operations and evaporation. Carters Regulation Dam provides a seasonal varying minimum release to the Coosawattee River for downstream fish and wildlife enhancement. Under drier conditions when basin inflows are reduced, project operations are adjusted to conserve storage in Carters Lake while continuing to meet project purposes in accordance with action zones as shown on Figure 5. In Zone 2, Carters Regulations Dam releases are reduced to 240 cfs.

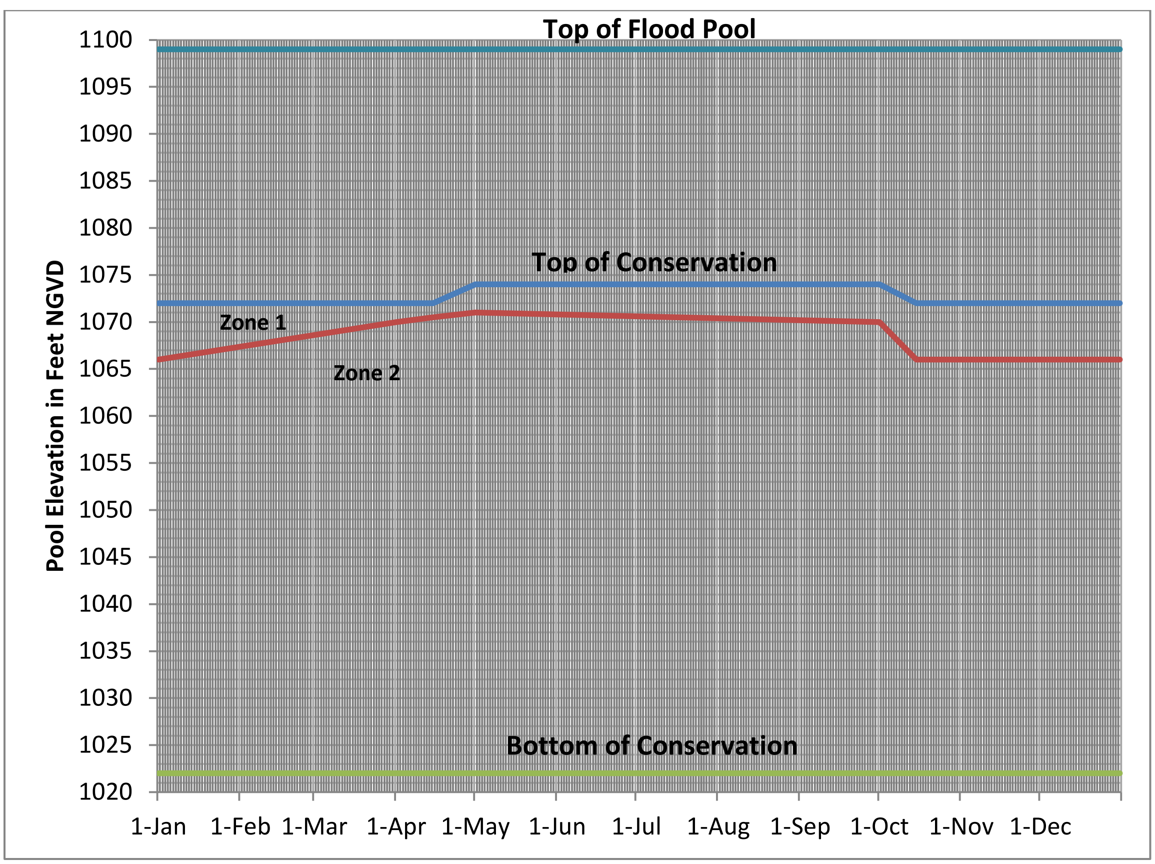


Figure 5. Carters Lake Guide Curve and Action Zones

D. **APC Coosa River Projects**. APC owns and operates the Coosa Hydro system of projects at Weiss Lake, H. Neely Henry Lake, Logan Martin Lake, Lay Lake, Mitchell Lake, and Jordan/Bouldin Dam and Lake on the Coosa River in the ACT Basin. APC Coosa River projects function mainly to generate electricity by hydropower. In addition, the upper 3 projects (Weiss, H. Neely Henry, and Logan Martin) operate pursuant to Public Law 83-436 regarding the requirement for the projects to be operated for flood risk management and navigation in accordance with reasonable rules and regulations of the Secretary of the Army. The rules and regulations are addressed in a memorandum of agreement between the Corps and APC, in individual water control manuals for the three projects, and in this ACT Basin DCP. The Weiss Lake is on the Coosa River in northeast Alabama, about 80 mi northeast of Birmingham, Alabama, and extends into northwest Georgia for about 13 miles upstream on the Coosa River. The dam impounds a 30,200 acres reservoir (Weiss Lake) at the normal summer elevation of 564 feet NGVD29 as depicted in the regulation guide curve shown in Figure 6 (source APC). The H. Neely Henry Lake is on the Coosa River in northeast Alabama, about 60 miles northeast of Birmingham, Alabama. The dam impounds an 11,200 acres reservoir at the normal summer elevation of 508 feet NGVD29 as depicted in the regulation guide curve shown in Figure 7 (source APC). The Logan Martin Lake is in northeast Alabama on the Coosa River, about 40 miles east of Birmingham, Alabama. The dam impounds a 15,263-acre reservoir at the normal summer elevation of 465 feet NGVD29 as depicted in the regulation guide curve shown in Figure 8 (source APC). The projects' authorizations, general features, and purposes are described in the Weiss, H. Neely Henry, and Logan Martin water control manual appendices to the ACT Basin Master Water Control Manual.

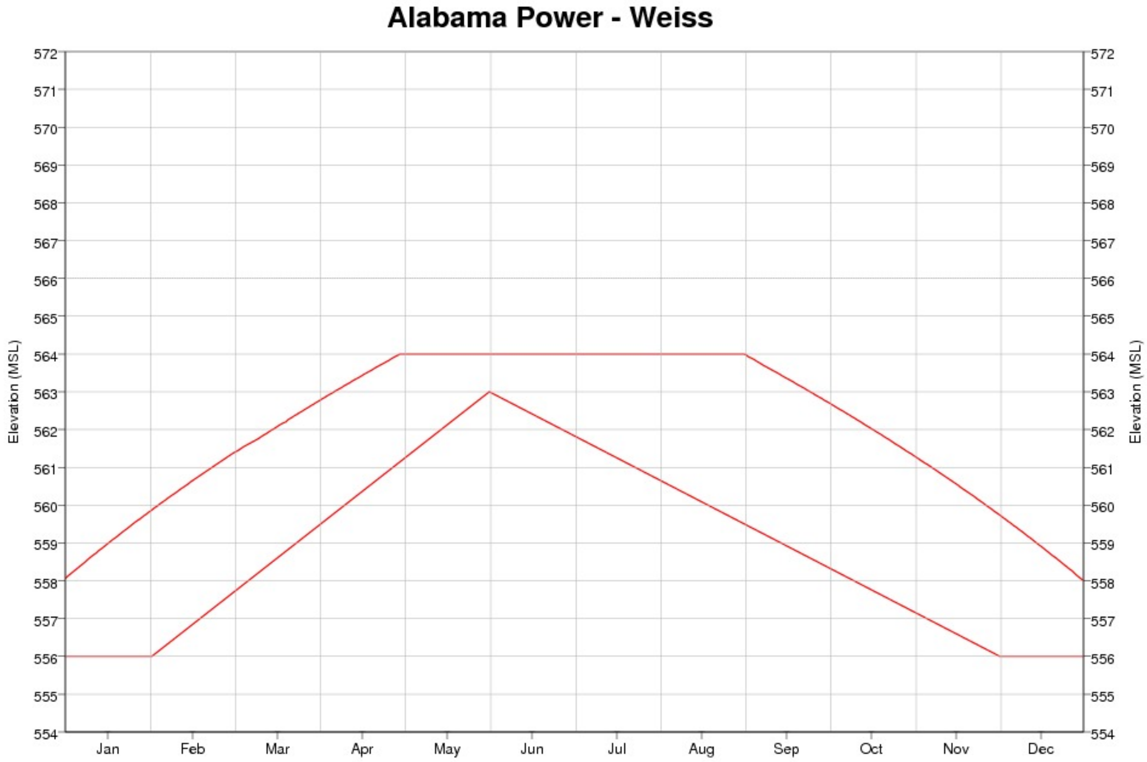


Figure 6. Weiss Lake Guide Curve

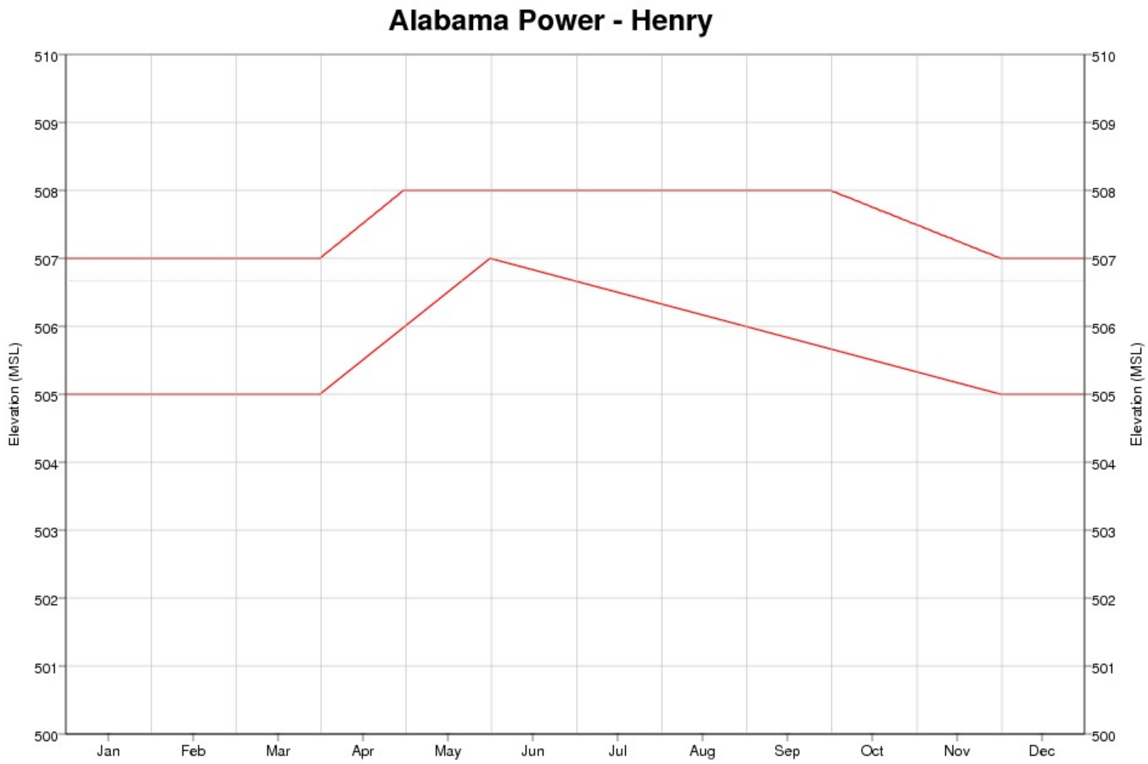


Figure 7. H. Neely Henry Lake Guide Curve

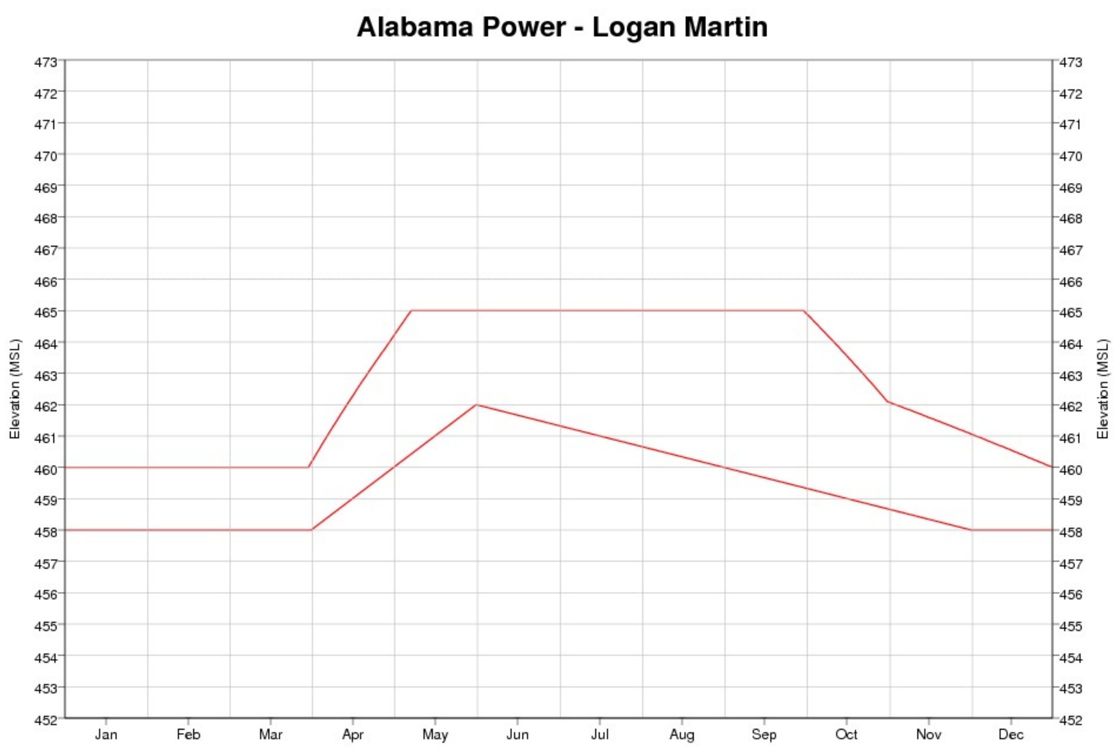


Figure 8. Logan Martin Lake Guide Curve

The downstream Coosa River APC run-of-river hydropower projects (Lay Dam and Lake, Mitchell Dam and Lake, and Jordan/Bouldin Dams and Lake) have no appreciable storage and are operated in conjunction with the upstream Coosa projects to meet downstream flow requirements and targets in support of the ACT Basin Drought Plan and navigation.

E. **APC Tallapoosa River Projects**. APC owns and operates the Tallapoosa River system of projects at Harris Dam and Lake, Martin Dam and Lake, Yates Dam, and Thurlow Dam in the ACT Basin. APC Tallapoosa River projects function mainly to generate electricity by hydropower. In addition, the Robert L. Harris project operates pursuant to 33 CFR, Chapter II, Part 208, Section 208.65 regarding the requirement for the project to be operated for flood risk management and navigation in accordance with reasonable rules and regulations of the Secretary of the Army. The rules and regulations prescribed are described in memorandums of understanding between the Corps and APC, individual water control manuals for the APC projects, and this DCP.

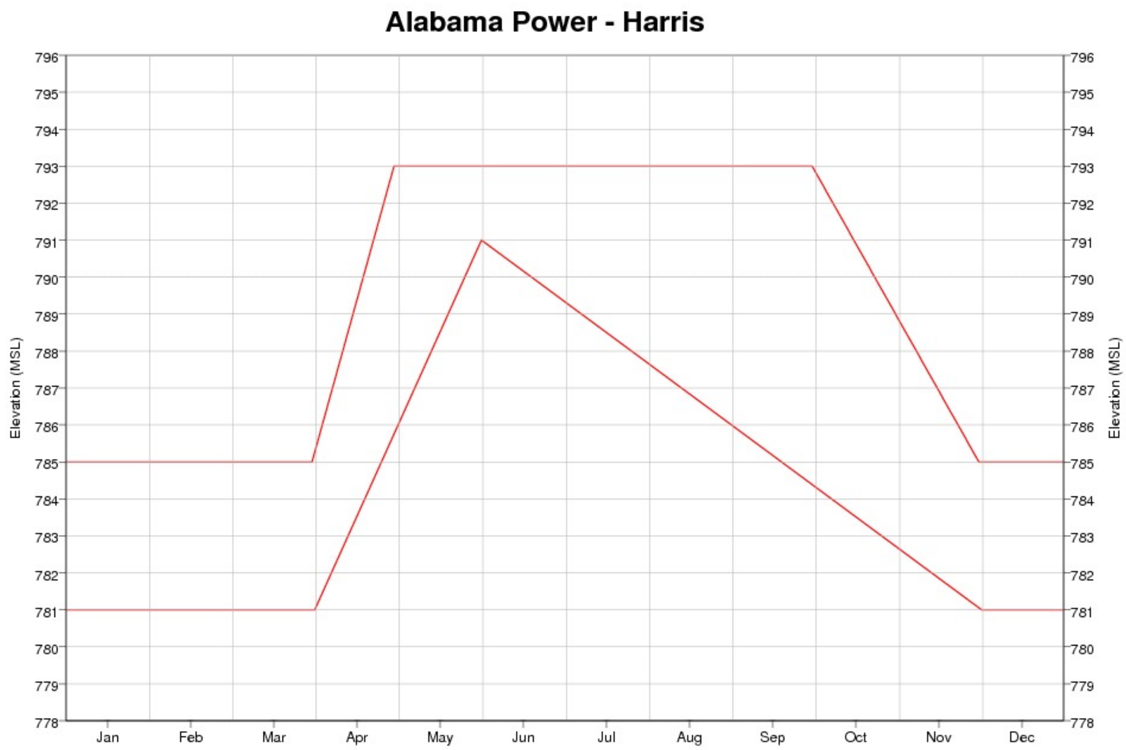


Figure 9. Robert L. Harris Lake Guide Curve

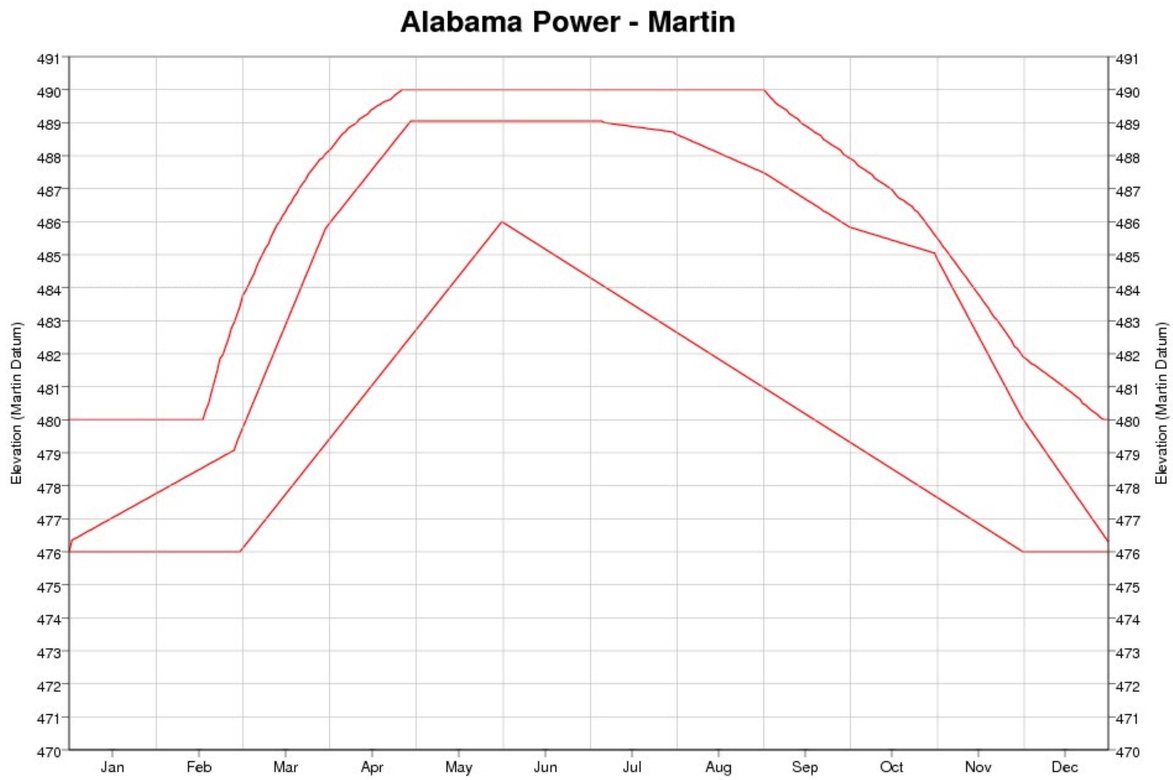


Figure 10. Martin Lake Guide Curve

F. **Corps Alabama River Projects**. The Corps operates three run-of-river lock and dam projects (Robert F. Henry, Millers Ferry, Claiborne) on the Alabama River in the lower ACT Basin to support commercial navigation. Claiborne Lake, together with R.E. "Bob" Woodruff Lake and William "Bill" Dannelly Lake, are collectively referred to as the Alabama River Lakes. The primary location used for communicating the available reliable navigation depth is the Claiborne Lock and Dam tailwater elevation. The water surface elevation is related to the available navigation depth based on the latest hydrographic surveys of the lower Alabama River reach downstream of Claiborne.

(1) Robert F. Henry. The R.E. "Bob" Woodruff Lake is created by the Robert F. Henry Lock and Dam on the Alabama River at river mile 236.3. R.E. "Bob" Woodruff Lake extends from the Robert F. Henry Lock and Dam upstream to the Walter Bouldin Dam. In addition to hydropower and navigation, R.E. "Bob" Woodruff Lake provides recreation and fish and wildlife conservation. R.E. "Bob" Woodruff Lake is 77 miles long and averages 1,300 feet wide. It has a surface area of 12,510 acres and a storage capacity of 234,200 acre-feet at a normal pool elevation of 125 feet NGVD29. Lake levels are typically fairly stable with minimal fluctuation between the operating pool elevation limits, 123 feet NGVD29 to 126 feet NGVD29. The emergency drawdown pool elevation is 122 feet NGVD29. An authorized 9-foot-deep by 200-foot-wide navigation channel exists over the entire length of the lake. The Jones Bluff hydropower plant generating capacity is 82 MW (declared value). The lake is a popular recreation destination, receiving up to two million visitors annually.

(2) Millers Ferry. The William "Bill" Dannelly Lake is created by the Millers Ferry Lock and Dam on the Alabama River at river mile 133. William "Bill" Dannelly Lake is 103 miles long and averages almost 1,400 feet wide. The reservoir has a surface area of 18,500 acres and a storage capacity of 346,254 acre-feet at a normal full pool elevation of 80 feet NGVD29. Lake levels remain fairly stable on a day-to-day basis with minimal fluctuation between the operating pool elevation limits, 79 feet NGVD29 to 80 feet NGVD29. It has an authorized 9-foot-deep by 200-foot-wide navigation channel which extends the entire length of the reservoir. The facility is a multipurpose reservoir constructed by the Corps for both navigation and hydropower. The reservoir also provides recreational benefits and has lands managed for wildlife mitigation. The Millers Ferry hydropower plant generating capacity is 90 MW (declared value). The reservoir provides ample recreation opportunities. Recreation visitors number three million annually.

(3) Claiborne. Claiborne Lake is created by the Claiborne Lock and Dam on the Alabama River at river mile 72.5. The lake is similar to a wide river, averaging about 800 feet wide, with a surface area of 5,930 acres. Claiborne Lake extends 60 miles upstream to the Millers Ferry Lock and Dam. Storage capacity in the lake is 96,360 acre-feet at a normal pool elevation of 35 feet NGVD29. The operating pool elevation limits are between 32 feet NGVD29 and 36 feet NGVD29. The lake has an authorized 9-foot-deep, 200-foot-wide navigation channel extending its entire length. The primary purpose of the Corps project is navigation. No hydropower generating capability exists at the project. The lake also provides recreation benefits and lands managed for wildlife mitigation.

G. As other ACT water management objectives are addressed, lake levels might decline during prime recreation periods. Drought conditions will cause further drawdowns in lake levels. While lake levels will be slightly higher than what would naturally occur if no specific drought actions are taken, reservoir levels will decline thus triggering impacts associated with reaching initial recreation and water access limited levels. Large reservoir drawdowns impact recreational use: access to the water for boaters and swimmers is inhibited; submerged hazards (e.g., trees, shoals, boulders) become exposed or nearly exposed, posing safety issues; and exposed banks and lake bottoms become unsightly and diminish the recreation experience. Consequently certain levels are identified in each Corps impoundment at which recreation would be affected. The *Initial Impact level* (IIL) represents the level at which recreation impacts are first observed (i.e., some boat launching ramps are unusable, most beaches are unusable or minimally usable, and navigation hazards begin to surface). The *Recreation Impact level* (RIL) defines the level at which major impacts on concessionaires and recreation are observed (more ramps are not usable, all beaches are unusable, boats begin having problems maneuvering in and out of marina basin areas, loss of retail business occurs). The level at which severe impacts are observed in all aspects of recreational activities is called the *Water Access Limited level* (WAL). At this point, all or almost all boat ramps are out of service, all swimming beaches are unusable, major navigation hazards occur, channels to marinas are impassable and/or wet slips must be relocated, and a majority of private boat docks are unusable. The individual project water control manuals describe the specific impact levels at each project and provide information regarding the effects of the water control plans on recreation.

V – WATER USES AND USERS

5-01. Water Uses and Users.

A. Uses – The ACT Basin rivers and lakes provide for wastewater dilution, M&I water supply, fish and wildlife propagation, hydropower generation, and recreational boating and fishing.

B. Users – The following tables list the surface water uses and water users within Georgia and Alabama in the ACT Basin.

Table 2. Surface water use: ACT Basin (Georgia 2005)

Water use category	Quantity (mgd)	% of total
Total Use	788.98	100%
Public Supply	154.78	19.6%
Domestic and Commercial	0.30	0.0%
Industrial and Mining	32.49	4.1%
Irrigation	11.31	1.4%
Livestock	16.18	2.1%
Thermoelectric Power Generation	573.92	72.8%

Table 3. M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa River Basin (Georgia)—upstream counties to downstream counties						
Coosa	Dalton Utilities - Conasauga R	155-1404-01	Whitfield	Conasauga River	49.400	40.300
Coosa	Dalton Utilities - Mill Creek	155-1404-02	Whitfield	Mill Creek	13.200	7.500
Coosa	Dalton Utilities - Coahulla Cr	155-1404-03	Whitfield	Coahulla Creek	6.000	5.000
Coosa	Dalton Utilities - Freeman Springs	155-1404-04	Whitfield	Freeman Springs	2.000	1.500
Coosa	Dalton Utilities - River Road	155-1404-05	Whitfield	Conasauga River	35.000	18.000
Coosa	Chatsworth Water Works Commission	105-1405-01	Murray	Holly Creek	1.100	1.000
Coosa	Chatsworth Water Works Commission	105-1405-02	Murray	Eton Springs	1.800	1.800
Coosa	Chatsworth Water Works Commission	105-1409-01	Murray	Carters Lake	2.550	2.300
Coosa	Chatsworth, City of	105-1493-02	Murray	Coosawattee River	2.200	2.000
Coosa	Ellijay, City of - Ellijay R	061-1407-01	Gilmer	Ellijay River	0.550	0.450
Coosa	Ellijay - Gilmer County W & S Authority	061-1408-01	Gilmer	Cartecay River	4.000	4.000
Coosa	Calhoun, City of	064-1411-03	Gordon	Big Spring	7.000	6.000
Coosa	Calhoun, City of	064-1412-01	Gordon	City Of Calhoun Spring	0.638	0.537
Coosa	Calhoun, City of	064-1492-02	Gordon	Oostanaula River	6.200	3.000

Table 3 (continued). M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa	Calhoun, City of	064-1493-01	Gordon	Coosawattee River	18.000	16.000
Coosa	Jasper, City of	112-1417-02	Pickens	Long Swamp Creek	1.000	1.000
Coosa	Bent Tree Community, Inc.	112-1417-03	Pickens	Chestnut Cove Creek and unnamed creek	0.250	0.230
Coosa	Bent Tree Community, Inc.	112-1417-04	Pickens	Lake Tamarack	0.250	0.230
Coosa	Big Canoe Utilities Company, Inc.	112-1417-05	Pickens	Lake Petit	1.000	1.000
Coosa	Big Canoe Utilities Company, Inc.	112-1417-06	Pickens	Blackwell Creek	2.650	2.650
Coosa	Etowah Water & Sewer Authority	042-1415-01	Dawson	Etowah River	5.500	4.400
Coosa	Cherokee County Water & Sewerage Auth	028-1416-01	Cherokee	Etowah River	43.200	36.000
Coosa	Gold Kist, Inc	028-1491-03	Cherokee	Etowah River	5.000	4.500
Coosa	Canton, City of	028-1491-04	Cherokee	Etowah River	23.000	18.700
Coosa	Canton, City of (Hickory Log Creek)	028-1491-05	Cherokee	Etowah River	39.000	39.000
Coosa	Bartow County Water Department	008-1411-02	Bartow	Bolivar Springs	0.800	0.800
Coosa	Adairsville, City of	008-1412-02	Bartow	Lewis Spring	5.100	4.100
Coosa	New Riverside Ochre Company, Inc.	008-1421-01	Bartow	Etowah River	5.000	5.000
Coosa	New Riverside Ochre Company, Inc.	008-1421-02	Bartow	Etowah River	6.000	6.000
Coosa	Emerson, City of	008-1422-02	Bartow	Moss Springs	0.630	0.500
Coosa	Gerdau AmeriSteel US, Inc. – Cartersville Steel Mill	008-1423-01	Bartow	Pettit Creek	2.000	1.500
Coosa	Baroid Drilling Fluids, Inc.	008-1423-02	Bartow	Etowah River	3.400	2.500
Coosa	Cartersville, City of	008-1423-04	Bartow	Etowah River	26.420	23.000
Coosa	Georgia Power Co. - Plant Bowen	008-1491-01	Bartow	Etowah River	520.000	85.000
Coosa	CCMWA	008-1491-05	Bartow	Allatoona Lake	86.000	78.000
Coosa	Cartersville, City of	008-1491-06	Bartow	Allatoona Lake	21.420	18.000
Coosa	La Fayette, City of Dry Creek	146-1401-01	Walker	Dry Creek	1.000	0.900
Coosa	La Fayette, City of Big Spring	146-1401-02	Walker	Big Spring	1.650	1.310
Coosa	Mount Vernon Mills - Riegel Apparel Div.	027-1401-03	Chattooga	Trion Spring	9.900	6.600
Coosa	Summerville, City of	027-1402-02	Chattooga	Raccoon Creek	3.000	2.500
Coosa	Summerville, City of	027-1402-04	Chattooga	Lowe Spring	0.750	0.500
Coosa	Mohawk Industries, Inc.	027-1402-05	Chattooga	Chattooga R./ Raccoon Cr.	4.500	4.000
Coosa	Oglethorpe Power Corp.	057-1402-03	Floyd	Heath Creek	3,838.000	3,030.000
Coosa	Floyd County - Brighton Plant	057-1414-02	Floyd	Woodward Creek	0.800	0.700

Table 3 (continued). M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa	Cave Spring, City of	057-1428-06	Floyd	Cave Spring	1.500	1.300
Coosa	Floyd County	057-1428-08	Floyd	Old Mill Spring	4.000	3.500
Coosa	Berry Schools, The (Berry College)	057-1429-01	Floyd	Berry (Possum Trot) Reservoir	1.000	0.700
Coosa	Inland-Rome Inc.	057-1490-01	Floyd	Coosa River	34.000	32.000
Coosa	Georgia Power Co. - Plant Hammond	057-1490-02	Floyd	Coosa River	655.000	655.000
Coosa	Rome, City of	057-1492-01	Floyd	Oostanaula & Etowah R	18.000	16.400
Coosa	Rockmart, City of	115-1425-01	Polk	Euharlee Creek	2.000	1.500
Coosa	Vulcan Construction Materials, L.P.	115-1425-03	Polk	Euharlee Creek	0.200	0.200
Coosa	Cedartown, City of	115-1428-04	Polk	Big Spring	3.000	2.600
Coosa	Polk County Water Authority	115-1428-05	Polk	Aragon, Morgan, Mulco Springs	1.600	1.100
Coosa	Polk County Water Authority	115-1428-07	Polk	Deaton Spring	4.000	4.000
Tallapoosa River Basin (Georgia)						
Tallapoosa	Haralson County Water Authority	071-1301-01	Haralson	Tallapoosa River	3.750	3.750
Tallapoosa	Bremen, City of	071-1301-02	Haralson	Beech Creek & Bremen Reservoir (Bush Creek)	0.800	0.580
Tallapoosa	Bowdon, City of Indian	022-1302-01	Carroll	Indian Creek	0.400	0.360
Tallapoosa	Southwire Company	022-1302-02	Carroll	Buffalo Creek	2.000	1.000
Tallapoosa	Villa Rica, City of	022-1302-04	Carroll	Lake Paradise & Cowens Lake	1.500	1.500
Tallapoosa	Carrollton, City of	022-1302-05	Carroll	Little Tallapoosa River	12.000	12.000
Tallapoosa	Bowdon, City of Lake Tysinger	022-1302-06	Carroll	Lake Tysinger	1.000	1.000

Source: GAEPD 2009a

Table 4. M&I surface water withdrawals in the ACT Basin (Georgia)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa River Basin (Georgia)			
Coosa (Conasauga)	Dalton Utilities	Whitfield	35.38
Coosa (Conasauga)	City of Chatsworth	Murray	1.26
Coosa (Coosawattee)	Ellijay-Gilmer County Water System	Gilmer	3.12
Coosa (Coosawattee)	City of Fairmount	Gordon	0.06
Coosa (Oostanaula)	City of Calhoun	Gordon	9.10
Coosa (Etowah)	Big Canoe Corporation	Pickens	0.48
Coosa (Etowah)	City of Jasper	Pickens	1.00
Coosa (Etowah)	Bent Tree Community	Pickens	0.07
Coosa (Etowah)	Lexington Components Inc (Rubber)	Pickens	0.01
Coosa (Etowah)	Etowah Water and Sewer Authority	Dawson	1.50
Coosa (Etowah)	Town of Dawsonville	Dawson	0.10
Coosa (Etowah)	City of Canton	Cherokee	2.83
Coosa (Etowah)	Cherokee County Water System	Cherokee	15.81
Coosa (Etowah)a	Gold Kist, Inc.	Cherokee	1.94

Table 4 (continued). M&I surface water withdrawals in the ACT Basin (Georgia)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa (Etowah)	City of Cartersville	Bartow	13.26
Coosa (Etowah)	New Riverside Ochre Company, Inc (Chemicals)	Bartow	1.67
Coosa (Etowah)	Gerdau AmeriSteel US, Inc. – Cartersville Steel Mill (Primary metals)	Bartow	0.16
Coosa (Etowah)	Georgia Power Co – Plant Bowen	Bartow	38.92
Coosa (Etowah)	CCMWA	Bartow	44.42
Coosa (Upper Coosa)	City of Lafayette	Walker	1.20
Coosa (Upper Coosa)	City of Summerville	Chattooga	2.05
Coosa (Upper Coosa)	Mount Vernon Mills – Riegel Apparel Division (Textiles)	Chattooga	2.74
Coosa (Oostanaula)	City of Cave Spring (Domestic/Commercial)	Floyd	0.30
Coosa (Etowah / Oostanaula)	City of Rome	Floyd	9.98
Coosa (Upper Coosa)	Floyd County Water System	Floyd	2.57
Coosa (Upper Coosa)	Inland-Rome Inc. (Paper)	Floyd	25.74
Coosa (Upper Coosa)	Georgia Power Co - Plant Hammond	Floyd	535.00
Coosa (Upper Coosa)	Polk County Water Authority	Polk	2.22
Coosa (Etowah)	Vulcan Construction Materials	Polk	0.09
Tallapoosa River Basin (Georgia)			
Tallapoosa (Upper)	City of Bremen	Haralson	0.32
Tallapoosa (Upper)	Haralson County Water Authority	Haralson	2.05
Tallapoosa (Upper)	City of Bowdon	Carroll	0.75
Tallapoosa (Upper)	Southwire Company	Carroll	0.09
Tallapoosa (Upper)	City of Carrollton	Carroll	5.37
Tallapoosa (Upper)	City of Temple	Carroll	0.26
Tallapoosa (Upper)	City of Villa Rica	Carroll	0.58
Tallapoosa (Upper)	Carroll County Water System	Carroll	4.08

Table 5. Surface water use - ACT Basin (Alabama, 2005) (mgd)

ACT subbasin	HUC	Public supply	Industrial	Irrigation	Livestock	Thermo-electric	Total, by subbasin
Upper Coosa	03150105	2.12	0	3.10	0.40	0	5.62
Middle Coosa	03150106	33.24	65.83	7.91	0.87	142.68	250.53
Lower Coosa	03150107	10.96	0.89	5.10	0.35	812.32	829.62
Upper Tallapoosa	03150108	0.90	0	0.15	0.40	0	1.45
Middle Tallapoosa	03150109	19.09	0	0.52	0.32	0	19.93
Lower Tallapoosa	03150110	38.22	2.23	4.22	0.28	0	44.95
Upper Alabama	03150201	10.40	30.63	3.84	0.84	4.14	49.85
Cahaba	03150202	52.90	0	3.49	0.25	0	56.64
Middle Alabama	03150203	0	21.04	1.73	0.48	0	23.25
Lower Alabama	03150204	0	54.61	0.64	0.02	0	55.27
Total - By Use Category		167.83	175.23	30.70	4.21	959.14	1337.11

Source: Hutson et al. 2009

Table 6. M&I surface water withdrawals in the ACT Basin (Alabama)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa River Basin (Alabama)			
Coosa (Upper)	Centre Water Works & Sewer Board	Cherokee	1.19
Coosa (Upper)	Piedmont Water Works & Sewer Board	Calhoun	0.93
Coosa (Middle)	Jacksonville Water Works & Sewer Board	Calhoun	1.34
Coosa (Middle)	Anniston Water Works & Sewer Board	Calhoun	0.08
Coosa (Middle)	Fort Payne Water Works Board	DeKalb	8.10
Coosa (Middle)	Goodyear Tire and Rubber Company	Etowah	9.87
Coosa (Middle)	Gadsden Water Works & Sewer Board	Etowah	14.86
Coosa (Middle)	Alabama Power Co – Gadsden Steam Plant	Etowah	142.68
Coosa (Middle)	SIC 32 – Unnamed Stone, Glass, Clay, and/or Concrete Products	St. Clair	3.49
Coosa (Middle)	Talladega/Shelby Water Treatment Plant	Talladega	6.44
Coosa (Middle)	Talladega County Water Department	Talladega	0.81
Coosa (Middle)	Talladega Water Works & Sewer Board	Talladega	1.62
Coosa (Middle)	Bowater Newsprint, Coosa Pines Operation	Talladega	52.47
Coosa (Lower)	Sylacauga Utilities Board	Talladega	3.25
Coosa (Lower)	SIC 22 – Unnamed Textile	Talladega	0.89
Coosa (Lower)	Goodwater Water Works & Sewer Board	Coosa	0.46
Coosa (Lower)	Alabama Power Co – E.C. Gaston Plant	Shelby	812.32
Coosa (Lower)	Clanton Waterworks & Sewer Board	Chilton	1.79
Coosa (Lower)	Five Star Water Supply	Elmore	5.46
Tallapoosa River Basin (Alabama)			
Tallapoosa (Upper)	Heflin Water Works	Cleburne	0.51
Tallapoosa (Upper)	Wedowee Gas, Water, and Sewer	Randolph	0.39
Tallapoosa (Middle)	Roanoke Utilities Board	Randolph	1.29
Tallapoosa (Middle)	Clay County Water Authority	Clay	1.87
Tallapoosa (Middle)	Lafayette	Chambers	0.53
Tallapoosa (Middle)	Central Elmore Water & Sewer Authority	Elmore	4.83
Basin (subbasin)	**Withdrawal by**	**County**	**Withdrawal (mgd)**
Tallapoosa (Middle)	Alexander City Water Department	Tallapoosa	10.57
Tallapoosa (Lower)	West Point Home, Inc	Lee	2.23
Tallapoosa (Lower)	Opelika Water Works Board	Lee	2.61
Tallapoosa (Lower)	Auburn Water Works Board	Lee	5.75
Tallapoosa (Lower)	Tallassee	Tallapoosa	1.98
Tallapoosa (Lower)	Tuskegee Utilities	Macon	2.71
Tallapoosa (Lower)	Montgomery Water Works & Sewer Board	Montgomery	25.17
Alabama River Basin			
Alabama (Upper)	Montgomery Water Works & Sewer Board	Montgomery	10.40
Alabama (Upper)	International Paper	Autauga	30.63
Alabama (Upper)	Southern Power Co – Plant E. B. Harris	Autauga	4.14
Alabama (Cahaba)	Birmingham Water Works & Sewer Board	Shelby	52.90
Alabama (Middle)	International Paper – Pine Hill	Wilcox	21.04
Alabama (Lower)	Alabama River Pulp Company	Monroe	54.61

Source: Hutson et al. 2009

VII – DROUGHT MANAGEMENT PLAN

7-01. General. The Drought Contingency Plan (DCP) for the ACT Basin implements drought conservation actions on the basis of composite system storage, state line flows, and basin inflow as triggers to drive drought response actions. The DCP also recognizes that a basin-wide drought plan must incorporate variable hydropower generation requirements from its headwater projects in Georgia (Allatoona Dam and Carters Dam), a reduction in the level of navigation service provided on the Alabama River as storage across the basin declines, and that environmental flow requirements must still be met to the maximum extent practicable. The Act basin-wide drought plan is composed of three components — Headwater regulation at

Allatoona Lake and Carters Lake in Georgia; Regulation at APC projects on the Coosa and Tallapoosa Rivers; and Downstream Alabama River regulation at Corps projects downstream of Montgomery, Alabama.

A. **Headwater Regulation for Drought at Allatoona Lake and Carters Lake**. Drought regulation at Allatoona Lake and Carters Lake consists of progressively reduced hydropower generation as pool levels decline in accordance with the conservation storage action zones established in the projects' water control plans. For instance, when Allatoona Lake is operating in normal conditions (Conservation storage Zone 1); hydropower generation typically ranges from 0 to 4 hours per day. However, as the pool drops to lower action zones during drought conditions, generation could be reduced to 0 to 2 hours per day. As Carters Lake pool level might drop into a conservation storage Zone 2, seasonal varying minimum target flows would be reduced to 240 cfs. The water control plan for each project describes the drought water control regulation plan in more detail.

B. **Drought Regulation at APC Projects on the Coosa, Tallapoosa, and Alabama River**. Regulation guidelines for the Coosa, Tallapoosa, and Alabama Rivers have been defined in a drought regulation matrix (Table 7) on the basis of a Drought Intensity Level (DIL). The DIL is a drought indicator, ranging from zero to three. The DIL is determined on the basis of three basin drought criteria (or triggers). A DIL 0 indicates normal regulation, while a DIL from 1 to 3 indicates some level of drought conditions. The DIL increases as more of the drought indicator thresholds (or triggers) occur. The drought regulation matrix defines minimum average daily flow requirements on a monthly basis for the Coosa, Tallapoosa, and Alabama Rivers as a function of the DIL and time of year. The combined occurrences of the drought triggers determine the DIL. Three intensity levels for drought operations are applicable to APC projects.

DIL 0 – (normal operation) 0 triggers occur
DIL 1 — (moderate drought) 1 of 3 triggers occur
DIL 2 — (severe drought) 2 of 3 triggers occur
DIL 3 — (exceptional drought) all 3 triggers occur

(1) Drought Indicators. The indicators used to determine drought intensity include the following:

1. **Low basin inflow**. The total basin inflow needed for navigation is the sum of the total filling volume plus 7Q10 flow (4,640 cfs). The total filling volume is defined as the volume of water required to return the pool to the top of the conservation guide curve and is calculated using the area-capacity tables for each project. Table 8 lists the monthly low basin inflow criteria. The basin inflow value is computed daily and checked on the 1st and 15th of the month. If computed basin inflow is less than the value required, the low basin inflow indicator is triggered. The basin inflow is total flow above the APC projects excluding Allatoona Lake and Carters Lake. It is the sum of local flows, minus lake evaporation and diversions. Figure 11 illustrates the local inflows to the Coosa and Tallapoosa Basins. The basin inflow computation differs from the navigation basin inflow, because it does not include releases from Allatoona Lake and Carters Lake. The intent is to capture the hydrologic condition across APC projects in the Coosa and Tallapoosa Basins.

Table 7. ACT Basin Drought Regulation Plan Matrix

<table>
<tr><th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th colspan="2">Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="4">Drought Level Response[a]</td><td colspan="13">DIL 0 - Normal Operations</td></tr>
<tr><td colspan="13">DIL 1: Low Basin Inflows or Low Composite or Low State Line Flow</td></tr>
<tr><td colspan="13">DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite or Low State Line Flow)</td></tr>
<tr><td colspan="13">DIL 3: Low Basin Inflows + Low Composite + Low State Line Flow</td></tr>
<tr><td rowspan="4">Coosa River Flow[b]</td><td colspan="3">Normal Operation: 2,000 cfs</td><td colspan="2">4,000 (8,000)</td><td colspan="2">4,000 – 2,000</td><td colspan="6">Normal Operation: 2,000 cfs</td></tr>
<tr><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">4,000 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">Jordan 2,000 +/-cfs</td></tr>
<tr><td colspan="3">Jordan 1,800 +/-cfs</td><td colspan="3">2,500 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">Jordan 1,800 +/-cfs</td></tr>
<tr><td colspan="3">Jordan 1,600 +/-cfs</td><td colspan="4">Jordan 1,800 +/-cfs</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="2">Jordan 1,800 +/-cfs</td><td>Jordan 1,600 +/- cfs</td></tr>
<tr><td rowspan="4">Tallapoosa River Flow[c]</td><td colspan="13">Normal Operations: 1200 cfs</td></tr>
<tr><td colspan="4">Greater of: 1/2 Yates Inflow or 2 x Heflin Gage(Thurlow Lake releases > 350 cfs)</td><td colspan="6">1/2 Yates Inflow</td><td colspan="3">1/2 Yates Inflow</td></tr>
<tr><td colspan="4">Thurlow Lake 350 cfs</td><td colspan="6">1/2 Yates Inflow</td><td colspan="3">Thurlow Lake 350 cfs</td></tr>
<tr><td colspan="7">Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)</td><td colspan="3">Thurlow Lake 350 cfs</td><td colspan="3">Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)</td></tr>
<tr><td rowspan="4">Alabama River Flow[d]</td><td colspan="13">Normal Operation: Navigation or 7Q10 flow</td></tr>
<tr><td colspan="4">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="6">7Q10 - Montgomery (4,640 cfs)</td><td colspan="3">Reduce: Full – 4,200 cfs</td></tr>
<tr><td colspan="5">3,700 cfs (20% 7Q10 Cut) - Montgomery</td><td colspan="5">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="3">Reduce: 4,200 cfs-> 3,700 cfs Montgomery (1 week ramp)</td></tr>
<tr><td colspan="4">2,000 cfs Montgomery</td><td colspan="3">3,700 cfs Montgomery</td><td colspan="3">4,200 cfs (10% 7Q10 Cut) - Montgomery</td><td colspan="3">Reduce: 4,200 cfs -> 2,000 cfs Montgomery (1 month ramp)</td></tr>
<tr><td rowspan="4">Guide Curve Elevation</td><td colspan="13">Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
</table>

a. Note these are based on flows that will be exceeded when possible.
b .Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow Lake flows are based on continuous +/- 5% of target flow: flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates.
d. Alabama River flows are 7-Day Average Flow.

Table 8. Low Basin Inflow Guide (in cfs-days)

Month	Coosa Filling Volume	Tallapoosa Filling Volume	Total Filling Volume	7Q10 flow	Required Basin Inflow
Jan	629	0	629	4,640	5,269
Feb	647	1,968	2,615	4,640	7,255
Mar	603	2,900	3,503	4,640	8,143
Apr	1,683	2,585	4,268	4,640	8,908
May	242	0	242	4,640	4,882
Jun			0	4,640	4,640
Jul			0	4,640	4,640
Aug			0	4,640	4,640
Sep	–602	–1,304	–1,906	4,640	2,734
Oct	–1,331	–2,073	–3,404	4,640	1,236
Nov	–888	–2,659	–3,547	4,640	1,093
Dec	–810	–1,053	–1,863	4,640	2,777

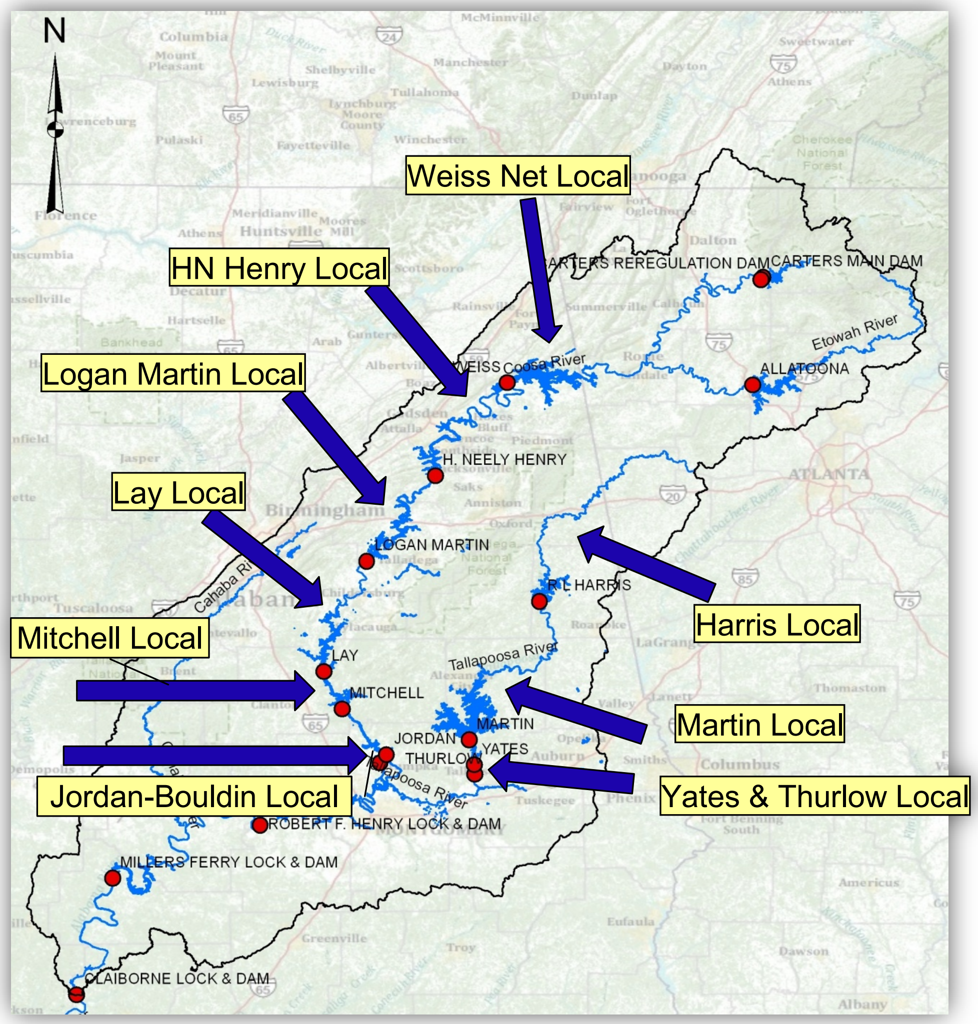


Figure 11. ACT Basin Inflows

2. **Low composite conservation storage**. Low composite conservation storage occurs when the APC projects' composite conservation storage is less than or equal to the storage available within the drought contingency curves for the APC reservoirs. Composite conservation storage is the sum of the amounts of storage available at the current elevation for each reservoir down to the drought contingency curve at each APC major storage project. The reservoirs considered for the trigger are R.L. Harris Lake, H. Neely Henry Lake, Logan Martin Lake, Lake Martin, and Weiss Lake. Figure 12 plots the APC composite zones. Figure 13 plots the APC low composite conservation storage trigger. If the actual active composite conservation storage is less than or equal to the active composite drought zone storage, the low composite conservation storage indicator is triggered. That computation is performed on the 1st and 15th of each month, and is considered along with the low state line flow trigger and basin inflow trigger.

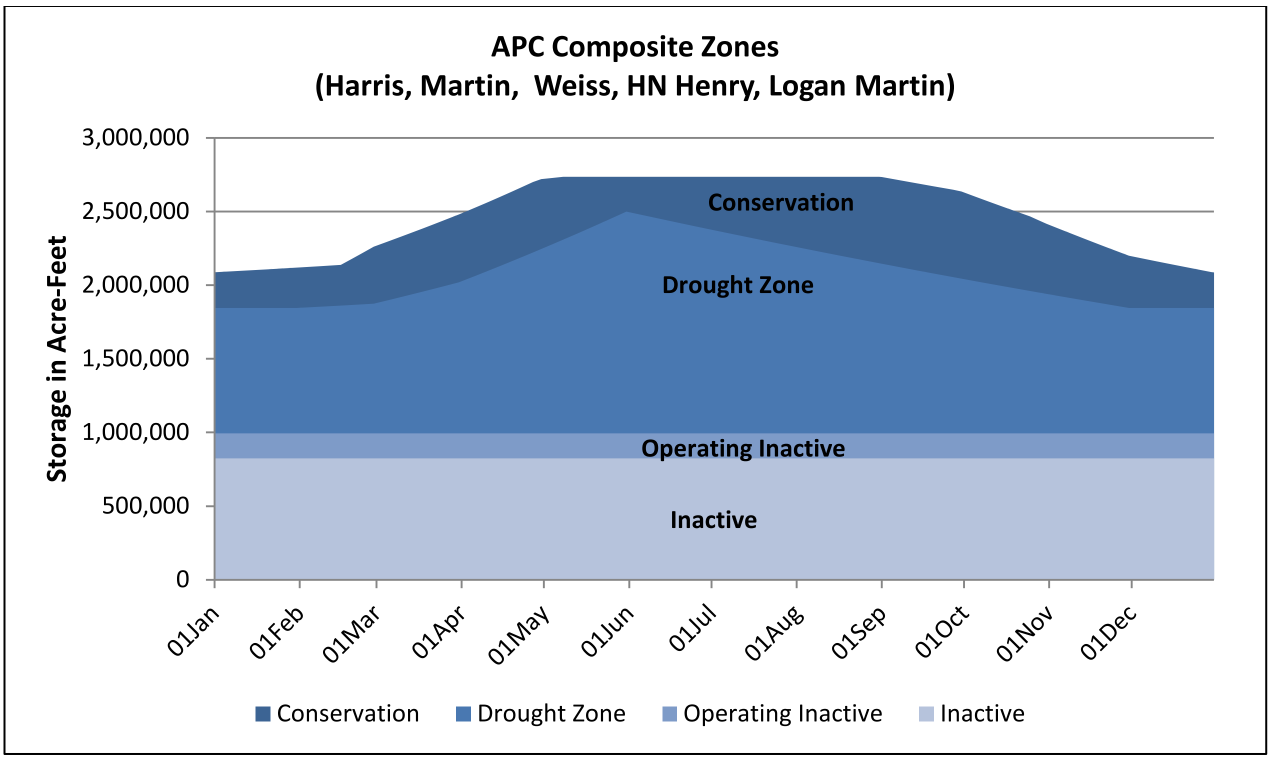


Figure 12. APC Composite Zones

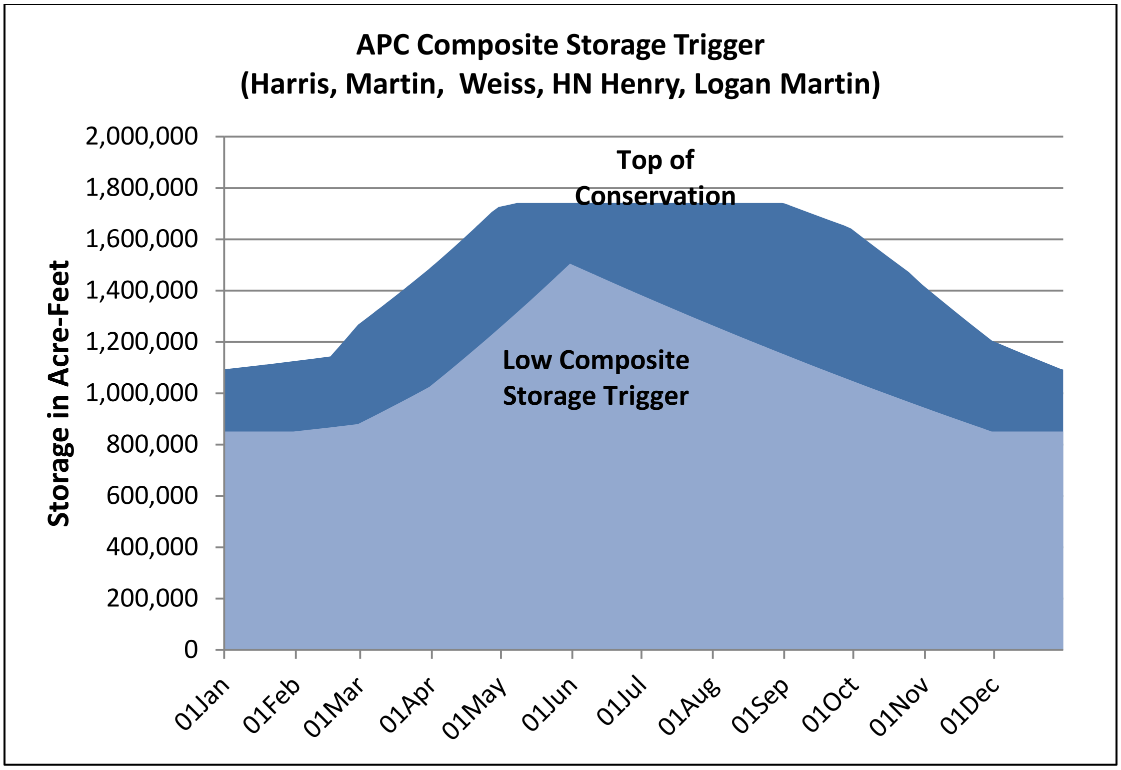


Figure 13. APC Low Composite Conservation Storage Drought Trigger

3. **Low state line flow**. A low state line flow trigger occurs when the Mayo's Bar USGS gage measures a flow below the monthly historical 7Q10 flow. The 7Q10 flow is defined as the lowest flow over a 7-day period that would occur once in 10 years. Table 9 lists the Mayo's Bar 7Q10 value for each month. The lowest 7-day average flow over the past 14 days is computed and checked at the 1st and 15th of the month. If the lowest 7-day average value is less than the Mayo's Bar 7Q10 value, the low state line flow indicator is triggered. If the result is greater than or equal to the trigger value from Table 9, the flow is considered normal, and the state line flow indicator is not triggered. The term state line flow is used in developing the drought management plan because of the proximity of the Mayo's Bar gage to the Alabama-Georgia state line and because it relates to flow data upstream of the Alabama-based APC reservoirs. State line flow is used only as a source of observed data for one of the three triggers and does not imply that flow targets exist at that geographic location. The ACT Basin drought matrix does not include or imply any Corps regulation that would result in water management decisions at Carters Lake or Allatoona Lake.

Table 9. State Line Flow Triggers

Month	Mayo's Bar (7Q10 in cfs)
Jan	2,544
Feb	2,982
Mar	3,258
Apr	2,911
May	2,497
Jun	2,153
Jul	1,693
Aug	1,601
Sep	1,406
Oct	1,325
Nov	1,608
Dec	2,043

Note: Based on USGS Coosa River at Rome Gage (Mayo's Bar, USGS 02397000) observed flow from 1949 to 2006

(2) Drought Regulation. The DIL is computed on the 1st and 15th of each month. Once a drought operation is triggered, the DIL can only recover from drought condition at a rate of one level per period. For example, as the system begins to recover from an exceptional drought with DIL 3, the DIL must be stepped incrementally back to zero to resume normal operations. In that case, even if the system triggers return to normal quickly, it will still take at least a month before normal operations can resume - conditions can improve only to DIL 2 for the next 15 days, then DIL 1 for the next 15 days, before finally returning to DIL 0.

For DIL 0, the matrix shows a Coosa River flow between 2,000 cfs and 4,000 cfs with peaking periods up to 8,000 cfs occurring. The required flow on the Tallapoosa River is a constant 1,200 cfs throughout the year. The navigation flows on the Alabama River are applied to the APC projects. The required navigation depth on the Alabama River is subject to the basin inflow.

For DIL 1, the Coosa River flow varies from 2,000 cfs to 4,000 cfs. On the Tallapoosa River, the required flow is the greater of one-half of the inflow into Yates Lake and twice the Heflin USGS gage from January thru April. For the remainder of the year, the required flow is one-half of Yates Lake inflow. The required flows on the Alabama River are reduced from the amounts required for DIL 0.

For DIL 2, the Coosa River flow varies from 1,800 cfs to 2,500 cfs. On the Tallapoosa River, the minimum is 350 cfs for part of the year and one-half of Yates Lake inflow for the remainder of the year. The requirement on the Alabama River is between 3,700 cfs and 4,200 cfs.

For DIL 3, the flows on the Coosa River range from 1,600 cfs to 2,000 cfs. A constant flow of 350 cfs on the Tallapoosa River is required. It is assumed an additional 50 cfs will occur between Thurlow Lake and the City of Montgomery water supply intake. Required flows on the Alabama River range from 2,000 cfs to 4,200 cfs

In addition to the flow regulation for drought conditions, the DIL affects the flow regulation to support navigation operations. When the DIL is equal to zero, APC projects are operated to meet the needed navigation flow target or the 7Q10 flow as defined in the navigation measure section. Once DIL is greater than zero, drought operations will occur, and flow regulation to support navigation operations is suspended.

7-02. **Extreme Drought Conditions**. An extreme drought condition exists when the remaining composite conservation storage is depleted, and additional emergency actions may be necessary. When conditions have worsened to this extent, utilization of the inactive storage must be considered. Such an occurrence would typically be contemplated in the second or third year of a drought. Inactive storage capacities have been identified for the two federal projects with significant storage (Figures 14 and 15). The operational concept established for the extreme drought impact level and to be implemented when instituting the use of inactive storage is based on the following actions:

(1) Inactive storage availability is identified to meet specific critical water use needs within existing project authorizations.

(2) Emergency uses and users will be identified in accordance with emergency authorizations and through stakeholder coordination. Typical critical water use needs within the basin are associated with public health and safety.

(3) Weekly projections of the inactive storage water availability to meet the critical water uses in the ACT Basin will be utilized when making water control decisions regarding withdrawals and water releases from the federal reservoirs.

(4) The inactive storage action zones will be developed and instituted as triggers to meet the identified priority water uses (releases will be restricted as storage decreases).

(5) Dam safety considerations will always remain the highest priority. The structural integrity of the dams due to static head limitations will be maintained.

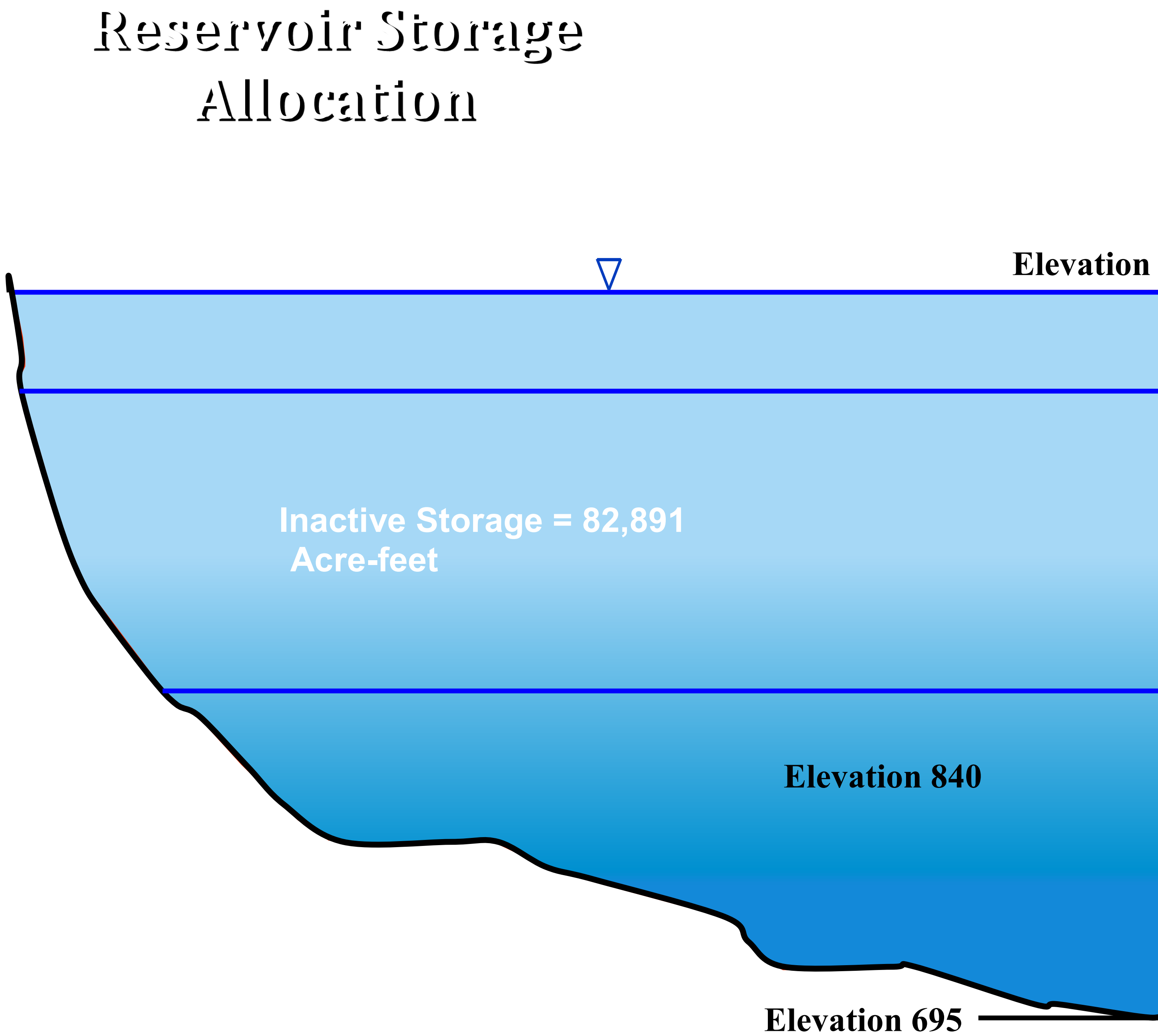


Figure 14. Storage in Allatoona Lake

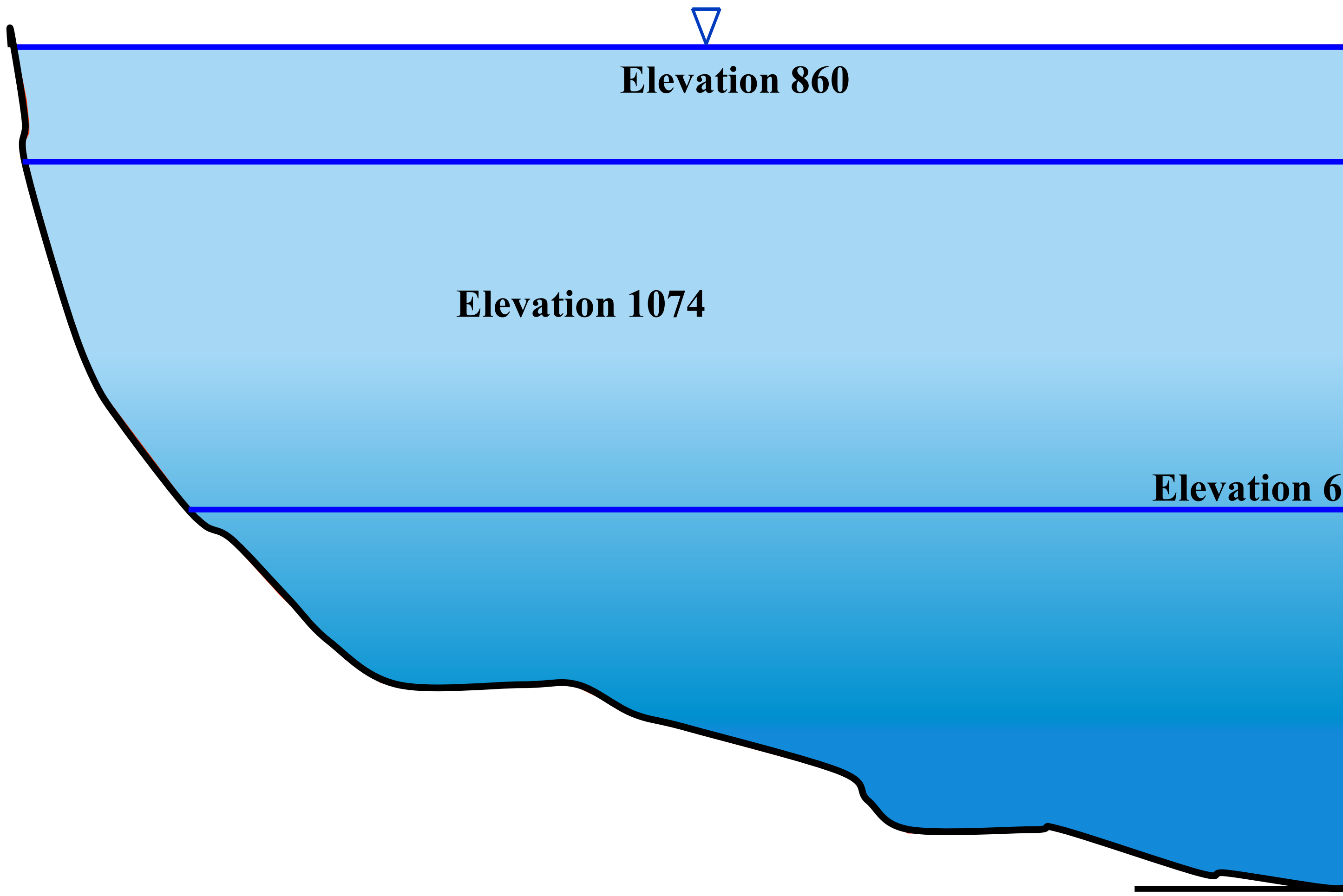


Figure 15. Storage in Carters Lake

VIII – DROUGHT MANAGEMENT COORDINATION AND PROCEDURES

8-01. USACE Coordination. It is the responsibility of the Mobile District Water Management Section and APC to monitor climatological and hydrometeorological conditions at all times to make prudent water management decisions. The Water Management Section makes daily decisions and coordinates with APC every two weeks or more often if conditions warrant and with other district representatives from the various areas for which the river systems are operated -- hydropower, recreation, navigation, environmental, and others to exchange information concerning the operation of the river system. This coordination includes conducting weekly meetings with these other district elements. Daily water management decisions regarding water availability, lake level forecasts, and storage forecasts are determined using the information obtained along with current project and basin hydrometeorological data. A weekly District River System Status report is prepared that summarizes the conditions in each of the river basins. When conditions become evident that normal low flow conditions are worsening, the Water Management Section will elevate the district coordination to a heightened awareness. When drought conditions are imminent, Emergency Management representatives will be notified of the conditions and will be included in the regular coordination activities.

8-02. Interagency Coordination. The Water Management Section will support the environmental team regarding actions that require coordination with the U.S. Fish and Wildlife Service (USFWS) for monitoring threatened and endangered species and with the Environmental Protection Agency (EPA), Georgia Environmental Protection Division (GAEPD), and Alabama Department of Environmental Management (ADEM) regarding requests to lower minimum flow targets below Claiborne Dam.

8-03. Public Information and Coordination. When conditions determine that a change in the water control actions from normal regulation to drought regulation is imminent, it is important that various users of the system are notified so that any environmental or operational preparations can be completed prior to any impending reduction in reservoir discharges, river levels, and reservoir pool levels. In periods of severe drought within the ACT Basin it will be within the discretion of the Division Commander to approve the enactment of ACT Basin Water Management conference calls. The purposes of the calls are to share ongoing water management decisions with basin stakeholders and to receive stakeholder input regarding needs and potential impacts to users within the basin. Depending upon the severity of the drought conditions, the calls will be conducted at regular monthly or bi-weekly intervals. Should issues arise, more frequent calls would be implemented.

a. Local Press and Corps Bulletins. The local press consists of periodic publications in or near the ACT Basin. Montgomery, Columbus, and Atlanta have some of the larger daily papers. The papers often publish articles related to the rivers and streams. Their representatives have direct contact with the Corps through the Public Affairs Office. In addition, they can access the Corps Web pages for the latest project information. The Corps and the Mobile District publish e-newsletters regularly which are made available to the general public via email and postings on various websites. Complete, real-time information is available at the

Mobile District's Water Management homepage http://water.sam.usace.army.mil/. The Mobile District Public Affairs Office issues press releases as necessary to provide the public with information regarding Water Management issues and activities and also provides information via the Mobile District web site.

IX – REFERENCES

Institute for Water Resources (IWR). 1991. National Study of Water Management During Drought A Research Assessment, U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources, IWR Report 91-NDS-3.

Institute for Water Resources (IWR). 1994. National Study of Water Management During Drought The Report to the U.S. Congress, U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources, IWR Report 94-NDS-12.

Institute for Water Resources (IWR). 1998. Water Supply Handbook, U.S. Army Corps, Water Resources Support Center, Institute for Water Resources, Revised IWR Report 96-PS-4.

U.S. Army Corps of Engineers, (USACE). 1993. Development of Drought Contingency Plans, Washington, DC: CECW-EH-W Technical Letter No. 1110-2-335, (ETL 1110-2-335).

U.S. Army Corps of Engineers, (USACE). January 2009. Western States Watershed Study: Drought.

U. S. Geological Survey (USGS). 2000. *Droughts in Georgia*. Open-file report 00-380. U.S. Geological Survey, Atlanta, Georgia.

2. USACE 2014 FINAL ENVIRONMENTAL IMPACT STATEMENT – UPDATE OF THE WATER CONTROL MANUAL, VOLUME 2: APPENDIX A (I)

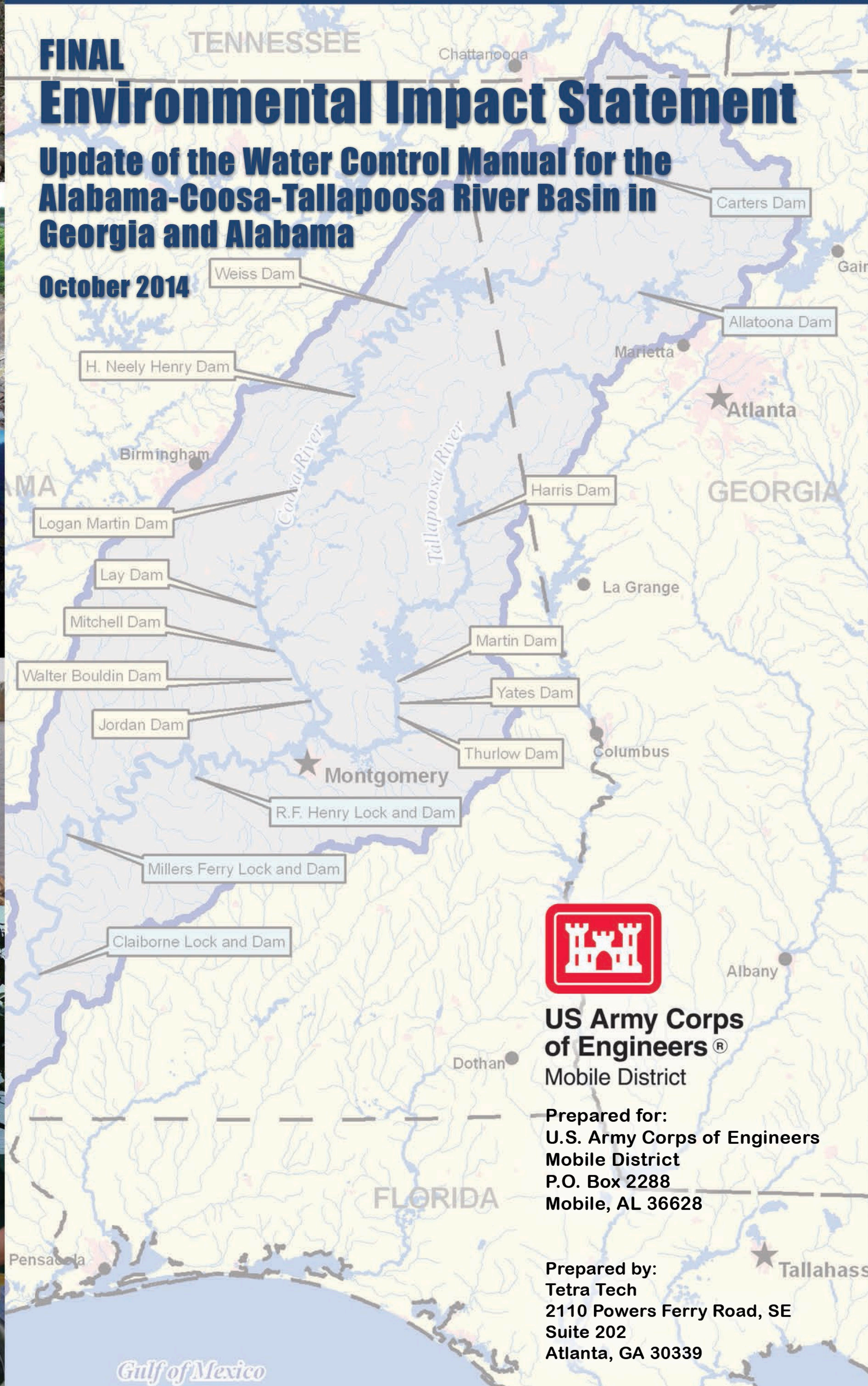





FINAL
Environmental Impact Statement

Update of the Water Control Manual for the Alabama-Coosa-Tallapoosa River Basin in Georgia and Alabama

October 2014



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US Army Corps of Engineers ®
Mobile District

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN WATER CONTROL MANUAL

APPENDIX I

R. L. HARRIS DAM AND LAKE
(ALABAMA POWER COMPANY)

TALLAPOOSA RIVER, ALABAMA

U.S. ARMY CORPS OF ENGINEERS
SOUTH ATLANTIC DIVISION
MOBILE DISTRICT
MOBILE, ALABAMA

SEPTEMBER 1972
REVISED OCTOBER 1993; JUNE 2004; and
DECEMBER 2014 (scheduled)

R. L. Harris Dam and Lake

NOTICE TO USERS OF THIS MANUAL

Regulations specify that this Water Control Manual be published in a hard copy binder with loose-leaf form, and only those sections, or parts thereof; requiring changes will be revised and printed. Therefore, this copy should be preserved in good condition so that inserts can be made to keep the manual current. Changes to individual pages must carry the date of revision, which is the South Atlantic Division's approval date.

REGULATION ASSISTANCE PROCEDURES

If unusual conditions arise, contact can be made with the Water Management Section, Mobile District Office by phoning (251) 690-2730 during regular duty hours and (251) 509-5368 during non-duty hours. The Alabama Power Company Reservoir Management Section Hydro Desk can be reached at (205) 257-4010 during regular duty hours.

METRIC CONVERSION

The values presented in the text are shown in English units only. Exhibit B contains a conversion table that can be used for metric units.

VERTICAL DATUM

All vertical data presented in this manual are referenced to the project's historical vertical datum, National Geodetic Vertical Datum of 1929 (NGVD29).

MEMORANDUM OF UNDERSTANDING

The R. L. Harris Dam and Lake Project will be operated during floods and in support of navigation downstream in accordance with regulations prescribed by the Secretary of the Army and published in the Code of Federal Regulations, Title 33, Chapter II, Part 208, Section 208. A Memorandum of Understanding (MOU) concerning the design, construction, and operation of the R. L. Harris development for flood control (now termed flood risk management) was adopted by the Alabama Power Company (APC) and the U.S. Army Corps of Engineers (herein referred to as the Corps of Engineers or Corps) on 27 September 1972 and later revised on 11 October 1990. This MOU is also intended to memorialize the functions and procedures for both the Corps and APC for implementing these plans and meeting their responsibilities with regard to the orderly exchange of hydrologic data. A copy of the MOU is included in this manual as Exhibit C.

R. L. HARRIS DAM AND LAKE

WATER CONTROL MANUAL
TALLAPOOSA RIVER, ALABAMA

U.S. Army Corps of Engineers, Mobile District, South Atlantic Division

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LIST OF PLATES

PERTINENT DATA

(see Exhibit A, page E-A-1 for Supplementary Pertinent Data)

GENERAL

Other names of project	Crooked Creek
Dam site location	
Miles above mouth of Tallapoosa River	139.1
Miles above mouth of Mobile River	494
Drainage area above dam site, square miles	1,454

STREAM FLOW AT USGS GAGE (#02414500) AT WADLEY, AL (cfs)

Average for Period of Record (calendar year 1924 – 2009)	2,562
Maximum daily discharge (8 May 2003)	103,000
Minimum daily discharge (Oct 1987)	41

RESERVOIR

Top of power pool (May through Sep) - feet NGVD29	793.0
Top of power pool (Dec through Mar) - feet NGVD29	785.0
Minimum operating pool elevation, feet NGVD29	768.0
Area at pool elevation 793.0, acres	10,660
Total volume at elevation 793.0, acre-feet	424,969
Power storage (elevation 768 to 793 ft NGVD29), acre-feet	206,944
Inactive Storage (below elevation 768 ft NGVD29), acre-feet	218,025
Length, miles	29
Shoreline distance at elevation 793 (summer pool), miles	272

SPILLWAY

Type	concrete-gravity
Net length, feet	310
Elevation of crest, feet above NGVD29	753.0
Type of gates	Tainter
Number of gates (40.5 ft x 40 ft)	6
Maximum discharge capacity (pool elev. 795.0), cfs	267,975

DAM

Total length including dikes, feet	3,242
Total length of non-overflow section, feet	2,632
Maximum height above stream bed, feet	151.5
Elevation, top of dam, feet NGVD29	810

POWER PLANT

Gross static head at full power pool (793 ft NGVD29), feet	131.7
Normal operating head at full turbine discharge, feet	124.0
Number of units	2
Maximum discharge per unit (approximate full gate), cfs	8,000
Total installation, kW	135,000

I - INTRODUCTION

1-01. Authorization. The River and Harbor Act approved 2 March 1945 (59 Stat. 10) authorized the Corps to develop a site at Crooked Creek for flood control, hydropower, and other purposes. Section 12 of Public Law (P.L.) 89-789 (80 Stat., 1405), approved 7 November 1966, suspended for two years the authority as far as hydropower was concerned, to permit development of the Tallapoosa River by private concerns. The Alabama Power Company (APC) filed an application with the Federal Power Commission (FPC) for the proposed project on 5 November 1968, and was issued a license for the construction of the Crooked Creek Hydroelectric Project (later renamed R. L. Harris). Operations for flood risk management and navigation support are conducted in accordance with regulations prescribed by the Secretary of the Army and published in 33 CFR, Chapter II, Part 208, Section 208.65. Therefore, this water control manual has been prepared as directed and in accordance with the Corps Water Management Regulations, specifically Engineering Regulation (ER) 1110-2-241, *Use of Storage Allocated for Flood Control and Navigation at Non-Corps Projects*. Also, ER 1110-2-240, *Water Control Management* prescribes the policies and procedures to be followed in carrying out water management activities, including establishment and updating of water control plans for non-Corps projects, as required by federal laws and directives. This manual is also prepared in accordance with pertinent sections of the Corps' Engineering Manual (EM) 1110-2-3600, *Management of Water Control Systems*; under the format and recommendations described in ER 1110-2-8156, *Preparation of Water Control Manuals*; and ER 1110-2-1941, *Drought Contingency Plans*. This manual is subject to review and revision at any time upon request of APC or the District Commander. Revisions to this manual are processed in accordance with ER 1110-2-240.

Below is a complete list of pertinent regulations and guidance and the date enacted:

ER 1110-2-240	Water Control Management	8 October 1982
ER 1110-2-241	Use of Storage Allocated for Flood Control and Navigation at Non-Corps Projects	24 May 1990
ER 1110-2-8156	Preparation of Water Control Manuals	31 August 1995
ER 1110-2-1941	Drought Contingency Plans	15 September 1981
EM-1110-2-3600	Management of Water Control Systems	30 November 1987

1-02. Purpose and Scope. This individual project manual primarily describes the flood risk management water control plan for the APC R. L. Harris Dam and Lake Project. In addition, the manual includes descriptions of the plans for navigation support and drought contingency operations. The description of the project's physical components, history of development, water control activities, and coordination with others are provided as supplemental information to enhance the knowledge and understanding of the water control plan. R. L. Harris Dam water control regulations must be coordinated with the multiple projects in the Alabama-Coosa-Tallapoosa (ACT) Basin to ensure consistency with the purposes for which the system was authorized. In conjunction with the ACT Basin Master Water Control Manual, this manual provides a general reference source for R. L. Harris water control regulation, guidance for water management decision making, and training for new personnel.

1-03. Related Manuals and Reports.

Other manuals related to the R. L. Harris Project water control regulation activities include the ACT Master Water Control Manual for the entire basin and nine appendices that compose the complete set of water control manuals for the ACT Basin:

Alabama-Coosa-Tallapoosa River Basin Master Water Control Manual

Appendix A	Allatoona Dam and Lake Allatoona
Appendix B	Weiss Dam and Lake (Alabama Power Company)
Appendix C	Logan Martin Dam and Lake (Alabama Power Company)
Appendix D	H. Neely Henry Dam and Lake (Alabama Power Company)
Appendix E	Millers Ferry Lock and Dam and William “Bill” Dannelly Lake
Appendix F	Claiborne Lock and Dam and Lake
Appendix G	Robert F. Henry Lock and Dam and R. E. “Bob” Woodruff Lake
Appendix H	Carters Dam and Lake and Carters Reregulation Dam
Appendix I	R. L. Harris Dam and Lake (Alabama Power Company)

Other pertinent information regarding the R. L. Harris Project and other APC Tallapoosa River projects are contained within the Federal Energy Regulatory Commission (FERC) licenses for the Harris, Martin, and Yates/Thurlow Projects. Historical, definite project reports and design memoranda also have useful information.

1-04. Project Owner. The R. L. Harris Dam and Lake Project is owned and operated by the APC under provisions of the licensing through the FERC for Project Number 2628.

1-05. Operating Agency. The R. L. Harris Project is operated for flood control and navigation support in accordance with regulations prescribed by the Secretary of the Army, which are published in the Code of Federal Regulations, Title 33, Chapter II, Part 208, Section 208.65. Day-to-day operation of the facility is assigned to the APC’s Reservoir Management Section in Birmingham, Alabama, which is part of the Transmission Department under the direction of the Reservoir Operations Coordinator. Long-range water planning and flood control operation is assigned to Reservoir Management in Birmingham, Alabama, which is part of Southern Company Hydro Services, under the direction of the Reservoir Management Supervisor. Operation of the project is in accordance with the FERC license and this water control manual.

1-06. Regulating Agencies. Regulating authority is shared between the Corps, the FERC, and the APC. A Memorandum of Understanding (MOU) has been adopted by the APC and the Corps concerning the operation of the project. The purpose of the MOU was to clarify the responsibilities of the Corps and APC with regard to the operation of the project for flood risk management and other purposes and to provide direction for the orderly exchange of hydrologic data. Those modifications agreed upon by both parties are contained in the regulation plan as presented in this manual. The MOU and this manual will be used to provide direction to implement the prescribed flood risk management operations. A copy of the MOU is included in this manual as Exhibit C.

II - DESCRIPTION OF PROJECT

2-01. Location. R. L. Harris Dam is located on the Tallapoosa River at river mile 139.1, near Lineville in Randolph County, Alabama. It is located 77 river miles above Martin Dam. The 29-mile long reservoir extends up both the Tallapoosa and Little Tallapoosa Rivers and is contained within Randolph and Clay Counties, Alabama. The area of the watershed above the project is 1,454 square miles and the maximum depth at the dam is 135 feet. Crooked Creek is located just below the dam. The location of the dam is about midway between Montgomery, Alabama and Atlanta, Georgia and is shown on Plate 2-1. The dam is also shown in Figure 2-1.

Figure 2-1. R. L. Harris Dam

2-02. Purpose. R. L. Harris Dam is a multiple-purpose project which constitutes one unit in the proposed total development of the power potential and other water resources of the Tallapoosa River. The dam was built by the APC principally for the production of hydroelectric power but the dam also provides flood risk management benefits and supports navigational flow requirements downstream as prescribed by the Secretary of the Army, published in the Code of Federal Regulations, Title 33, Chapter II, Part 208, Section 208.65. The R. L. Harris Lake provides a source of potential water supply for domestic, agricultural, and municipal and industrial users subject to FERC license requirements. The lake also creates a large recreational area providing opportunities for fishing, boating, and other water-based recreational activities.

2-03. Physical Components. The R. L. Harris Development consists of a dam having a concrete gated spillway section with compacted earth abutment dikes; a reservoir having a surface area of 10,660 acres and extends 29 miles upstream at full summer pool elevation of 793 feet NGVD29; a 135,000 kilowatt power plant, which is part of the main dam, located on the west side of the river between the spillway and the left bank earth abutment; a substation; and appurtenant electrical and mechanical facilities. The project is shown under construction in Figure 2-2. The principal features of the project are described in detail in subsequent paragraphs. Sections and plan of the dam, powerhouse and appurtenant works are shown on Plates 2-2 and 2-3.

a. Dam. The dam is a concrete gravity-type structure having a top elevation of 810 feet NGVD29 and a length of 3,242 feet including the dikes. The maximum height above the existing river bed is 151.5 feet. Sections and plan of the dam and appurtenant works are shown on Plate 2-3. The dam is located at river mile 139.1 on the Tallapoosa River approximately midway between Montgomery, Alabama, and Atlanta, Georgia.

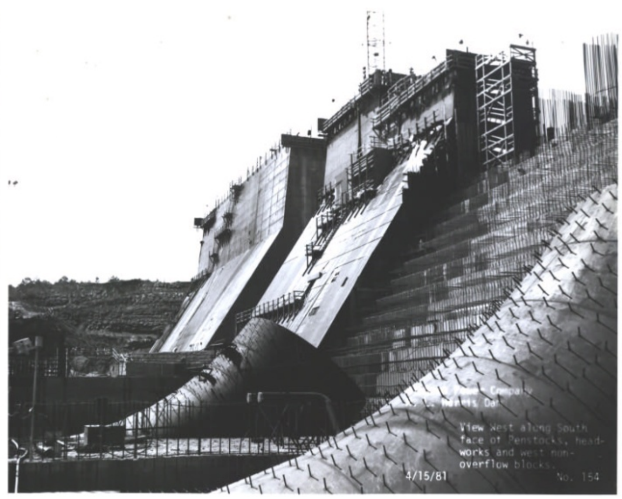


Figure 2-2. R. L. Harris Project Under Construction

b. Reservoir. R. L. Harris Lake extends up the Tallapoosa River a distance of 29 miles with an arm also extending up the Little Tallapoosa River. The maximum summer full pool elevation is 793 feet NGVD29 which provides a total storage of 424,969 acre-feet, covers a surface area of 10,660 acres, and has 272 miles of shoreline. During the flood season (December through March), the lake is normally maintained at elevation 785 feet NGVD29 which provides 100,108 acre-feet of storage for flood risk management operations between elevations 795 and 785 feet NGVD29. At elevation 795 feet NGVD29, the upper limits of the Induced Surcharge Curve, the lake has a total storage of 446,711 acre-feet, and a surface area of 11,120 acres. R. L. Harris Lake provides 206,944 acre-feet of power storage between elevations 768 and 793 feet NGVD29 during summer operation and 128,578 acre-feet between elevations 768 and 785 feet NGVD29 during winter operation. The lake drainage area is 1,454 square miles. Area-capacity curves and associated data points are shown on Plate 2-19.

c. Spillway. The spillway is 310 feet long and contains six tainter gates, each 40.5 feet wide and 40.0 feet high. The spillway crest is at elevation 753.0. A section and downstream elevation are shown on Plate 2-3. The gates are operated by plant personnel and are controlled from the powerhouse. One of the gates is split horizontally so that the upper section can be raised for the periodic passing of trash. The gate opening sequence and schedule are given on Plates 2-6 through 2-17. At elevation 795.0, the upper limits of the Induced Surcharge Curve, the spillway has a capacity of almost 270,000 cfs. A rating curve of the spillway discharge is shown on Plate 2-18.

In December 2012 into January 2013, APC upgraded the original hydraulically driven pawl and ratchet operating mechanisms and controls on its 6 Harris Dam spillway gates to an electric motor gear driven system with digital controls. This upgrade required a removal of most of the original equipment that is depicted below in Figure 2-3 and Figure 2-4.

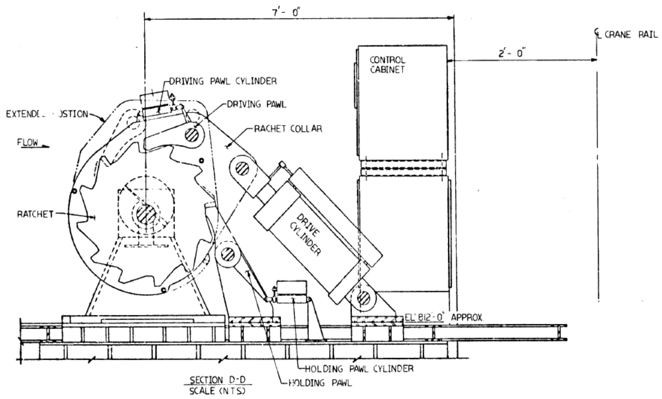


Figure 2-3. Original Spillway Machinery

Figure 2-4. Original Spillway Machinery

The spillway gate operations defined in this manual were based on single ratchet movements, defined over a series of steps found in Plates 2-6 through 2-17. The ratchet itself, as seen in Figure 2-3, consists of 12 positions, meaning that 12 ratchet movements equates to 1 full 360 degree revolution of the attached torque tube.

During this upgrade, only the ratchet system and controls for the ratchet system were removed. In the upgraded system now installed, electric motors, rather than hydraulics, drive a large gear which drives the same torque tube, which rotates the drum containing the wire cables that move the spillway gates. The torque tubes, drums, and wire cable systems all remain the same. Therefore, one revolution of the torque tube by any operator, whether hydraulic or electric, will result in the same displacement of the radial spill gate, and result in the same discharge as well. Figures 2-5 through 2-10 show the new drive system.

In place of the hydraulically driven pawl and ratchet operating mechanism a series of electric motors, gears, and digital controls that can provide accurate control over the range of the gate opening was installed. The key in this new system is a digital rotational transducer (Figure 2-9) that measures revolutions of the torque tube. Recall that one revolution of the torque tube by any operator will result in the same displacement of the radial spill gate, and result in the same discharge as well.

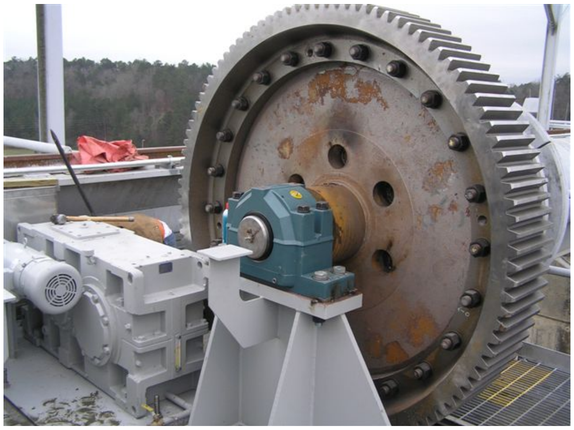


Figure 2-5. New Spillway Machinery

Figure 2-6. New Spillway Machinery

Figure 2-7. New Spillway Machinery

Figure 2-8. New Spillway Machinery

Figure 2-9. New Spillway Machinery

Figure 2-10. New Spillway Machinery

In an effort to keep future operations of the gates consistent with historical operations and the reservoir regulation manual, the digital controls were programmed to mimic the old pawl and ratchet operating mechanism movements. The indicators for gate position (Figure 2-10) were programmed so that one full revolution of the torque tube, as measured by the rotational transducer would display "12"; two full revolutions of the torque tube, as measured by the rotational transducer would display "24"; three full revolutions of the torque tube, as measured by the rotational transducer would display "36", etc. This allows the operator to program the gates to move to a particular position.

This is best illustrated by looking at the Gate Opening Schedule in Plates 2-6 through 2-17. For this illustration, assume that hydrologic conditions were calling for step 231. At this step, the human operator would set gate numbers 1, 2, 3, 4, and 5 to position 40 and gate 6 to position 31 (see Plate 2-17). The transition is seamless because of the translation from ratchets to revolutions, i.e., no difference in gate displacement between the two.

d. Powerhouse and Penstocks. The powerhouse is situated on the right bank or west toe of the non-overflow section. The building is approximately 91 feet wide and 225 feet long and houses two 67,500 kW generators operating at a 121 feet net head with a best gate release of approximately 13,000 cfs. The penstocks leading to the turbines are 27 feet in diameter with the invert of the intake at the upstream face of the dam at elevation 710.0 feet NGVD29. The centerline of the distributor is at elevation 659.0 feet NGVD29. A section of the powerhouse is shown on Plate 2-5. Performance curves for the turbines are shown on Plate 7-2.

2-04. Related Control Facilities. Operation of the R. L. Harris powerhouse and spillway gates can be operated either locally or remotely controlled. Operation is closely coordinated with the operation of the other developments in the Tallapoosa River Basin downstream.

2-05. Public Facilities. Many recreational advantages are inherent in an impoundment of this nature including fishing, hunting, boating, swimming, and picnicking and special attention has been given to the encouragement of recreational aspects where they do not conflict with major purposes. Development of project lands for recreational purposes is in accordance with the Land Use Plan approved by the FERC. There are presently seven public boat ramps available with plans for additional ramps as recreational activity increases. Located on the west side of the dam is a public tailrace fishing platform and associated parking and restroom facilities. Public hiking and nature trails are also available on project lands.

III - HISTORY OF PROJECT

3-01. Authorization. Because of abundant streamflow and numerous excellent power sites, the ACT River System has long been recognized as having vast hydroelectric power potential. The system has been studied for the development of hydropower by both private interests and the Federal Government.

The Corps, as an agency of the United States Government, was authorized by the River and Harbor Act, approved 2 March 1945 (59 Stat. 10), to develop a site at Crooked Creek for flood control, hydropower and other purposes. The project was a part of the comprehensive plan for the development of Alabama-Coosa River System as contained in House Document No. 414, 77th Congress, 1st Session. Section 12 of Public Law 89-789 (80 Stat., 1405), approved 7 November 1966, suspended for two years the authority as far as hydropower was concerned, to permit development of the Tallapoosa River by private concerns. The APC filed an application for a preliminary permit with the Federal Power Commission (FPC) on 7 November 1966 to study the Crooked Creek site for development. Subsequently, APC filed an application for a license for the proposed project on 5 November 1968.

3-02. Planning and Design. On 28 December 1973, the FPC issued a license to APC for construction of the Crooked Creek Hydroelectric Project, No. 2628. At the request of APC, the project was renamed R. L. Harris Dam and Lake 15 February 1974.

3-03. Construction. Construction was started on 1 November 1974, and temporarily stopped on 22 December 1978. The construction then resumed on a limited basis on 11 August 1980 and fully resumed on 20 January 1981. The dam and spillway were completed on 27 October 1982. The powerhouse and appurtenance works were completed on 20 April 1983, with Units 1 and 2 available for commercial operation on 20 April 1983. Filling of the reservoir began on 27 October 1982 and the pool reached the minimum power guide curve elevation of 785 feet NGVD29 on 16 December 1982.

3-04. Related Projects. The R. L. Harris Dam and Lake Project is the most upstream of the APC projects on the Tallapoosa River at river mile 139.1. Downstream of the R. L. Harris Dam is the Martin Dam and Powerhouse at river mile 60.6, followed by the Yates Dam and Powerhouse at river mile 52.7, and the Thurlow Dam and Powerhouse at river mile 49.7. The sites are shown on Plate 2-1.

3-05. Modifications to Regulations. The Harris water control manual was revised in October 1993, administratively revised in June 2004, and revised in December 2014.

3-06. Principal Regulation Problems. There have been no significant regulation problems, such as erosion, boils, severe leakage, etc., at the R. L. Harris Project.

IV - WATERSHED CHARACTERISTICS

4-01. General Characteristics

a. ACT Basin. The head of the Coosa River is at Rome, Georgia at the confluence of the Etowah and Oostanaula Rivers. It flows west to the Alabama State line, then in a southwesterly then southerly direction for about 286 miles to join the Tallapoosa River near Wetumpka, Alabama. The Tallapoosa River forms in northwest Georgia about 40 miles west of Atlanta, Georgia. It flows in a southwesterly direction for about 195 miles into East Central Alabama and then westerly for about 40 miles to join the Coosa River to form the Alabama River. The Alabama River flows in a southwesterly direction about 310 miles where it joins the Tombigbee River to form the Mobile River. The Mobile River flows southerly about 45 miles where it empties into Mobile Bay at Mobile, Alabama, an estuary of the Gulf of Mexico. The entire ACT Basin with the Tallapoosa River Basin highlighted, and some of the other ACT projects are shown on Plate 2-1. The river mile and size of the drainage area above selected sites in the ACT Basin are shown on Table 4-1.

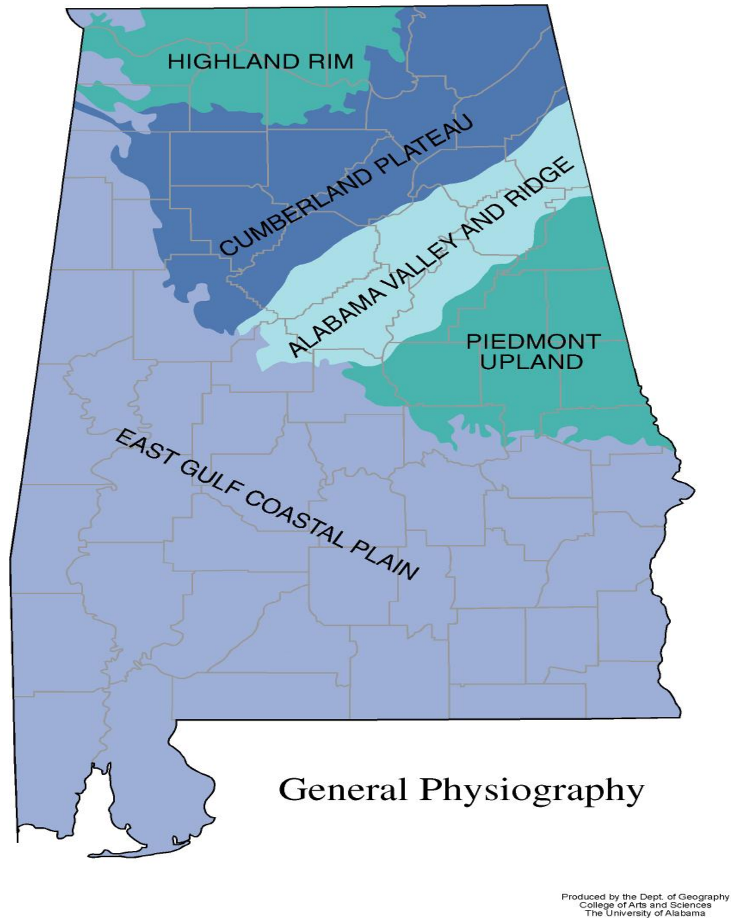
b. Tallapoosa River Basin. The Tallapoosa River Basin drains a total of 4,687 square miles of which 721 square miles are in Georgia and 3,966 square miles are in Alabama. The main river width varies from about 250 to over 700 feet with banks generally about 20 feet above the river bed. The total fall of the river is 1,144 feet in 268 miles, giving an average fall of about 4.3 feet per mile. The principal tributary streams are the Little Tallapoosa River and Sougahatchee, South Sandy, Uphapee, and Hillabee Creeks. The width of the drainage area of the basin ranges from approximately 30 miles to 50 miles.

c. Principal Tributaries and Structures of the Tallapoosa River. The principal tributaries of the Tallapoosa River are the Little Tallapoosa River and Sougahatchee, South Sandy, Crooked, Uphapee and Hillabee Creeks. The APC operates three additional hydropower projects on the Tallapoosa River; Martin, Yates and Thurlow Dams, all of which are located below R. L. Harris Dam.

Table 4-1. River Mile and Drainage Area for Selected Sites in ACT Basin

River Mile and Drainage Area for Important Sites in the ACT Basin				
River Mile above mouth of Mobile River	**River**	**Location**	**Drainage Area (sq mi)**	**Owner**
693	Etowah	Allatoona Dam	1,122	CORPS
645.2	Etowah	Mouth	1,861	
672	Coosawattee	Carters Dam	374	CORPS
645.2	Oostanaula	Mouth	2,150	
638.1	Coosa	Mayos Bar	4,040	
585.1	Coosa	Weiss Dam	5,270	APC
506.2	Coosa	H Neely Henry Dam	6,596	APC
457.4	Coosa	Logan Martin Dam	7,743	APC
410.2	Coosa	Lay Dam	9,053	APC
396.2	Coosa	Mitchell Dam	9,778	APC
378.3	Coosa	Jordan Dam	10,102	APC
497.4	Tallapoosa	R. L. Harris Dam	1,454	APC
420	Tallapoosa	Martin Dam	2,984	APC
412.1	Tallapoosa	Yates Dam	3,293	APC
409.1	Tallapoosa	Thurlow Dam	3,308	APC
281.2	Alabama	Robert F Henry Dam*	16,233	CORPS
178	Alabama	Millers Ferry Dam*	20,637	CORPS
117.5	Alabama	Claiborne Dam*	21,473	CORPS
* Navigation Lock at Project				
CORPS - Corps of Engineers; APC - Alabama Power Company				

4-02. Topography. The R. L. Harris Project is located in the Piedmont Upland physiographic province of the southern Appalachian Mountains (see Figure 4-1). The Piedmont Upland ecoregion is characterized by low, rolling hills in the north and broad rolling uplands in the south. Land surface altitudes range from 500 to 1,000 feet. Like the Blue Ridge, the Piedmont Upland is underlain by impervious metamorphic and igneous crystalline rocks. The regolith, composed of soils and saprolite, can be 10 to 150 feet depending on the differential weathering of the crystalline rocks. Groundwater is stored in the regolith and enters the crystalline rocks at fault zones. The ecoregion has a dissected upland with rounded interstream valleys with typically dendritic streams. The streams in the Piedmont Upland are fast flowing and are characterized by rapids and riffles, making them ideal for hydropower development.



The Piedmont Upland ecoregion is underlain by Precambrian and Paleozoic crystalline rocks, which include mica schist, felsic gneiss and schist, and granite and granite gneiss. Less extensive outcrops of quartzites are also present. The principal aquifers in the Piedmont Upland province are fracture-conduit aquifers in the bedrock, where water-bearing zones occur along geologic features such as lithologic contacts, joints, fractures, faults, folds, and veins.

4-03. Geology and Soils. Piedmont Upland soils are typically shallow and well drained, and water moves rapidly toward streams during precipitation events. The R. L. Harris Project area soils are dominantly Ultisols. This soil order, which covers the majority of the State of Alabama, has developed in forested, humid/high rainfall, subtropical conditions on old landscapes (*e.g.*, not glaciated or recently flooded). These soils are characterized by a surface soil that is often acidic and low in plant nutrients. The surface has a low base status (a measure of fertility) due to high rainfall weathering that has occurred over long time periods and parent materials low in base forming minerals. Although Ultisols are not as fertile as many other soil orders they do support abundant forest growth and respond well to management for agriculture.

4-04. Sediment. Significant sources of sediment within the basin are agricultural land erosion, dredging and mining activities, unpaved roads, sliviculture, and variation in land uses that result in conversion of forests to lawns or pastures. In general, the quantity and size of sediment transported by rivers is influenced by the presence of dams. Impoundments behind dams serve as sediment traps where particles settle in the lake headwaters because of slower flows. Large impoundments typically trap coarser particles plus some of the silt and clay. Often releases from dams scour or erode the streambed downstream. Ultisols dominate the Piedmont Upland ecoregion. They generally lack the original topsoil because of erosion during intensive cotton farming beginning in the 18th century.

Siltation studies by APC indicate that shoaling over the years is reduced because of increased vegetation in the basin. Siltation is the major source of impairment to meeting State water quality standards on the Tallapoosa River; however, the vast majority of the water bodies on the 2012 303(d) list of impaired waters are not within the Harris Project. Erosion studies indicate that sheet and rill erosion on cropland in Alabama fell by 17 percent from 1982 to 1997.

4-05. Climate. Chief factors that control the climate of the ACT Basin are its geographical position in the southern end of the temperate zone and its proximity to the Gulf of Mexico and South Atlantic Ocean. Another factor is the range in altitude from almost sea level at the southern end to higher than 3,000 feet in the Blue Ridge Mountains to the north. Frontal systems influence conditions throughout the year. During the warmer months, thunderstorms are a major producer of rainfall. Tropical disturbances and hurricanes also affect the region.

a. Temperature. The average annual temperature in the vicinity of the Harris watershed for the time period 1981-2010 is 61.9º F. Table 4-2 provides average, maximum and minimum monthly normal temperature data for six locations in or nearby the Harris watershed. Climatologists define a climatic normal as the arithmetic average of a climate element, such as temperature, over a prescribed 30-year time interval. The National Climatic Data Center (NCDC) uses a homogenous and complete dataset with no changes to the collection site or missing values to determine the 30-year normal values. When developing this 30-year normal dataset, the NCDC has standard methods available to them to make adjustments to the dataset for any inhomogeneities or missing data before computing normal values. Extreme temperatures recorded in the mid-ACT Basin range from 108º to -18º F. Both extremes occurred at Valley Head, Alabama. An interactive map showing the location of these stations and others is shown at:
http://www.sercc.com/climateinfo/historical/historical.html.

Table 4-3 shows the extreme temperatures for four stations within the middle ACT Basin. The maximum and minimum recorded temperatures for each month are shown. These stations are Gadsden, Childersburg, and Valley Head in Alabama, and Calhoun Experiment Station in Georgia.

b. Precipitation. Due to the topographic lift of the Blue Ridge Mountains, the upland slopes are subject to intense local storms and to general storms of heavy rainfall lasting days. Heavy rains may occur at any time during the year, but are most frequent between late fall and mid-spring, when the majority of the large floods in the basin have been recorded. The large flood of March 1990 occurred when a storm front extended from Mobile, Alabama, to Montgomery, Alabama, to Rome, Georgia, and subtropical moisture was continuously drawn along the line producing an extended period of heavy rain. The normal monthly and annual precipitation in and around the Harris watershed is shown on Table 4-4. This is based on the arithmetical mean of the normals at six stations. These stations are the same as the temperature stations. About 40 percent of the normal annual precipitation occurs from January through April, while only about 30 percent occurs during the dry period August through November. The average annual snowfall is three to five inches, usually in January and February, but is of minor importance in producing runoff.

The maximum annual rainfall recorded in the mid-ACT Basin was 80.88 inches at Wadley, Alabama in 1975 while the lowest was 32.72 inches recorded at Carrollton, Georgia in 1954.

The maximum basin average rainfall of 73.22 inches occurred in 1975 while the minimum of 33.96 inches occurred in 1954.

Flood-producing storms can occur over the basin at any time, but they are much more frequent in the winter and early spring. Major storms in the winter are usually of the frontal type. Summer storms consist mainly of convective thundershowers with occasional tropical storms affecting southern sections of the basin.

Table 4-2. Monthly Temperatures for Various Locations in Middle ACT Basin

NORMAL MONTHLY TEMPERATURE (ºF) FOR MIDDLE ACT BASIN (MAX & MIN), 1981-2010														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
WEST POINT, GA	MAX	53.5	57.8	65.7	73.0	80.3	86.7	89.2	88.1	83.0	73.7	65.3	55.9	72.8
USC00099291	MIN	32.1	35.2	41.5	48.0	57.5	65.7	69.7	69.1	62.7	50.9	41.8	34.6	50.8
	AVG	42.8	46.5	53.6	60.5	68.9	76.2	79.4	78.6	72.9	62.3	53.5	45.3	61.8
CARROLLTON, GA	MAX	51.3	56.0	64.0	71.9	79.0	85.3	87.6	86.7	81.0	71.9	63.2	53.5	71.0
USC00091640	MIN	29.4	32.9	38.5	46.5	55.2	63.4	67.3	67.0	59.9	47.9	38.8	32.0	48.3
	AVG	40.4	44.4	51.2	59.2	67.1	74.4	77.4	76.9	70.4	59.9	51.0	42.7	59.7
BANKHEAD LOCK & DAM, AL	MAX	53.2	57.9	66.0	74.1	81.2	88.2	91.0	90.7	85.4	75.4	65.6	55.5	73.8
USC00010505	MIN	32.3	36.2	41.9	48.7	58.3	66.5	70.3	69.7	63.3	51.6	42.6	35.4	51.5
	AVG	42.8	47.0	54.0	61.4	69.8	77.4	80.6	80.2	74.3	63.5	54.1	45.4	62.6
TUSCALOOSA ACFD, AL	MAX	56.3	61.2	69.7	77.2	84.1	90.2	92.7	92.6	87.7	77.7	67.7	58.2	76.3
USC00018380	MIN	34.9	38.4	45.1	51.6	61.0	68.5	72.1	71.6	65.3	53.5	44.1	37.3	53.7
	AVG	45.6	49.8	57.4	64.4	72.5	79.3	82.4	82.1	76.5	65.6	55.9	47.8	65.0
CENTRE, AL	MAX	50.7	55.3	64.7	73.2	80.4	87.1	90.3	89.6	84.1	73.9	63.6	52.7	72.2
USC00011490	MIN	27.9	30.5	37.5	44.9	53.6	62.8	66.8	66.1	59.4	47.1	37.7	30.3	47.1
	AVG	39.3	42.9	51.1	59.1	67.0	75.0	78.6	77.9	71.8	60.5	50.7	41.5	59.7
BESSEMER 3 WSW, AL	MAX	53.6	58.4	66.7	74.6	81.5	88.0	90.9	90.8	85.3	75.1	65.2	55.7	73.9
USC00010764	MIN	32.9	36.1	42.3	49.3	59.1	66.2	70.1	69.3	62.9	51.6	42.2	35.2	51.5
	AVG	43.2	47.2	54.5	61.9	70.3	77.1	80.5	80.1	74.1	63.3	53.7	45.5	62.7
BASIN AVG	MAX	53.1	57.8	66.1	74.0	81.1	87.6	90.3	89.8	84.4	74.6	65.1	55.3	73.3
BASIN AVG	MIN	31.3	34.9	41.1	48.2	57.5	65.5	69.4	68.8	62.3	50.4	41.2	34.1	50.5
BASIN AVG	AVG	42.4	46.3	53.6	61.1	69.3	76.6	79.8	79.3	73.3	62.5	53.2	44.7	61.9

Table 4-3. Extreme Temperatures Within Middle ACT Basin

Extreme Temperatures (ºF) Within Middle ACT Basin								
Month	Station:(013151) GADSDEN		Station:(011620) CHILDERSBURG WATER PLAN		Station:(018469) VALLEY HEAD		Station:(091474) CALHOUN EXPERIMENT STN	
	High	Low	High	Low	High	Low	High	Low
Period	1893 To 1968		1957 To 2009		1893 To 2009		1953 To 1997	
January	80	-4	81	-4	79	-15	76	-10
February	91	-13	85	4	80	-18	80	-7
March	93	6	89	7	90	2	86	4
April	94	24	93	23	92	19	91	22
May	101	34	97	33	100	29	97	33
June	108	44	102	41	104	35	103	40
July	108	50	105	51	106	45	105	50
August	106	49	104	49	105	45	104	47
September	108	34	100	34	104	29	102	32
October	99	25	93	22	98	19	95	20
November	87	4	88	14	90	-2	85	12
December	82	5	83	2	85	-8	77	-2

Table 4-4. Normal Rainfall (inches) Based on 30-Year Period – 1981 Through 2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
WEST POINT, GA USC00099291	4.45	4.82	5.36	3.94	3.12	3.96	4.98	3.77	3.36	3.03	4.48	4.81	50.08
CARROLLTON, GA USC00091640	4.65	5.20	5.25	3.92	4.08	3.78	4.88	3.43	3.62	3.55	4.55	4.48	51.39
BANKHEAD LOCK & DAM, AL USC00010505	5.99	5.68	5.69	4.58	4.67	5.07	5.57	4.05	4.01	4.15	5.17	5.21	59.84
TUSCALOOSA ACFD, AL USC00018380	5.37	5.61	4.84	4.32	4.14	4.50	5.10	3.76	3.56	3.80	5.21	4.74	54.95
CENTRE, AL USC00011490	5.21	5.26	5.26	4.27	4.34	4.34	4.74	4.41	3.73	3.39	4.48	4.67	54.10
BESSEMER 3 WSW, AL USC00010764	5.53	5.15	5.61	4.62	5.04	4.51	5.07	3.72	3.85	3.74	5.08	5.20	57.12
BASIN AVG	5.19	5.15	6.10	4.90	4.18	4.16	5.28	3.95	3.63	2.84	4.07	4.93	54.58

Extreme rainfall events for three stations within the middle ACT Basin are shown on Table 4-5. Gadsden and Valley Head, Alabama, and Rome, Georgia, are shown with the monthly maximum and minimum values. Also shown is the one-day maximum rainfall for each location.

Table 4-5. Extreme Rainfall Events (inches), Period of Record

	Station:(013151)			Station:(018469)			Station:(097600)		
	GADSDEN			VALLEY HEAD			ROME		
	Monthly Maximum	Monthly Minimum	1 Day Maximum	Monthly Maximum	Monthly Minimum	1 Day Maximum	Monthly Maximum	Monthly Minimum	1 Day Maximum
Period	1893 To 1968			1893 To 2009			1893 To 2009		
January	13.95	1.40	5.60	12.05	1.70	5.00	12.42	0.85	4.65
February	14.10	0.71	4.86	14.73	0.74	7.39	13.45	0.74	5.30
March	12.87	1.26	6.65	15.87	0.89	4.78	17.98	1.07	6.22
April	11.84	0.06	4.57	11.40	0.58	5.15	13.60	0.30	4.30
May	8.59	0.00	4.69	11.27	0.12	4.19	11.33	0.22	2.99
June	9.09	0.43	2.75	12.47	0.54	3.60	10.85	0.23	3.31
July	17.57	0.69	4.88	12.50	0.66	4.52	14.76	0.87	4.05
August	10.44	0.56	3.12	13.80	0.00	8.05	14.54	0.49	4.92
September	10.30	0.00	3.36	11.02	0.00	8.06	11.33	0.00	4.95
October	13.43	0.00	4.98	9.91	0.00	6.02	10.37	0.00	6.67
November	20.03	0.03	4.60	11.72	0.51	4.72	16.26	0.36	5.58
December	14.13	0.57	8.38	13.67	0.77	4.28	16.47	0.58	5.96

4-06. Storms and Floods. Flood producing storms may occur over the Tallapoosa River Basin at anytime but are more frequent during the winter and spring. Major storms in the winter are usually of the frontal type, which persist for several days and cover large areas. Summer thunderstorms are typically non-frontal convective type events that are normally short and intense, and usually cover small areas. In addition, during the summer and fall, tropical weather systems occasionally pass through the area and can produce major rainfall events over a period of several days. Gage records for the “Tallapoosa River near Heflin” gage (USGS gage 02412000) near Heflin, Alabama, approximately 59 miles upstream of the dam, are available from July 1952 to the present. The USGS gage “Tallapoosa River at Wadley” (02414500), at Wadley, Alabama is approximately 14 miles below the R. L. Harris Dam. Daily flow data at Wadley is available from 1 October 1923 through the present. The gage is used in determination of minimum flow requirements in the Tallapoosa River. Flow hydrographs at Wadley are shown from 1923 to 2012 on Plates 4-1 to 4-9. Mean monthly and average flows at this site are also presented on Plates 4-10 and 4-12. The rating curve at the gage is shown on Plate 4-13. Inflow and discharge records from 1983 to December 2012 at R. L. Harris Dam are shown on Plates 4-14 to 4-17. The tailwater rating curve for Harris Dam is shown on Plate 4-18.

A major storm system in the spring of 1990 produced record floods on the Alabama River. On 16 March 1990, with the river still high from previous rains, the entire basin received very heavy rainfall for two days. The Rock Mills, Alabama gage reported 5.3 inches for the one-day total. A flow of 60,100 cfs was recorded at the USGS Wadley gage. The greatest one-day precipitation at Rock Mills of 7 inches was recorded in February 1961. Plate 4-19 shows the pool elevation, inflow, and discharge for the March 1990 flood.

After a summer with very little rain, heavy rains from Hurricane Opal brought flash flooding to parts of Alabama and the Tallapoosa River Basins. Hurricane Opal made landfall as a marginal Category 3 hurricane near Pensacola, FL on Oct 4, 1995 and moved inland resulting in rainfall totals from 5 to 10 inches over portions of the Florida panhandle, Alabama and Georgia. Plate 4-20 shows the pool elevation, inflow, and discharge for the October 1995 flood.

In 2003, a storm over the basin produced a one day rainfall total of 6.3 inches at the Rock Mills gage. The corresponding flow at Wadley was recorded at 103,000 cfs (37.30 feet stage at gage). The largest flood recorded at the dam since construction is the flood of 2003. Plate 4-21 shows the pool elevation, inflow, and discharge for the May 2003 flood.

4-07. Runoff Characteristics. In the ACT Basin, rainfall occurs throughout the year but is less abundant from August through November. Only a portion of rainfall actually runs into local streams to form the major rivers. Factors that determine the percent of rainfall entering streams include the intensity of the rain, antecedent conditions, ground cover and time of year (plants growing or dormant). Intense storms will have high runoff potential regardless of other conditions while a slow rain can produce little measurable runoff. The annual runoff in the vicinity of the dam is about 21 inches or about 38 percent of the annual rainfall. Runoff is usually high during the winter and spring and relatively low during the summer and early fall. Ice and snow are somewhat common but have little effect on runoff.

4-08. Water Quality. Alabama Department of Environmental Management (ADEM) has designated various portions of R. L. Harris Lake with 'use classifications' of *swimming and other whole body water-contact sports*, and *fish and wildlife*. The lake meets all designated water use criteria established by the state of Alabama. Various portions of the Tallapoosa River above the lake have designated 'use classifications' of *outstanding Alabama waters*, *public water supply*, and *fish and wildlife*. Georgia sections of the Tallapoosa River and Little Tallapoosa River have been designated 'use classifications' of *drinking water* and *secondary trout waters* by the Georgia Environmental Protection Division. Tallapoosa River below R. L. Harris Dam has been designated 'use classification' of *fish and wildlife*, in accordance with Alabama Water Quality Control laws. Both Alabama and Georgia have promulgated water quality criteria with specific criteria related to the use classifications.

Total maximum daily loads (TMDLs) have been identified for various portions of the Tallapoosa and Little Tallapoosa Rivers. In the Alabama portion of the rivers, TMDLs for pathogens and siltation have been proposed. In Georgia, TMDLs have been finalized for fecal coliforms, and sedimentation for sections of the Tallapoosa and Little Tallapoosa Rivers. Several of the most important water quality parameters are discussed below.

a. <u>Dissolved Oxygen</u>: Alabama's water quality criteria regulations (ADEM Admin. Code R. 335-6-10-.09) states the following for segments designated with use classifications of Swimming, Fish and Wildlife and Public Water Supply:

> *For a diversified warm water biota, including game fish, daily dissolved oxygen concentrations shall not be less than 5.0 milligrams per liter (mg/l) at all times; except under extreme conditions due to natural causes, it may range between 5.0 mg/l and 4 mg/l, provided that the water quality is favorable in all other parameters. The normal seasonal and daily fluctuations shall be maintained above these levels. In no event shall the dissolved oxygen level be less than 4 mg/l due to discharges from existing hydroelectric generation impoundments. All new hydroelectric generation impoundments, including addition of new hydroelectric generation units to existing impoundments, shall be designed so that the discharge will contain at least 5.0 mg/l dissolved oxygen where practicable and technologically possible. The Environmental Protection Agency, in cooperation with the State of Alabama and parties responsible for impoundments, shall develop a program to improve the design of existing facilities.*

> *The dissolved oxygen criterion is established at a depth of 5 feet in water 10 feet or greater in depth; for those waters less than 10 feet in depth, the dissolved oxygen criterion is applied at mid-depth. Levels of organic materials may not deplete the daily dissolved oxygen concentration below this level, nor may nutrient loads result in algal growth and decay that violates the dissolved oxygen criterion.*

For segments classified as *outstanding Alabama water*, the dissolved oxygen standard is at least 5.5 mg/l at all times with no less than 4 mg/l under extreme conditions from natural causes.

The Georgia dissolved oxygen standard for waters classified as *drinking water* is a daily average greater or equal to 5 mg/l and no less than 4 mg/l at all times. For waters classified as *secondary trout waters*, the dissolved oxygen standard is a daily average greater or equal to 6 mg/l and no less than 5 mg/l at all times.

In-lake water quality data collected by Alabama Department of Environmental Management (ADEM) and the Lake Wedowee Property Owners Association (Lake Wedowee is a local name for R. L. Harris Lake) indicate near saturated levels of dissolved oxygen in the epilimnion (upper portion of the water column) and reduced or near anoxic dissolved oxygen levels in the hypolimnion (lower portion of the water column) in the summertime. This is due to thermal stratification which occurs in relatively deep, lakes in the southeast during the summertime and is described further in paragraph 4.08.c. below. In the wintertime, the lake is completely mixed vertically (destratified) and high levels of dissolved oxygen occur throughout the water column.

b. Nutrients: R. L. Harris Lake is currently classified as mesotrophic, which indicates an intermediate level of productivity, greater than oligotrophic lakes, but less than eutrophic lakes. A mesotrophic lake is commonly clear with beds of submerged aquatic plants and medium levels of nutrients. R. L. Harris Lake was classified as eutrophic in the mid 1990's and early 2000's, but since 2005, nutrients and chlorophyll *a* levels have dropped to mesotrophic levels.

In 2001, ADEM established a lake nutrient standard (measured by concentration levels of chlorophyll *a,* a surrogate measure of algal biomass) for R. L. Harris Lake during the growing season (April – October) of an average of less than 10 micrograms per liter (µg/l) of chlorophyll *a* or an average of less than 12 *ug/l* if measured immediately upstream of the Tallapoosa River, Little Tallapoosa River confluence.

c. Lake Stratification. During the colder winter months, the water in R. L. Harris Lake is generally cold, relatively clear, and the same temperature from the top to the bottom. Water on the top and bottom of the reservoir has similar densities. Wind action keeps the lake well mixed, resulting in adequate dissolved oxygen levels throughout the water column. During winter-time, water temperature and oxygen concentrations do not limit fish movement in the lake. Lake water, which is released through the hydropower units from near the bottom of the lake into the Tallapoosa River below the dam, is cold, oxygenated, and relatively clear.

During spring and early summer, the lake warms and stratifies into three distinct layers: a surface layer called the epilimnion, a bottom layer called the hypolimnion, and a transition layer between the two called the metalimnion, or the thermocline. Figure 4-2 shows the summer stratification layers.

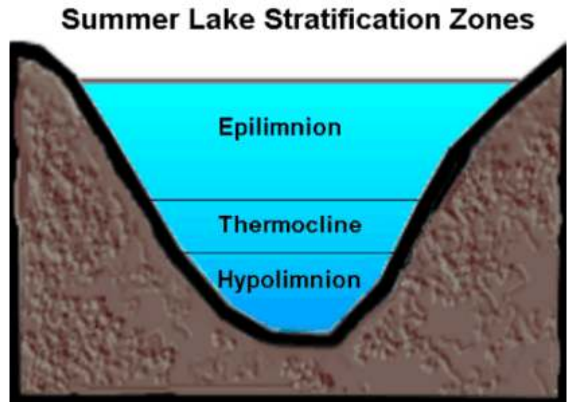


Figure 4-2. Lake Stratification

The warm, upper layer is fairly uniform in temperature and varies from 15 to 30 feet thick throughout the summer. It is well oxygenated from wind action and photosynthesis.

The hypolimnion, the cold (45 to 55 °F) bottom layer, becomes isolated and no longer mixes with the warm, oxygenated epilimnion. Oxygen is not produced in the hypolimnion because the cold, deep layer does not receive sunlight and is devoid of phytoplankton production. Early in the lake stratification process, the hypolimnion still contains some oxygen but declines through the summer as biological and chemical processes consume oxygen. By summer's end, the lake is strongly stratified. The epilimnion is warm and well oxygenated. Water temperature and oxygen concentrations in the thermocline are both lower but still often provide acceptable habitat for cool-water fish species. In the hypolimnion, the water is cold and low in oxygen (less than 3 mg/l). As oxygen levels fall, some metals and sulfides in the lake sediments become soluble. They dissolve in the water and can be released downstream, entering the river. The river water becomes re-aerated rapidly as it flows downstream, thus releasing the metals and sulfides that have become soluble.

In the fall, the lake begins to lose heat, and the process of destratification begins. The warm water of the epilimnion cools and becomes deeper and denser. As the epilimnion's density approaches the density of the hypolimnion, mixing of the layers occurs and the stratification is broken. This event is called *lake turnover*, and generally occurs around November - December each year. After mixing, no layers exist, and the entire lake has a relatively uniform temperature and oxygen levels.

d. Downstream Water Quality Conditions. Water quality conditions in the releases from R. L. Harris Dam are typical for hydropower projects in the southeast; i.e., cold water year-round with low dissolved oxygen levels during summer-time lake stratification periods and high dissolved oxygen levels during winter-time lake destratification periods. Turbidity is relatively low year-round. The potential for sediment release of solubilized metals occurs during lake stratification periods when the hypolimnion reaches anoxic conditions. The water use classification established by the State of Alabama for the Tallapoosa River below R. L. Harris Dam is *fish and wildlife*, with corresponding water quality standards as described in Paragraph 4-08.a.

4-09. Channel and Floodway Characteristics. There are no major damage centers between R. L .Harris and Martin Dam downstream. However, information on the historical high and low stages at the Wadley Gage (USGS #02414500), 15 miles downstream of Harris Dam, is shown in Table 4-6. Table 4-7 provides details for river stages and flood damages at Wadley, Alabama. Flooding during a potential dam failure is addressed in Chapter 9.

Table 4-6
Historical Crests for Tallapoosa River at Wadley, AL, USGS #02414500
(1) 37.30 ft on 05/08/2003 (2) 30.57 ft on 04/14/1979 (3) 27.90 ft on 02/05/1936 (4) 27.90 ft on 03/16/1976 (5) 26.72 ft on 03/17/1990 (6) 25.83 ft on 05/01/1963 (7) 25.62 ft on 03/30/1977 (8) 25.35 ft on 02/25/1961 (9) 24.30 ft on 01/07/1946 (10) 24.00 ft on 03/20/1970
Low Water Records
(1) 2.00 ft on 10/02/1954

Table 4-7. Flood Impacts at Wadley, Alabama
(15 miles downstream of Harris Dam, USGS# 02414500)

Stages (feet)	Impacts
35	The east end of the Highway 22 bridge begins to flood. Water reaches the store/gas station on Highway 22 just west of town.
30	Major Flood Stage is reached and some flooding of businesses occur in the Wadley area, including Plantation Patterns.
20	Moderate Flood Stage is reached and some flooding occurs in lower lying areas around Wadley. Between 22 and 25 feet, the bridge over Beaverdam Creek floods..
13	Flood Stage is reached with flooding of pasture lands in the area.

4-10. Upstream Structures. There are no federal or APC projects located on the Tallapoosa River above the R. L. Harris Dam and Lake Project.

4-11. Downstream Structures. The APC projects downstream of the R. L. Harris Project include Martin, Yates, and Thurlow Dams. Below those, on the Alabama River, are three federal projects, Robert F. Henry, Millers Ferry, and Claiborne Locks and Dams. Locations of these projects are shown on Plate 2-1.

The existing upstream and downstream Federal and APC projects and the drainage areas above them are shown on Table 4-8 below.

Table 4-8. Federal and APC Projects on the ACT

Agency	Alabama River Projects	Drainage Area (sq mi)
CORPS	Claiborne	21,473
CORPS	Millers Ferry	20,637
CORPS	R.F. Henry	16,233
	Coosa River Projects	
APC	Jordan/Bouldin*	10,102
APC	Mitchell	9,778
APC	Lay	9,053
APC	Logan Martin	7,743
APC	Henry	6,596
APC	Weiss	5,270
CORPS	Allatoona	1,122
CORPS	Carters	374
	Tallapoosa Projects	
APC	Thurlow	3,308
APC	Yates	3,293
APC	Martin	2,984
APC	Harris	1,454

* Jordan and Bouldin Dams share the same drainage area and reservoir

V - DATA COLLECTION AND COMMUNICATION NETWORKS

5-01. Hydrometeorological Stations. Management of water resources requires continuous, real-time knowledge of hydrologic conditions. Both the APC and the Corps collect and maintain records of hydrologic data and other information in connection with the operation of projects in the Coosa River Basin. Since the data collected by the APC are needed by the Corps in carrying out its responsibility of monitoring the flood control operations of the H. Neely Henry Project, and the data collected by the Corps supplements that being collected by the APC and is of value to them in planning their project operations, it is important that each agency furnish the other with such of its hydrologic and operating data as may be needed or found beneficial in its operation. This requires that communications facilities be available between the Mobile District Office of the Corps of Engineers and Reservoir Management. The USGS and National Weather Service (NWS), in cooperation with the APC, the Corps, and other federal and state agencies, maintain a network of real-time gaging stations throughout the ACT Basin..

a. Facilities APC's Hydrologic Data Acquisition System (HDAS) is a combination of over 100 rain, stage, and evaporation gages located in the river basins where APC dams and reservoirs are located. The largest majority of these gages are owned and operated by APC. APC also utilizes data from relevant USGS gages. The rainfall gages and river gages are equipped with data collecting platforms that store data on site and transmit to orbiting satellites. The stations continuously collect various types of data including stage, flow, and precipitation. All the rainfall, reservoir, and river stage reporting gages regularly used by the Corps and APC in the ACT Basin, including the Tallapoosa River Basin above R. L. Harris Dam, are shown on Plate 5-1. Figure 5-1 shows a typical encoder with wheel tape housed in a stilling well used for measuring river stage or lake elevation. Figure 5-2 shows a typical precipitation station, with rain gage, solar panel, and Geostationary Operational Environmental Satellite (GOES) antenna for transmission of data.

Figure 5-1. Encoder with Wheel Tape for Measuring the River Stage or Lake Elevation in the Stilling Well

Figure 5-2. Typical Field Installation of a Precipitation Gage

All rainfall gages equipped as data collecting platforms are capable of being part of the reporting network. Data are available from many stations in and adjacent to the ACT Basin. For operation of the R. L. Harris Project, APC operates the HDAS that delivers real time rainfall and river stage data through SouthernLINC packet data radios and dedicated network connections. The rainfall stations APC uses to operate the facility are listed in Table 5-1. The sites in the vicinity of R. L. Harris are shown on Plate 5-1, along with other gage locations.

Table 5-1. Rainfall Reporting Network for the Tallapoosa River Basin Above R. L. Harris Dam

Rainfall Reporting Network	
River Basin	**Station**
Little Tallapoosa	Villa Rica, GA
Little Tallapoosa	Carrollton, GA
Tallapoosa	Bremen, GA
Tallapoosa	Heflin, AL
Little Tallapoosa	Newell, AL
Tallapoosa	Harris Dam, AL

All river stage gages equipped as data collecting platforms are also capable of being part of the reporting network. Data are available from many stations in and adjacent to the ACT Basin. The river stage reporting network gages used for operation of the R. L. Harris Dam are shown in the Table 5-2 below. The locations of river stage stations are shown on Plate 5-1.

Table 5-2. River Stage Reporting Network for R. L. Harris Dam

River Reporting Network			
River	**Station**	**River Miles above Mouth**	**Drainage Area (sq miles)**
Tallapoosa	Tallapoosa River near Heflin, AL; USGS # 02412000	186.8	448
Little Tallapoosa	Little Tallapoosa River near Newell, AL; USGS # 02413300		406

Data are collected at sites throughout the ACT Basin through a variety of sources and integrated into one verified and validated central database. The basis for automated data collection at a gage location is the Data Collection Platform. The Data Collection Platform is a computer microprocessor at the gage site. A Data Collection Platform has the capability to interrogate sensors at regular intervals to obtain real-time information (e.g., river stage, reservoir elevation, water and air temperature, precipitation). The Data Collection Platform then saves the information, performs simple analysis of it, and then transmits the information to a fixed geostationary satellite. Data Collection Platforms transmit real-time data at regular intervals to the GOES System operated by the National Oceanic and Atmospheric Administration (NOAA). The GOES Satellite's Data Collection System sends the data directly down to the NOAA Satellite and Information Service in Wallops Island, Virginia. The data are then rebroadcast over a domestic communications satellite (DOMSAT). The Mobile District Water Management Section operates and maintains a Local Readout Ground System (LRGS) that collects the Data Collection Platform-transmitted, real-time data from the DOMSAT. Figure 5-3 depicts a typical schematic of how the system operates.

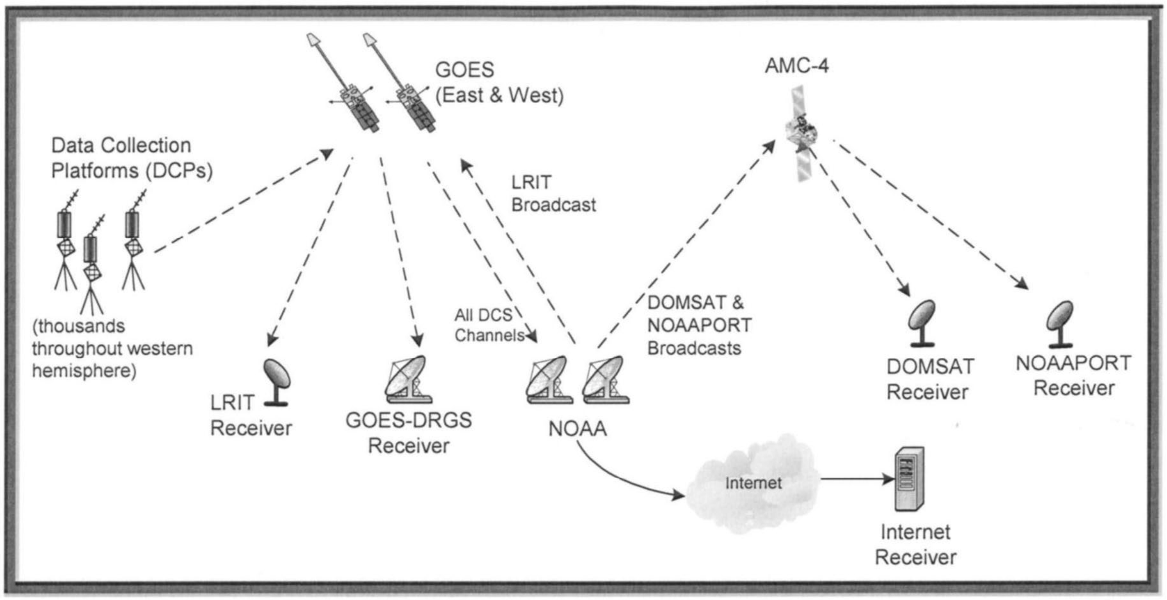


Figure 5-3. Typical configuration of the GOES System

b. Reporting. Central to APC hydro operations, monitoring, and reporting network is the Hydro Optimization Management System (HOMS). HOMS is a complex and dynamic system of data collection, analysis, and management tools, and includes an arrangement of hydrologic and flow monitoring systems and tools as well. HOMS exists for the purpose of real time monitoring, and as a decision tool and support for computer applications related to the operation of Alabama Power's 14 hydroelectric facilities located within the Coosa, Tallapoosa and Black Warrior River Basins.

The Corps operates and maintains a Water Control Data System (WCDS) for the Mobile District that integrates large volumes of hydrometeorological and project data so the basin can be regulated to meet the operational objectives of the system. The WCDS, in combination with the new Corps Water Management System (CWMS), together automate and integrate data acquisition, data management, and data dissemination.

c. Maintenance. Maintenance of data reporting equipment in the Tallapoosa River Basin near R. L. Harris Dam is a cooperative effort among the USGS, NWS, Corps, and APC.

If gages appear to be out of service, the following agencies can be contacted for repair:

USGS Georgia Water Science Center, 3039 Amwiler Road, Suite 130, Atlanta, GA 30022-5803
Phone: (770) 903-9100 Web: http://ga.water.usgs.gov

USGS Alabama Water Science Center, 75 Technacenter Drive, Montgomery, AL 36117
Phone: (334) 395-4120 Web: http://al.water.usgs.gov

NWS Southern Region, 819 Taylor Street, Room 10E09, Fort Worth, TX 76102
Phone: (817) 978-1100 Web: http://www.srh.noaa.gov/

U.S. Army Corps of Engineers, Mobile District, 109 Saint Joseph Street, Mobile, AL 36602-3630
Phone: (251) 690-2730 Web: http://www.sam.usace.army.mil/water/

5-02. Water Quality Stations. Water quality measurements are made at 14 USGS gaging stations within the Alabama River Basin. The data for these stations can be obtained from the USGS yearly publication, *Water Resources Data Alabama* and *Water Resources Data Georgia.*

5-03. Recording Hydrologic Data. At Harris Dam, the plant control system is equipped with one or more programmable logic controllers (PLC). The PLC receives data from various inputs from the dam then a server located at the Alabama Power's corporate headquarters polls the plant PLC for data. Additional data essential to HOMS is collected through HDAS, a combination of over 100 rain, stage, and evaporation gages located in the river basins where Alabama Power dams and reservoirs are located. The largest majority of these gages are owned and operated by Alabama Power. Where physically practical, Alabama Power pulls data from adjacent USGS rain and stage gages to enhance the viability of the overall HDAS. All data collected in the field is transmitted either via Alabama Power's dedicated network connections, where available, or the SouthernLINC Wireless radio network. Data is stored on servers located at the Alabama Power Corporate Headquarters.

Data collected from the various sources are then rendered into web and desktop applications to monitor operations and activities at the Alabama Power hydro facilities. These applications are provided to the Power System Coordinator (PSC) at the Alabama Control Center Hydro Desk (ACC or Hydro Desk) to monitor the operations and activities at hydropower facilities 24 hours per day, seven days per week.

Most reservoir data are transmitted in hourly increments for inclusion in daily log sheets that are retained indefinitely. Gage data are transmitted in increments of 15 minutes, one hour, or other intervals. Reservoir data are examined and recorded in water control models every morning (or other times when needed). The data are automatically transferred to forecast models.

Automated timed processes also provide provisional real-time data needed for support of real-time operational decisions. Interagency data exchange has been implemented with the USGS and NWS Southeast River Forecast Center (SERFC). A direct link to SERFC is maintained to provide real-time products generated by NWS offices. Information includes weather and flood forecasts and warnings, tropical storm information, NEXRAD radar rainfall, graphical weather maps and more. Likewise, a direct link to USGS gages in the field allows for direct downloading of USGS data to Corps databases.

5-04. Communications

a. Regulating Office With Project Office. Direct communication between the APC and R. L. Harris Dam is provided by the company's SouthernLINC network telephone and email. The power plant at R. L. Harris Dam is operated by remote control from the Reservoir Management Section located in Birmingham, Alabama. Personnel are available but not always on duty at the dam.

b. Between Project Office and Others. The Water Management Section communicates daily with the NWS and APC's Reservoir Management section to exchange data and forecasting information. Data exchange is normally accomplished by electronic transmission to the Mobile District server and is supplemented by telephone and facsimile when necessary. The Water Management Section also has a computer link with the NWS's AWIPS (Advanced Weather Interactive Processing System) communication system via the River Forecast Center in Atlanta, Georgia. The Water Management Section uses a telephone auto-answer recorded message to provide daily information to the public. Water resources information for the R. L.

Harris Project is available to the public at the Corps' website, http://www.sam.usace.army.mil/water/. The site contains real-time information, historical data and general information. Information for the R. L. Harris Lake is also provided by the APC at https://lakes.alabamapower.com.

Emergency communication for the Corps and APC personnel during non-duty hours is available at the numbers found on the emergency contact information list located in Exhibit E.

The United States Geological Survey operates numerous stage and rain gages in the Tallapoosa River basin near Harris Dam which are funded by both the Corps and APC. These measurements are reported through the GOES system and are available to both APC and the Corps on the USGS web site.

5-05. Project Reporting Instructions. Communications for exchange of data between the Corps Water Management Section and APC's Reservoir Management and ACC Hydro Desk will normally be accomplished by electronic transmission to the Corps' WCDS server. The APC provides the Corps with hourly and daily reservoir data for all of their ACT projects. This includes reservoir pool and tailwater elevations, inflows, discharges and precipitation. APC also provides 7-day discharge forecasts for each project. The hourly data is transmitted and stored in the Corps database once every hour, 24 hours a day. Daily data, including the 7-day forecast for each project, is provided once a day around 0800 hours, and includes both midnight and 0600 hours data for the APC projects.

In addition to automated data, project operators maintain record logs of gate position, water elevation, and other relevant hydrological information including inflow and discharge. This information is stored by the APC and the Corps Water Management Section. Unforeseen or emergency conditions at the project that require unscheduled manipulations of the reservoir should be reported to the Corps Water Management Section as soon as possible.

If the automatic data collection and transfer are not working, operators will, upon request, fax or email daily or hourly project data to the Water Management Section for manual input into the database.

5-06. Warnings. During floods, dangerous flow conditions, or other emergencies, the proper authorities and the public must be informed. In general, flood warnings are coupled with river forecasting. The NWS has the legal responsibility for issuing flood forecast to the public, and will have the lead role for disseminating the information. For emergencies involving the R. L. Harris Project, the Reservoir Management Section will begin notifications of local law enforcement, government officials, and emergency management agencies in accordance with APC's Emergency Action Plan for Harris Dam.

5-07. Role of Regulating Office. Regulating authority for the R. L. Harris Project is shared between APC, FERC, and the Corps in accordance with the MOU that was adopted by APC and the Corps prior to the completion of the project. The purpose of the MOU is to clarify the responsibilities of the two agencies with regard to the operation of the project for flood risk management and navigation support and to provide direction for the orderly exchange of hydrologic data. The Water Management Section of the Mobile District Office is responsible for developing operating procedures for flood conditions and to prepare water control manuals, such as this one, that describe water management regulation for flood risk management and navigation support at the project. These water control manuals are regularly reviewed and updated as needed.

VI - HYDROLOGIC FORECASTS

6-01. General. Obtaining forecasts for the operation of the R. L. Harris Dam is the responsibility of the APC. The APC, the NWS, and the Corps exchange data daily to provide quality forecasts on inflows, headwater elevations, tailwater elevations and river stages.

a. Role of the Corps. The Corps Water Management Section obtains flow estimates for the APC projects on a daily basis. Sub-daily updates are obtained as necessary. The Water Management Section considers these inflows, local flows, current pool levels, and discharge requirements in scheduling releases from downstream federal projects on the Alabama River. The Water Management Section maintains records of precipitation, river stages, reservoir elevations and general stream-flow conditions throughout the Mobile District, with special emphasis on the areas affecting or affected by reservoir operation. The Water Management Section performs the following duties in connection with the operation of the R. L. Harris Project:

(1) Maintains liaison with personnel of APC Reservoir Management for the daily exchange of hydrologic data.

(2) Maintains records of rainfall and river stages for the Coosa River Basin, and records of pool level and outflow at R. L. Harris Dam and other impoundments in the basin.

(3) Monitors operation of the power plant and spillway at R. L. Harris Dam for compliance with the regulation schedule for flood control operation.

(4) Transmits to APC Reservoir Management any instructions for special operations which may be required due to unusual flood conditions. (Except in emergencies where time does not permit, these instructions will first be cleared with the Chief of Engineering Division.)

(5) Evaluates special water control plan variance requests submitted by APC Reservoir Management and provides approval or disapproval.

The Water Management Section maintains close liaison with the NWS's River Forecast Center in Peachtree City, Georgia, and their Birmingham, Alabama, offices at all times to receive forecast and other data as needed. A mutual exchange of information increases the forecasting capability of the NWS at NWS river stations which may be affected by operations at Corps projects.

b. Role of Alabama Power Company. The flood control regulation schedule that has been adopted is based on current reservoir level and inflows or forecasts of inflow. The APC has developed a computer model of the river system that utilizes rainfall and river gage stations located strategically throughout the basin. The APC is continually evaluating the results, and as experience is gained, improvements will be incorporated into the model.

c. Role of Other Agencies. The NWS is responsible for preparing and publicly disseminating forecasts relating to precipitation, temperatures, and other meteorological elements related to weather and weather-related forecasting in the ACT Basin. For the Tallapoosa River Basin, forecasts are prepared by the SERFC located in Peachtree City, Georgia, and are issued through their office in Birmingham, Alabama. The Water Management Section uses the NWS as a key source of information for weather forecasts. The meteorological forecasting provided by the NWS is considered critical to the Corps' water resources management mission. The 24- and 48-hour Quantitative Precipitation Forecasts (QPFs) are invaluable in providing guidance for basin release determinations. Using precipitation forecasts and subsequent runoff directly relates to project release decisions during normal operations.

(1) The NWS is the federal agency responsible for preparing and issuing streamflow and river-stage forecasts for public dissemination. The SERFC routinely prepares and distributes five-day streamflow and river-stage forecasts at key gaging stations along the Alabama, Coosa, and Tallapoosa Rivers. Streamflow forecasts are available at additional forecast points during periods above normal rainfall. In addition, SERFC provides a revised regional QPF on the basis of local expertise beyond the NWS Hydrologic Prediction Center QPF. SERFC also provides the Water Management Section with flow forecasts for selected locations on request.

(2) The Corps and SERFC have a cyclical procedure for providing forecast data between federal agencies. As soon as reservoir release decisions have been planned and scheduled for the proceeding days, the release decision data are sent to SERFC. Taking release decision data, coupled with local inflow forecasts at forecast points along the ACT, SERFC can provide inflow forecasts into Corps and APC projects. Having revised inflow forecasts from SERFC, the Corps and APC have up-to-date forecast data to make the following days' release decisions.

6-02. Flood Condition Forecasts. During flood conditions, quantifiable flow forecasts are prepared based on rainfall that has already fallen. Operational decisions are made on the basis of actual streamflow and/or stage data unless following Section 7-05, Alternative Flood Control Operation. Streamflow and/or stage forecasts resulting from rainfall that has already occurred are considered in the planning process of potential future operations including any variances that may need to be obtained. APC prepares flow and stage forecasts on an as needed basis for internal use and decision support, where applicable. The NWS SERFC produces official forecasts that are made publically available on their website.

a. Requirements. Accurate flood forecasting requires a knowledge of antecedent conditions, rainfall and runoff that has occurred, and tables or unit hydrographs to apply the runoff to existing flow conditions. Predictive QPF data are needed for what if scenario.

b. Methods. The Corps provides a link to the NWS website so that the Water Management Section, the affected county emergency management officials, and the public can obtain this vital information in a timely fashion. When hydrologic conditions exist so that all or portions of the ACT Basin are considered to be flooding, existing Corps streamflow and short and long-range forecasting runoff models are run on a more frequent, as-needed basis. Experience demonstrates that the sooner a significant flood event can be recognized and the appropriate release of flows scheduled, an improvement in overall flood control can be achieved. Stored storm water that has accumulated from significant rainfall events must be evacuated following the event and as downstream conditions permit to provide effective flood risk management. Flood risk management carries the highest priority during significant runoff events that pose a threat to human health and safety. The accumulation and evacuation of storage for the authorized purpose of flood risk management is accomplished in a manner that will prevent, insofar as possible, flows exceeding those which will cause flood damage downstream. During periods of significant basin flooding, the frequency of contacts between the Water Management Section and SERFC staff are increased to allow a complete interchange of available data upon which the most reliable forecasts and subsequent project regulation can be based. Table 6-1 provides SERFC forecast locations in the Alabama River Basin.

Table 6-1. SERFC Forecast Locations for the Alabama River Basin

Daily Stage/Elevation Forecasts				
	Station	**Station ID**	**Critical Stage**	**Flood Stage**
	Montgomery	MGMA1	26	35
	R. F. Henry TW	TYLA1		122
	Millers Ferry TW	MRFA1		66
	Claiborne TW	CLBA1	35	42
Daily 24-hour Inflow in 1000 SFD Forecast				
Reservoir		**Station ID**		
R. F. Henry		TYLA1		
Millers Ferry		MRFA1		
Additional Stage Forecasts Only for Significant Rises				
River/Creek	**Station**	**Station ID**	**Critical Stage**	**Flood Stage**
Coosa	Weiss Dam	CREA1		564
Coosa	Gadsden	GAPA1		511
Coosa	Logan Martin Dam	CCSA1		465
Coosa	Childersburg	CHLA1		402
Coosa	Wetumpka	WETA1	40	45
Tallapoosa	Wadley	WDLA1	30	13
Tallapoosa	Milstead	MILA1	15	40
Tallapoosa	Tallapoosa Wt Pit	MGYA1	15	25
Catoma Creek	Montgomery	CATA1	16	20
Alabama	Selma	SELA1	30	45
Cahaba	Cahaba Hts	CHGA1		14
Cahaba	Centreville	CKLA1	20	23
Cahaba	Suttle	SUTA1	28	32
Cahaba	Marion Junction	MNJA1	15	36

VII - WATER CONTROL PLAN

7-01. General Objectives. The R. L. Harris Project will normally operate to produce peaking hydropower. During periods of low streamflow, hydropower generation will also augment the flow of the river downstream. The power guide curve, which defines the upper limit of the power pool, varies seasonally. The maximum storage for flood risk management operation is about 100,000 acre-feet. Hydropower generation releases will be made for operations, and in accordance to the prescribed operating plans for flood risk management, to keep the reservoir elevation at or below the seasonal elevation specified by the power guide curve. Reservoir regulation during major storms may require special consideration and the operation may deviate from these schedules with the approval of the Corps.

7-02. Constraints. APC releases water from the R. L. Harris Project in conjunction with other reservoirs to provide a weekly volume of flow to the Alabama River for navigation.

7-03. Overall Plan for Water Control

a. General Regulation. The water control operations of R. L. Harris Dam are in accordance with the regulation schedule as outlined in the following paragraphs. Any deviation from the prescribed instructions during flood operations will be at the direction of the Water Management Section Mobile District, Corps of Engineers. Deviations during normal operations will be coordinated with the APC Reservoir Management Section. Mobile Water Management Section will notify SAD regarding all deviations.

b. Basin Above R. L. Harris Project. There are no federal or APC projects located above the R. L. Harris Dam and Lake Project. The annual runoff from the 1,454 square-mile drainage area above the dam of about 21 inches or about 38 percent of the annual rainfall is controlled by the R. L. Harris Project to the maximum extent possible within its storage capability. Runoff is usually high during the winter and spring and relatively low during the summer and early fall.

7-04. Flood Risk Management. A summary of the basic regulation schedule for flood risk management procedures is provided in the table on Plate 7-3. This schedule provides detailed instructions to be used by the operating personnel of APC to carry out the operation of the project during floods. During floods, the project will operate to pass the inflow up to approximately 13,000 cfs by releasing water through the powerhouse to maintain the reservoir near the power guide curve. If the reservoir rises above the power guide curve or is predicted to in the near future but below elevation 790 feet NGVD29, the project will operate to discharge 13,000 cfs or an amount that will not cause the USGS river gage at Wadley, Alabama to exceed 13.0 feet, unless greater discharge amounts are required by the induced surcharge curves. When R. L. Harris Lake level rises above elevation 790 feet NGVD29, the powerhouse discharge will be increased to the larger of approximately 16,000 cfs or the amount indicated by the induced surcharge curves, Plate 7-4. Once the lake level begins to fall, all spillway gate openings and the powerhouse discharge will be maintained at those settings until the lake level returns to the power guide curve as shown on Plate 7-1. If a second flood enters the lake prior to the complete evacuation of the stored flood waters, the release will be as directed by the induced surcharge curve or the flood control operating instructions described in section 7-05 below.

7-05. Alternative Flood Control Operation. APC has developed a real time computer model and data collection network for the basin above R. L. Harris Dam. The model has the capabilities of incorporating data from rainfall, both actual and predicted QPF, and river stations at upstream control gages and based on that data, prepares inflow forecasts for periods of up to 144 hours. The model then uses the forecasted inflow values to compute the anticipated storage requirements for the current rate of discharge. If it is determined that the anticipated storage requirement will exceed the available storage, the discharge is increased until the required storage and the available storage match. This balancing of storage has the same objective as the traditional induced surcharge method which is to reduce downstream flooding as much as reasonably possible while protecting the safety of the dam.

The flood risk management operation at the R. L. Harris Project may be in accordance with either of the plans identified in Paragraphs 7-04 or 7-05 and may be used interchangeably. However, currently, APC does not operate by the alternative plan described in Paragraph 7-05. Additionally, there is no schedule to implement the real-time model. If the alternative plan as described in Paragraph 7-05 is used, producing discharge rates in excess of those indicated in the induced surcharge schedule for a period of six consecutive hours and additional increases are indicated that will cause the USGS gage at Wadley, Alabama to exceed 13 feet, the operator will contact the Water Management Section of the Corps before increasing the release rate. If the operator is unable to contact the Water Management Section, the current discharge rate will be maintained until releases in excess of that amount are required by the induced surcharge schedule.

The flood risk management operating plans described above are designed to provide optimum benefits for the limited storage available in the project. However, in the event of a major storm over the basin, the APC and the District Commander will collaborate in the prompt analysis of all available information. Temporary modification in flood risk management regulations that will provide the most effective utilization of the flood risk management capacities at the project (i.e., a variance) may be employed after receiving approval from the South Atlantic Division Office by telephone or electronic mail.

7-06. Correlation with Other Projects. R. L. Harris Dam is the farthest upstream of a series of four APC dams on the Tallapoosa River. Those dams; Harris, Martin, Yates, and Thurlow, utilize a large portion of the available head of the Tallapoosa River in Alabama. The three dams below R. L. Harris Dam provide a continuous series of pools in the Tallapoosa River. R. L. Harris and Martin are the only storage projects, while Yates and Thurlow essentially operate as run-of-the-river projects passing the inflow as it enters each lake. Operation of the R. L. Harris project affects the operation of all the downstream projects especially Martin, the closest downstream project. The operation of Yates and Thurlow are directly dependent upon the operation at Martin and are scheduled in accordance with the discharge from that project. The flood risk management operation at R. L. Harris is designed to be completely independent from downstream operations. Following a flood, emptying of flood storage from R. L. Harris Lake may prolong the time required to evacuate the stored flood waters in Martin Lake. The Corps and APC have arranged for regular and rapid exchange of data which will permit the maximum benefit for downstream projects during flood risk management operations.

7-07. Spillway Gate Operating Schedule. The operation of the spillway gates will be in accordance with the gate opening schedule as shown on Plates 2-6 through 2-17. The Reservoir management Section will determine the appropriate discharge from the induced surcharge schedule and set the gates to the step that will produce a discharge as near as practical to that rate. The spillway gates will be operated in accordance with the gate regulation schedule to ensure that the top of the gates remain out of the water.

7-08. Minimum Flow Agreement. Flow in the Alabama River is largely controlled by APC impoundments on the Coosa and Tallapoosa Rivers. Pursuant to articles in the FERC licenses for these impoundments, a minimum discharge must be released to support navigation on the Alabama River. These flows also benefit downstream water quality. Under the terms of the previous negotiated agreement, APC projects would provide releases from the Jordan/Bouldin Project on the Coosa and Thurlow Project on the Tallapoosa River equal to a continuous minimum 7-day average flow of 4,640-cfs (32,480 dsf/7 days). This navigation flow target of 4,640 cfs was originally derived from the 7Q10 flow at Claiborne Lake of 6,600 cfs (determined from observed flow between 1929 – 1981 at the USGS gage # 02429500, Alabama River at Claiborne, Alabama). Those flows were established with the understanding that if APC provided 4,640 cfs from their Bouldin, Jordan, and Thurlow Projects, the Corps and intervening basin inflow would be able to provide the remaining water to meet 6,600 cfs at Claiborne Lake. However, as dry conditions continued in 2007, water managers realized that, if the basin inflows from rainfall were insufficient, the minimum flow target would not likely be achievable. Therefore, in coordination with APC, drought operations for the middle reaches of the ACT Basin have been revised and are described in detail in Exhibit D, *ACT River Basin Drought Contingency Plan*. The Drought Contingency Plan is summarized in Paragraph 7-13 of this manual. The Drought Contingency Plan flows are described in Table 7-5, ACT Drought Management Plan.

7-09. Recreation. Recreational activities are best served by maintaining a full conservation pool. Lake levels above top of conservation pool invade the camping and park sites. When the lake recedes several feet below the top of conservation pool, access to the water and beaches may become limited. Water management personnel are aware of recreational impacts resulting from reservoir fluctuations and attempt to maintain reasonable lake levels, especially during the peak recreational use periods, but there are no specific requirements relative to maintaining recreational levels. Other project functions usually determine releases from the dam and the resulting lake levels.

7-10. Water Quality. Water Quality Criteria established by the State of Alabama applicable to the R. L. Harris Project requires that the dissolved oxygen in the discharge from the project shall not be less than 5.0 mg/L. The APC has incorporated several design and operational features into the project in recognition of this criterion. Each hydroelectric turbine has been designed with a turbine aeration system to augment the discharged dissolved oxygen levels. This aeration system is designed to naturally aspirate air below the turbine wheel. A movable skimmer weir near the face of the dam can also be used during summer-time thermal stratification periods to make selective withdrawal from the upper layers of the lake where dissolved oxygen levels are higher. In addition, the APC is required to maintain a minimum continuous flow of 45 cfs downstream of R. L. Harris Dam at Wadley, Alabama. When conditions cause the USGS stream gage at Wadley, Alabama to approach a flow of 45 cfs, releases from the dam will be made so that flows do not fall below that amount. These flows are made in the interest of protecting and developing the downstream aquatic habitat.

7-11. Hydroelectric Power. A guide curve delineating the seasonally varying, top-of-power-pool level in R. L. Harris Lake is shown on Plate 7-1. Normally, the lake level will be maintained on or below the curve except when flood inflows exceeding the discharge capacity of the hydropower units cause the lake level to rise. The lake is lowered each year during the flood season to elevation 785 feet NGVD29 to provide additional flood storage capacity in the system. The hydropower performance curve is shown on Plate 7-2.

R. L. Harris Dam will normally operate on a weekly cycle with the hydropower generated available for use in the daily peak-load periods on Monday through Friday although weekend peaking power operations also occur. When R. L. Harris Lake is below the top of the power pool curve, the power plant will be operated to provide APC system power demand. Whenever the lake reaches the top of the power pool elevation, the power plant will operate as necessary, up to full-gate capacity, in order to discharge the amount of water required to keep the lake level from exceeding the top of the power pool curve elevation.

7-12. Navigation. Navigation is an important use of water resources in the ACT Basin. The Alabama River, from Montgomery downstream to the Mobile area, provides a navigation route for commercial barge traffic, serving as a regional economic resource. A minimum flow is required to ensure usable water depths to support navigation. APC releases water from the R. L. Harris Project in conjunction with other storage projects in the basin to provide a weekly volume of flow to the Alabama River. Congress has authorized continuous navigation on the river, when sufficient water is available. The three Corps locks and dams on the Alabama River and a combination of dredging, river training works, and flow augmentation together support navigation depths on the river. The lack of regular dredging and routine maintenance has led to inadequate depths at times in the Alabama River navigation channel.

When supported by maintenance dredging, ACT Basin reservoir storage, and hydrologic conditions, adequate flows will provide a reliable navigation channel. In doing so, the goal of the water control plan is to ensure a predictable minimum navigable channel in the Alabama River for a continuous period that is sufficient for navigation use. Figure 7-1 shows the effect of dredging on flow requirements for different navigation channel depths using 2004 – 2010 survey data. As shown on Figure 7-1, pre-dredging conditions exist between November and April; dredging occurs between May and August; and post-dredging conditions exist from September through October, until November rainfall causes shoaling to occur somewhere along the navigation channel.

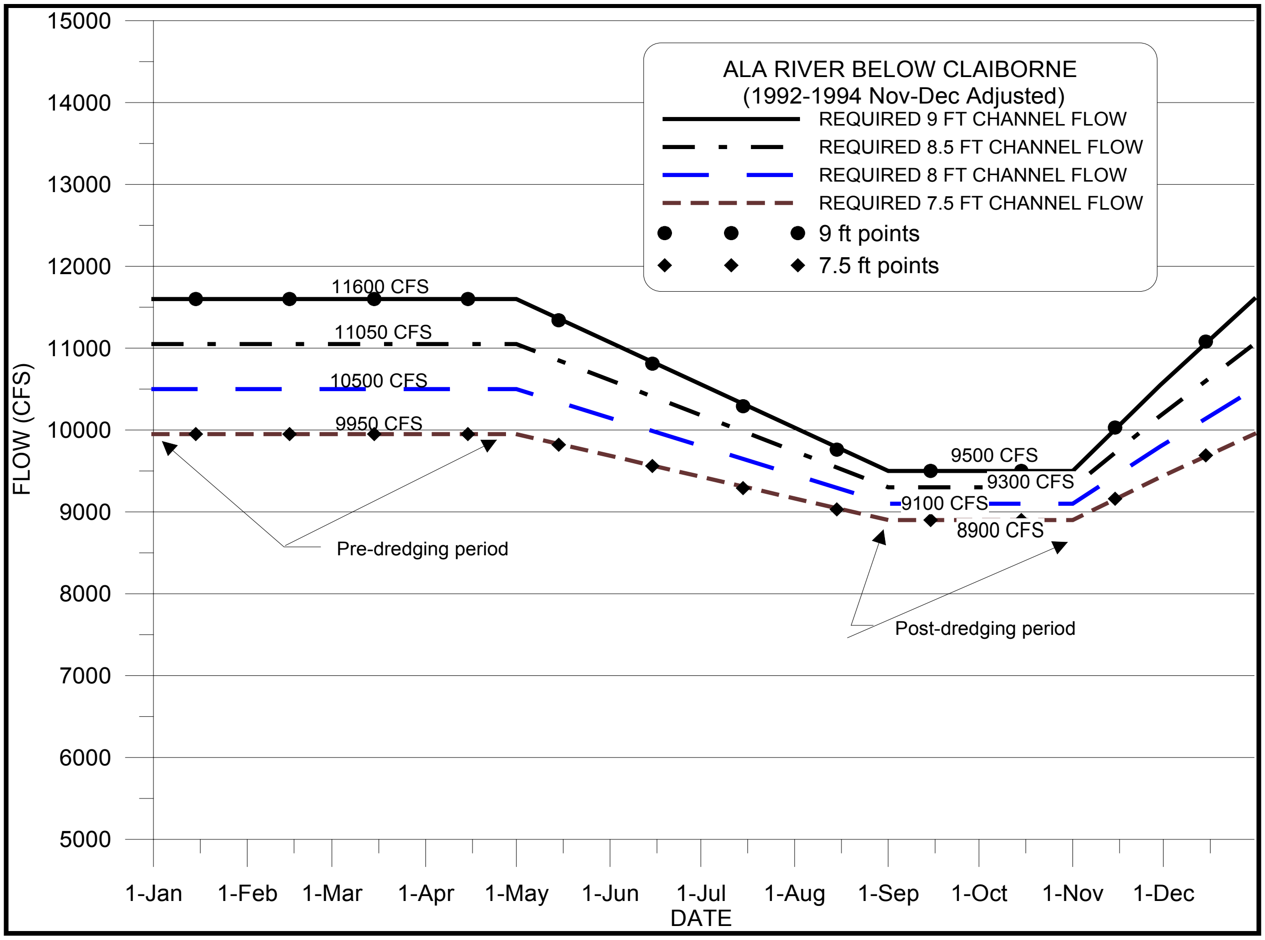


Figure 7-1. Flow-Depth Pattern (Navigation Template) Using 2004 – 2010 Survey Data

A 9-foot-deep by 200-foot-wide navigation channel is authorized on the Alabama River to Montgomery, Alabama. When a 9.0-foot channel cannot be met, a shallower 7.5-foot channel would still allow for light loaded barges moving through the navigation system. A minimum depth of 7.5 feet can provide a limited amount of navigation. Under low flow conditions, even the 7.5 feet depth has not been available at all times.

Flow releases from upstream APC projects have a direct influence on flows needed to support navigation depths on the lower Alabama River. Flows for navigation are most needed in the unregulated part of the lower Alabama River below Claiborne Lock and Dam. When flows are available, R. F. Henry, Millers Ferry, and Claiborne are regulated to maintain stable pool levels, coupled with the necessary channel maintenance dredging, to support sustained use of the authorized navigation channel and to provide the full navigation depth of nine feet. When river conditions or funding available for dredging of the river indicates that project conditions (9-foot channel) will probably not be attainable in the low water season, the three Alabama River projects are operated to provide flows for a reduced project channel depth as determined by surveys of the river. APC operates its reservoirs on the Coosa and Tallapoosa Rivers (specifically flows from their Jordan, Bouldin, and Thurlow (JBT) Projects) to provide a minimum navigation flow target in the Alabama River at Montgomery, Alabama. The monthly minimum navigation flow targets are shown in Table 7-1. However, flows may be reduced if conditions warrant. Additional intervening flow or drawdown discharge from the R. F. Henry and Millers Ferry Projects must be used to provide a usable depth for navigation and/or meet the 7Q10 flow of 6,600 cfs below Claiborne Dam. However, the limited storage afforded in both the R. E. “Bob” Woodruff and William “Bill” Dannelly Lakes can only help meet the 6,600 cfs level at Claiborne Lake for a short period. As local inflows diminish or the storage is exhausted, a lesser amount would be released depending on the amount of local inflows. Table 7-2 and Figure 7-2 show the required basin inflow for a 9.0-foot channel; Table 7-3 and Figure 7-3 show the required basin inflow for a 7.5-foot channel.

During low-flow periods, it is not always possible to provide the authorized 9-foot deep by 200-foot-wide channel dimensions. In recent years, funding for dredging has been reduced resulting in higher flows being required to provide the design navigation depth. In addition, recent droughts in 2000 and 2007 had a severe impact on the availability of navigation depths in the Alabama River.

Historically, navigation has been supported by releases from storage in the ACT Basin. Therefore, another critical component in the water control plan for navigation involves using an amount of storage from APC storage projects similar to that which has historically been used, but in a more efficient manner.

The ACT Basin navigation regulation plan is based on storage and flow/stage/channel depth analyses using basin inflows and average storage usage by APC (e.g., navigation operations would not be predicated on use of additional storage) during normal hydrologic conditions. Under that concept, the Corps and APC make releases that support navigation when basin inflows meet or exceed seasonal targets for either the 9.0-foot or 7.5-foot channel templates. Triggers are also identified (e.g., when basin inflow are less than required natural flows) to change operational goals between the 9.0-foot and 7.5-foot channels. Similarly, basin inflow triggers are identified when releases for navigation are suspended and only 4,640 cfs releases would occur. During drought operations, releases to support navigation are suspended until system recovery occurs as defined in the ACT Basin Drought Contingency Plan (Exhibit D).

Table 7-1. Monthly Navigation Flow Target in CFS

Month	9.0-ft target below Claiborne Lake (from Navigation Template) (cfs)	9.0-ft Jordan, Bouldin, Thurlow goal (cfs)	7.5-ft target below Claiborne Lake (from Navigation Template) (cfs)	7.5-ft Jordan, Bouldin, Thurlow goal (cfs)
Jan	11,600	9,280	9,950	7,960
Feb	11,600	9,280	9,950	7,960
Mar	11,600	9,280	9,950	7,960
Apr	11,600	9,280	9,950	7,960
May	11,340	9,072	9.820	7,856
Jun	10,810	8,648	9,560	7,648
Jul	10,290	8,232	9,290	7,432
Aug	9,760	7,808	9,030	7,224
Sep	9,500	7,600	8,900	7,120
Oct	9,500	7,600	8,900	7,120
Nov	10,030	8,024	9,160	7,328
Dec	11,080	8,864	9,690	7,752

Table 7-2. Basin Inflow Above APC Projects Required to Meet a 9.0-foot Navigation Channel

Month	APC navigation Target (cfs)	Monthly historic storage usage (cfs)	Required basin inflow (cfs)
Jan	9,280	–994	10,274
Feb	9,280	–1,894	11,174
Mar	9,280	–3,028	12,308
Apr	9,280	–3,786	13,066
May	9,072	–499	9,571
Jun	8,648	412	8,236
Jul	8,232	749	7,483
Aug	7,808	1,441	6,367
Sep	7,600	1,025	6,575
Oct	7,600	2,118	5,482
Nov	8,024	2,263	5,761
Dec	8,864	1,789	7,075

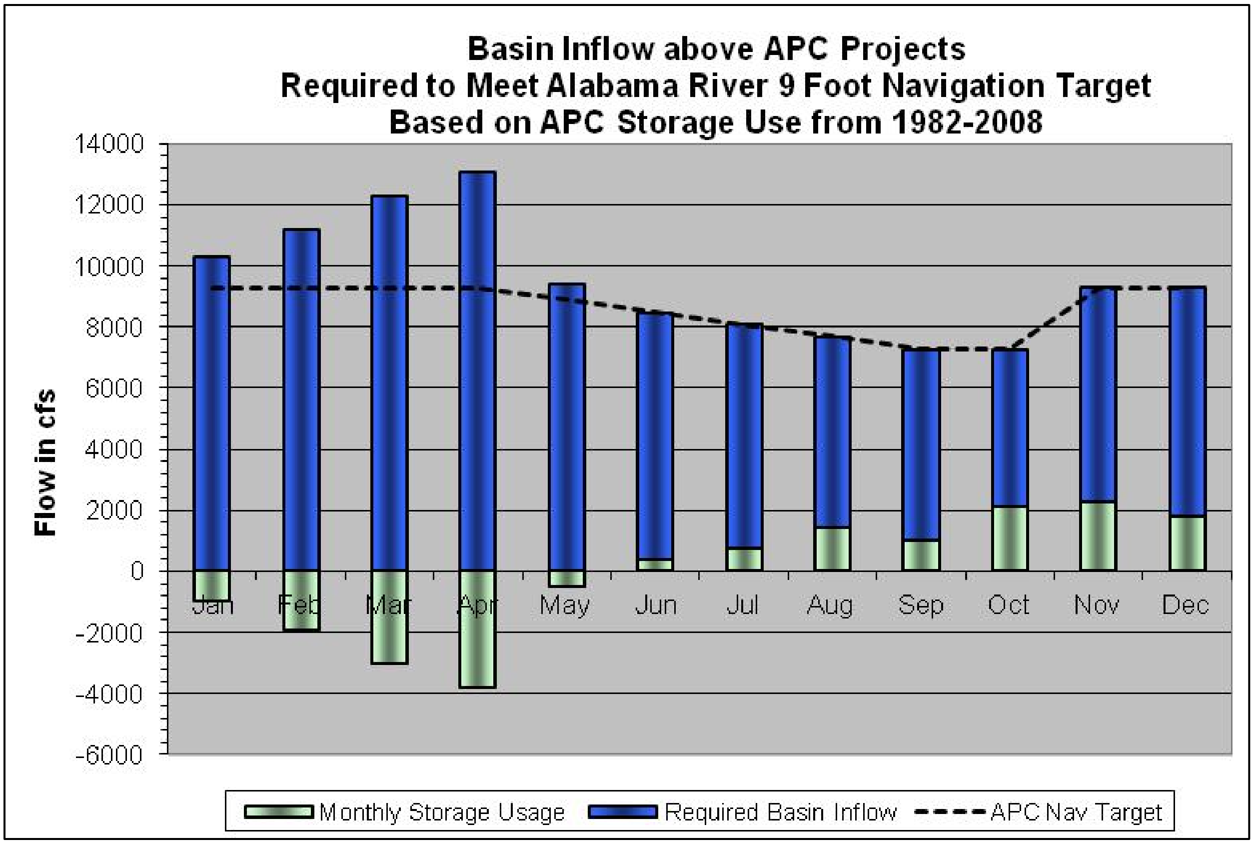


Figure 7-2. Flow Requirements From Rainfall (or Natural Sources) and Reservoir Storage to Achieve the JBT Goal for Navigation Flows for a 9-foot Channel.

Table 7-3. Basin Inflow Above APC Projects Required to Meet a 7.5-foot Navigation Channel

Month	APC navigation Target (cfs)	Monthly historic storage usage (cfs)	Required basin inflow (cfs)
Jan	7,960	–994	8,954
Feb	7,960	–1,894	9,854
Mar	7,960	–3,028	10,988
Apr	7,960	–3,786	11,746
May	7,856	–499	8,355
Jun	7,648	412	7,236
Jul	7,432	749	6,683
Aug	7,224	1,441	5,783
Sep	7,120	1,025	6,095
Oct	7,120	2,118	5,002
Nov	7,328	2,263	5,065
Dec	7,752	1,789	5,963

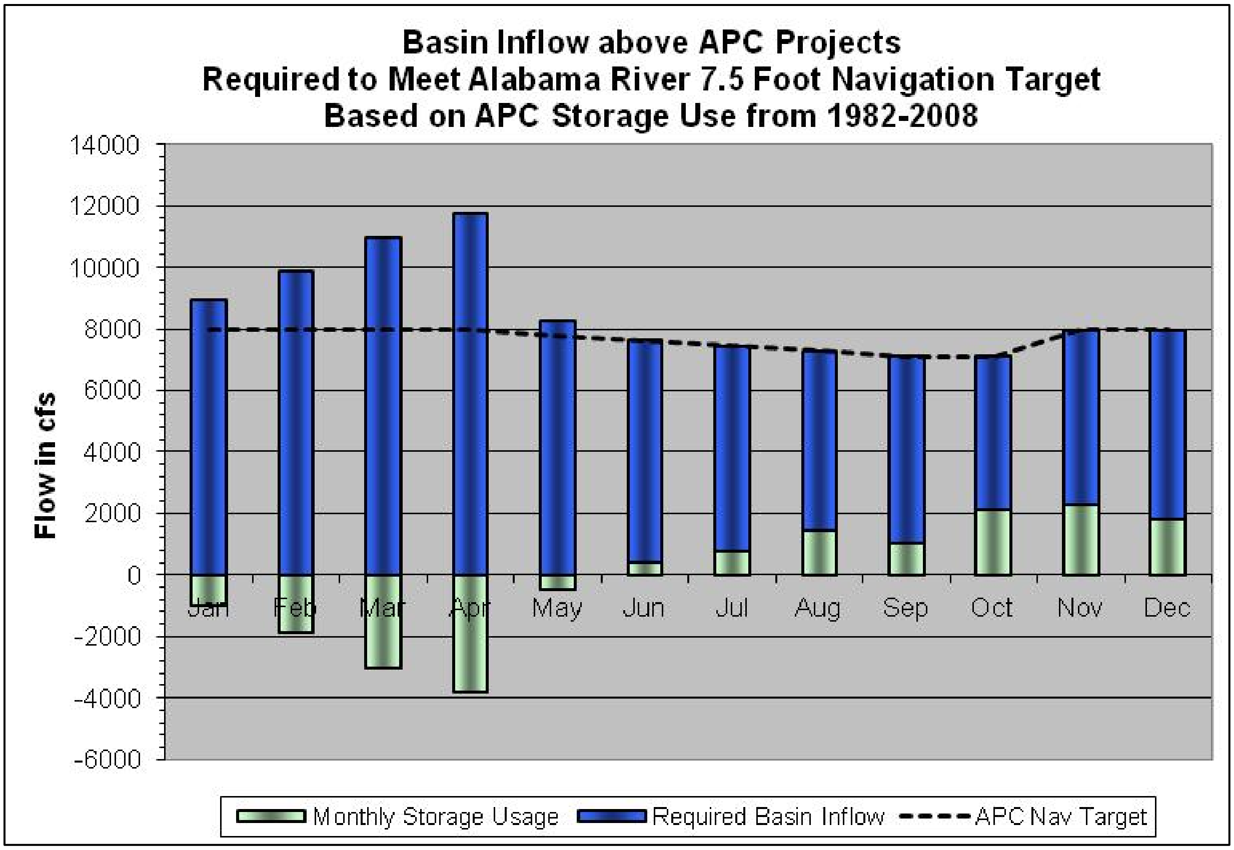


Figure 7-3. Flow Requirements From Rainfall (or Natural Sources) and Reservoir Storage to Achieve the JBT Goal for Navigation Flows for a 7.5-foot Channel.

During normal flow periods, no special water control procedures are required for navigation at the R. F. Henry Project other than maintaining the proper pool level. The normal maximum allowable drawdown at elevation 123.0 feet NGVD29 provides a clearance of 13.0 feet over the upper lock sill and should provide minimum depths for a 9-foot navigation channel at Montgomery and up to Bouldin Dam. Navigable depth is normally available downstream of the project if Millers Ferry is within its normal operating level. However, shoaling between Selma and R. F. Henry may result in the need to make water releases to increase the depth over any shoals. This will be accomplished by regular or specially scheduled hydropower releases when possible.

During high flow periods, navigation will be discontinued through the R. F. Henry lock during flood periods when the headwater reaches elevation 131.0 feet NGVD29. At this elevation the discharge will be 156,000 cfs which is expected to occur on an average of once every three years and the freeboard will be one-foot on the guide and lock walls.

In the event that the Mobile District Water Management Section determines upcoming reductions in water releases may impact the available navigation channel depth, they shall contact the Black Warrior/Tombigbee - Alabama/Coosa Project Office, and the Mobile District Navigation Section, to coordinate the impact. Water Management shall provide the Claiborne tailwater gage forecast to the project office and the Navigation Section. Using this forecast and the latest available project channel surveys, the project office and the Navigation Section will evaluate the potential impact to available navigation depths. Should this evaluation determine that the available channel depth is adversely impacted, the project office and the Navigation Section will work together, providing Water Management with their determination of the controlling depth. Thereafter, the project office and the Navigation Section will coordinate the issuance of a navigation bulletin. The notices will be issued as expeditiously as possible to give barge owners, and other waterway users, sufficient time to make arrangements to lighten loads or remove their vessels before action is taken at upstream projects to reduce flows. The bulletin will be posted to the Mobile District Navigation website at

http://navigation.sam.usace.army.mil/docs/index.asp?type=nn

Although special releases will not be standard practice, they could occur for a short duration to assist maintenance dredging and commercial navigation for special shipments if basin hydrologic conditions are adequate. The Corps will evaluate such requests on a case by case basis, subject to applicable laws and regulations and the basin conditions.

7-13. Drought Contingency Plan.

An ACT Basin Drought Contingency Plan (DCP) has been developed to implement water control regulation drought management actions. The plan includes operating guidelines for drought conditions and normal conditions. The R. L. Harris Project operates in concert with other APC projects to meet the provisions of the DCP related to flow requirements from the Coosa and Tallapoosa River Basins. APC and the Corps will coordinate water management during drought with other federal agencies, navigation interests, the states, and other interested parties as necessary. The following information provides a summary of the DCP water control actions for the ACT Basin projects. The drought plan is described in detail in Exhibit D Drought Contingency Plan.

The ACT Basin Drought Plan matrix defines monthly minimum flow requirements except where noted for the Coosa, Tallapoosa, and Alabama Rivers as a function of a Drought Intensity Level (DIL) and time of year. Such flow requirements are daily averages. The ACT Basin drought plan is activated when one or more of the following drought triggers is exceeded:

1. Low basin inflow
2. Low state line flow
3. Low composite conservation storage

Drought management actions would become increasingly more austere when two triggers are exceeded (Drought Level 2) or all three are exceeded (Drought Level 3). The combined occurrences of the drought triggers determine the DIL. Table 7-4 lists the three drought operation intensity levels applicable to APC projects.

Table 7-4. ACT Basin Drought Intensity Levels

Drought Intensity Level (DIL)	Drought Level	No. of Triggers Exceeded
-	Normal Regulation	0
DIL 1	Moderate Drought	1
DIL 2	Severe Drought	2
DIL 3	Exceptional Drought	3

Drought management measures for ACT Basin-wide drought regulation consists of three major components:

- Headwater regulation at Allatoona Lake and Carters Lake in Georgia
- Regulation at APC projects on the Coosa and Tallapoosa Rivers
- Regulation at Corps projects downstream of Montgomery on the Alabama River

The headwater regulation component includes water control actions in accordance with established action zones, minimum releases, and hydropower generation releases in accordance with project water control plans. Regulation of APC projects will be in accordance with Table 7-5, ACT Drought Management Plan, in which the drought response will be triggered by one or more of the three indicators - state line flows, basin inflow, or composite conservation storage. Corps operation of its Alabama River projects downstream of Montgomery will respond to drought operations of the APC projects upstream.

7-14. Flood Emergency Action Plan. APC maintains the Flood Emergency Action Plan for the R. L. Harris Project. The plan was developed and is updated in accordance with FERC guidelines. APC is responsible for notifying the appropriate agencies/organizations in the unlikely event of an emergency at Harris Dam. The Flood Emergency Action Plan is updated at least once a year, with a full reprint every five years. Inundation maps, developed by APC and updated as necessary, are also provided in the R. L. Harris Project Flood Emergency Action Plan.

7-15. Rate of Release Change. Gradual changes are important when releases are being decreased and downstream conditions are very wet, resulting in saturated riverbank conditions. The Corps acknowledges that a significant reduction in basin releases over a short period can result in some bank sloughing, and release changes are scheduled accordingly when a slower rate of change does not significantly affect downstream flood risk. Overall, the effect of basin regulation on streambank erosion has been reduced by the regulation of the basin because higher peak-runoff flows into the basin are captured and metered out more slowly.

Table 7-5. ACT Drought Management Plan

<table>
<tr><th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th colspan="2">Jun</th><th>Jul</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="4">Drought Level Response[a]</td><td colspan="13">DIL 0 - Normal Operations</td></tr>
<tr><td colspan="13">DIL 1: Low Basin Inflows or Low Composite or Low State Line Flow</td></tr>
<tr><td colspan="13">DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite or Low State Line Flow)</td></tr>
<tr><td colspan="13">DIL 3: Low Basin Inflows + Low Composite + Low State Line Flow</td></tr>
<tr><td rowspan="4">Coosa River Flow[b]</td><td colspan="3">Normal Operation: 2,000 cfs</td><td colspan="2">4,000 (8,000)</td><td colspan="2">4,000 – 2,000</td><td colspan="6">Normal Operation: 2,000 cfs</td></tr>
<tr><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">4,000 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">Jordan 2,000 +/-cfs</td></tr>
<tr><td colspan="3">Jordan 1,600 to 2,000 +/-cfs</td><td colspan="3">2,500 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="3">Jordan 1,600 to 2,000 +/-cfs</td></tr>
<tr><td colspan="3">Jordan 1,600 +/-cfs</td><td colspan="4">Jordan 1,600 to 2,000 +/-cfs</td><td colspan="3">Jordan 2,000 +/-cfs</td><td colspan="2">Jordan 1,600 to 2,000 +/-cfs</td><td>Jordan 1,600 +/- cfs</td></tr>
<tr><td rowspan="4">Tallapoosa River Flow[c]</td><td colspan="13">Normal Operations: 1200 cfs</td></tr>
<tr><td colspan="4">Greater of: 1/2 Yates Inflow or 2 x Heflin Gage(Thurlow Lake releases > 350 cfs)</td><td colspan="6">1/2 Yates Inflow</td><td colspan="3">1/2 Yates Inflow</td></tr>
<tr><td colspan="4">Thurlow Lake 350 cfs</td><td colspan="6">1/2 Yates Inflow</td><td colspan="3">Thurlow Lake 350 cfs</td></tr>
<tr><td colspan="7">Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)</td><td colspan="3">Thurlow Lake 350 cfs</td><td colspan="3">Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)</td></tr>
<tr><td rowspan="4">Alabama River Flow[d]</td><td colspan="13">Normal Operation: Navigation or 4,640 cfs flow</td></tr>
<tr><td colspan="4">4,200 cfs (10% Cut) - Montgomery</td><td colspan="6">4,640 cfs - Montgomery</td><td colspan="3">Reduce: Full – 4,200 cfs</td></tr>
<tr><td colspan="5">3,700 cfs (20% Cut) - Montgomery</td><td colspan="5">4,200 cfs (10% Cut) - Montgomery</td><td colspan="3">Reduce: 4,200 cfs-> 3,700 cfs Montgomery (1 week ramp)</td></tr>
<tr><td colspan="4">2,000 cfs Montgomery</td><td colspan="3">3,700 cfs Montgomery</td><td colspan="3">4,200 cfs (10% Cut) - Montgomery</td><td colspan="3">Reduce: 4,200 cfs -> 2,000 cfs Montgomery (1 month ramp)</td></tr>
<tr><td rowspan="4">Guide Curve Elevation</td><td colspan="13">Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
<tr><td colspan="13">Corps Variances: As Needed; FERC Variance for Lake Martin</td></tr>
</table>

a. Note these are base flows that will be exceeded when possible.
b. Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow Lake flows are based on continuous +/- 5% of target flow: flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates.
d. Alabama River flows are 7-Day Average Flow.

VIII - EFFECT OF WATER CONTROL PLAN

8-01. General. The River and Harbor Act, approved 2 March 1945 (59 Stat. 10) authorized the Corps of Engineers to develop a site at Crooked Creek for flood control, hydropower, and other purposes. Section 12 of Public Law 89-789 (80 Stat., 1405), approved 7 November 1966, suspended for two years the authority as far as hydropower was concerned, to permit development of the Tallapoosa River by private concerns. The APC filed an application with the Federal Power Commission for the proposed project on 5 November 1968, and was issued a license for the construction, operation and maintenance of the Crooked Creek Hydroelectric Project (later renamed R. L. Harris). The R. L. Harris Project is a peaking hydropower peaking project with operating lake elevations that range from 793 to 785 feet NGVD29.

The impacts of the *ACT Master Water Control Manual* and its Appendices, including this water control manual have been fully evaluated in an Environmental Impact Statement (EIS) that was published on _______. A Record of Decision (ROD) for the action was signed on _______. During the preparation of the EIS, a review of all direct, secondary and cumulative impacts was made. As detailed in the EIS, the decision to prepare the Water Control Manual and the potential impacts were coordinated with Federal and State agencies, environmental organizations, Native American tribes, and other stakeholder groups and individuals having an interest in the basin. The ROD and EIS are public documents and references to their accessible locations are available upon request.

8-02. Flood Risk Management. R. L. Harris Dam controls 7.9 percent of the conservation storage in the ACT basin (see Table 4-7). The discharge frequency curve at the dam site for the period 1983 – 2010 is shown on Plate 8-1. The curve was developed from average daily discharge data from the APC. The pre-dam and post-dam discharge frequency curves at Wadley, Alabama, 14 miles below the dam are shown on Plate 8-2. The data were taken from the USGS “Tallapoosa River at Wadley” gage, No. 02414500. The floods of 1977 and 1979 were routed through the reservoir using the Induced Surcharge Regulation as well as Basin Model Regulation. Results are shown on Plates 8-3 through 8-6. The observed maximum post-construction flood of 2003 is also presented on Plate 4-21. The data for this flood were APC hourly values. Regulation of the probable maximum flood is shown on Plate 8-7. Headwater and tailwater stage frequency curves are shown on Plates 8-8 and 8-9.

8-03. Recreation. R. L. Harris Lake is an important recreational resource, providing significant economic and social benefits for the region and the Nation. The project contains 10,660 acres of water at the summer power pool elevation of 793.0 feet NGVD29. A wide variety of recreational opportunities are provided at the lake including boating, fishing, camping, picnicking, water skiing, hunting, and sightseeing. The local and regional economic benefits of recreation at R. L. Harris Lake are significant. The effects of the R. L. Harris water control operations on recreation opportunities are minimal between the maximum and minimum power pool elevations of 793 to 785 feet NGVD29.

8-04. Water Quality. The water quality conditions that are generally present in R. L. Harris Lake are typical of water quality conditions and trends that exist in reservoirs throughout the ACT Basin that are relatively deep with thermal stratification during the summer and completely mixed during the winter. Water quality conditions in the main body of the lake are typically better than in the arms because of nutrient and sediment-rich, riverine inflows. Sediment and phosphorus concentrations are also highest in the upper arms and decrease toward the main pool as velocity is lowered and sediment is removed from suspension. During summer-time, dissolved oxygen levels and water temperatures are typically highest near the top of the water column, with colder, less oxygenated water existing near the bottom. Additionally, chlorophyll *a* concentrations vary both seasonally and spatially and are highest from July to October during periods of low flow. Point and nonpoint sources from urban areas increase sediment and pollutant loads in the rivers immediately downstream. Reservoirs in the ACT Basin, including R. L. Harris Lake, typically act as a sink, removing pollutant loads and sediment.

Total maximum daily loads (TMDLs) have been identified for various portions of the Tallapoosa and Little Tallapoosa Rivers. In the Alabama portion of the rivers, TMDLs for pathogens and siltation have been proposed. In Georgia, TMDLs have been finalized for fecal coliforms, and sedimentation for sections of the Tallapoosa and Little Tallapoosa Rivers. R. L. Harris Lake is currently classified as mesotrophic, which indicates an intermediate level of productivity in the lake. ADEM has established a lake chlorophyll *a* criterion for R. L. Harris Lake during the growing season (April – October) of an average of less than 10 micrograms per liter (µg/l) of chlorophyll *a* or an average of less than 12 *ug/l* if measured immediately upstream of the Tallapoosa River, Little Tallapoosa River confluence.

8-05. Fish and Wildlife. The Tallapoosa River, a 4,687-square-mile watershed, originates in Paulding County located in western Georgia. The upper portion of the river (above Harris Dam) represents the last unimpounded and unregulated habitat in the watershed. Recent surveys estimate 86 fish species below the fall line (geographical boundary between the Piedmont and Southeastern Plains) and 42 fish species above the fall line. Twenty species of mussels have also been documented from the river and its tributaries, including the federally threatened fine-lined pocketbook.

The four reservoirs (R.L. Harris, Martin, Yates, and Thurlow) in this sub-basin impound 71 of the 268 miles of the Tallapoosa River to create 53,234 acres of reservoir habitat. R. L. Harris Lake contains an abundance of Alabama spotted bass and largemouth bass. Lake Martin is known for producing great Alabama spotted bass fishing during the winter. Lake Martin spills immediately into two smaller lakes, Yates and Thurlow. Fisheries at the two lakes are dictated by the flow from Lake Martin. Rising or steady water levels can produce good fishing for striped bass, Alabama spotted bass, white bass, and various sunfish species.

The Tallapoosa River below R. L. Harris Dam represents one of the longest and highest quality segments of Piedmont River habitat remaining in the Mobile River drainage, one of the most biologically diverse river drainages in North America. Extensive areas of shoal habitat, river features that typically support high faunal diversity are characteristic along this portion of the river. The native fish assemblage includes at least 57 species, including at least five species endemic to the Tallapoosa River System. The invertebrate fauna is less well known; however, the fine-lined pocketbook (*Hamiota altilis*), which is listed as Threatened under the Endangered Species Act, and at least two endemic species of crayfishes occur in the Piedmont reach.

Operational flow changes affect habitat for reservoir fisheries and other aquatic resources mainly through changes in water levels, changes in reservoir flushing rates (retention times), and associated changes in water quality parameters, such as primary productivity, nutrient loading, dissolved oxygen concentrations, and vertical stratification. Seasonal water level fluctuations can substantially influence littoral (shallow-water) habitats, decreasing woody debris deposition, restricting access to backwaters and wetlands, and limiting seed banks and stable water levels necessary for native aquatic vegetation. Those limitations, in turn, significantly influence the reproductive success of resident fish populations. High water levels inundating shoreline vegetation during spawning periods frequently have been associated with enhanced reproductive success and strong year class development for largemouth bass, spotted bass, bluegill, crappie, and other littoral species. Conversely, low or declining water levels can adversely affect reproductive success by reducing the area of available littoral spawning and rearing habitats. Substantial daily or weekly fluctuations in lake levels associated with hydropower peaking operations can negatively affect lake fisheries by dewatering spawning and nursery habitats for littoral species, exposing nests and eggs deposited in shallow-water habitats, and reducing the availability of shoreline cover and its associated invertebrate food supply.

8-06. Hydroelectric Power. The R. L. Harris Dam Hydropower Project, along with 13 other hydroelectric facilities throughout the State of Alabama, provides approximately six percent of the Alabama Power Company's power generation. The State of Alabama depends on these facilities as a source of dependable and stable electricity. Hydroelectric power is also one of the cheaper forms of electrical energy, and it can be generated and supplied quickly as needed in response to changing demand.

Hydropower is typically produced as peak energy at R. L. Harris Dam, i.e., power is generated during the hours that the demand for electrical power is highest, causing significant variations in downstream flows. Daily hydropower releases from the dam vary from zero during off-peak periods to as much as 13,000 cfs, which is approximately best gate turbine discharge. Often, the weekend releases are lower than those during the weekdays. Lake elevations can vary 0.5 to 1.5 feet during a 24-hour period as a result of hydropower releases. Tailwater levels can also vary significantly daily because of peaking hydropower operations at R. L. Harris Dam, characterized by a rapid rise in downstream water levels immediately after generation is initiated and a rapid fall in stage as generation is ceased. Except during high flow conditions when hydropower may be generated for more extended periods of time, this peaking power generation scenario with daily fluctuating stages downstream is repeated nearly every weekday (not generally on weekends).

Hydropower generation by the R. L. Harris Dam Hydropower Plant, in combination with the other hydropower power projects in the ACT Basin, helps to provide direct benefits to a large segment of the basin's population in the form of dependable, stable, and relatively low-cost power. Hydropower plays an important role in meeting the electrical power demands of the region.

8-07. Navigation. APC releases water from R. L. Harris Project in conjunction with their other storage projects in the Tallapoosa and Coosa Rivers to provide flows to support navigation. The navigation plan provides the flexibility to support flow targets when the system experiences normal flow conditions, reduced support as basin hydrology trends to drier conditions, and suspension of navigation support during sustained low flow conditions.

8-08. Drought Contingency Plans. The importance of drought contingency plans has become increasingly obvious as more demands are placed on the water resources of the basin. During low flow conditions, the reservoirs within the basin may not be able to fully support all project purposes. Several drought periods have occurred since construction of the R. L. Harris Project in 1983. The duration of low flows can be seasonal or they can last for several years. Some of the more extreme droughts occurred in the early and mid 1980's, and most of the time period between late-1998 to mid-2009. There were periods of high flows during these droughts but the lower than normal rainfall trend continued.

The purpose of drought planning is to minimize the effect of drought, to develop methods for identifying drought conditions, and to develop both long- and short-term measures to be used to respond to and mitigate the effects of drought conditions. During droughts, reservoir regulation techniques are planned to preserve and ensure the more critical needs. Minimum instream flows protect the area below R. L. Harris Dam and conservation efforts strengthen the ability to supply water supply needs.

For the R. L. Harris Project, the APC and the Corps will coordinate water management activities during the drought with other private power companies and federal agencies, navigation interests, the States, and other interested state and local parties as necessary. Drought operations will be in accordance with Table 7-5, ACT Drought Management Plan, Tallapoosa River flows.

8-09. Flood Emergency Action Plans. Normally, all flood risk management operations are directed by APC Reservoir Management following the flood risk management procedures outlined in this manual with data sharing and communication between APC and the Water Management Section of the Corps. If, however, a storm of flood-producing magnitude occurs and all communications are disrupted between APC and the Corps, flood risk management measures, as previously described in Chapter VII of this appendix, will begin and/or continue.

The R. L. Harris Dam is well maintained and has not experienced unusual events or problems. Discharges from the dam are released into the Tallapoosa River which flow into Lake Martin. Most of the area between R. L. Harris Dam and Lake Martin is largely undeveloped rural and agricultural land. The most immediate downstream development is the City of Wadley, Alabama. Dam failure at R. L. Harris would pose little impact to roads and highways immediately downstream, with the exception of County road 15, and Highway 77/22 in the Wadley, Alabama area.

IX - WATER CONTROL MANAGEMENT

9-01. Responsibilities and Organization. Many agencies in federal and state governments are responsible for developing and monitoring water resources in the ACT Basin. Some of the federal agencies are the Corps, U.S. Environmental Protection Agency, National Parks Service, U.S. Coast Guard, USGS, U.S. Department of Energy, U.S. Department of Agriculture, USFWS, and NOAA. In addition to the federal agencies, each state has agencies involved: the Georgia Environmental Protection Division (GAEPD), The Middle Chattahoochee Regional Water Planning Council (includes Tallapoosa and Little Tallapoosa River Basins in Georgia), and the Alabama Department of Environmental Management, Alabama Office of Water Resources.

a. Alabama Power Company. The R. L. Harris Project was constructed and is operated by the APC. Day-to-day operation of the project is assigned to the APC's Reservoir Management Section in Birmingham, Alabama, as part of the Power Delivery System under the direction of Reservoir Operations Supervisor. Long-range water planning and flood risk management operation is assigned to APC's Reservoir Management in Birmingham, Alabama, as part of Southern Company Services Hydro Services, under the direction of the System Operations Supervisor.

b. U.S. Army Corps of Engineers. Authority for water control regulation of federal projects in the ACT Basin has been delegated to the South Atlantic Division (SAD) Commander. The responsibility for water control regulation activities has been entrusted to the Mobile District, Engineering Division, Water Management Section. Water control actions for federal projects are regulated to meet the authorized project purposes in coordination with federally authorized ACT Basin-wide system purposes and public law. It is the responsibility of the Water Management Section to coordinate with APC to develop the Harris Project water control regulation procedures for flood risk management and navigation. The Water Management Section monitors the Coosa River projects for compliance with the approved water control plans and agreements. The Water Management Section will perform the following specific duties in connection with the operation of the R. L. Harris Project:

(1) Maintain liaison with personnel of APC's Reservoir Management for the daily exchange of hydrologic data.

(2) Maintain records of rainfall and river stages for the Coosa River Basin, and records of pool level and outflow at R. L. Harris Dam and other impoundments in the basin.

(3) Monitor operations of the power plant and spillway at R. L. Harris Dam for compliance with the regulation schedule for flood control operations, Plate 7-2.

(4) Transmit to APC Reservoir Management any instructions for special operations which may be required due to unusual flood conditions (except in emergencies where time does not permit, these instructions will first be cleared with the Chief of Hydrology and Hydraulics Branch and the Chief of Engineering Division).

(5) Evaluate special water control plan variance requests submitted by APC Reservoir Management and provide approval or disapproval

c. Other Federal Agencies. Other federal agencies work closely with APC and the Corps to provide their agency support for the various project purposes of R. L. Harris and to meet the federal requirements for which they might be responsible. The responsibilities and interagency coordination between the Corps and the federal agencies are discussed in Paragraph 9-02.

d. State and County Agencies

(1) Alabama. The Alabama Office of Water Resources (OWR) administers programs for river basin management, river assessment, water supply assistance, water conservation, flood mapping, the National Flood Insurance Program and water resources development. Further, OWR serves as the state liaison with federal agencies on major water resources related projects, conducts any special studies on instream flow needs, and administers environmental education and outreach programs to increase awareness of Alabama's water resources.

i. The Alabama Department of Environmental Management Drinking Water Branch works closely with the more than 700 water systems in Alabama that provide safe drinking water to four million citizens.

ii. The Alabama Chapter of the Soil and Water Conservation Society fosters the science and the art of soil, water, and related natural resource management to achieve sustainability.

(2) Georgia. Georgia Environmental Protection Division (GAEPD) conducts water resource assessments to determine a sound scientific understanding of the condition of the water resources, in terms of the quantity of surface water and groundwater available to support current and future in-stream and off-stream uses and the capacity of the surface water resources to assimilate pollution. Regional water planning councils in Georgia (Middle Chattahoochee Planning Council covers the Tallapoosa and Little Tallapoosa River Basins) prepare recommended Water Development and Conservation Plans. Those regional plans promote the sustainable use of Georgia's waters by selecting an array of management practices, to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens.

e. Stakeholders. Many non-federal stakeholder interest groups are active in the ACT Basin. The groups include lake associations, M&I water users, navigation interests, environmental organizations, and other basin-wide interests groups. Coordinating water management activities with the interest groups, state and federal agencies, and others is accomplished as required on an ad-hoc basis and on regularly scheduled water management teleconferences when needed to share information regarding water control regulation actions and gather stakeholder feedback. The Master Water Control Manual includes a list of state and federal agencies and active stakeholders in the ACT Basin that have participated in the ACT Basin water management teleconferences and meetings.

9-02. Interagency Coordination

a. Local Press and Corps Bulletins. The local press includes any periodic publications in or near the R. L. Harris Watershed and the ACT Basin. Montgomery, Alabama, and Atlanta, Georgia, have some of the larger daily papers. These papers often publish articles related to the rivers and streams. Their representatives have direct contact with the Corps and APC through their respective Public Affairs offices. In addition, the local press and the public can access current project information on the Corps and APC web pages.

b. National Weather Service (NWS). NWS is the federal agency in NOAA that is responsible for weather and weather forecasts. The NWS along with its River Forecast Center maintains a network of reporting stations throughout the Nation. It continuously provides current weather conditions and forecasts. It prepares river forecasts for many locations including the ACT Basin. Often, it prepares predictions on the basis of *what if* scenarios. Those include rainfall that is possible but has not occurred. In addition, the NWS provides information on hurricane tracts and other severe weather conditions. It monitors drought conditions and provides the information. Information is available through the Internet, the news, and the Mobile District's direct access.

c. U.S. Geological Survey (USGS). The USGS is an unbiased, multidisciplinary science organization that focuses on biology, geography, geology, geospatial information, and water. The agency is responsible for the timely, relevant, and impartial study of the landscape, natural resources, and natural hazards. Through the APC-USGS partnership and the Corps-USGS Cooperative Gaging program, the USGS maintains a comprehensive network of gages in the ACT Basin. The USGS Water Science Centers in Georgia and Alabama publish real-time reservoir levels, river and tributary stages, and flow data through the USGS National Water Information Service (NWIS) web site.

d. U.S. Fish and Wildlife Service (USFWS). The USFWS is an agency of the Department of the Interior whose mission is working with others to conserve, protect and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The USFWS is the responsible agency for the protection of federally listed threatened and endangered species and federally designated critical habitat in accordance with the Endangered Species Act of 1973. The USFWS also coordinates with other federal agencies under the auspices of the Fish and Wildlife Coordination Act. APC and the Corps, Mobile District, with support from the Water Management Section, coordinate water control actions and management with USFWS in accordance with both laws.

9-03. Framework for Water Management Changes. Special interest groups often request modifications of the basin water control plan or project specific water control plan. The R. L. Harris Project and other ACT Basin projects were constructed to meet specific, authorized purposes, and major changes in the water control plans would require modifying, either the project itself or the purposes for which the projects were built. However, continued increases in the use of water resources demand constant monitoring and evaluating reservoir regulations and reservoir systems to insure their most efficient use. Within the constraints of the FERC regulating license for the R. L. Harris Project, Congressional authorizations, and engineering regulations, the water control plan and operating techniques are often reviewed to see if improvements are possible without violating authorized project functions. When deemed appropriate, temporary variances to the water control plan approved by FERC and the Corps can be implemented to provide the most efficient regulation while balancing the multiple purposes of the ACT Basin-wide System.

EXHIBIT A

SUPPLEMENTARY PERTINENT DATA

EXHIBIT A
SUPPLEMENTARY PERTINENT DATA

GENERAL	
Other names of project	Crooked Creek
Dam site location	
State	Alabama
Basin	Alabama-Tallapoosa
River	Tallapoosa
Miles above mouth of Tallapoosa River	139.1
Miles above mouth of Mobile River	494
Drainage area above dam site, sq. miles	1,454
Drainage area above Martin Dam, sq. miles	2,984
Drainage area above mouth of Tallapoosa, sq. miles	4,687
1 inch of runoff equals, acre-ft (1,454 sq mi)	77,493
Type of project	Dam, Reservoir and Power plant
Objectives of regulation	Hydropower, Navigation, and Flood Risk Management
Project Owner	Alabama Power Company (APC)
Regulating Agencies	APC, Corps of Eng, and FERC

STREAM FLOW AT USGS Gage at WADLEY, AL (cfs)	
Average for Period of Record (calendar yr 1924 – 2009)	2,562
Maximum daily discharge	103,000
Minimum daily discharge	41
Maximum annual discharge (calendar yr 1975)	4,904
Minimum annual discharge (calendar yr 2007)	790

REGULATED FLOODS	
Maximum flood of project record (8 May 2003)	
Peak inflow, cfs (@ 0400 hrs)	106,494
Peak outflow, cfs (0400 hrs)	98,454
Peak pool elevation, feet above NGVD29	794.9
Peak discharge of Probable Maximum Flood, cfs	310,300

RESERVOIR	
Elevation of probable maximum flood, ft above NGVD29	800.3
Full pool elevation May through September, feet above NGVD29	793.0
Full pool elevation December through March, feet above NGVD29	785.0
Maximum operating pool elevation, feet above NGVD29	793.0

Minimum operating pool elevation, feet above NGVD29	768.0

RESERVOIR (Cont'd)

Area at pool elevation 793.0, acres	10,660
Total volume at elevation 793.0, acre-feet	425,721
Power storage (elevation 768 to 793 ft NGVD29)	206,944
Inactive Storage (below elevation 768 ft NGVD29)	218,025
Length, miles	29
Shoreline distance at elevation 793 (summer pool), miles	272
Shoreline distance at elevation 785 (winter pool), miles	229

SPILLWAY

Type	concrete-gravity
Net length, feet	310
Elevation of crest, feet above NGVD29	753.0
Type of gates	Tainter
Number of gates	6
Length of gates, feet	40.5
Height of gates, feet	40.0
Maximum discharge capacity (pool elev. 795.0), cfs	267,975
Elevation of top of gates in closed position, feet above NGVD29	793.5

DAM

Total length including dikes, feet	3,242
Total length of non-overflow section, feet	2,632
Maximum height above stream bed, feet	151.5
Elevation, top of dam, feet	810

POWER PLANT

Maximum power pool elevation, feet above NGVD29	793.0
Gross static head at full power pool (793 ft NGVD29), feet	131.7
Normal operating head at full turbine discharge, feet	124.0
Length of powerhouse, feet	225
Width of powerhouse, feet	91
Number of units	2
Maximum discharge per unit (approximate full gate) cfs	8,000
Diameter of penstock leading to the turbines, ft	27
Elevation of centerline of intake to turbine	710.0
Elevation of centerline of distributor	659.0
Total installation, kW	135,000

EXHIBIT B

UNIT CONVERSIONS

AREA CONVERSION

UNIT	m^2	km^2	ha	in^2	ft^2	yd^2	mi^2	ac
1 m^2	1	10^{-6}	10^{-4}	1550	10.76	1.196	3.86 X 10^{-7}	2.47 X 10^{-4}
1 km^2	10^{6}	1	100	1.55 X 10^{9}	1.076 X 10^{7}	1.196 X 10^{6}	0.3861	247.1
1 ha	10^{4}	0.01	1	1.55 X 10^{7}	1.076 X 10^{7}	1.196 X 10^{4}	3.86 X 10^{-3}	2,471
1 in^2	6.45 X 10^{-4}	6.45 X 10^{10}	6.45 X 10^{-8}	1	6.94 X 10^{-3}	7.7 X 10^{-4}	2.49 X 10^{-10}	1.57 X 10^{7}
1 ft^2	.0929	9.29 X 10^{-8}	9.29 X 10^{-6}	144	1	0.111	3.59 X 10^{-8}	2.3 X 10^{-5}
1 yd^2	0.8361	8.36 X 10^{-7}	8.36 X 10^{-5}	1296	9	1	3.23 X 10^{-7}	2.07 X 10^{-4}
1 mi^2	2.59 X 10^{6}	2.59	259	4.01 X 10^{9}	2.79 X 10^{7}	3.098 X 10^{6}	1	640
1 ac	4047	0.004047	0.4047	6. 27 X 10^{6}	43560	4840	1.56 X 10^{-3}	1

LENGTH CONVERSION

UNIT	cm	m	Km	in.	ft	yd	mi
Cm	1	0.01	0.00001	0.3937	0.0328	0.0109	6.21 X 10^{-6}
M	100	1	0.001	39.37	3.281	1.094	6.21 X 10^{-4}
Km	10^{5}	1000	1	39,370	3281	1093.6	0.621
in.	2.54	0.0254	2.54 X 10^{-5}	1	0.0833	0.0278	1.58 X 10^{-5}
Ft	30.48	0.3048	3.05 X 10^{-4}	12	1	0.33	1.89 X 10^{-4}
Yd	91.44	0.9144	9.14 X 10^{-4}	36	3	1	5.68 X 10^{-4}
Mi	1.01 X 10^{5}	1.61 X 10^{3}	1.6093	63,360	5280	1760	1

FLOW CONVERSION

UNIT	m^3/s	m^3/day	l/s	ft^3/s	ft^3/day	ac-ft/day	gal/min	gal/day	mgd
m^3/s	1	86,400	1000	35.31	3.05 X 10^{6}	70.05	1.58 X 10^{4}	2.28 X 10^{7}	22.824
m^3/day	1.16 X 10^{-5}	1	0.0116	4.09 X 10^{-4}	35.31	8.1 X 10^{-4}	0.1835	264.17	2.64 X 10^{-4}
l/s	0.001	86.4	1	0.0353	3051.2	0.070	15.85	2.28 X 10^{4}	2.28 X 10^{-2}
ft^3/s	0.0283	2446.6	28.32	1	8.64 X 10^{4}	1.984	448.8	6.46 X 10^{5}	0.646
ft^3/day	3.28 X 10^{-7}	1233.5	3.28 X 10^{-4}	1.16 X 10^{-5}	1	2.3 X 10^{-5}	5.19 X 10^{-3}	7.48	7.48 X 10^{-6}
ac-ft/day	0.0143	5.451	14.276	0.5042	43,560	1	226.28	3.26 X 10^{5}	0.3258
gal/min	6.3 X 10^{-5}	0.00379	0.0631	2.23 X 10^{-3}	192.5	4.42 X 10^{-3}	1	1440	1.44 X 10^{-3}
gal/day	4.3 X 10^{-8}	3785	4.38 X 10^{-4}	1.55 X 10^{-6}	11,337	3.07 X 10^{-6}	6.94 X 10^{-4}	1	10^{-6}
Mgd	0.0438		43.82	1.55	1.34 X 10^{5}	3.07	694	10^{6}	1

VOLUME CONVERSION

UNIT	liters	m^3	in^3	ft^3	gal	ac-ft	million gal
Liters	1	0.001	61.02	0.0353	0.264	8.1 X 10^{-7}	2.64 X 10^{-7}
m^3	1000	1	61,023	35.31	264.17	8.1 X 10^{-4}	2.64 X 10^{-4}
in^3	1.64 X 10^{-2}	1.64 X 10^{-5}	1	5.79 X 10^{-4}	4.33 X 10^{-3}	1.218 X 10^{-8}	4.33 X 10^{-9}
ft^3	28.317	0.02832	1728	1	7.48	2.296 X 10^{-5}	7.48 X 10^{6}
Gal	3.785	3.78 X 10^{-3}	231	0.134	1	3.07 X 10^{-6}	10^{6}
ac-ft	1.23 X 10^{6}	1233.5	75.3 X 10^{6}	43,560	3.26 X 10^{5}	1	0.3260
million gallon	3.785 X 10^{6}	3785	2.31 X 10^{8}	1.34 X 10^{5}	10^{6}	3.0684	1

COMMON CONVERSIONS

1 million gallons per day (MGD) = 1.55 cfs
1 day-second-ft (DSF) = 1.984 acre-ft = 1 cfs for 24 hours
1 cubic foot per second of water falling 8.81 feet = 1 horsepower
1 cubic foot per second of water falling 11.0 feet at 80% efficiency = 1 horsepower
1 inch of depth over one square mile = 2,323,200 cubic feet
1 inch of depth over one square mile = 0.0737 cubic feet per second for one year.

EXHIBIT C

MEMORANDUM OF UNDERSTANDING BETWEEN CORPS OF ENGINEERS AND ALABAMA POWER COMPANY

INSERT SIGNED COPIES: MOU DATED 27 SEP 1972; REVISION TO MOU DATED 11 OCT 1990; AND 2011 "ATTACHMENT"

EXHIBIT D

ALABAMA-COOSA-TALLAPOOSA (ACT) RIVER BASIN

DROUGHT CONTINGENCY PLAN

DROUGHT CONTINGENCY PLAN

FOR

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

ALLATOONA DAM AND LAKE
CARTERS DAM AND LAKE
ALABAMA POWER COMPANY COOSA RIVER PROJECTS
ALABAMA POWER COMPANY TALLAPOOSA RIVER PROJECTS
ALABAMA RIVER PROJECTS

US Army Corps of Engineers ®

South Atlantic Division
Mobile District

December 2014

DROUGHT CONTINGENCY PLAN
FOR THE
ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

I – INTRODUCTION

1-01. <u>Purpose of Document</u>. The purpose of this Drought Contingency Plan (DCP) is to provide a basic reference for water management decisions and responses to water shortage in the Alabama-Coosa-Tallapoosa (ACT) River Basin induced by climatological droughts. As a water management document it is limited to those drought concerns relating to water control management actions for federal U.S. Army Corps of Engineers (Corps) and Alabama Power Company (APC) dams. This DCP does not prescribe all possible actions that might be taken in a drought situation due to the long-term nature of droughts and unique issues that may arise. The primary value of this DCP is in documenting the overall ACT Basin Drought Management Plan for the system of Corps and APC projects; in documenting the data needed to support water management decisions related to drought regulation; and in defining the coordination needed to manage the ACT project's water resources to ensure that they are used in a manner consistent with the needs which develop during a drought. This DCP addresses the water control regulation of the five Corps impoundments and the APC Coosa and Tallapoosa projects (Table 1) in regard to water control regulation during droughts. Details of the drought management plan as it relates to each project and its water control regulation during droughts are provided in the water control manual within the respective project appendix to the ACT Basin Master Water Control Manual.

II – AUTHORITIES

2-01. <u>Authorities</u>. The following list provides the policies and guidance that are pertinent to the development of drought contingency plans and actions directed therein.

A. ER 1110-2-1941, "Drought Contingency Plans", dated 15 Sep 1981. This regulation provides policy and guidance for the preparation of drought contingency plans as part of the Corps of Engineers' overall water management activities.

B. ER 1110-2-8156, "Preparation of Water Control Manuals", dated 31 Aug 1995. This document provides a guide for preparing water control manuals for individual water resource projects and for overall river basins to include drought contingency plans.

C. ER 1110-2-240, "Water Control Management", dated 8 Oct 1982. This regulation prescribes the policies and procedures to be followed in water management activities including special regulations to be conducted during droughts. It also sets the responsibility and approval authority in development of water control plans.

D. EM 1110-2-3600, "Management of Water Control Systems", dated 30 Nov 1987. This guidance memorandum requires that the drought management plan be incorporated into the project water control manuals and master water control manuals. It also provides guidance in formulating strategies for project regulation during droughts.

Table 1. Reservoir impoundments within the ACT River Basin

River/Project Name	Owner/State/ Year Initially Completed	Total storage at Full Pool (acre-feet)	Conservation Storage (acre-feet)	Percentage of ACT Basin Conservation Storage (%)
Coosawattee River				
Carters Dam and Lake	Corps/GA/1974	383,565	141,402	5.9
Carters Reregulation Dam	Corps/GA/1974	17,500	16,000	0.1
Etowah River				
Allatoona Dam and Lake	Corps/GA/1949	367,471	284,580	10.8
Hickory Log Creek Dam	CCMWA/Canton/ 2007	17,702	NA	NA
Coosa River				
Weiss Dam and Lake	APC/AL/1961	306,655	263,417	10.0
H. Neely Henry Dam and Lake	APC/AL/1966	120,853	118,210	4.5
Logan Martin Dam and Lake	APC/AL/1964	273,467	144,383	5.5
Lay Dam and Lake	APC/AL/1914	262,887	92,352	3.5
Mitchell Dam and Lake	APC/AL/1923	170,783	51,577	1.9
Jordan Dam and Lake	APC/AL/1928	236,130	19,057	0.7
Walter Bouldin Dam	APC/AL/1967	236,130	NA	--
Tallapoosa River				
Harris Dam and Lake	APC/AL/1982	425,721	207,317	7.9
Martin Dam and Lake	APC/AL/1926	1,628,303	1,202,340	45.7
Yates Dam and Lake	APC/AL/1928	53,908	6,928	0.3
Thurlow Dam and Lake	APC/AL/1930	17,976	NA	--
Alabama River				
Robert F. Henry Lock and Dam/R.E. “Bob” Woodruff Lake	Corps/AL/1972	247,210	36,450	1.4
Millers Ferry Lock and Dam/William “Bill” Dannelly Lake	Corps/AL/1969	346,254	46,704	1.8
Claiborne Lock and Dam and Lake	Corps/AL/1969	102,480	NA	--

III – DROUGHT IDENTIFICATION

3-01. <u>Definition</u>. Drought can be defined in different ways - meteorological, hydrological, agricultural, and socioeconomic. In this DCP, the definition of drought used in the *National Study of Water Management During Drought* is used:

> “Droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or streamflow.”

That definition defines drought in terms of its impact on water control regulation, reservoir levels, and associated conservation storage. Water management actions during droughts are intended to balance the water use and water availability to meet water use needs. Because of hydrologic variability, there cannot be 100 percent reliability that all water demands are met. Droughts occasionally will be declared and mitigation or emergency actions initiated to lessen the stresses placed on the water resources within a river basin. Those responses are tactical measures to conserve the available water resources (USACE 2009).

3-02. Drought Identification. There is no known method of predicting how severe or when a drought will occur. There are, however, indicators that are useful in determining when conditions are favorable: below normal rainfall; lower than average inflows; and low reservoir levels, especially immediately after the spring season when rainfall and runoff conditions are normally the highest. When conditions indicate that a drought is imminent, the Corps Water Management Section (WMS) and APC will increase the monitoring of the conditions and evaluate the impacts on reservoir projects if drought conditions continue or become worse for 30-, 60-, or 90-day periods. Additionally, WMS and APC will determine if a change in operating criteria would aid in the total regulation of the river system and if so, what changes would provide the maximum benefits from any available water.

Various products are used to detect and monitor the extent and severity of basin drought conditions. One key indicator is the U.S. Drought Monitor available through the U.S. Drought Portal, www.drought.gov. The National Weather Service (NWS) Climate Prediction Center (CPC) also develops short-term (6- to 10-day and 8- to 14-day) and long-term (1-month and 3-month) precipitation and temperature outlooks and a U.S. Seasonal Drought Outlook, which are useful products for monitoring dry conditions. The Palmer Drought Severity Index is also used as a drought reference. The Palmer index assesses total moisture by using temperature and precipitation to compute water supply and demand and soil moisture. It is considered most relevant for non-irrigated cropland and primarily reflects long-term drought. However, the index requires detailed data and cannot reflect an operation of a reservoir system. The Alabama Office of the State Climatologist also produces a Lawn and Garden Moisture Index for Alabama, Florida, Georgia, and South Carolina, which gives a basin-wide ability to determine the extent and severity of drought conditions. The runoff forecasts developed for both short- and long-range periods reflect drought conditions when appropriate. There is also a heavy reliance on the latest El Niño Southern Oscillation (ENSO) forecast modeling to represent the potential effects of La Niña on drought conditions and spring inflows. Long-range models are used with greater frequency during drought conditions to forecast potential effects on reservoir elevations, ability to meet minimum flows, and water supply availability. A long-term, numerical model, Extended Streamflow Prediction, developed by the NWS, provides probabilistic forecasts of streamflow and reservoir stages on the basis of climatic conditions, streamflow, and soil moisture. Extended Streamflow Prediction results are used in projecting possible future drought conditions. Other parameters and models can indicate a lack of rainfall and runoff and the degree of severity and continuance of a drought. For example, models using data of previous droughts or a percent of current to mean monthly flows with several operational schemes have proven helpful in forecasting reservoir levels for water management planning purposes. Other parameters considered during drought management are the ability of the various lakes to meet the demands placed on storage, the probability that lake elevations will return to normal seasonal levels, basin streamflows, basin groundwater table levels, and the total available storage to meet hydropower marketing system demands.

3-03. Historical Droughts. Drought events have occurred in the ACT Basin with varying degrees of severity and duration. Five of the most significant historical basin wide droughts occurred in 1940-1941, 1954-1958, 1984-1989, 1999-2003, and 2006-2009. The 1984 to 1989 drought caused water shortages across the basin in 1986. This resulted in the need for the

Corps to make adjustments in the water management practices. Water shortages occurred again from 1999 through 2002 and during 2007 through 2008. The 2006 to 2009 drought was the most devastating recorded in Alabama and western Georgia. Precipitation declines began in December 2005. These shortfalls continued through winter 2006-07 and spring 2007, exhibiting the driest winter and spring in the recorded period of record. The Corps and APC had water levels that were among the lowest recorded since the impoundments were constructed. North Georgia received less than 75 percent of normal precipitation (30-year average). The drought reached peak intensity in 2007, resulting in a D-4 Exceptional Drought Intensity (the worst measured) throughout the summer of 2007.

3-04. **Severity**. Water shortage problems experienced during droughts are not uniform throughout the ACT River Basin. Even during normal, or average, hydrologic conditions, various portions of the basin experience water supply problems. The severity of the problems are primarily attributed to the pattern of human habitation within the basin; the source of water utilized (surface water vs. ground water); and the characteristics of the water resources available for use. During droughts, these problems can be intensified. A severe drought in the basin develops when a deficiency of rainfall occurs over a long time period and has a typical duration of 18 to 24 months. The number of months of below normal rainfall is more significant in determining the magnitude of a drought in the basin than the severity of the deficiency in specific months. However, the severity of the rainfall deficiency during the normal spring wet season has a significant impact on the ability to refill reservoirs after the fall/winter drawdown period. Another confounding factor which influences droughts in the basin is the variability of rainfall over the basin, both temporarily and spatially.

IV – BASIN AND PROJECT DESCRIPTION

4-01. **Basin Description**. The headwater streams of the Alabama-Coosa-Tallapoosa (ACT) River Basin rise in the Blue Ridge Mountains of Georgia and Tennessee and flow southwest, combining at Rome, Georgia, to form the Coosa River. The confluence of the Coosa and Tallapoosa Rivers in central Alabama forms the Alabama River near Wetumpka, Alabama. The Alabama River flows through Montgomery and Selma and joins with the Tombigbee River at the mouth of the ACT Basin to form the Mobile River about 45 miles above Mobile, Alabama. The Mobile River flows into Mobile Bay at an estuary of the Gulf of Mexico. The total drainage area of the ACT Basin is approximately 22,739 square miles: 17,254 square miles in Alabama; 5,385 square miles in Georgia; and 100 square miles in Tennessee. A detailed description of the ACT River Basin is provided in the ACT Master Water Control Manual, Chapter II – Basin Description and Characteristics.

4-02. **Project Description**. The Corps operates five projects in the ACT Basin: Allatoona Dam and Lake on the Etowah River; Carters Dam and Lake and Reregulation Dam on the Coosawattee River; and Robert F. Henry Lock and Dam, Millers Ferry Lock and Dam, and Claiborne Lock and Dam on the Alabama River. Claiborne is a lock and dam without any appreciable water storage behind it. Robert F. Henry and Millers Ferry are operated as run-of-river projects and only very limited pondage is available to support hydropower peaking and other project purposes. APC owns and operates eleven hydropower dams in the ACT Basin; seven dams on the Coosa River and four dams on the Tallapoosa River. Figure 1 depicts the percentage of conservation storage of each project in the ACT Basin. Figure 2 shows the project locations within the basin. Figure 3 provides a profile of the basin and each project.

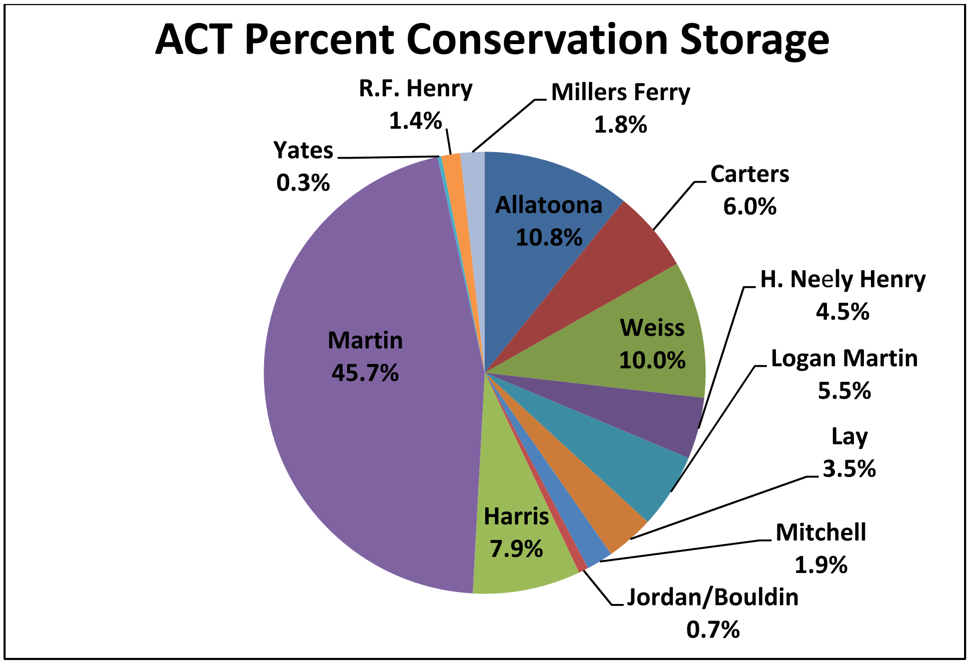


Figure 1. ACT Percent Conservation Storage

A. General. Of the 16 reservoirs (considering Jordan Dam and Lake and Bouldin Dam as one reservoir and Carters Lake and Carters Reregulation Dam as one reservoir), Lake Martin on the Tallapoosa River has the greatest amount of storage, containing 45.7 percent of the conservation storage in the ACT Basin. Allatoona Lake, R.L. Harris Lake, Weiss Lake, and Carters Lake are the next four largest reservoirs respectively, in terms of storage. APC controls approximately 80 percent of the available conservation storage; Corps projects (Robert F. Henry Lock and Dam, Millers Ferry Lock and Dam, Allatoona Lake, and Carters Lake) control 20 percent. The two most upstream Corps reservoirs, Allatoona Lake and Carters Lake, account for 16.8 percent of the total basin conservation storage.

Figure 2. Alabama-Coosa-Tallapoosa River Basin Project Location Map

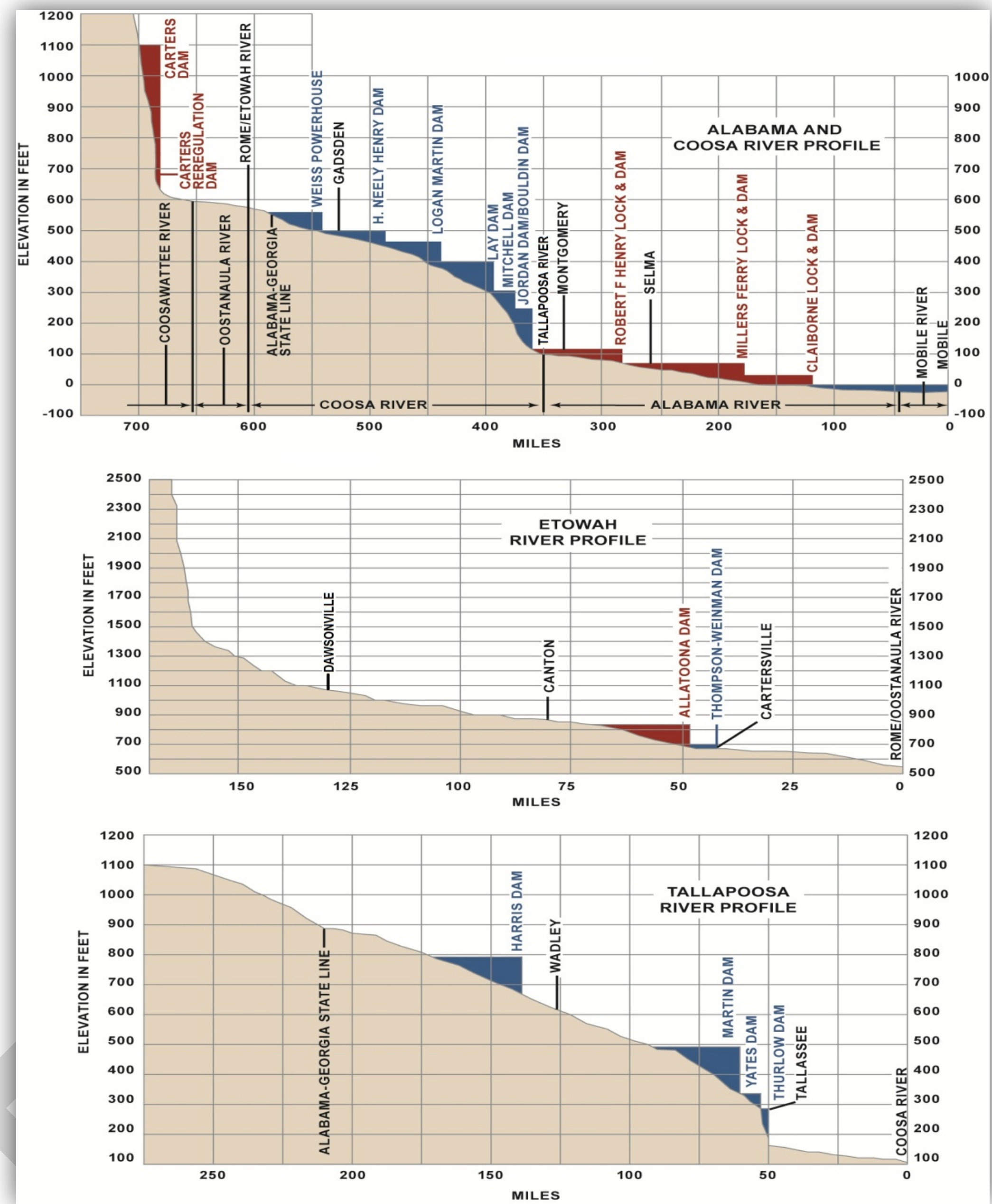


Figure 3. Alabama-Coosa-Tallapoosa River Basin Profile Map

B. Allatoona Dam and Lake. The Allatoona Dam on the Etowah River creates the 11,862 acre Allatoona Lake. The project's authorization, general features, and purposes are described in the Allatoona Dam and Lake Water Control Manual. The Allatoona Lake top of conservation pool is elevation 840 feet NGVD29 during the late spring and summer months (May through August); transitions to elevation 835 feet NGVD29 in the fall (October through mid-November); transitions to a winter drawdown to elevation 823 feet NGVD29 (1-15 January); and refills back to elevation 840 feet NGVD29 during the winter and spring wet season as shown in the water control plan guide curve (Figure 4). However, the lake level may fluctuate significantly from the guide curve over time, dependent primarily upon basin inflows but also influenced by project operations, evaporation, withdrawals, and return flows. A minimum flow of about 240 cfs is continuously released through a small unit, which generates power while providing a constant flow to the Etowah River downstream. Under drier conditions when basin inflows are reduced, project operations are adjusted to conserve storage in Allatoona Lake while continuing to meet project purposes in accordance with four action zones as shown on Figure 4.

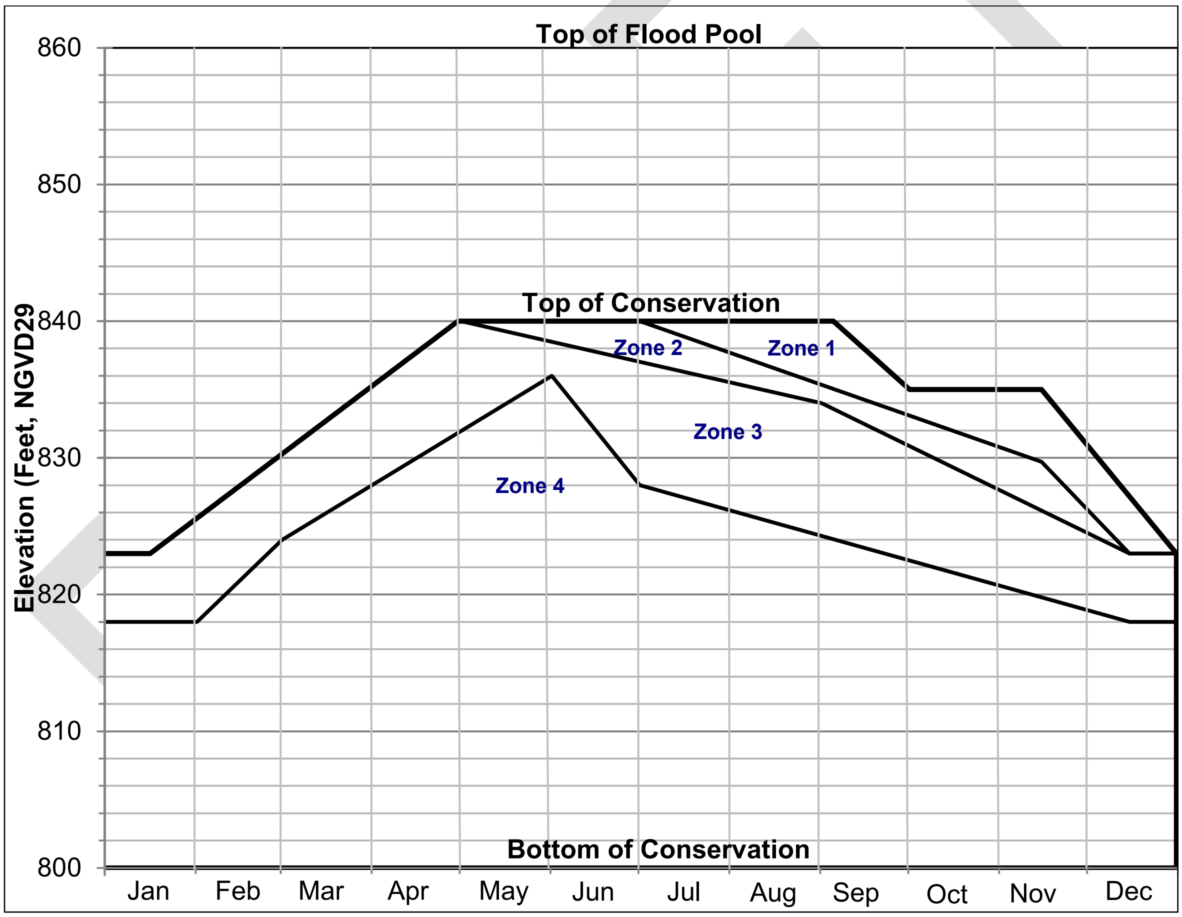


Figure 4. Allatoona Lake Guide Curve and Action Zones

C. Carters Dam and Lake and Reregulation Dam. Carters Lake is formed by Carters Dam, a Corps' reservoir on the Coosawattee River in northwest Georgia upstream of Rome, Georgia. The Carters project is a pumped-storage peaking facility that utilizes a Reregulation Dam and storage pool in conjunction with the main dam and lake. The project's authorization, general features, and purposes are described in the Carters Dam and Lake and Regulation Dam water control manual. The Carters Lake top of conservation pool is elevation 1,074 feet NGVD29 from 1 May to 1 November; transitioning to elevation 1,072 feet NGVD29 between 1 November and 1 December; remains at elevation 1,072 feet NGVD 29 from 1 December to April; then transitioning back to 1,074 feet NGVD29 between 1 April and 1 May. This is shown in the water control plan guide curve (Figure 5). As expected with a peaking/pumped storage operation, both Carters Lake and the reregulation pool experience frequent elevation changes. Typically, water levels in Carters Lake vary no more than 1 to 2 feet per day. The reregulation pool will routinely fluctuate by several feet (variable) daily as the pool receives peak hydropower discharges from Carters Lake and serves as the source for pumpback operations into Carters Lake during non-peak hours. The reregulation pool will likely reach both its normal maximum elevation of 696 feet NGVD29 and minimum elevation of 677 feet NGVD29 at least once each week. However, the general trend of the lake level may fluctuate significantly from the guide curve over time, dependent primarily upon basin inflows but also influenced by project operations and evaporation. Carters Regulation Dam provides a seasonal varying minimum release to the Coosawattee River for downstream fish and wildlife conservation. Under drier conditions when basin inflows are reduced, project operations are adjusted to conserve storage in Carters Lake while continuing to meet project purposes in accordance with action zones as shown on Figure 5. In Zone 2, Carters Regulations Dam releases are reduced to 240 cfs.

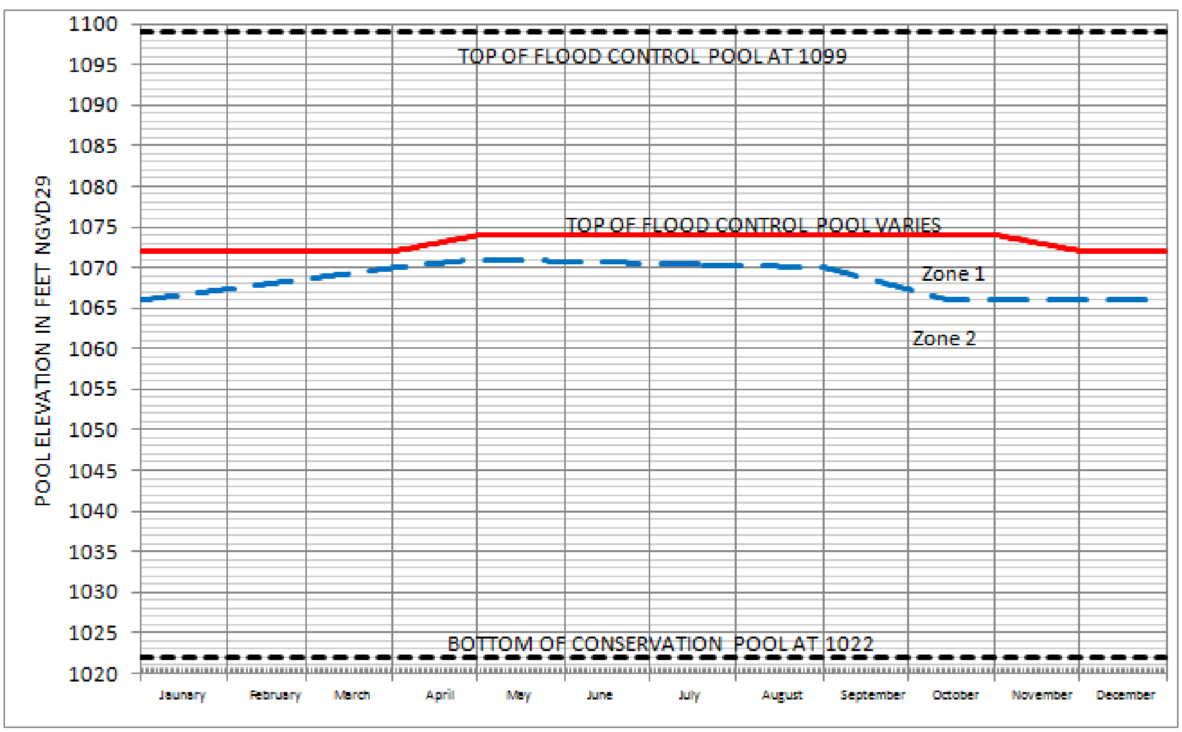


Figure 5. Carters Lake Guide Curve and Action Zones

D. APC Coosa River Projects. APC owns and operates the Coosa Hydro system of projects at Weiss Lake, H. Neely Henry Lake, Logan Martin Lake, Lay Lake, Mitchell Lake, and Jordan/Bouldin Dam and Lake on the Coosa River in the ACT Basin. APC Coosa River projects function mainly to generate electricity by hydropower. In addition, the upper three projects (Weiss, H. Neely Henry, and Logan Martin) operate pursuant to Public Law 83-436 regarding the requirement for the projects to be operated for flood risk management and navigation in accordance with reasonable rules and regulations of the Secretary of the Army. The rules and regulations are addressed in a memorandum of understanding between the Corps and APC (Exhibit B of the *Master Water Control Manual, Alabama-Coosa-Tallapoosa (ACT) River Basin, Alabama, Georgia*), in individual water control manuals for the three projects, and in this ACT Basin DCP. The Weiss Lake is on the Coosa River in northeast Alabama, about 80 mi northeast of Birmingham, Alabama, and extends into northwest Georgia for about 13 miles upstream on the Coosa River. The dam impounds a 30,027 acres reservoir (Weiss Lake) at the normal summer elevation of 564 feet NGVD29 as depicted in the regulation guide curve shown in Figure 6 (source APC). The H. Neely Henry Lake is on the Coosa River in northeast Alabama, about 60 miles northeast of Birmingham, Alabama. The dam impounds an 11,200 acres reservoir at the normal summer elevation of 508 feet NGVD29 as depicted in the regulation guide curve shown in Figure 7 (source APC). The Logan Martin Lake is in northeast Alabama on the Coosa River, about 40 miles east of Birmingham, Alabama. The dam impounds a 15,269-acre reservoir at the normal summer elevation of 465 feet NGVD29 as depicted in the regulation guide curve shown in Figure 8 (source APC). The projects' authorizations, general features, and purposes are described in the Weiss, H. Neely Henry, and Logan Martin water control manual appendices to the ACT Basin Master Water Control Manual.

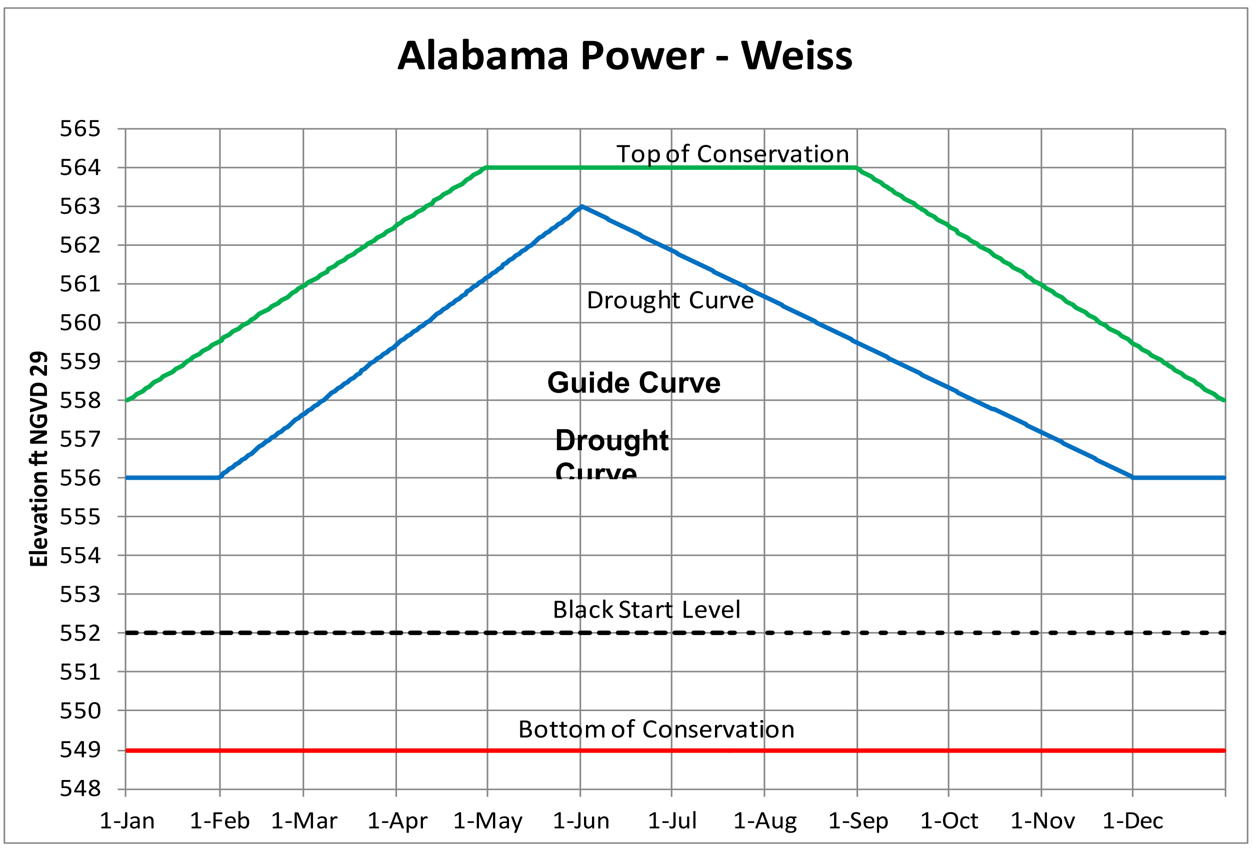


Figure 6. Weiss Lake Guide Curve

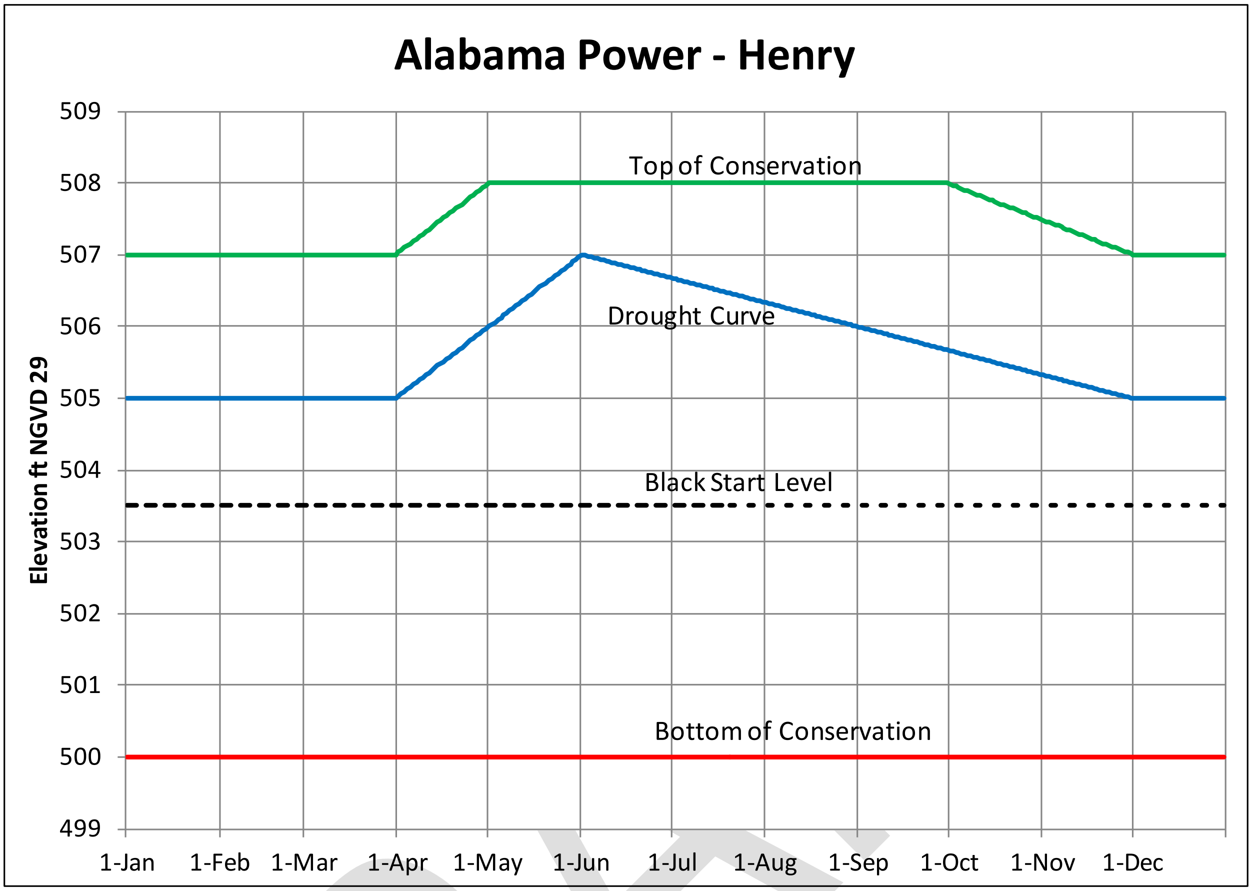


Figure 7. H. Neely Henry Lake Guide Curve

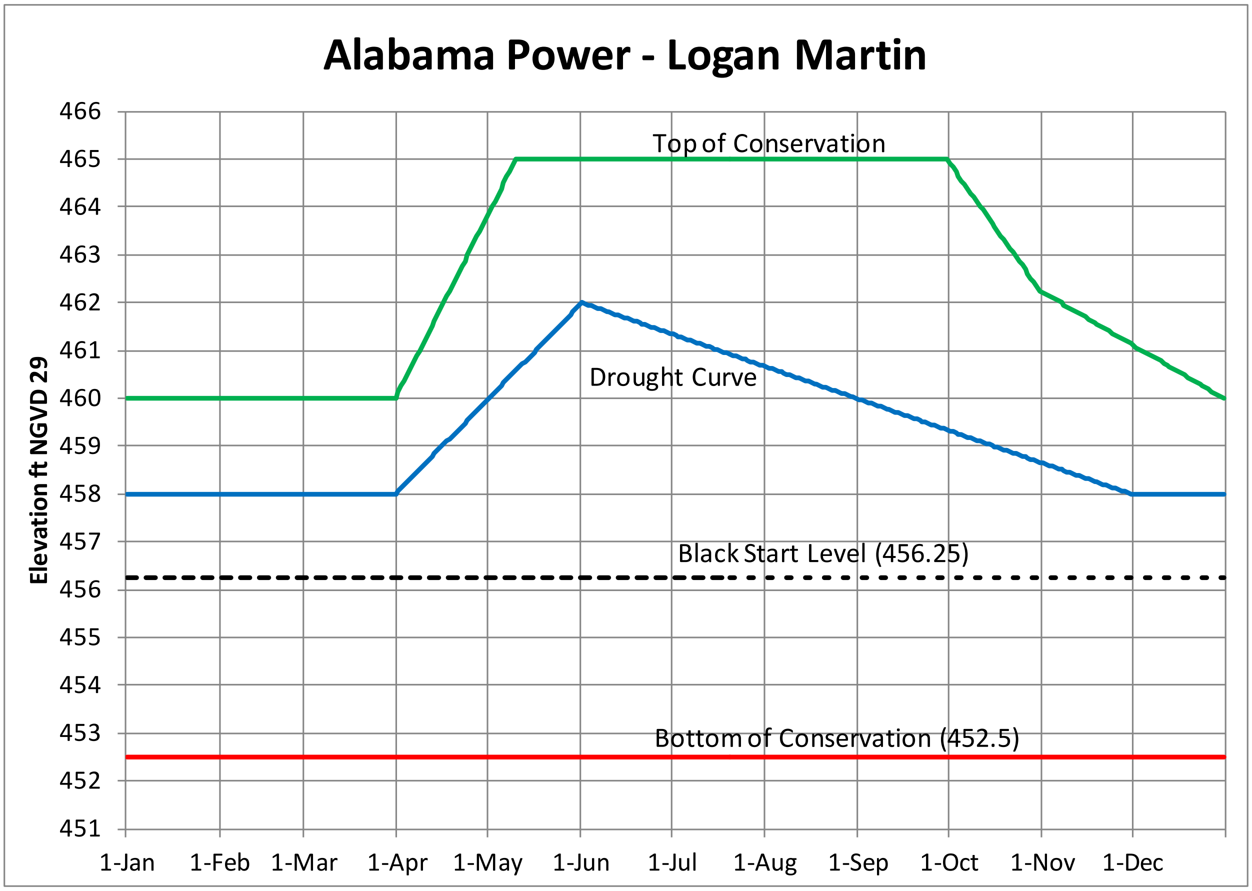


Figure 8. Logan Martin Lake Guide Curve

The downstream Coosa River APC run-of-river hydropower projects (Lay Dam and Lake, Mitchell Dam and Lake, and Jordan/Bouldin Dams and Lake) have no appreciable storage and are operated in conjunction with the upstream Coosa projects to meet downstream flow requirements and targets in support of the ACT Basin Drought Plan and navigation.

E. APC Tallapoosa River Projects. APC owns and operates the Tallapoosa River system of projects at Harris Dam and Lake, Martin Dam and Lake, Yates Dam, and Thurlow Dam in the ACT Basin. APC Tallapoosa River projects function mainly to generate electricity by hydropower. In addition, the Robert L. Harris Project operates pursuant to 33 CFR, Chapter II, Part 208, Section 208.65 regarding the requirement for the project to be operated for flood risk management and navigation in accordance with reasonable rules and regulations of the Secretary of the Army. The rules and regulations prescribed are described in a memorandum of understanding between the Corps and APC, individual water control manuals for the APC projects, and this DCP.

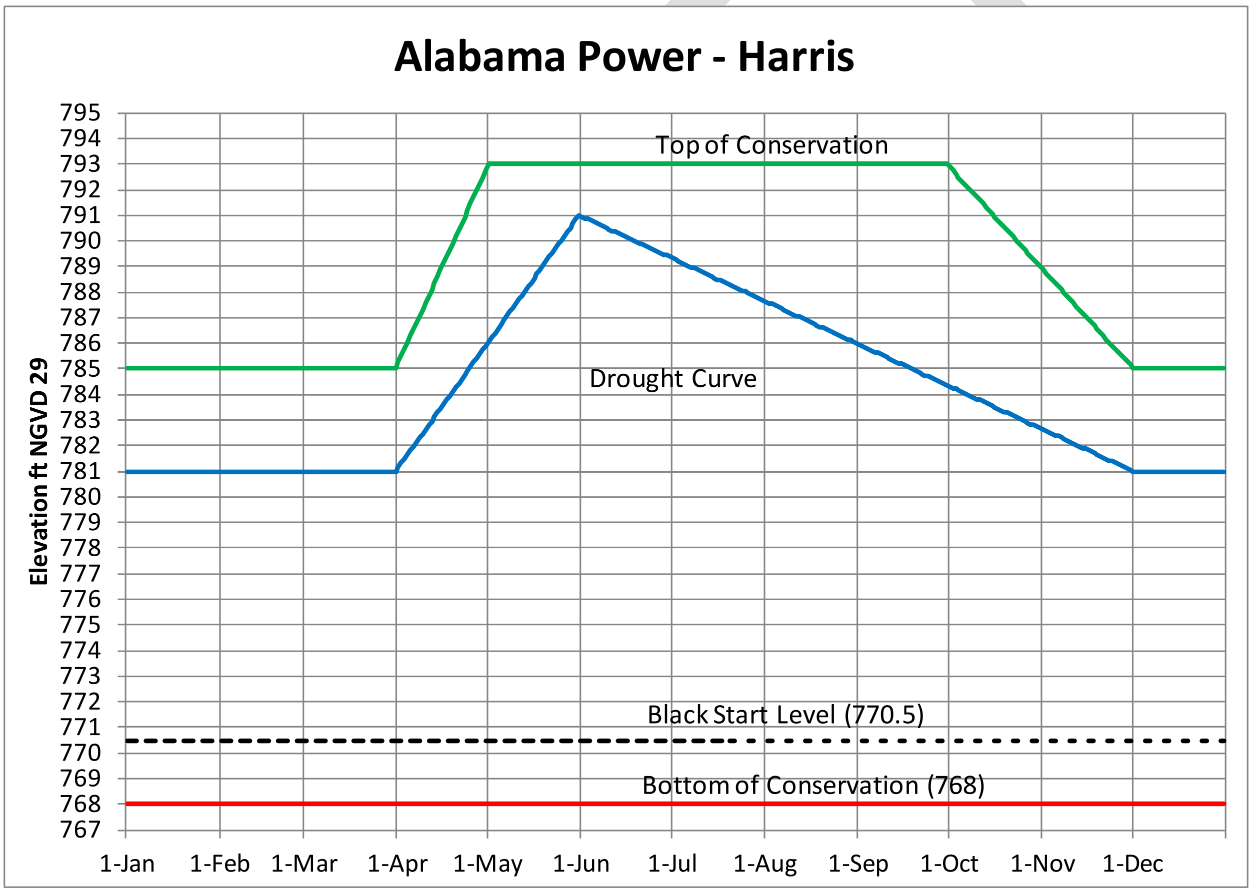


Figure 9. Robert L. Harris Lake Guide Curve

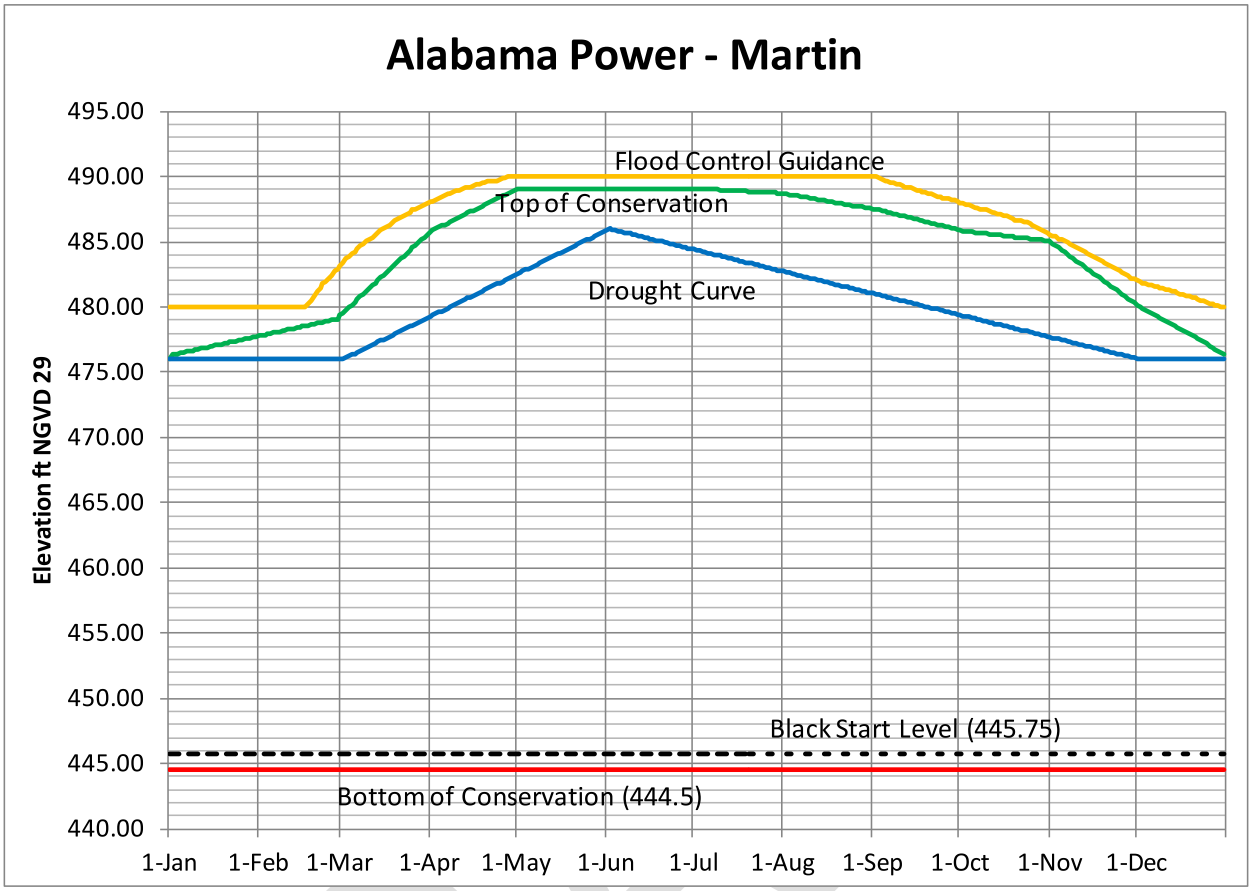


Figure 10. Martin Lake Guide Curve

F. Corps Alabama River Projects. The Corps operates three run-of-river lock and dam projects (Robert F. Henry, Millers Ferry, Claiborne) on the Alabama River in the lower ACT Basin to support commercial navigation. Claiborne Lake, together with R.E. “Bob” Woodruff Lake and William “Bill” Dannelly Lake, are collectively referred to as the Alabama River Lakes. The primary location used for communicating the available reliable navigation depth is the Claiborne Lock and Dam tailwater elevation. The water surface elevation is related to the available navigation depth based on the latest hydrographic surveys of the lower Alabama River reach downstream of Claiborne.

(1) Robert F. Henry. The R.E. “Bob” Woodruff Lake is created by the Robert F. Henry Lock and Dam on the Alabama River at river mile 236.3. R.E. “Bob” Woodruff Lake extends from the Robert F. Henry Lock and Dam upstream to the Walter Bouldin Dam. In addition to hydropower and navigation, R.E. “Bob” Woodruff Lake provides recreation and fish and wildlife conservation. R.E. “Bob” Woodruff Lake is 77 miles long and averages 1,300 feet wide. It has a surface area of 12,510 acres and a storage capacity of 234,200 acre-feet at a normal pool elevation of 126 feet NGVD29. Lake levels are typically fairly stable with minimal fluctuation between the operating pool elevation limits, 123 feet NGVD29 to 126 feet NGVD29. The emergency drawdown pool elevation is 122 feet NGVD29. An authorized 9-foot-deep by 200-foot-wide navigation channel exists over the entire length of the lake. The Jones Bluff

hydropower plant generating capacity is 82 MW (declared value). The lake is a popular recreation destination, receiving up to two million visitors annually.

(2) Millers Ferry. The William "Bill" Dannelly Lake is created by the Millers Ferry Lock and Dam on the Alabama River at river mile 133. William "Bill" Dannelly Lake is 103 miles long and averages almost 1,400 feet wide. The reservoir has a surface area of 18,500 acres and a storage capacity of 346,254 acre-feet at a normal full pool elevation of 80 feet NGVD29. Lake levels remain fairly stable on a day-to-day basis with minimal fluctuation between the operating pool elevation limits, 79 feet NGVD29 to 80 feet NGVD29. It has an authorized 9-foot-deep by 200-foot-wide navigation channel which extends the entire length of the reservoir. The facility is a multipurpose reservoir constructed by the Corps for both navigation and hydropower. The reservoir also provides recreational benefits and has lands managed for wildlife mitigation. The Millers Ferry hydropower plant generating capacity is 90 MW (declared value). The reservoir provides ample recreation opportunities. Recreation visitors number three million annually.

(3) Claiborne. Claiborne Lake is created by the Claiborne Lock and Dam on the Alabama River at river mile 72.5. The lake is similar to a wide river, averaging about 800 feet wide, with a surface area of 5,930 acres. Claiborne Lake extends 60 miles upstream to the Millers Ferry Lock and Dam. Storage capacity in the lake is 96,360 acre-feet at a normal pool elevation of 35 feet NGVD29. The operating pool elevation limits are between 32 feet NGVD29 and 36 feet NGVD29. The lake has an authorized 9-foot-deep, 200-foot-wide navigation channel extending its entire length. The primary purpose of the Corps project is navigation. No hydropower generating capability exists at the project. The lake also provides recreation benefits and lands managed for wildlife mitigation.

G. As other ACT water management objectives are addressed, lake levels might decline during prime recreation periods. Drought conditions will cause further drawdowns in lake levels. While lake levels will be slightly higher than what would naturally occur if no specific drought actions are taken, reservoir levels will decline thus triggering impacts associated with reaching initial recreation and water access limited levels. Large reservoir drawdowns impact recreational use: access to the water for boaters and swimmers is inhibited; submerged hazards (e.g., trees, shoals, boulders) become exposed or nearly exposed, posing safety issues; and exposed banks and lake bottoms become unsightly and diminish the recreation experience. Consequently certain levels are identified in each Corps impoundment at which recreation would be affected. The *Initial Impact level* (IIL) represents the level at which recreation impacts are first observed (i.e., some boat launching ramps are unusable, most beaches are unusable or minimally usable, and navigation hazards begin to surface). The *Recreation Impact level* (RIL) defines the level at which major impacts on concessionaires and recreation are observed (more ramps are not usable, all beaches are unusable, boats begin having problems maneuvering in and out of marina basin areas, loss of retail business occurs). The level at which severe impacts are observed in all aspects of recreational activities is called the *Water Access Limited level* (WAL). At this point, all or almost all boat ramps are out of service, all swimming beaches are unusable, major navigation hazards occur, channels to marinas are impassable and/or wet slips must be relocated, and a majority of private boat docks are unusable. The individual project water control manuals describe the specific impact levels at each project and provide information regarding the effects of the water control plans on recreation.

V – WATER USES AND USERS

5-01. Water Uses and Users.

A. Uses – The ACT Basin rivers and lakes provide for wastewater dilution, M&I water supply, fish and wildlife propagation, hydropower generation, and recreational boating and fishing.

B. Users – The following tables list the surface water uses and water users within Georgia and Alabama in the ACT Basin.

Table 2. Surface water use: ACT Basin (Georgia 2005)

Water use category	Quantity (mgd)	% of total
Total Use	788.98	100%
Public Supply	154.78	19.6%
Domestic and Commercial	0.30	0.0%
Industrial and Mining	32.49	4.1%
Irrigation	11.31	1.4%
Livestock	16.18	2.1%
Thermoelectric Power Generation	573.92	72.8%

Table 3. M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa River Basin (Georgia)—upstream counties to downstream counties						
Coosa	Dalton Utilities, Conasauga R	155-1404-01	Whitfield	Conasauga River	49.400	40.300
Coosa	Dalton Utilities, Mill Creek	155-1404-02	Whitfield	Mill Creek	13.200	7.500
Coosa	Dalton Utilities, Coahulla Cr	155-1404-03	Whitfield	Coahulla Creek	6.000	5.000
Coosa	Dalton Utilities, Freeman Sprngs	155-1404-04	Whitfield	Freeman Springs	2.000	1.500
Coosa	Dalton Utilities - River Road	155-1404-05	Whitfield	Conasauga River	35.000	18.000
Coosa	Chatsworth WW Commission	105-1405-01	Murray	Holly Creek	1.100	1.000
Coosa	Chatsworth WW Commission	105-1405-02	Murray	Eton Springs	1.800	1.800
Coosa	Chatsworth WW Commission	105-1409-01	Murray	Carters Lake	2.550	2.300
Coosa	Chatsworth, City of	105-1493-02	Murray	Coosawattee River	2.200	2.000
Coosa	Ellijay, City of - Ellijay R	061-1407-01	Gilmer	Ellijay River	0.550	0.450
Coosa	Ellijay - Gilmer County W & S Authority	061-1408-01	Gilmer	Cartecay River	4.000	4.000
Coosa	Calhoun, City of	064-1411-03	Gordon	Big Spring	7.000	6.000
Coosa	Calhoun, City of	064-1412-01	Gordon	City Of Calhoun Spring	0.638	0.537
Coosa	Calhoun, City of	064-1492-02	Gordon	Oostanaula River	6.200	3.000

Table 3 (continued). M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa	Calhoun, City of	064-1493-01	Gordon	Coosawattee River	18.000	16.000
Coosa	Jasper, City of	112-1417-02	Pickens	Long Swamp Creek	1.000	1.000
Coosa	Bent Tree Community, Inc.	112-1417-03	Pickens	Chestnut Cove Creek and unnamed creek	0.250	0.230
Coosa	Bent Tree Community, Inc.	112-1417-04	Pickens	Lake Tamarack	0.250	0.230
Coosa	Big Canoe Utilities Company, Inc.	112-1417-05	Pickens	Lake Petit	1.000	1.000
Coosa	Big Canoe Utilities Company, Inc.	112-1417-06	Pickens	Blackwell Creek	2.650	2.650
Coosa	Etowah Water & Sewer Authority	042-1415-01	Dawson	Etowah River	5.500	4.400
Coosa	Cherokee County Water & Sewerage Auth	028-1416-01	Cherokee	Etowah River	43.200	36.000
Coosa	Gold Kist, Inc	028-1491-03	Cherokee	Etowah River	5.000	4.500
Coosa	Canton, City of	028-1491-04	Cherokee	Etowah River	23.000	18.700
Coosa	Canton, City of (Hickory Log Creek)	028-1491-05	Cherokee	Etowah River	39.000	39.000
Coosa	Bartow County Water Department	008-1411-02	Bartow	Bolivar Springs	0.800	0.800
Coosa	Adairsville, City of	008-1412-02	Bartow	Lewis Spring	5.100	4.100
Coosa	New Riverside Ochre Company, Inc.	008-1421-01	Bartow	Etowah River	5.000	5.000
Coosa	New Riverside Ochre Company, Inc.	008-1421-02	Bartow	Etowah River	6.000	6.000
Coosa	Emerson, City of	008-1422-02	Bartow	Moss Springs	0.630	0.500
Coosa	Gerdau AmeriSteel US, Inc. – Cartersville Steel Mill	008-1423-01	Bartow	Pettit Creek	2.000	1.500
Coosa	Baroid Drilling Fluids, Inc.	008-1423-02	Bartow	Etowah River	3.400	2.500
Coosa	Cartersville, City of	008-1423-04	Bartow	Etowah River	26.420	23.000
Coosa	Georgia Power Co. - Plant Bowen	008-1491-01	Bartow	Etowah River	520.000	85.000
Coosa	CCMWA	008-1491-05	Bartow	Allatoona Lake	86.000	78.000
Coosa	Cartersville, City of	008-1491-06	Bartow	Allatoona Lake	21.420	18.000
Coosa	La Fayette, City of Dry Creek	146-1401-01	Walker	Dry Creek	1.000	0.900
Coosa	La Fayette, City of Big Spring	146-1401-02	Walker	Big Spring	1.650	1.310
Coosa	Mount Vernon Mills - Riegel Apparel Div.	027-1401-03	Chattooga	Trion Spring	9.900	6.600
Coosa	Summerville, City of	027-1402-02	Chattooga	Raccoon Creek	3.000	2.500
Coosa	Summerville, City of	027-1402-04	Chattooga	Lowe Spring	0.750	0.500
Coosa	Mohawk Industries, Inc.	027-1402-05	Chattooga	Chattooga R./ Raccoon Cr.	4.500	4.000
Coosa	Oglethorpe Power Corp.	057-1402-03	Floyd	Heath Creek	3,838.000	3,030.000
Coosa	Floyd County - Brighton Plant	057-1414-02	Floyd	Woodward Creek	0.800	0.700

Table 3 (continued). M&I surface water withdrawal permits in the ACT Basin (Georgia)

River basin	Permit holder	Permit number	County	Source water	Permit limit max day (mgd)	Permit limit monthly average (mgd)
Coosa	Cave Spring, City of	057-1428-06	Floyd	Cave Spring	1.500	1.300
Coosa	Floyd County	057-1428-08	Floyd	Old Mill Spring	4.000	3.500
Coosa	Berry Schools, The (Berry College)	057-1429-01	Floyd	Berry (Possum Trot) Reservoir	1.000	0.700
Coosa	Inland-Rome Inc.	057-1490-01	Floyd	Coosa River	34.000	32.000
Coosa	Georgia Power Co. - Plant Hammond	057-1490-02	Floyd	Coosa River	655.000	655.000
Coosa	Rome, City of	057-1492-01	Floyd	Oostanaula & Etowah R	18.000	16.400
Coosa	Rockmart, City of	115-1425-01	Polk	Euharlee Creek	2.000	1.500
Coosa	Vulcan Construction Materials, L.P.	115-1425-03	Polk	Euharlee Creek	0.200	0.200
Coosa	Cedartown, City of	115-1428-04	Polk	Big Spring	3.000	2.600
Coosa	Polk County Water Authority	115-1428-05	Polk	Aragon, Morgan, Mulco Springs	1.600	1.100
Coosa	Polk County Water Authority	115-1428-07	Polk	Deaton Spring	4.000	4.000
Tallapoosa River Basin (Georgia)						
Tallapoosa	Haralson County Water Authority	071-1301-01	Haralson	Tallapoosa River	3.750	3.750
Tallapoosa	Bremen, City of	071-1301-02	Haralson	Beech Creek & Bremen Reservoir (Bush Creek)	0.800	0.580
Tallapoosa	Bowdon, City of Indian	022-1302-01	Carroll	Indian Creek	0.400	0.360
Tallapoosa	Southwire Company	022-1302-02	Carroll	Buffalo Creek	2.000	1.000
Tallapoosa	Villa Rica, City of	022-1302-04	Carroll	Lake Paradise & Cowens Lake	1.500	1.500
Tallapoosa	Carrollton, City of	022-1302-05	Carroll	Little Tallapoosa River	12.000	12.000
Tallapoosa	Bowdon, City of Lake Tysinger	022-1302-06	Carroll	Lake Tysinger	1.000	1.000

Source: GAEPD 2009a

Table 4. M&I surface water withdrawals in the ACT Basin (Georgia)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa River Basin (Georgia)			
Coosa (Conasauga)	Dalton Utilities	Whitfield	35.38
Coosa (Conasauga)	City of Chatsworth	Murray	1.26
Coosa (Coosawattee)	Ellijay-Gilmer County Water System	Gilmer	3.12
Coosa (Coosawattee)	City of Fairmount	Gordon	0.06
Coosa (Oostanaula)	City of Calhoun	Gordon	9.10
Coosa (Etowah)	Big Canoe Corporation	Pickens	0.48
Coosa (Etowah)	City of Jasper	Pickens	1.00
Coosa (Etowah)	Bent Tree Community	Pickens	0.07
Coosa (Etowah)	Lexington Components Inc (Rubber)	Pickens	0.01
Coosa (Etowah)	Etowah Water and Sewer Authority	Dawson	1.50
Coosa (Etowah)	Town of Dawsonville	Dawson	0.10
Coosa (Etowah)	City of Canton	Cherokee	2.83
Coosa (Etowah)	Cherokee County Water System	Cherokee	15.81
Coosa (Etowah)a	Gold Kist, Inc.	Cherokee	1.94

Table 4 (continued). M&I surface water withdrawals in the ACT Basin (Georgia)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa (Etowah)	City of Cartersville	Bartow	13.26
Coosa (Etowah)	New Riverside Ochre Company, Inc (Chemicals)	Bartow	1.67
Coosa (Etowah)	Gerdau AmeriSteel US, Inc. – Cartersville Steel Mill (Primary metals)	Bartow	0.16
Coosa (Etowah)	Georgia Power Co – Plant Bowen	Bartow	38.92
Coosa (Etowah)	CCMWA	Bartow	44.42
Coosa (Upper Coosa)	City of Lafayette	Walker	1.20
Coosa (Upper Coosa)	City of Summerville	Chattooga	2.05
Coosa (Upper Coosa)	Mount Vernon Mills – Riegel Apparel Division (Textiles)	Chattooga	2.74
Coosa (Oostanaula)	City of Cave Spring (Domestic/Commercial)	Floyd	0.30
Coosa (Etowah / Oostanaula)	City of Rome	Floyd	9.98
Coosa (Upper Coosa)	Floyd County Water System	Floyd	2.57
Coosa (Upper Coosa)	Inland-Rome Inc. (Paper)	Floyd	25.74
Coosa (Upper Coosa)	Georgia Power Co - Plant Hammond	Floyd	535.00
Coosa (Upper Coosa)	Polk County Water Authority	Polk	2.22
Coosa (Etowah)	Vulcan Construction Materials	Polk	0.09
Tallapoosa River Basin (Georgia)			
Tallapoosa (Upper)	City of Bremen	Haralson	0.32
Tallapoosa (Upper)	Haralson County Water Authority	Haralson	2.05
Tallapoosa (Upper)	City of Bowdon	Carroll	0.75
Tallapoosa (Upper)	Southwire Company	Carroll	0.09
Tallapoosa (Upper)	City of Carrollton	Carroll	5.37
Tallapoosa (Upper)	City of Temple	Carroll	0.26
Tallapoosa (Upper)	City of Villa Rica	Carroll	0.58
Tallapoosa (Upper)	Carroll County Water System	Carroll	4.08

Table 5. Surface water use - ACT Basin (Alabama, 2005) (mgd)

ACT subbasin	HUC	Public supply	Industrial	Irrigation	Livestock	Thermo-electric	Total, by Subbasin
Upper Coosa	03150105	2.12	0	3.10	0.40	0	5.62
Middle Coosa	03150106	33.24	65.83	7.91	0.87	142.68	250.53
Lower Coosa	03150107	10.96	0.89	5.10	0.35	812.32	829.62
Upper Tallapoosa	03150108	0.90	0	0.15	0.40	0	1.45
Middle Tallapoosa	03150109	19.09	0	0.52	0.32	0	19.93
Lower Tallapoosa	03150110	38.22	2.23	4.22	0.28	0	44.95
Upper Alabama	03150201	10.40	30.63	3.84	0.84	4.14	49.85
Cahaba	03150202	52.90	0	3.49	0.25	0	56.64
Middle Alabama	03150203	0	21.04	1.73	0.48	0	23.25
Lower Alabama	03150204	0	54.61	0.64	0.02	0	55.27
Total - By Use Category		167.83	175.23	30.70	4.21	959.14	1337.11

Source: Hutson et al. 2009

Table 6. M&I surface water withdrawals in the ACT Basin (Alabama)

Basin (subbasin)	Withdrawal by	County	Withdrawal (mgd)
Coosa River Basin (Alabama)			
Coosa (Upper)	Centre Water Works & Sewer Board	Cherokee	1.19
Coosa (Upper)	Piedmont Water Works & Sewer Board	Calhoun	0.93
Coosa (Middle)	Jacksonville Water Works & Sewer Board	Calhoun	1.34
Coosa (Middle)	Anniston Water Works & Sewer Board	Calhoun	0.08
Coosa (Middle)	Fort Payne Water Works Board	DeKalb	8.10
Coosa (Middle)	Goodyear Tire and Rubber Company	Etowah	9.87
Coosa (Middle)	Gadsden Water Works & Sewer Board	Etowah	14.86
Coosa (Middle)	Alabama Power Co – Gadsden Steam Plant	Etowah	142.68
Coosa (Middle)	SIC 32 – Unnamed Stone, Glass, Clay, and/or Concrete Products	St. Clair	3.49
Coosa (Middle)	Talladega/Shelby Water Treatment Plant	Talladega	6.44
Coosa (Middle)	Talladega County Water Department	Talladega	0.81
Coosa (Middle)	Talladega Water Works & Sewer Board	Talladega	1.62
Coosa (Middle)	Bowater Newsprint, Coosa Pines Operation	Talladega	52.47
Coosa (Lower)	Sylacauga Utilities Board	Talladega	3.25
Coosa (Lower)	SIC 22 – Unnamed Textile	Talladega	0.89
Coosa (Lower)	Goodwater Water Works & Sewer Board	Coosa	0.46
Coosa (Lower)	Alabama Power Co – E.C. Gaston Plant	Shelby	812.32
Coosa (Lower)	Clanton Waterworks & Sewer Board	Chilton	1.79
Coosa (Lower)	Five Star Water Supply	Elmore	5.46
Tallapoosa River Basin (Alabama)			
Tallapoosa (Upper)	Heflin Water Works	Cleburne	0.51
Tallapoosa (Upper)	Wedowee Gas, Water, and Sewer	Randolph	0.39
Tallapoosa (Middle)	Roanoke Utilities Board	Randolph	1.29
Tallapoosa (Middle)	Clay County Water Authority	Clay	1.87
Tallapoosa (Middle)	Lafayette	Chambers	0.53
Tallapoosa (Middle)	Central Elmore Water & Sewer Authority	Elmore	4.83
Basin (subbasin)	**Withdrawal by**	**County**	**Withdrawal (mgd)**
Tallapoosa (Middle)	Alexander City Water Department	Tallapoosa	10.57
Tallapoosa (Lower)	West Point Home, Inc	Lee	2.23
Tallapoosa (Lower)	Opelika Water Works Board	Lee	2.61
Tallapoosa (Lower)	Auburn Water Works Board	Lee	5.75
Tallapoosa (Lower)	Tallassee	Tallapoosa	1.98
Tallapoosa (Lower)	Tuskegee Utilities	Macon	2.71
Tallapoosa (Lower)	Montgomery Water Works & Sewer Board	Montgomery	25.17
Alabama River Basin			
Alabama (Upper)	Montgomery Water Works & Sewer Board	Montgomery	10.40
Alabama (Upper)	International Paper	Autauga	30.63
Alabama (Upper)	Southern Power Co – Plant E. B. Harris	Autauga	4.14
Alabama (Cahaba)	Birmingham Water Works & Sewer Board	Shelby	52.90
Alabama (Middle)	International Paper – Pine Hill	Wilcox	21.04
Alabama (Lower)	Alabama River Pulp Company	Monroe	54.61

Source: Hutson et al. 2009

VI. – CONSTRAINTS

6-01. <u>General.</u> The availability of water resources in the ACT Basin is constrained by existing water supply storage contracts, Corps water control manuals, minimum flow requirements from Allatoona and Carters Dams, APC FERC licenses, Corps-APC Memorandum of Understanding, and industrial water quality flow needs. Existing water supply storage contracts do not include the use of the inactive storage pool and would require developing and implementing an emergency storage contract in order to access this water resource. Each Corps project has a water control manual that specifies operational requirements for varying basin conditions and requires a deviation approval to operate outside the parameters established by the manual. The Allatoona Project has a minimum flow release requirement of 240 cfs for downstream purposes. The Carters Project has a seasonally varying minimum flow release requirement that ranges from 250 – 865 cfs during normal conditions and a minimum of 240 cfs during low flow conditions. The APC projects are operated under FERC licenses which define specific operational requirements for each project and require approval from FERC and possibly the Corps and State agencies before any revised operations could be implemented. The Corps and APC projects are also operated under the rules and regulations found in the Corps-APC Memorandum of Understanding, which describes operational requirements for flood conditions and navigation within the ACT Basin. Some industrial NPDES permits within the ACT Basin have water quality discharge limitations which are impacted by the volume of water flow in the river.

VII – DROUGHT MANAGEMENT PLAN

7-01. **General**. The Drought Contingency Plan (DCP) for the ACT Basin implements drought conservation actions on the basis of composite system storage, state line flows, and basin inflow as triggers to drive drought response actions. The DCP also recognizes that a basin-wide drought plan must incorporate variable hydropower generation requirements from its headwater projects in Georgia (Allatoona Dam and Carters Dam), a reduction in the level of navigation service provided on the Alabama River as storage across the basin declines, and that environmental flow requirements must still be met to the maximum extent practicable. The Act basin-wide drought plan is composed of three components — Headwater regulation at Allatoona Lake and Carters Lake in Georgia; Regulation at APC projects on the Coosa and Tallapoosa Rivers; and Downstream Alabama River regulation at Corps projects downstream of Montgomery, Alabama.

A. Headwater Regulation for Drought at Allatoona Lake and Carters Lake. Drought regulation at Allatoona Lake and Carters Lake consists of progressively reduced hydropower generation as pool levels decline in accordance with the conservation storage action zones established in the projects' water control plans. For instance, when Allatoona Lake is operating in normal conditions (Conservation storage Zone 1); hydropower generation typically ranges from 0 to 4 hours per day. However, as the pool drops to lower action zones during drought conditions, generation could be reduced to 0 to 2 hours per day. As Carters Lake pool level might drop into a conservation storage Zone 2, seasonal varying minimum target flows would be reduced to 240 cfs. The water control manual for each project describes the drought water control regulation plan in more detail.

B. Drought Regulation at APC Projects on the Coosa, Tallapoosa, and Alabama River. Regulation guidelines for the Coosa, Tallapoosa, and Alabama Rivers have been defined in a drought regulation matrix (Table 7) on the basis of a Drought Intensity Level (DIL). The DIL is a drought indicator, ranging from one to three. The DIL is determined on the basis of three basin drought criteria (or triggers). A DIL from 1 to 3 indicates some level of drought conditions. The DIL increases as more of the drought indicator thresholds (or triggers) occur. The drought regulation matrix defines minimum average daily flow requirements on a monthly basis for the Coosa, Tallapoosa, and Alabama Rivers as a function of the DIL and time of year. The combined occurrences of the drought triggers determine the DIL. Three intensity levels for drought operations are applicable to APC projects.

DIL 1 — (moderate drought) 1 of 3 triggers occur
DIL 2 — (severe drought) 2 of 3 triggers occur
DIL 3 — (exceptional drought) all 3 triggers occur

(1) Drought Indicators. The indicators used to determine drought intensity include the following:

1. **Low basin inflow**. The total basin inflow needed is the sum of the total filling volume plus 4,640 cfs. The total filling volume is defined as the volume of water required to return the pool to the top of the conservation guide curve and is calculated using the area-capacity tables for each project. Table 8 lists the monthly low basin inflow criteria. The basin inflow value is computed daily and checked on the first and third Tuesday of the month. If computed basin inflow is less than the value required, the low basin inflow indicator is triggered. The basin inflow is total flow above the APC projects excluding Allatoona Lake and Carters Lake. It is the sum of local flows, minus lake evaporation and diversions. Figure 11 illustrates the local inflows to the Coosa and Tallapoosa Basins. The basin inflow computation differs from the navigation basin inflow, because it does not include releases from Allatoona Lake and Carters Lake. The intent is to capture the hydrologic condition across APC projects in the Coosa and Tallapoosa Basins.

Table 7. ACT Basin Drought Regulation Plan Matrix

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Drought Level Response[a]	Normal Operations											
	DIL 1: Low Basin Inflows or Low Composite or Low State Line Flow											
	DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite or Low State Line Flow)											
	DIL 3: Low Basin Inflows + Low Composite + Low State Line Flow											
Coosa River Flow[b]	Normal Operation: 2,000 cfs			4,000 (8,000)		4,000 – 2,000	Normal Operation: 2,000 cfs					
	Jordan 2,000 +/-cfs			4,000 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 2,000 +/-cfs		
	Jordan 1,600 to 2,000 +/-cfs			2,500 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 1,600 to 2,000 +/-cfs		
	Jordan 1,600 +/-cfs			Jordan 1,600 to 2,000 +/-cfs			Jordan 2,000 +/-cfs			Jordan 1,600 to 2,000 +/-cfs		Jordan 1,600 +/- cfs
Tallapoosa River Flow[c]	Normal Operations: 1200 cfs											
	Greater of: 1/2 Yates Inflow or 2 x Heflin Gage(Thurlow Lake releases > 350 cfs)				1/2 Yates Inflow					1/2 Yates Inflow		
	Thurlow Lake 350 cfs				1/2 Yates Inflow					Thurlow Lake 350 cfs		
	Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)						Thurlow Lake 350 cfs			Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)		
Alabama River Flow[d]	Normal Operation: Navigation or 4,640 cfs flow											
	4,200 cfs (10% Cut) - Montgomery				4,640 cfs - Montgomery					Reduce: Full – 4,200 cfs		
	3,700 cfs (20% Cut) - Montgomery					4,200 cfs (10% Cut) - Montgomery				Reduce: 4,200 cfs-> 3,700 cfs Montgomery (1 week ramp)		
	2,000 cfs Montgomery				3,700 cfs Montgomery		4,200 cfs (10% Cut) - Montgomery			Reduce: 4,200 cfs -> 2,000 cfs Montgomery (1 month ramp)		
Guide Curve Elevation	Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)											
	Corps Variances: As Needed; FERC Variance for Lake Martin											
	Corps Variances: As Needed; FERC Variance for Lake Martin											
	Corps Variances: As Needed; FERC Variance for Lake Martin											

a. Note these are based on flows that will be exceeded when possible.
b .Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow Lake flows are based on continuous +/- 5% of target flow: flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates.
d. Alabama River flows are 7-Day Average Flow.

Table 8. Low Basin Inflow Guide (in cfs-days)

Month	Coosa Filling Volume	Tallapoosa Filling Volume	Total Filling Volume	Minimum JBT Target Flow	Required Basin Inflow
Jan	628	0	628	4,640	5,268
Feb	626	1,968	2,594	4,640	7,234
Mar	603	2,900	3,503	4,640	8,143
Apr	1,683	2,585	4,269	4,640	8,909
May	248	0	248	4,640	4,888
Jun			0	4,640	4,640
Jul			0	4,640	4,640
Aug			0	4,640	4,640
Sep	–612	–1,304	–1,916	4,640	2,724
Oct	–1,371	–2,132	–3,503	4,640	1,137
Nov	–920	–2,748	–3,667	4,640	973
Dec	–821	–1,126	–1,946	4,640	2,694

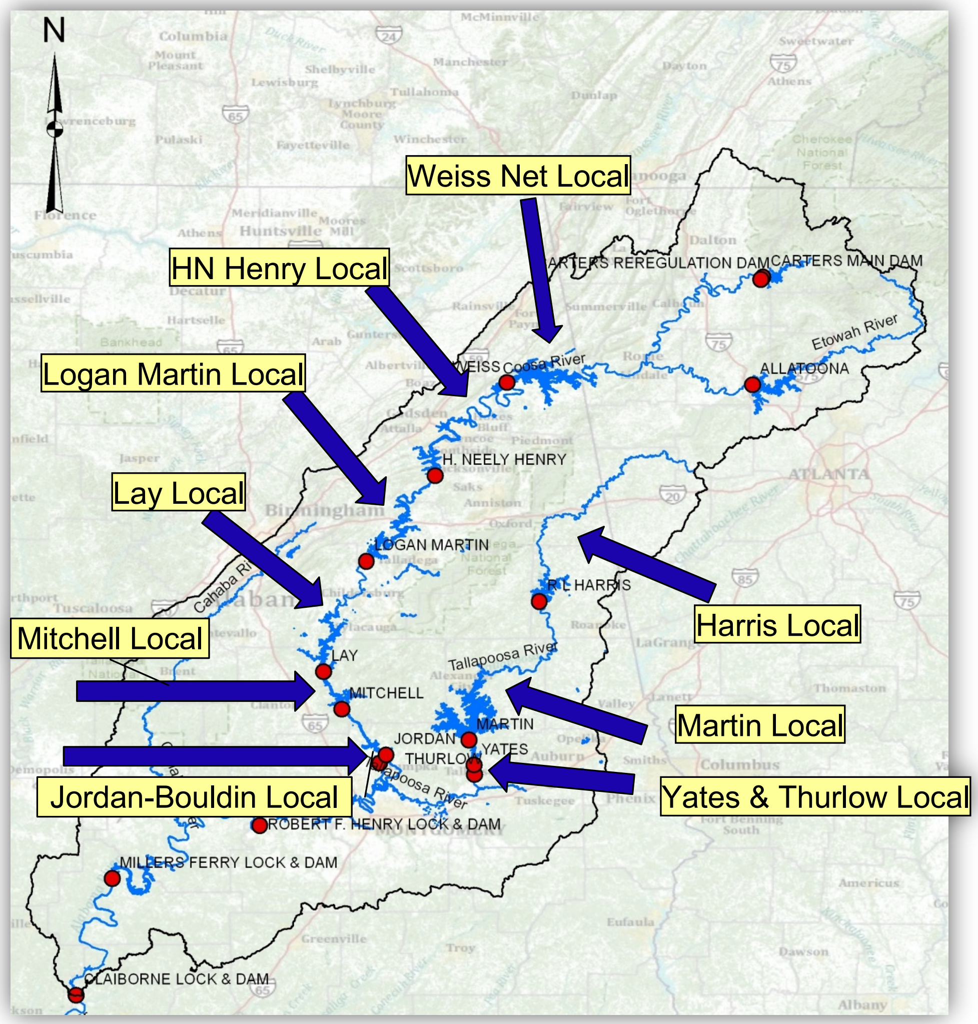


Figure 11. ACT Basin Inflows

2. **Low composite conservation storage**. Low composite conservation storage occurs when the APC projects' composite conservation storage is less than or equal to the storage available within the drought contingency curves for the APC reservoirs. Composite conservation storage is the sum of the amounts of storage available at the current elevation for each reservoir down to the drought contingency curve at each APC major storage project. The reservoirs considered for the trigger are R.L. Harris Lake, H. Neely Henry Lake, Logan Martin Lake, Lake Martin, and Weiss Lake. Figure 12 plots the APC composite zones. Figure 13 plots the APC low composite conservation storage trigger. If the actual active composite conservation storage is less than or equal to the active composite drought zone storage, the low composite conservation storage indicator is triggered. That computation is performed on the first and third Tuesday of each month, and is considered along with the low state line flow trigger and basin inflow trigger.

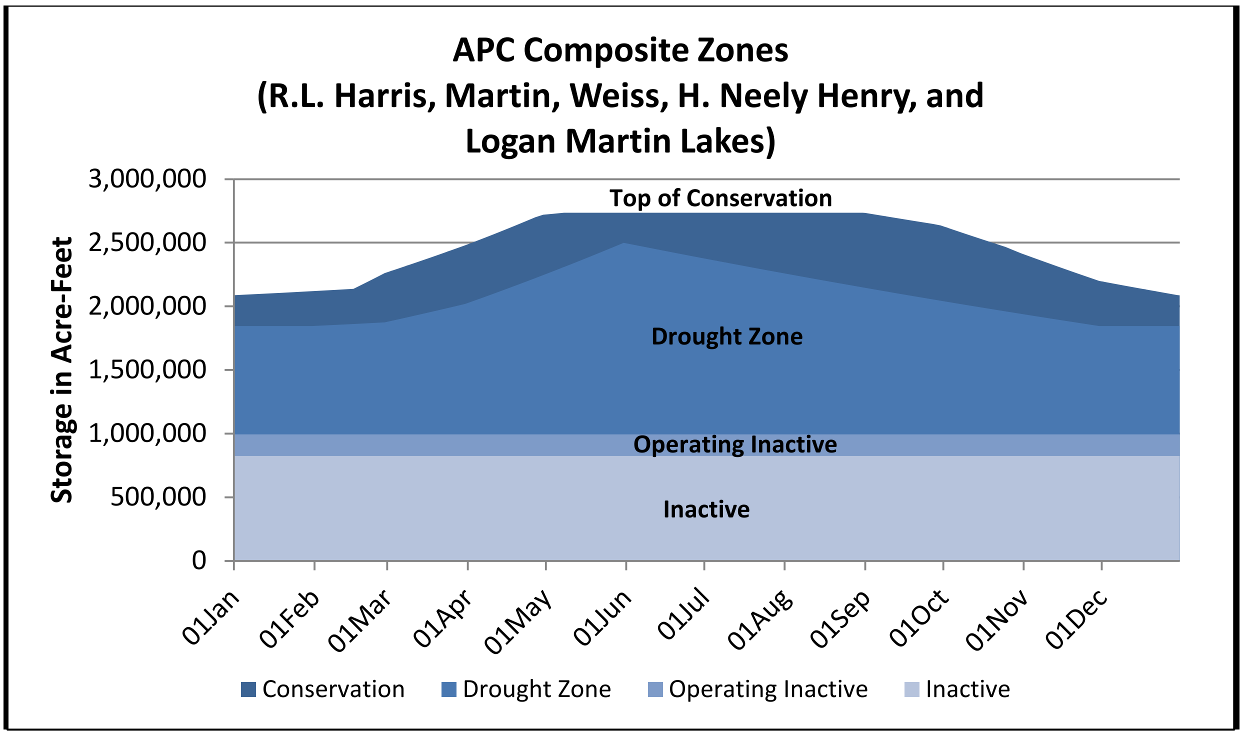


Figure 12. APC Composite Zones

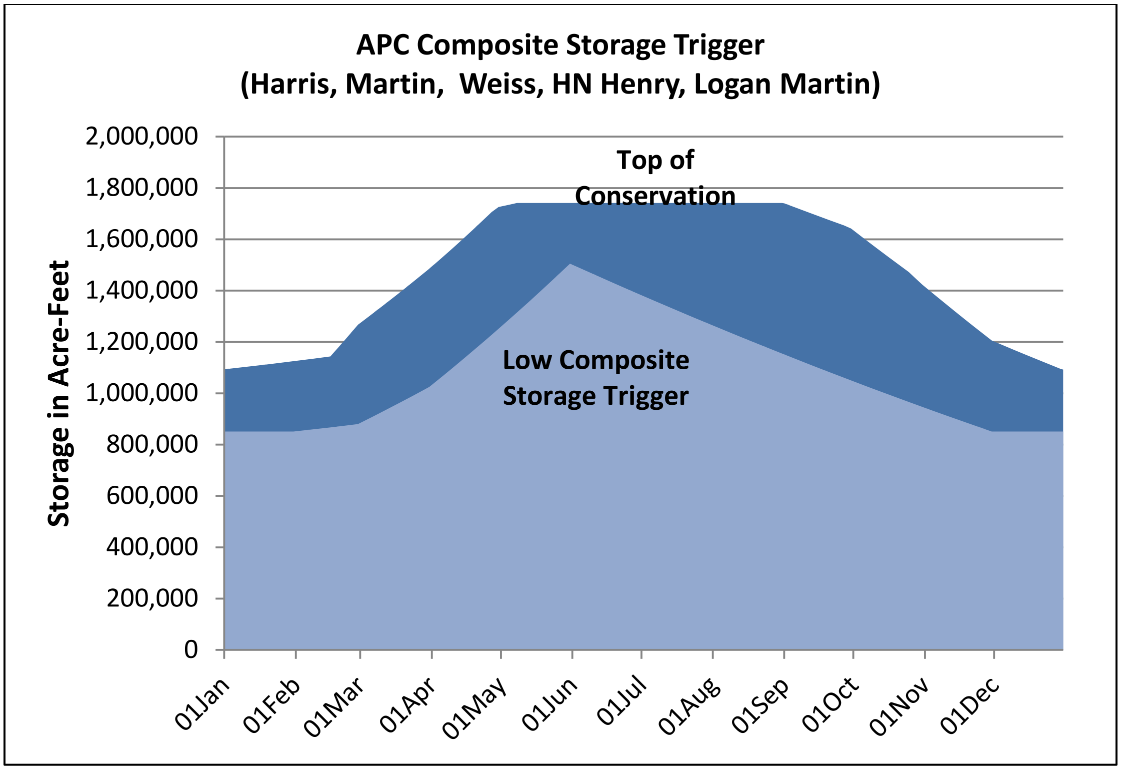


Figure 13. APC Low Composite Conservation Storage Drought Trigger

3. **Low state line flow**. A low state line flow trigger occurs when the Mayo's Bar USGS gage measures a flow below the monthly historical 7Q10 flow. The 7Q10 flow is defined as the lowest flow over a 7-day period that would occur once in 10 years. Table 9 lists the Mayo's Bar 7Q10 value for each month (determined from observed flows from 1949 – 2006). The lowest 7-day average flow over the past 14 days is computed and checked at the first and third Tuesday of the month. If the lowest 7-day average value is less than the Mayo's Bar 7Q10 value, the low state line flow indicator is triggered. If the result is greater than or equal to the trigger value from Table 9, the flow is considered normal, and the state line flow indicator is not triggered. The term state line flow is used in developing the drought management plan because of the proximity of the Mayo's Bar gage to the Alabama-Georgia state line and because it relates to flow data upstream of the Alabama-based APC reservoirs. State line flow is used only as a source of observed data for one of the three triggers and does not imply that flow targets exist at that geographic location. The ACT Basin drought matrix does not include or imply any Corps regulation that would result in water management decisions at Carters Lake or Allatoona Lake.

Table 9. State Line Flow Triggers

Month	Mayo's Bar (7Q10 in cfs)
Jan	2,544
Feb	2,982
Mar	3,258
Apr	2,911
May	2,497
Jun	2,153
Jul	1,693
Aug	1,601
Sep	1,406
Oct	1,325
Nov	1,608
Dec	2,043

Note: Based on USGS Coosa River at Rome Gage (Mayo's Bar, USGS 02397000) observed flow from 1949 to 2006

(2) Drought Regulation. The DIL is computed on the first and third Tuesday of each month. Once a drought operation is triggered, the DIL can only recover from drought condition at a rate of one level per period. For example, as the system begins to recover from an exceptional drought with DIL 3, the DIL must be stepped incrementally back to zero to resume normal operations. In that case, even if the system triggers return to normal quickly, it will still take at least a month before normal operations can resume - conditions can improve only to DIL 2 for the next 15 days, then DIL 1 for the next 15 days, before finally returning to normal operating conditions.

For normal operations, the matrix shows a Coosa River flow between 2,000 cfs and 4,000 cfs with peaking periods up to 8,000 cfs occurring. The required flow on the Tallapoosa River is a constant 1,200 cfs throughout the year. The navigation flows on the Alabama River are applied to the APC projects. The required navigation depth on the Alabama River is subject to the basin inflow.

For DIL 1, the Coosa River flow varies from 2,000 cfs to 4,000 cfs. On the Tallapoosa River, the required flow is the greater of one-half of the inflow into Yates Lake or twice the Heflin USGS gage from January thru April. For the remainder of the year, the required flow is one-half of Yates Lake inflow. The required flows on the Alabama River are reduced from the amounts required for DIL 0.

For DIL 2, the Coosa River flow varies from 1,800 cfs to 2,500 cfs. On the Tallapoosa River, the minimum is 350 cfs for part of the year and one-half of Yates Lake inflow for the remainder of the year. The requirement on the Alabama River is between 3,700 cfs and 4,200 cfs.

For DIL 3, the flows on the Coosa River range from 1,600 cfs to 2,000 cfs. A constant flow of 350 cfs on the Tallapoosa River is required. It is assumed an additional 50 cfs will occur between Thurlow Lake and the City of Montgomery water supply intake. Required flows on the Alabama River range from 2,000 cfs to 4,200 cfs

In addition to the flow regulation for drought conditions, the DIL affects the flow regulation to support navigation operations. Under normal operations, the APC projects are operated to meet the needed navigation flow target or 4,640 cfs flow as defined in the navigation measure section. Once drought operations begin, flow regulation to support navigation operations is suspended.

7-02. Extreme Drought Conditions. An extreme drought condition exists when the remaining composite conservation storage is depleted, and additional emergency actions may be necessary. When conditions have worsened to this extent, utilization of the inactive storage must be considered. Such an occurrence would typically be contemplated in the second or third year of a drought. Inactive storage capacities have been identified for the two federal projects with significant storage (Figures 14 and 15). The operational concept established for the extreme drought impact level and to be implemented when instituting the use of inactive storage is based on the following actions:

(1) Inactive storage availability is identified to meet specific critical water use needs within existing project authorizations.

(2) Emergency uses and users will be identified in accordance with emergency authorizations and through stakeholder coordination. Typical critical water use needs within the basin are associated with public health and safety.

(3) Weekly projections of the inactive storage water availability to meet the critical water uses in the ACT Basin will be utilized when making water control decisions regarding withdrawals and water releases from the federal reservoirs.

(4) The inactive storage action zones will be developed and instituted as triggers to meet the identified priority water uses (releases will be restricted as storage decreases).

(5) Dam safety considerations will always remain the highest priority. The structural integrity of the dams due to static head limitations will be maintained.

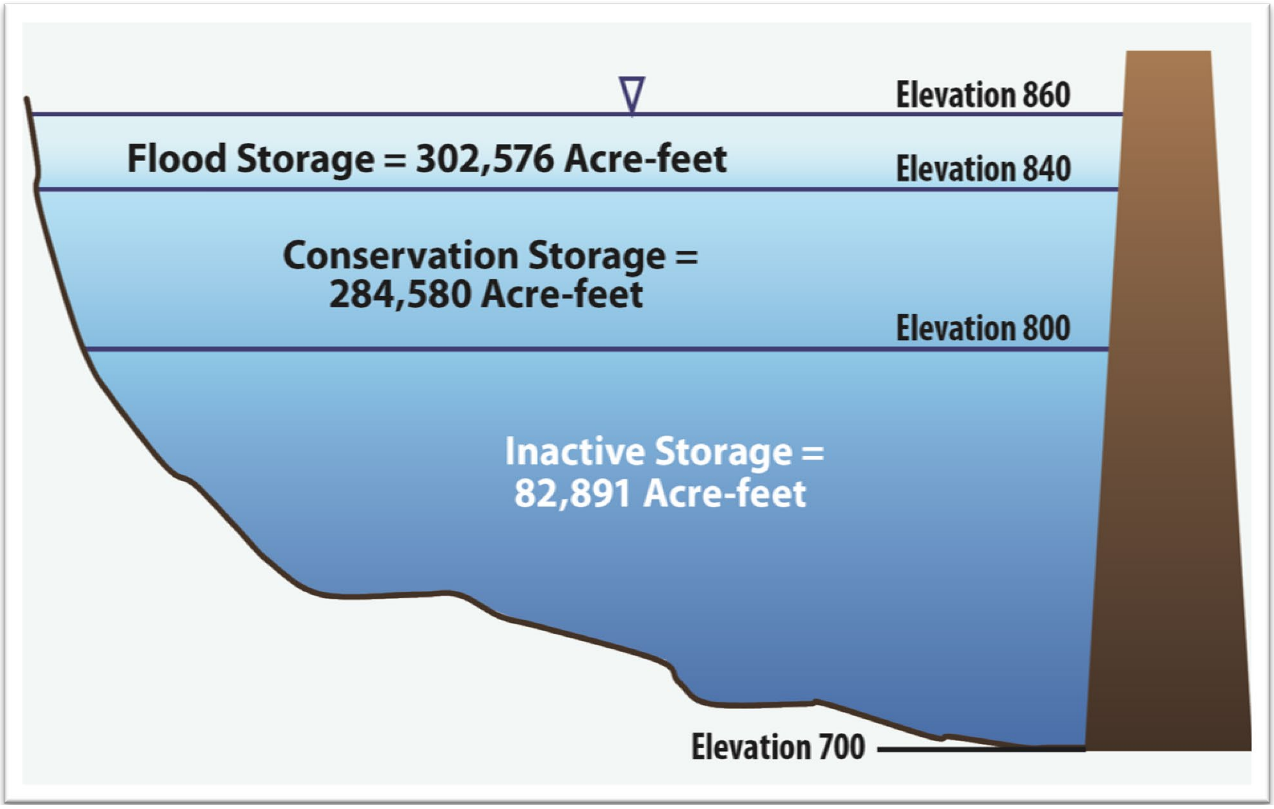


Figure 14. Storage in Allatoona Lake

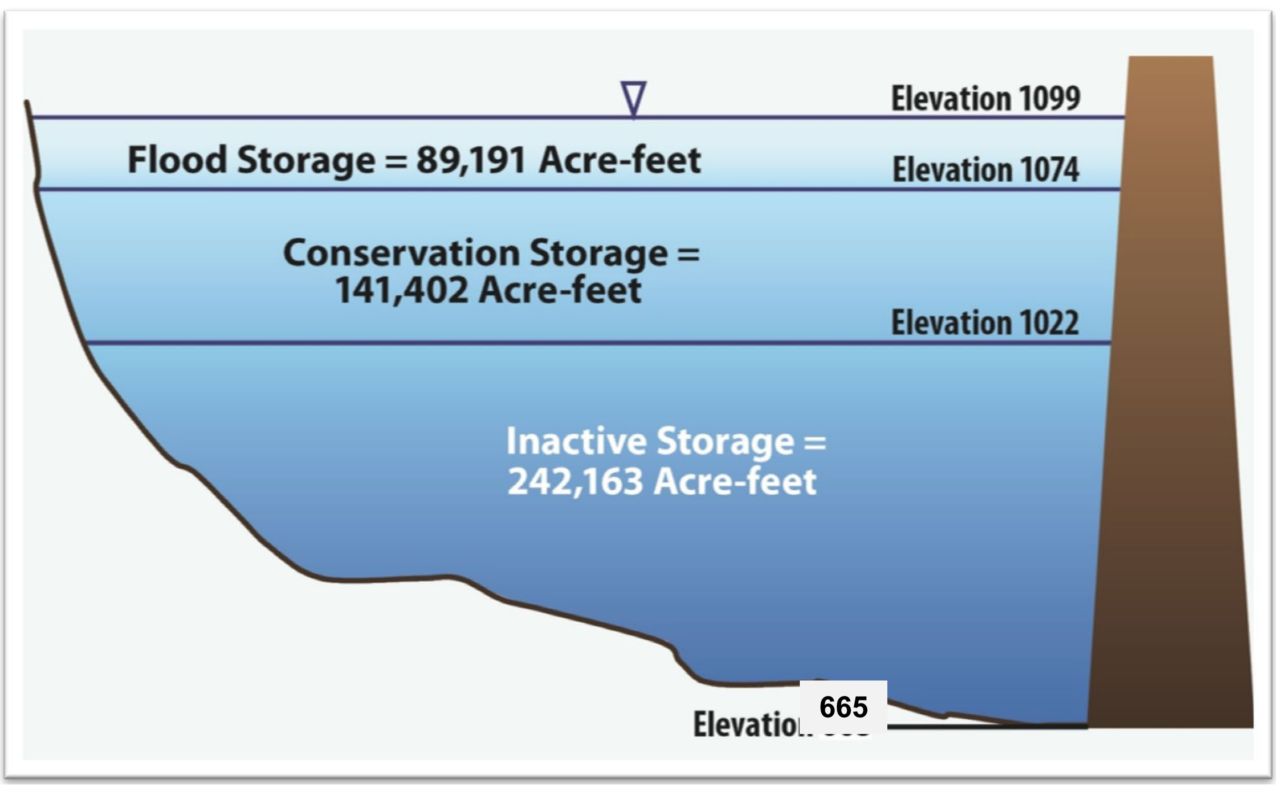


Figure 15. Storage in Carters Lake (excluding reregulation pool)

VIII – DROUGHT MANAGEMENT COORDINATION AND PROCEDURES

8-01. USACE Coordination. It is the responsibility of the Mobile District Water Management Section and APC to monitor climatological and hydrometeorological conditions at all times to make prudent water management decisions. The Water Management Section makes daily decisions and coordinates with APC every two weeks or more often if conditions warrant and with other district representatives from the various areas for which the river systems are operated -- hydropower, recreation, navigation, environmental, and others to exchange information concerning the operation of the river system. This coordination includes conducting weekly meetings with these other district elements. Daily water management decisions regarding water availability, lake level forecasts, and storage forecasts are determined using the information obtained along with current project and basin hydrometeorological data. A weekly District River System Status report is prepared that summarizes the conditions in each of the river basins. When conditions become evident that normal low flow conditions are worsening, the Water Management Section will elevate the district coordination to a heightened awareness. When drought conditions are imminent, Emergency Management representatives will be notified of the conditions and will be included in the regular coordination activities.

8-02. Interagency Coordination. The Water Management Section will support the environmental team regarding actions that require coordination with the U.S. Fish and Wildlife Service (USFWS) for monitoring threatened and endangered species and with the Environmental Protection Agency (EPA), Georgia Environmental Protection Division (GAEPD), and Alabama Department of Environmental Management (ADEM) regarding requests to lower minimum flow targets below Claiborne Dam.

8-03. Public Information and Coordination. When conditions determine that a change in the water control actions from normal regulation to drought regulation is imminent, it is important that various users of the system are notified so that any environmental or operational preparations can be completed prior to any impending reduction in reservoir discharges, river levels, and reservoir pool levels. In periods of severe drought within the ACT Basin it will be within the discretion of the Division Commander to approve the enactment of ACT Basin Water Management conference calls. The purposes of the calls are to share ongoing water management decisions with basin stakeholders and to receive stakeholder input regarding needs and potential impacts to users within the basin. Depending upon the severity of the drought conditions, the calls will be conducted at regular monthly or bi-weekly intervals. Should issues arise, more frequent calls would be implemented.

a. Local Press and Corps Bulletins. The local press consists of periodic publications in or near the ACT Basin. Montgomery, Columbus, and Atlanta have some of the larger daily papers. The papers often publish articles related to the rivers and streams. Their representatives have direct contact with the Corps through the Public Affairs Office. In addition, they can access the Corps Web pages for the latest project information. The Corps and the Mobile District publish e-newsletters regularly which are made available to the general public via email and postings on various websites. Complete, real-time information is available at the Mobile District's Water Management homepage http://water.sam.usace.army.mil/. The Mobile District Public Affairs Office issues press releases as necessary to provide the public with information regarding Water Management issues and activities and also provides information via the Mobile District web site.

IX – REFERENCES

Institute for Water Resources (IWR). 1991. National Study of Water Management During Drought A Research Assessment, U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources, IWR Report 91-NDS-3.

Institute for Water Resources (IWR). 1994. National Study of Water Management During Drought The Report to the U.S. Congress, U.S. Army Corps of Engineers, Water Resources Support Center, Institute for Water Resources, IWR Report 94-NDS-12.

Institute for Water Resources (IWR). 1998. Water Supply Handbook, U.S. Army Corps, Water Resources Support Center, Institute for Water Resources, Revised IWR Report 96-PS-4.

U.S. Army Corps of Engineers, (USACE). 1993. Development of Drought Contingency Plans, Washington, DC: CECW-EH-W Technical Letter No. 1110-2-335, (ETL 1110-2-335).

U.S. Army Corps of Engineers, (USACE). January 2009. Western States Watershed Study: Drought.

U. S. Geological Survey (USGS). 2000. *Droughts in Georgia*. Open-file report 00-380. U.S. Geological Survey, Atlanta, Georgia

EXHIBIT E

EMERGENCY CONTACT INFORMATION

Emergency Contact Information

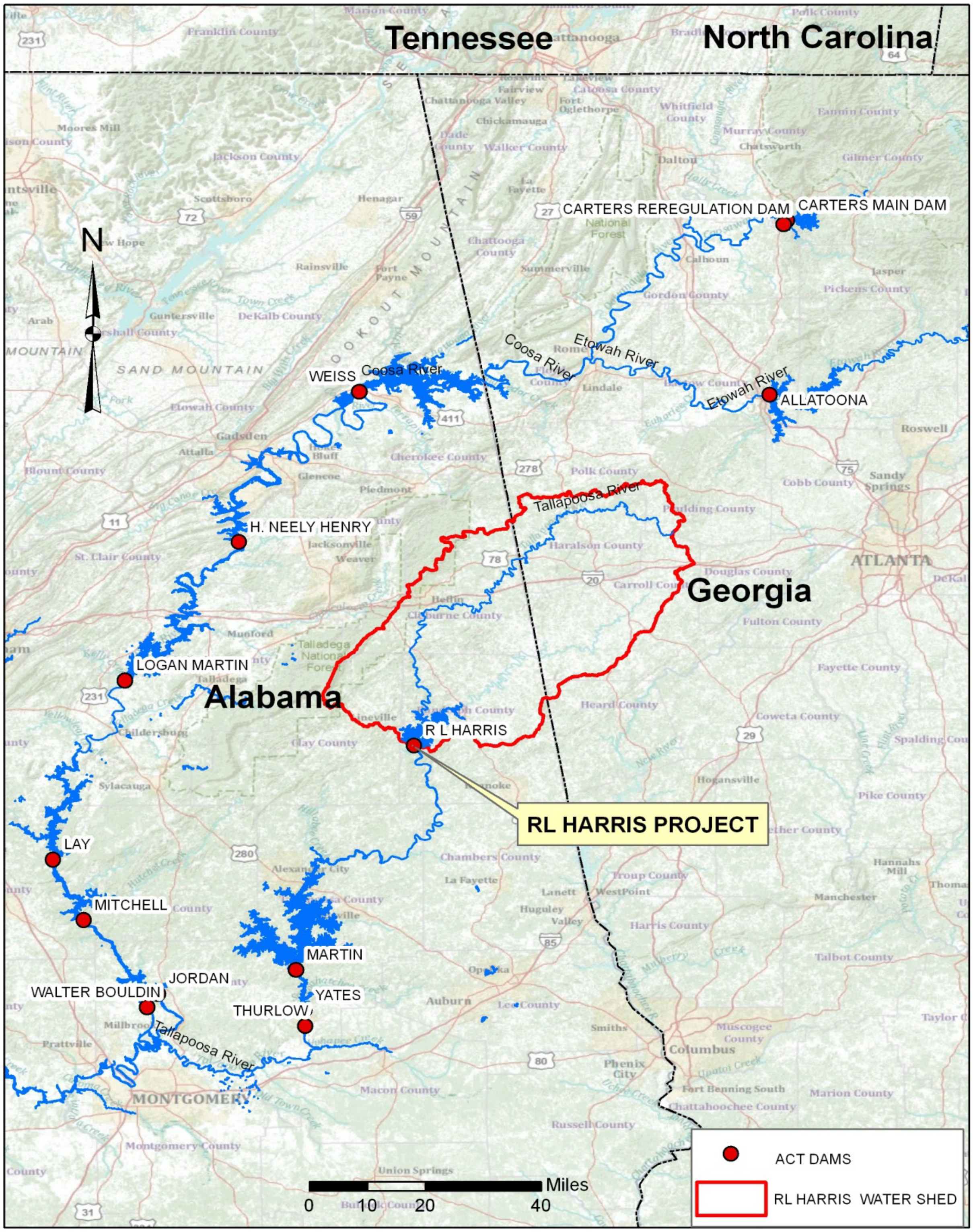
Alabama Power Company:

Reservoir Operations Supervisor	(205) 257-1401
Reservoir Operations Supervisor Alternate Daytime	(205) 257-4010
Reservoir Operations Supervisor After-Hours	(205) 257-4010

US Army Corps of Engineers:

Water Management Section	(251) 690-2737
Chief of Water Management	(251) 690-2730 or (251) 509-5368
R. L. Harris Powerhouse	(256) 396-0081

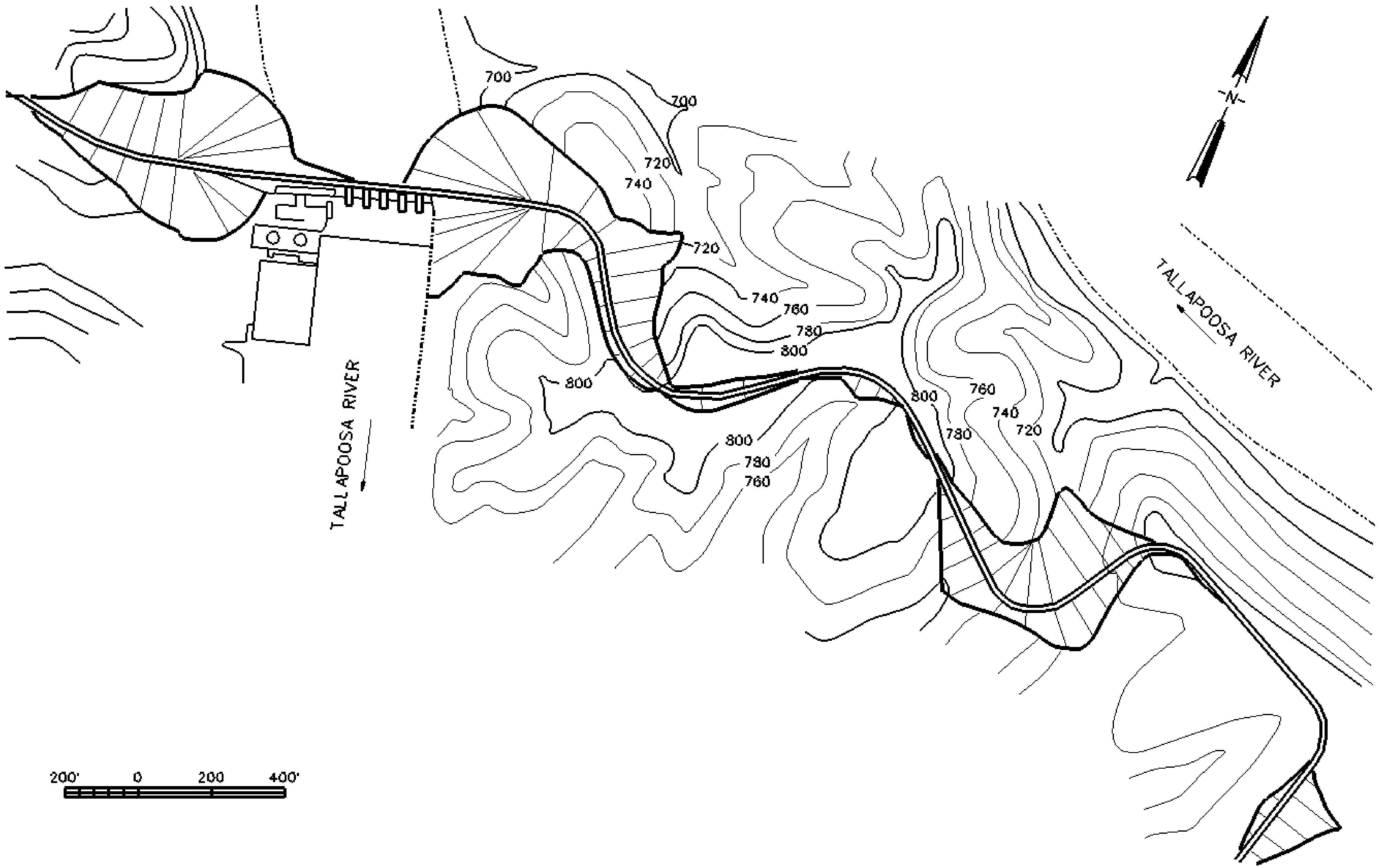
PLATES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

LOCATION MAP

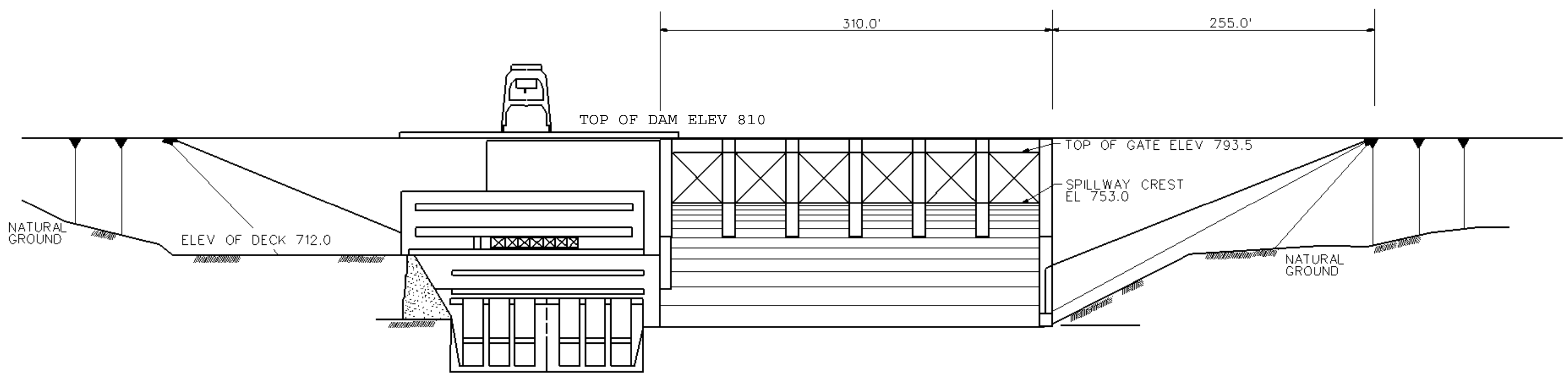


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

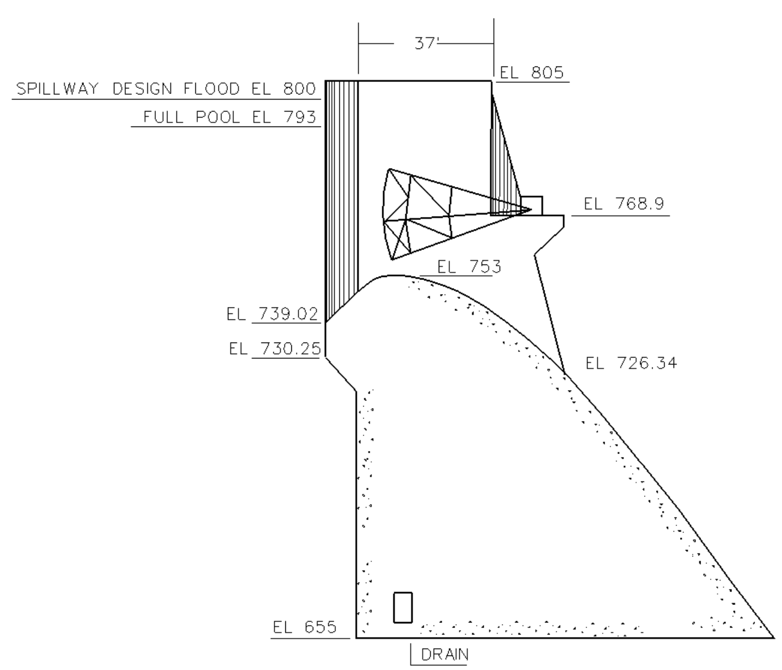
WATER CONTROL MANUAL

R.L. HARRIS DAM AND LAKE

PLAN



DOWNSTREAM ELEVATION

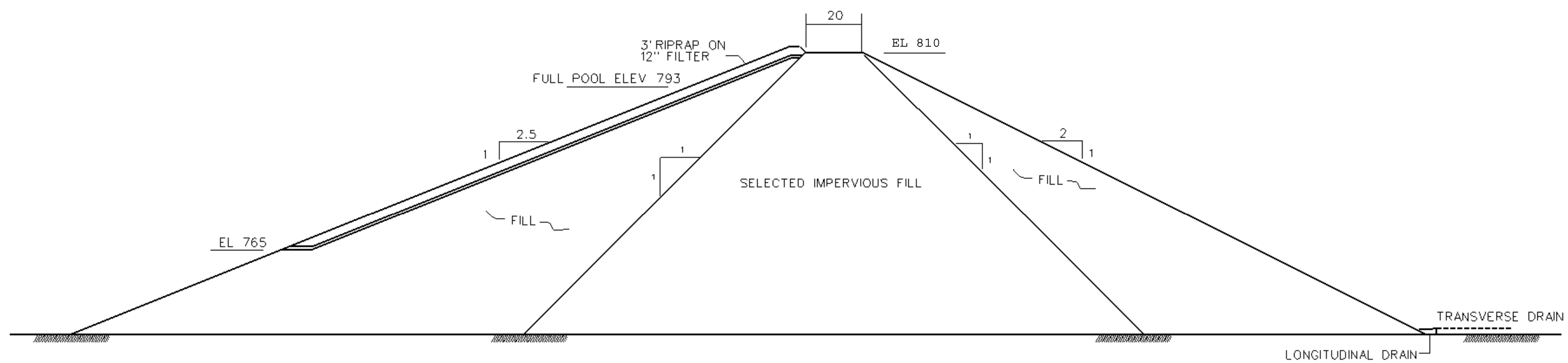


SPILLWAY SECTION

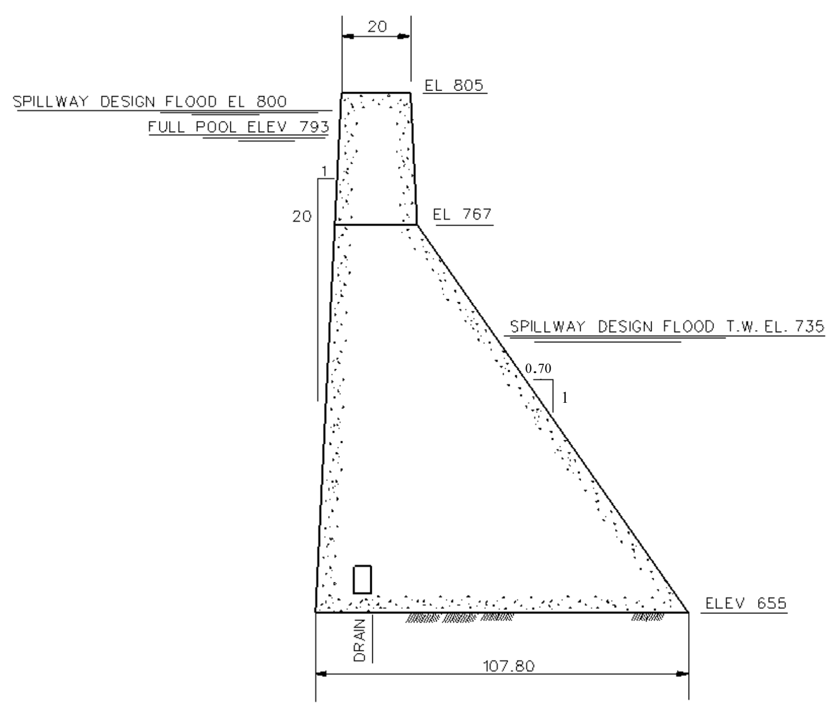
ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

SPILLWAY ELEVATION AND SECTION



TYPICAL EARTH DIKE SECTION

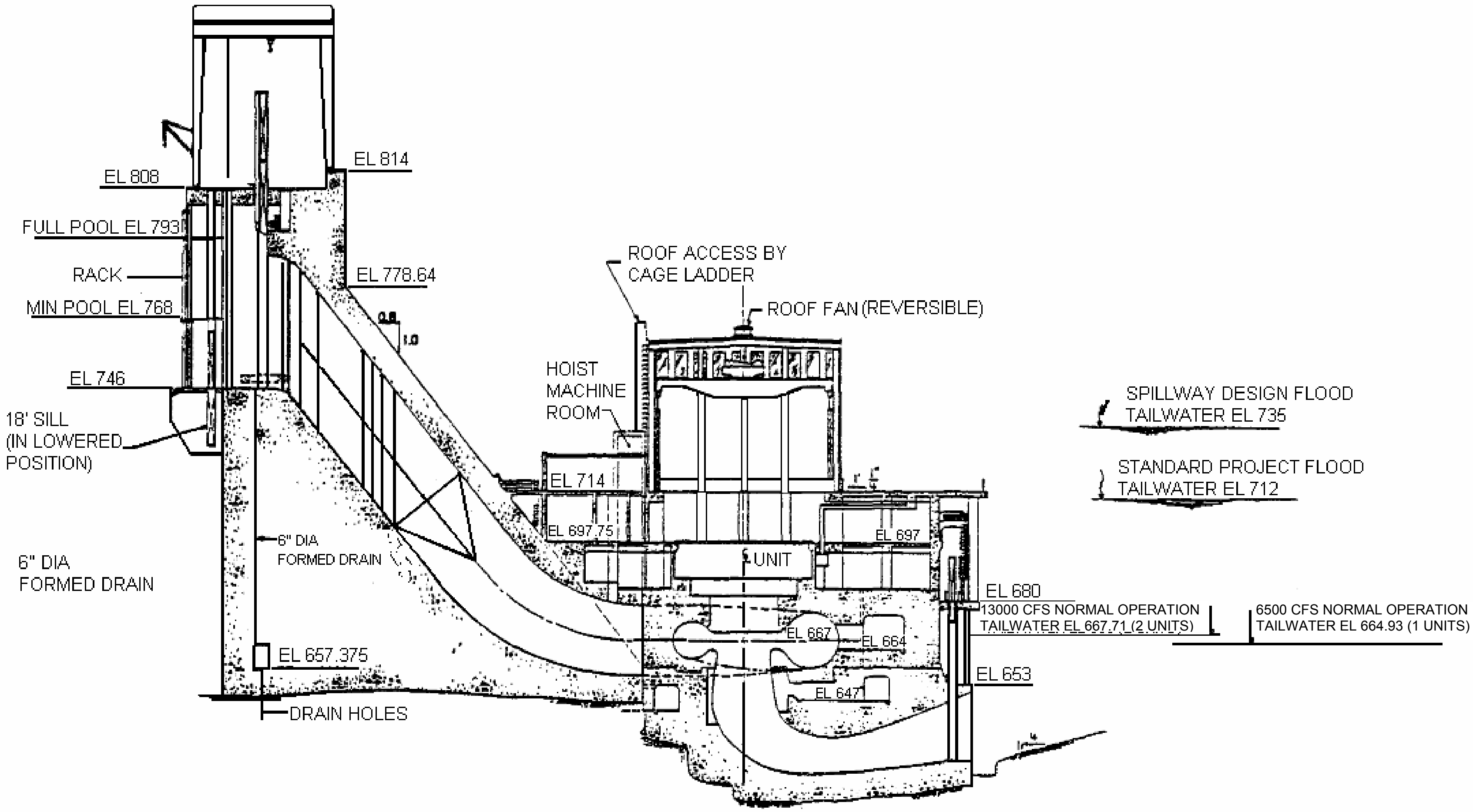


NON-OVERFLOW SPILLWAY SECTION

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DIKE AND NON-OVERFLOW SPILLWAY SECTION



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

POWERHOUSE SECTION

GATE OPENING SCHEDULE																							
	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
1	0	1	0	0	0	0	542	551	560	568	576	584	592	600	608	616	624	631	639	639	639	639	639
2	0	1	1	0	0	0	1084	1102	1120	1136	1152	1168	1184	1200	1216	1232	1248	1262	1278	1278	1278	1278	1278
3	0	1	1	1	0	0	1626	1653	1680	1704	1728	1752	1776	1800	1824	1848	1872	1893	1917	1917	1917	1917	1917
4	0	1	1	1	1	0	2168	2204	2240	2272	2304	2336	2368	2400	2432	2464	2496	2524	2556	2556	2556	2556	2556
5	1	1	1	1	1	0	2710	2755	2800	2840	2880	2920	2960	3000	3040	3080	3120	3155	3195	3195	3195	3195	3195
6	1	1	1	1	1	1	3252	3306	3360	3408	3456	3504	3552	3600	3648	3696	3744	3786	3834	3834	3834	3834	3834
7	1	2	1	1	1	1	4210	4279	4348	4411	4475	4537	4600	4662	4724	4786	4847	4903	4964	4964	4964	4964	4964
8	1	2	2	1	1	1	5168	5252	5336	5414	5494	5570	5648	5724	5800	5876	5950	6020	6094	6094	6094	6094	6094
9	1	2	2	2	1	1	6126	6225	6324	6417	6513	6603	6696	6786	6876	6966	7053	7137	7224	7224	7224	7224	7224
10	1	2	2	2	2	1	7084	7198	7312	7420	7532	7636	7744	7848	7952	8056	8156	8254	8354	8354	8354	8354	8354
11	2	2	2	2	2	1	8042	8171	8300	8423	8551	8669	8792	8910	9028	9146	9259	9371	9484	9484	9484	9484	9484
12	2	2	2	2	2	2	9000	9144	9288	9426	9570	9702	9840	9972	10104	10236	10362	10488	10614	10614	10614	10614	10614
13	2	3	2	2	2	2	9960	10120	10280	10434	10593	10741	10893	11040	11187	11333	11473	11613	11753	11753	11753	11753	11753
14	2	3	3	2	2	2	10920	11096	11272	11442	11616	11780	11946	12108	12270	12430	12584	12738	12892	12892	12892	12892	12892
15	2	3	3	3	2	2	11880	12072	12264	12450	12639	12819	12999	13176	13353	13527	13695	13863	14031	14031	14031	14031	14031
16	2	3	3	3	3	2	12840	13048	13256	13458	13662	13858	14052	14244	14436	14624	14806	14988	15170	15170	15170	15170	15170
17	3	3	3	3	3	2	13800	14024	14248	14466	14685	14897	15105	15312	15519	15721	15917	16113	16309	16309	16309	16309	16309
18	3	3	3	3	3	3	14760	15000	15240	15474	15708	15936	16158	16380	16602	16818	17028	17238	17448	17448	17448	17448	17448
19	3	4	3	3	3	3	15722	15979	16235	16485	16734	16978	17216	17453	17689	17920	18145	18369	18593	18593	18593	18593	18593
20	3	4	4	3	3	3	16684	16958	17230	17496	17760	18020	18274	18526	18776	19022	19262	19500	19738	19738	19738	19738	19738

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
21	3	4	4	4	3	3	17646	17937	18225	18507	18786	19062	19332	19599	19863	20124	20379	20631	20883	20883	20883	20883	20883
22	3	4	4	4	4	3	18608	18916	19220	19518	19812	20104	20390	20672	20950	21226	21496	21762	22028	22028	22028	22028	22028
23	4	4	4	4	4	3	19570	19895	20215	20529	20838	21146	21448	21745	22037	22328	22613	22893	23173	23173	23173	23173	23173
24	4	4	4	4	4	4	20532	20874	21210	21540	21864	22188	22506	22818	23124	23430	23730	24024	24318	24318	24318	24318	24318
25	4	5	4	4	4	4	21497	21856	22209	22556	22896	23236	23570	23897	24219	24540	24855	25164	25473	25473	25473	25473	25473
26	4	5	5	4	4	4	22462	22838	23208	23572	23928	24284	24634	24976	25314	25650	25980	26304	26628	26628	26628	26628	26628
27	4	5	5	5	4	4	23427	23820	24207	24588	24960	25332	25698	26055	26409	26760	27105	27444	27783	27783	27783	27783	27783
28	4	5	5	5	5	4	24392	24802	25206	25604	25992	26380	26762	27134	27504	27870	28230	28584	28938	28938	28938	28938	28938
29	5	5	5	5	5	4	25357	25784	26205	26620	27024	27428	27826	28213	28599	28980	29355	29724	30093	30093	30093	30093	30093
30	5	5	5	5	5	5	26322	26766	27204	27636	28056	28476	28890	29292	29694	30090	30480	30864	31248	31248	31248	31248	31248
31	5	6	5	5	5	5	27288	27750	28206	28655	29092	29528	29958	30377	30795	31206	31612	32011	32410	32410	32410	32410	32410
32	5	6	6	5	5	5	28254	28734	29208	29674	30128	30580	31026	31462	31896	32322	32744	33158	33572	33572	33572	33572	33572
33	5	6	6	6	5	5	29220	29718	30210	30693	31164	31632	32094	32547	32997	33438	33876	34305	34734	34734	34734	34734	34734
34	5	6	6	6	6	5	30186	30702	31212	31712	32200	32684	33162	33632	34098	34554	35008	35452	35896	35896	35896	35896	35896
35	6	6	6	6	6	5	31152	31686	32214	32731	33236	33736	34230	34717	35199	35670	36140	36599	37058	37058	37058	37058	37058
36	6	6	6	6	6	6	32118	32670	33216	33750	34272	34788	35298	35802	36300	36786	37272	37746	38220	38220	38220	38220	38220
37	6	7	6	6	6	6	33084	33654	34217	34769	35309	35842	36369	36889	37403	37906	38407	38897	39386	39386	39386	39386	39386
38	6	7	7	6	6	6	34050	34638	35218	35788	36346	36896	37440	37976	38506	39026	39542	40048	40552	40552	40552	40552	40552
39	6	7	7	7	6	6	35016	35622	36219	36807	37383	37950	38511	39063	39609	40146	40677	41199	41718	41718	41718	41718	41718
40	6	7	7	7	7	6	35982	36606	37220	37826	38420	39004	39582	40150	40712	41266	41812	42350	42884	42884	42884	42884	42884
41	6	8	7	7	7	6	36945	37588	38220	38844	39456	40058	40653	41238	41816	42386	42949	43503	44052	44052	44052	44052	44052

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
42	6	8	8	7	7	6	37908	38570	39220	39862	40492	41112	41724	42326	42920	43506	44086	44656	45220	45220	45220	45220	45220
43	6	8	8	8	7	6	38871	39552	40220	40880	41528	42166	42795	43414	44024	44626	45223	45809	46388	46388	46388	46388	46388
44	6	8	8	8	8	6	39834	40534	41220	41898	42564	43220	43866	44502	45128	45746	46360	46962	47556	47556	47556	47556	47556
45	6	9	8	8	8	6	40792	41512	42217	42914	43598	44271	44935	45589	46232	46867	47497	48116	48726	48726	48726	48726	48726
46	6	9	9	8	8	6	41750	42490	43214	43930	44632	45322	46004	46676	47336	47988	48634	49270	49896	49896	49896	49896	49896
47	6	9	9	9	8	6	42708	43468	44211	44946	45666	46373	47073	47763	48440	49109	49771	50424	51066	51066	51066	51066	51066
48	6	9	9	9	9	6	43666	44446	45208	45962	46700	47424	48142	48850	49544	50230	50908	51578	52236	52236	52236	52236	52236
49	6	10	9	9	9	6	44619	45418	46201	46973	47730	48473	49209	49934	50646	51349	52045	52731	53406	53406	53406	53406	53406
50	6	10	10	9	9	6	45572	46390	47194	47984	48760	49522	50276	51018	51748	52468	53182	53884	54576	54576	54576	54576	54576
51	6	10	10	10	9	6	46525	47362	48187	48995	49790	50571	51343	52102	52850	53587	54319	55037	55746	55746	55746	55746	55746
52	6	10	10	10	10	6	47478	48334	49180	50006	50820	51620	52410	53186	53952	54706	55456	56190	56916	56916	56916	56916	56916
53	6	11	10	10	10	6	48426	49302	50168	51014	51847	52666	53474	54269	55053	55825	56591	57342	58086	58086	58086	58086	58086
54	6	11	11	10	10	6	49374	50270	51156	52022	52874	53712	54538	55352	56154	56944	57726	58494	59256	59256	59256	59256	59256
55	6	11	11	11	10	6	50322	51238	52144	53030	53901	54758	55602	56435	57255	58063	58861	59646	60426	60426	60426	60426	60426
56	6	11	11	11	11	6	51270	52206	53132	54038	54928	55804	56666	57518	58356	59182	59996	60798	61596	61596	61596	61596	61596
57	6	12	11	11	11	6	52223	53181	54127	55053	55963	56859	57741	58611	59468	60312	61145	61965	62780	62780	62780	62780	62780
58	6	12	12	11	11	6	53176	54156	55122	56068	56998	57914	58816	59704	60580	61442	62294	63132	63964	63964	63964	63964	63964
59	6	12	12	12	11	6	54129	55131	56117	57083	58033	58969	59891	60797	61692	62572	63443	64299	65148	65148	65148	65148	65148
60	6	12	12	12	12	6	55082	56106	57112	58098	59068	60024	60966	61890	62804	63702	64592	65466	66332	66332	66332	66332	66332
61	6	13	12	12	12	6	56028	57074	58101	59109	60099	61075	62036	62980	63913	64830	65738	66630	67514	67514	67514	67514	67514
62	6	13	13	12	12	6	56974	58042	59090	60120	61130	62126	63106	64070	65022	65958	66884	67794	68696	68696	68696	68696	68696

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

GATE STEP	GATE NUMBER 1	2	3	4	5	6	POOL ELEVATION (FT NGVD 29) 784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
63	6	13	13	13	12	6	57920	59010	60079	61131	62161	63177	64176	65160	66131	67086	68030	68958	69878	69878	69878	69878	69878
64	6	13	13	13	13	6	58866	59978	61068	62142	63192	64228	65246	66250	67240	68214	69176	70122	71060	71060	71060	71060	71060
65	6	14	13	13	13	6	59803	60937	62050	63145	64216	65273	66311	67335	68345	69338	70319	71284	72239	72239	72239	72239	72239
66	6	14	14	13	13	6	60740	61896	63032	64148	65240	66318	67376	68420	69450	70462	71462	72446	73418	73418	73418	73418	73418
67	6	14	14	14	13	6	61677	62855	64014	65151	66264	67363	68441	69505	70555	71586	72605	73608	74597	74597	74597	74597	74597
68	6	14	14	14	14	6	62614	63814	64996	66154	67288	68408	69506	70590	71660	72710	73748	74770	75776	75776	75776	75776	75776
69	6	15	14	14	14	6	63541	64765	65969	67149	68305	69445	70565	71669	72759	73828	74886	75926	76952	76952	76952	76952	76952
70	6	15	15	14	14	6	64468	65716	66942	68144	69322	70482	71624	72748	73858	74946	76024	77082	78128	78128	78128	78128	78128
71	6	15	15	15	14	6	65395	66667	67915	69139	70339	71519	72683	73827	74957	76064	77162	78238	79304	79304	79304	79304	79304
72	6	15	15	15	15	6	66322	67618	68888	70134	71356	72556	73742	74906	76056	77182	78300	79394	80480	80480	80480	80480	80480
73	6	16	15	15	15	6	67238	68557	69850	71119	72363	73586	74792	75978	77148	78294	79431	80545	81650	81650	81650	81650	81650
74	6	16	16	15	15	6	68154	69496	70812	72104	73370	74616	75842	77050	78240	79406	80562	81696	82820	82820	82820	82820	82820
75	6	16	16	16	15	6	69070	70435	71774	73089	74377	75646	76892	78122	79332	80518	81693	82847	83990	83990	83990	83990	83990
76	6	16	16	16	16	6	69986	71374	72736	74074	75384	76676	77942	79194	80424	81630	82824	83998	85160	85160	85160	85160	85160
77	6	17	16	16	16	6	70890	72302	73688	75049	76382	77695	78984	80256	81507	82735	83949	85143	86324	86324	86324	86324	86324
78	6	17	17	16	16	6	71794	73230	74640	76024	77380	78714	80026	81318	82590	83840	85074	86288	87488	87488	87488	87488	87488
79	6	17	17	17	16	6	72698	74158	75592	76999	78378	79733	81068	82380	83673	84945	86199	87433	88652	88652	88652	88652	88652
80	6	17	17	17	17	6	73602	75086	76544	77974	79376	80752	82110	83442	84756	86050	87324	88578	89816	89816	89816	89816	89816
81	6	18	17	17	17	6	74492	76001	77483	78937	80362	81761	83141	84495	85831	87145	88440	89714	90972	90972	90972	90972	90972
82	6	18	18	17	17	6	75382	76916	78422	79900	81348	82770	84172	85548	86906	88240	89556	90850	92128	92128	92128	92128	92128
83	6	18	18	18	17	6	76272	77831	79361	80863	82334	83779	85203	86601	87981	89335	90672	91986	93284	93284	93284	93284	93284

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
84	6	18	18	18	18	6	77162	78746	80300	81826	83320	84788	86234	87654	89056	90430	91788	93122	94440	94440	94440	94440	94440
85	6	19	18	18	18	6	78045	79655	81234	82784	84303	85794	87263	88706	90129	91525	92904	94259	95597	95597	95597	95597	95597
86	6	19	19	18	18	6	78928	80564	82168	83742	85286	86800	88292	89758	91202	92620	94020	95396	96754	96754	96754	96754	96754
87	6	19	19	19	18	6	79811	81473	83102	84700	86269	87806	89321	90810	92275	93715	95136	96533	97911	97911	97911	97911	97911
88	6	19	19	19	19	6	80694	82382	84036	85658	87252	88812	90350	91862	93348	94810	96252	97670	99068	99068	99068	99068	99068
89	6	20	19	19	19	6	81572	83287	84968	86615	88233	89818	91379	92914	94423	95907	97371	98811	100230	100230	100230	100230	100230
90	6	20	20	19	19	6	82450	84192	85900	87572	89214	90824	92408	93966	95498	97004	98490	99952	101392	101392	101392	101392	101392
91	6	20	20	20	19	6	83328	85097	86832	88529	90195	91830	93437	95018	96573	98101	99609	101093	102554	102554	102554	102554	102554
92	6	20	20	20	20	6	84206	86002	87764	89486	91176	92836	94466	96070	97648	99198	100728	102234	103716	103716	103716	103716	103716
93	6	21	20	20	20	6	85069	86893	88681	90430	92145	93830	95484	97112	98713	100286	101838	103365	104869	104869	104869	104869	104869
94	6	21	21	20	20	6	85932	87784	89598	91374	93114	94824	96502	98154	99778	101374	102948	104496	106022	106022	106022	106022	106022
95	6	21	21	21	20	6	86795	88675	90515	92318	94083	95818	97520	99196	100843	102462	104058	105627	107175	107175	107175	107175	107175
96	6	21	21	21	21	6	87658	89566	91432	93262	95052	96812	98538	100238	101908	103550	105168	106758	108328	108328	108328	108328	108328
97	6	22	21	21	21	6	88505	90441	92334	94191	96007	97792	99544	101268	102962	104627	106268	107880	109472	109472	109472	109472	109472
98	6	22	22	21	21	6	89352	91316	93236	95120	96962	98772	100550	102298	104016	105704	107368	109002	110616	110616	110616	110616	110616
99	6	22	22	22	21	6	90199	92191	94138	96049	97917	99752	101556	103328	105070	106781	108468	110124	111760	111760	111760	111760	111760
100	6	22	22	22	22	6	91046	93066	95040	96978	98872	100732	102562	104358	106124	107858	109568	111246	112904	112904	112904	112904	112904
101	6	23	22	22	22	6	91876	93924	95927	97892	99813	101699	103554	105375	107165	108923	110656	112357	114038	114038	114038	114038	114038
102	6	23	23	22	22	6	92706	94782	96814	98806	100754	102666	104546	106392	108206	109988	111744	113468	115172	115172	115172	115172	115172
103	6	23	23	23	22	6	93536	95640	97701	99720	101695	103633	105538	107409	109247	111053	112832	114579	116306	116306	116306	116306	116306
104	6	23	23	23	23	6	94366	96498	98588	100634	102636	104600	106530	108426	110288	112118	113920	115690	117440	117440	117440	117440	117440

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
105	6	24	23	23	23	6	95177	97340	99459	101532	103562	105553	107508	109429	111316	113170	114996	116790	118562	118562	118562	118562	118562
106	6	24	24	23	23	6	95988	98182	100330	102430	104488	106506	108486	110432	112344	114222	116072	117890	119684	119684	119684	119684	119684
107	6	24	24	24	23	6	96799	99024	101201	103328	105414	107459	109464	111435	113372	115274	117148	118990	120806	120806	120806	120806	120806
108	6	24	24	24	24	6	97610	99866	102072	104226	106340	108412	110442	112438	114400	116326	118224	120090	121928	121928	121928	121928	121928
109	6	25	24	24	24	6	98403	100689	102924	105108	107250	109349	111406	113428	115415	117366	119288	121177	123039	123039	123039	123039	123039
110	6	25	25	24	24	6	99196	101512	103776	105990	108160	110286	112370	114418	116430	118406	120352	122264	124150	124150	124150	124150	124150
111	6	25	25	25	24	6	99989	102335	104628	106872	109070	111223	113334	115408	117445	119446	121416	123351	125261	125261	125261	125261	125261
112	6	25	25	25	25	6	100782	103158	105480	107754	109980	112160	114298	116398	118460	120486	122480	124438	126372	126372	126372	126372	126372
113	6	26	25	25	25	6	101554	103962	106315	108618	110873	113081	115246	117372	119460	121512	123530	125513	127470	127470	127470	127470	127470
114	6	26	26	25	25	6	102326	104766	107150	109482	111766	114002	116194	118346	120460	122538	124580	126588	128568	128568	128568	128568	128568
115	6	26	26	26	25	6	103098	105570	107985	110346	112659	114923	117142	119320	121460	123564	125630	127663	129666	129666	129666	129666	129666
116	6	26	26	26	26	6	103870	106374	108820	111210	113552	115844	118090	120294	122460	124590	126680	128738	130764	130764	130764	130764	130764
117	6	27	26	26	26	6	104622	107159	109636	112056	114427	116748	119022	121253	123446	125601	127717	129799	131849	131849	131849	131849	131849
118	6	27	27	26	26	6	105374	107944	110452	112902	115302	117652	119954	122212	124432	126612	128754	130860	132934	132934	132934	132934	132934
119	6	27	27	27	26	6	106126	108729	111268	113748	116177	118556	120886	123171	125418	127623	129791	131921	134019	134019	134019	134019	134019
120	6	27	27	27	27	6	106878	109514	112084	114594	117052	119460	121818	124130	126404	128634	130828	132982	135104	135104	135104	135104	135104
121	6	28	27	27	27	6	107609	110278	112880	115422	117909	120346	122733	125073	127373	129630	131849	134029	136176	136176	136176	136176	136176
122	6	28	28	27	27	6	108340	111042	113676	116250	118766	121232	123648	126016	128342	130626	132870	135076	137248	137248	137248	137248	137248
123	6	28	28	28	27	6	109071	111806	114472	117078	119623	122118	124563	126959	129311	131622	133891	136123	138320	138320	138320	138320	138320
124	6	28	28	28	28	6	109802	112570	115268	117906	120480	123004	125478	127902	130280	132618	134912	137170	139392	139392	139392	139392	139392
125	6	29	28	28	28	6	110511	113313	116044	118714	121319	123873	126376	128828	131234	133598	135919	138202	140449	140449	140449	140449	140449

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
126	6	29	29	28	28	6	111220	114056	116820	119522	122158	124742	127274	129754	132188	134578	136926	139234	141506	141506	141506	141506	141506
127	6	29	29	29	28	6	111929	114799	117596	120330	122997	125611	128172	130680	133142	135558	137933	140266	142563	142563	142563	142563	142563
128	6	29	29	29	29	6	112638	115542	118372	121138	123836	126480	129070	131606	134096	136538	138940	141298	143620	143620	143620	143620	143620
129	6	30	29	29	29	6	113144	116264	119128	121926	124656	127330	129950	132515	135033	137502	139931	142315	144662	144662	144662	144662	144662
130	6	30	30	29	29	6	113650	116986	119884	122714	125476	128180	130830	133424	135970	138466	140922	143332	145704	145704	145704	145704	145704
131	6	30	30	30	29	6	114156	117708	120640	123502	126296	129030	131710	134333	136907	139430	141913	144349	146746	146746	146746	146746	146746
132	6	30	30	30	30	6	114662	118430	121396	124290	127116	129880	132590	135242	137844	140394	142904	145366	147788	147788	147788	147788	147788
133	6	31	30	30	30	6	114662	118867	122130	125058	127916	130712	133452	136133	138764	141342	143879	146368	148816	148816	148816	148816	148816
134	6	31	31	30	30	6	114662	119304	122864	125826	128716	131544	134314	137024	139684	142290	144854	147370	149844	149844	149844	149844	149844
135	6	31	31	31	30	6	114662	119741	123598	126594	129516	132376	135176	137915	140604	143238	145829	148372	150872	150872	150872	150872	150872
136	6	31	31	31	31	6	114662	120178	124332	127362	130316	133208	136038	138806	141524	144186	146804	149374	151900	151900	151900	151900	151900
137	6	32	31	31	31	6	114662	120178	124755	128109	131096	134020	136880	139679	142426	145117	147762	150359	152912	152912	152912	152912	152912
138	6	32	32	31	31	6	114662	120178	125178	128856	131876	134832	137722	140552	143328	146048	148720	151344	153924	153924	153924	153924	153924
139	6	32	32	32	31	6	114662	120178	125601	129603	132656	135644	138564	141425	144230	146979	149678	152329	154936	154936	154936	154936	154936
140	6	32	32	32	32	6	114662	120178	126024	130350	133436	136456	139406	142298	145132	147910	150636	153314	155948	155948	155948	155948	155948
141	6	33	32	32	32	6	114662	120178	126024	130729	134196	137248	140230	143153	146017	148823	151578	154283	156944	156944	156944	156944	156944
142	6	33	33	32	32	6	114662	120178	126024	131108	134956	138040	141054	144008	146902	149736	152520	155252	157940	157940	157940	157940	157940
143	6	33	33	33	32	6	114662	120178	126024	131487	135716	138832	141878	144863	147787	150649	153462	156221	158936	158936	158936	158936	158936
144	6	33	33	33	33	6	114662	120178	126024	131866	136476	139624	142702	145718	148672	151562	154404	157190	159932	159932	159932	159932	159932
145	6	34	33	33	33	6	114662	120178	126024	131866	136866	140396	143507	146554	149538	152458	155329	158143	160912	160912	160912	160912	160912
146	6	34	34	33	33	6	114662	120178	126024	131866	137256	141168	144312	147390	150404	153354	156254	159096	161892	161892	161892	161892	161892

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

GATE STEP	GATE NUMBER 1	2	3	4	5	6	POOL ELEVATION (FT NGVD 29) 784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
147	6	34	34	34	33	6	114662	120178	126024	131866	137646	141940	145117	148226	151270	154250	157179	160049	162872	162872	162872	162872	162872
148	6	34	34	34	34	6	114662	120178	126024	131866	138036	142712	145922	149062	152136	155146	158104	161002	163852	163852	163852	163852	163852
149	6	35	34	34	34	6	114662	120178	126024	131866	138036	143086	146707	149879	152984	156024	159011	161938	164816	164816	164816	164816	164816
150	6	35	35	34	34	6	114662	120178	126024	131866	138036	143460	147492	150696	153832	156902	159918	162874	165780	165780	165780	165780	165780
151	6	35	35	35	34	6	114662	120178	126024	131866	138036	143834	148277	151513	154680	157780	160825	163810	166744	166744	166744	166744	166744
152	6	35	35	35	35	6	114662	120178	126024	131866	138036	144208	149062	152330	155528	158658	161732	164746	167708	167708	167708	167708	167708
153	6	36	35	35	35	6	114662	120178	126024	131866	138036	144208	149390	153127	156357	159518	162622	165665	168655	168655	168655	168655	168655
154	6	36	36	35	35	6	114662	120178	126024	131866	138036	144208	149718	153924	157186	160378	163512	166584	169602	169602	169602	169602	169602
155	6	36	36	36	35	6	114662	120178	126024	131866	138036	144208	150046	154721	158015	161238	164402	167503	170549	170549	170549	170549	170549
156	6	36	36	36	36	6	114662	120178	126024	131866	138036	144208	150374	155518	158844	162098	165292	168422	171496	171496	171496	171496	171496
157	6	37	36	36	36	6	114662	120178	126024	131866	138036	144208	150374	155807	159655	162940	166164	169323	172426	172426	172426	172426	172426
158	6	37	37	36	36	6	114662	120178	126024	131866	138036	144208	150374	156096	160466	163782	167036	170224	173356	173356	173356	173356	173356
159	6	37	37	37	36	6	114662	120178	126024	131866	138036	144208	150374	156385	161277	164624	167908	171125	174286	174286	174286	174286	174286
160	6	37	37	37	37	6	114662	120178	126024	131866	138036	144208	150374	156674	162088	165466	168780	172026	175216	175216	175216	175216	175216
161	6	38	37	37	37	6	114662	120178	126024	131866	138036	144208	150374	156674	162326	166290	169634	172911	176129	176129	176129	176129	176129
162	6	38	38	37	37	6	114662	120178	126024	131866	138036	144208	150374	156674	162564	167114	170488	173796	177042	177042	177042	177042	177042
163	6	38	38	38	37	6	114662	120178	126024	131866	138036	144208	150374	156674	162802	167938	171342	174681	177955	177955	177955	177955	177955
164	6	38	38	38	38	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	168762	172196	175566	178868	178868	178868	178868	178868
165	6	39	38	38	38	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	168954	173033	176433	179765	179765	179765	179765	179765
166	6	39	39	38	38	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	169146	173870	177300	180662	180662	180662	180662	180662
167	6	39	39	39	38	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	169338	174707	178167	181559	181559	181559	181559	181559

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE																							
	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
168	6	39	39	39	39	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	169530	175544	179034	182456	182456	182456	182456	182456
169	6	40	39	39	39	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	169530	175747	179883	183336	183336	183336	183336	183336
170	6	40	40	39	39	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	169530	175950	180732	184216	184216	184216	184216	184216
171	6	40	40	40	39	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	169530	176153	181581	185096	185096	185096	185096	185096
172	6	40	40	40	40	6	114662	120178	126024	131866	138036	144208	150374	156674	163040	169530	176356	182430	185976	185976	185976	185976	185976
173	7	40	40	40	40	6	115628	121162	127025	132885	139073	145262	151445	157761	164143	170650	177491	183581	187142	187142	187142	187142	187142
174	8	40	40	40	40	6	116591	122144	128025	133903	140109	146316	152516	158849	165247	171770	178628	184734	188310	188310	188310	188310	188310
175	9	40	40	40	40	6	117549	123122	129022	134919	141143	147367	153585	159936	166351	172891	179765	185888	189480	189480	189480	189480	189480
176	10	40	40	40	40	6	118502	124094	130015	135930	142173	148416	154652	161020	167453	174010	180902	187041	190650	190650	190650	190650	190650
177	11	40	40	40	40	6	119450	125062	131003	136938	143200	149462	155716	162103	168554	175129	182037	188193	191820	191820	191820	191820	191820
178	12	40	40	40	40	6	120403	126037	131998	137953	144235	150517	156791	163196	169666	176259	183186	189360	193004	193004	193004	193004	193004
179	13	40	40	40	40	6	121349	127005	132987	138964	145266	151568	157861	164286	170775	177387	184332	190524	194186	194186	194186	194186	194186
180	14	40	40	40	40	6	122286	127964	133969	139967	146290	152613	158926	165371	171880	178511	185475	191686	195365	195365	195365	195365	195365
181	15	40	40	40	40	6	123213	128915	134942	140962	147307	153650	159985	166450	172979	179629	186613	192842	196541	196541	196541	196541	196541
182	16	40	40	40	40	6	124129	129854	135904	141947	148314	154680	161035	167522	174071	180741	187744	193993	197711	197711	197711	197711	197711
183	17	40	40	40	40	6	125033	130782	136856	142922	149312	155699	162077	168584	175154	181846	188869	195138	198875	198875	198875	198875	198875
184	18	40	40	40	40	6	125923	131697	137795	143885	150298	156708	163108	169637	176229	182941	189985	196274	200031	200031	200031	200031	200031
185	19	40	40	40	40	6	126806	132606	138729	144843	151281	157714	164137	170689	177302	184036	191101	197411	201188	201188	201188	201188	201188
186	20	40	40	40	40	6	127684	133511	139661	145800	152262	158720	165166	171741	178377	185133	192220	198552	202350	202350	202350	202350	202350
187	21	40	40	40	40	6	128547	134402	140578	146744	153231	159714	166184	172783	179442	186221	193330	199683	203503	203503	203503	203503	203503
188	22	40	40	40	40	6	129394	135277	141480	147673	154186	160694	167190	173813	180496	187298	194430	200805	204647	204647	204647	204647	204647

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE																							
	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
189	23	40	40	40	40	6	130224	136135	142367	148587	155127	161661	168182	174830	181537	188363	195518	201916	205781	205781	205781	205781	205781
190	24	40	40	40	40	6	131035	136977	143238	149485	156053	162614	169160	175833	182565	189415	196594	203016	206903	206903	206903	206903	206903
191	25	40	40	40	40	6	131828	137800	144090	150367	156963	163551	170124	176823	183580	190455	197658	204103	208014	208014	208014	208014	208014
192	26	40	40	40	40	6	132600	138604	144925	151231	157856	164472	171072	177797	184580	191481	198708	205178	209112	209112	209112	209112	209112
193	27	40	40	40	40	6	133352	139389	145741	152077	158731	165376	172004	178756	185566	192492	199745	206239	210197	210197	210197	210197	210197
194	28	40	40	40	40	6	134083	140153	146537	152905	159588	166262	172919	179699	186535	193488	200766	207286	211269	211269	211269	211269	211269
195	29	40	40	40	40	6	134792	140896	147313	153713	160427	167131	173817	180625	187489	194468	201773	208318	212326	212326	212326	212326	212326
196	30	40	40	40	40	6	135298	141618	148069	154501	161247	167981	174697	181534	188426	195432	202764	209335	213368	213368	213368	213368	213368
197	31	40	40	40	40	6	135298	142055	148803	155269	162047	168813	175559	182425	189346	196380	203739	210337	214396	214396	214396	214396	214396
198	32	40	40	40	40	6	135298	142055	149226	156016	162827	169625	176401	183298	190248	197311	204697	211322	215408	215408	215408	215408	215408
199	33	40	40	40	40	6	135298	142055	149226	156395	163587	170417	177225	184153	191133	198224	205639	212291	216404	216404	216404	216404	216404
200	34	40	40	40	40	6	135298	142055	149226	156395	163977	171189	178030	184989	191999	199120	206564	213244	217384	217384	217384	217384	217384
201	35	40	40	40	40	6	135298	142055	149226	156395	163977	171563	178815	185806	192847	199998	207471	214180	218348	218348	218348	218348	218348
202	36	40	40	40	40	6	135298	142055	149226	156395	163977	171563	179143	186603	193676	200858	208361	215099	219295	219295	219295	219295	219295
203	37	40	40	40	40	6	135298	142055	149226	156395	163977	171563	179143	186892	194487	201700	209233	216000	220225	220225	220225	220225	220225
204	38	40	40	40	40	6	135298	142055	149226	156395	163977	171563	179143	186892	194725	202524	210087	216885	221138	221138	221138	221138	221138
205	39	40	40	40	40	6	135298	142055	149226	156395	163977	171563	179143	186892	194725	202716	210924	217752	222035	222035	222035	222035	222035
206	40	40	40	40	40	6	135298	142055	149226	156395	163977	171563	179143	186892	194725	202716	211127	218601	222915	222915	222915	222915	222915
207	40	40	40	40	40	7	136264	143039	150227	157414	165014	172617	180214	187979	195828	203836	212262	219752	224081	224081	224081	224081	224081
208	40	40	40	40	40	8	137227	144021	151227	158432	166050	173671	181285	189067	196932	204956	213399	220905	225249	225249	225249	225249	225249
209	40	40	40	40	40	9	138185	144999	152224	159448	167084	174722	182354	190154	198036	206077	214536	222059	226419	226419	226419	226419	226419

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
210	40	40	40	40	40	10	139138	145971	153217	160459	168114	175771	183421	191238	199138	207196	215673	223212	227589	227589	227589	227589	227589
211	40	40	40	40	40	11	140086	146939	154205	161467	169141	176817	184485	192321	200239	208315	216808	224364	228759	228759	228759	228759	228759
212	40	40	40	40	40	12	141039	147914	155200	162482	170176	177872	185560	193414	201351	209445	217957	225531	229943	229943	229943	229943	229943
213	40	40	40	40	40	13	141985	148882	156189	163493	171207	178923	186630	194504	202460	210573	219103	226695	231125	231125	231125	231125	231125
214	40	40	40	40	40	14	142922	149841	157171	164496	172231	179968	187695	195589	203565	211697	220246	227857	232304	232304	232304	232304	232304
215	40	40	40	40	40	15	143849	150792	158144	165491	173248	181005	188754	196668	204664	212815	221384	229013	233480	233480	233480	233480	233480
216	40	40	40	40	40	16	144765	151731	159106	166476	174255	182035	189804	197740	205756	213927	222515	230164	234650	234650	234650	234650	234650
217	40	40	40	40	40	17	145669	152659	160058	167451	175253	183054	190846	198802	206839	215032	223640	231309	235814	235814	235814	235814	235814
218	40	40	40	40	40	18	146559	153574	160997	168414	176239	184063	191877	199855	207914	216127	224756	232445	236970	236970	236970	236970	236970
219	40	40	40	40	40	19	147442	154483	161931	169372	177222	185069	192906	200907	208987	217222	225872	233582	238127	238127	238127	238127	238127
220	40	40	40	40	40	20	148320	155388	162863	170329	178203	186075	193935	201959	210062	218319	226991	234723	239289	239289	239289	239289	239289
221	40	40	40	40	40	21	149183	156279	163780	171273	179172	187069	194953	203001	211127	219407	228101	235854	240442	240442	240442	240442	240442
222	40	40	40	40	40	22	150030	157154	164682	172202	180127	188049	195959	204031	212181	220484	229201	236976	241586	241586	241586	241586	241586
223	40	40	40	40	40	23	150860	158012	165569	173116	181068	189016	196951	205048	213222	221549	230289	238087	242720	242720	242720	242720	242720
224	40	40	40	40	40	24	151671	158854	166440	174014	181994	189969	197929	206051	214250	222601	231365	239187	243842	243842	243842	243842	243842
225	40	40	40	40	40	25	152464	159677	167292	174896	182904	190906	198893	207041	215265	223641	232429	240274	244953	244953	244953	244953	244953
226	40	40	40	40	40	26	153236	160481	168127	175760	183797	191827	199841	208015	216265	224667	233479	241349	246051	246051	246051	246051	246051
227	40	40	40	40	40	27	153988	161266	168943	176606	184672	192731	200773	208974	217251	225678	234516	242410	247136	247136	247136	247136	247136
228	40	40	40	40	40	28	154719	162030	169739	177434	185529	193617	201688	209917	218220	226674	235537	243457	248208	248208	248208	248208	248208
229	40	40	40	40	40	29	155428	162773	170515	178242	186368	194486	202586	210843	219174	227654	236544	244489	249265	249265	249265	249265	249265
230	40	40	40	40	40	30	155934	163495	171271	179030	187188	195336	203466	211752	220111	228618	237535	245506	250307	250307	250307	250307	250307

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

GATE OPENING SCHEDULE

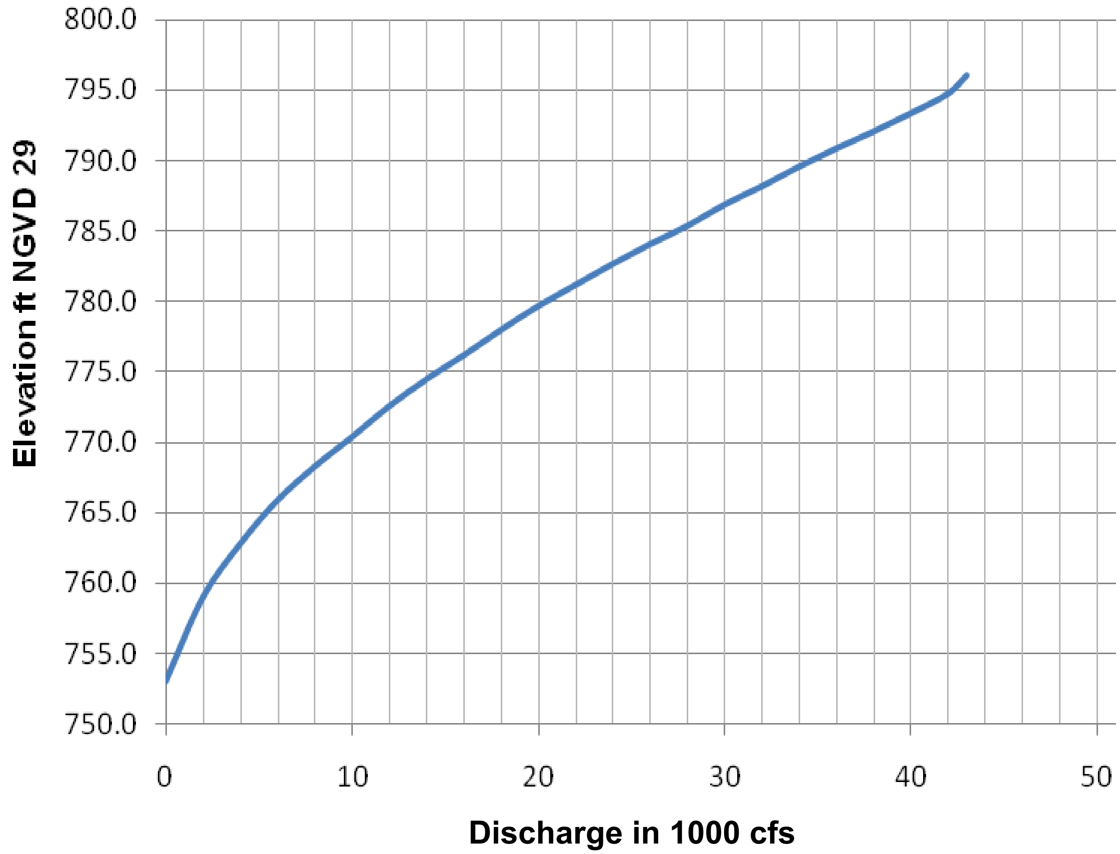
	GATE NUMBER						POOL ELEVATION (FT NGVD 29)																
GATE STEP	1	2	3	4	5	6	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
	GATE POSITION						SPILLWAY DISCHAGE (CFS)																
231	40	40	40	40	40	31	155934	163932	172005	179798	187988	196168	204328	212643	221031	229566	238510	246508	251335	251335	251335	251335	251335
232	40	40	40	40	40	32	155934	163932	172428	180545	188768	196980	205170	213516	221933	230497	239468	247493	252347	252347	252347	252347	252347
233	40	40	40	40	40	33	155934	163932	172428	180924	189528	197772	205994	214371	222818	231410	240410	248462	253343	253343	253343	253343	253343
234	40	40	40	40	40	34	155934	163932	172428	180924	189918	198544	206799	215207	223684	232306	241335	249415	254323	254323	254323	254323	254323
235	40	40	40	40	40	35	155934	163932	172428	180924	189918	198918	207584	216024	224532	233184	242242	250351	255287	255287	255287	255287	255287
236	40	40	40	40	40	36	155934	163932	172428	180924	189918	198918	207912	216821	225361	234044	243132	251270	256234	256234	256234	256234	256234
237	40	40	40	40	40	37	155934	163932	172428	180924	189918	198918	207912	217110	226172	234886	244004	252171	257164	257164	257164	257164	257164
238	40	40	40	40	40	38	155934	163932	172428	180924	189918	198918	207912	217110	226410	235710	244858	253056	258077	258077	258077	258077	258077
239	40	40	40	40	40	39	155934	163932	172428	180924	189918	198918	207912	217110	226410	235902	245695	253923	258974	258974	258974	258974	258974
240	40	40	40	40	40	40	155934	163932	172428	180924	189918	198918	207912	217110	226410	235902	245898	254772	259854	259854	259854	259854	259854

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GATE OPENING SCHEDULE

Discharge in 1000 cfs	Elevation ft NGVD 29
0	753.0
2	759.0
4	762.8
6	765.9
8	768.3
10	770.4
12	772.6
14	774.5
16	776.2
18	778.0
20	779.7
22	781.2
24	782.7
26	784.1
28	785.4
30	786.9
32	788.2
34	789.6
36	790.9
38	792.1
40	793.4
42	794.8
43	796.1

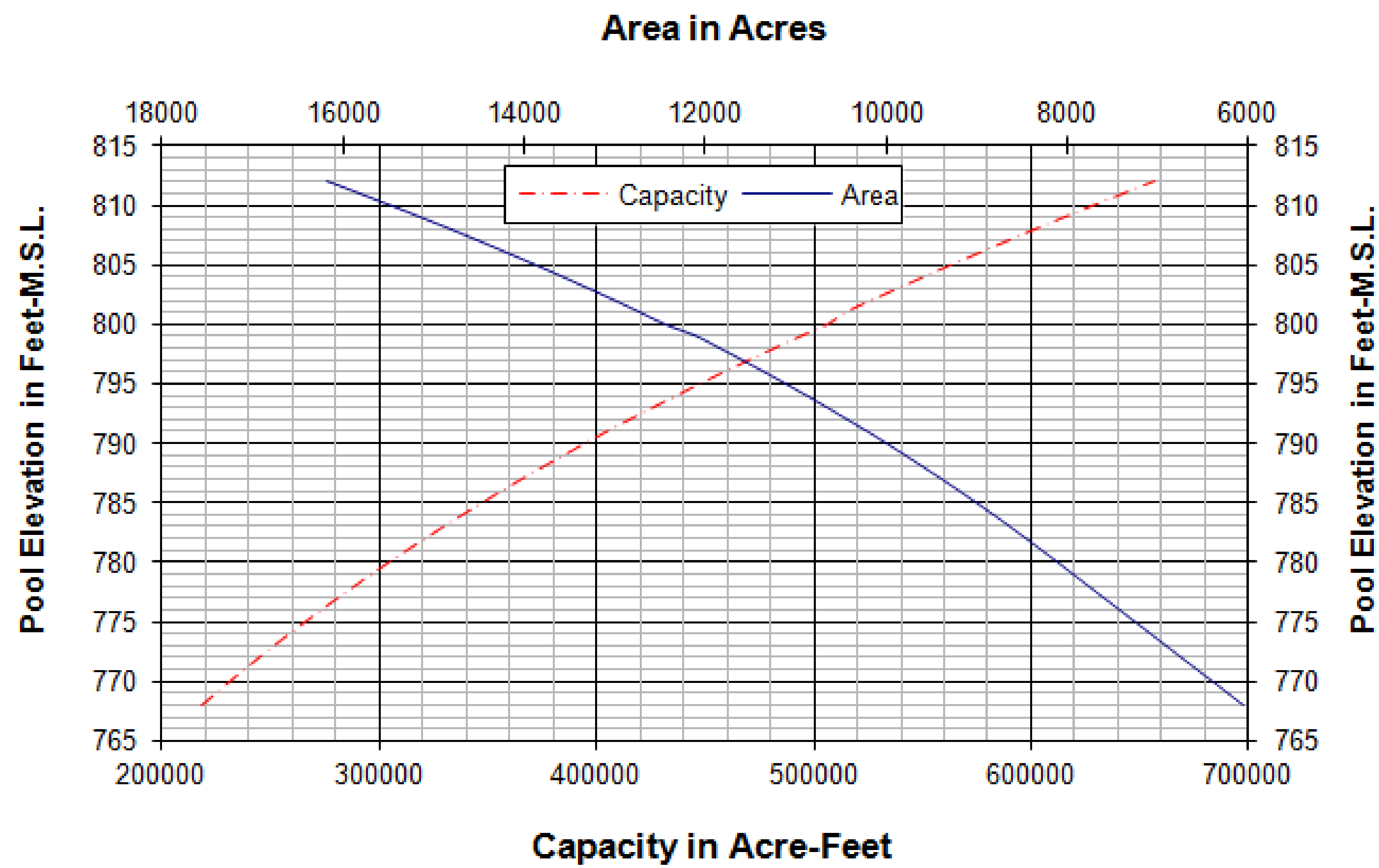


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

SPILLWAY DISCHARGE RATING FOR A SINGLE GATE

Pool Elev	Total Area	Total Storage	Pool Elev	Total Area	Total Storage
768	6060	218403	790	10007	394724
769	6231	224770	791	10220	404840
770	6402	231276	792	10440	415170
771	6573	237901	793	10660	425721
772	6745	244685	794	10886	436495
773	6916	251607	795	11120	447501
774	7087	258688	796	11360	458742
775	7258	265928	797	11602	470222
776	7429	273306	798	11852	481951
777	7600	280844	799	12108	493933
778	7772	288540	800	12454.67	506171
779	7943	296394	801	12730	514403
780	8113	304436	802	13011	526323
781	8288	312637	803	13298	538436
782	8462	321012	804	13592	550745
783	8641	329564	805	13892	563250
784	8823	338298	806	14199	575954
785	9012	347216	807	14512	588858
786	9202	356324	808	14833	601964
787	9397	365625	809	15160	615273
788	9597	375122	810	15495	628787
789	9801	384821	811	15837	642507
			812	16187	656437

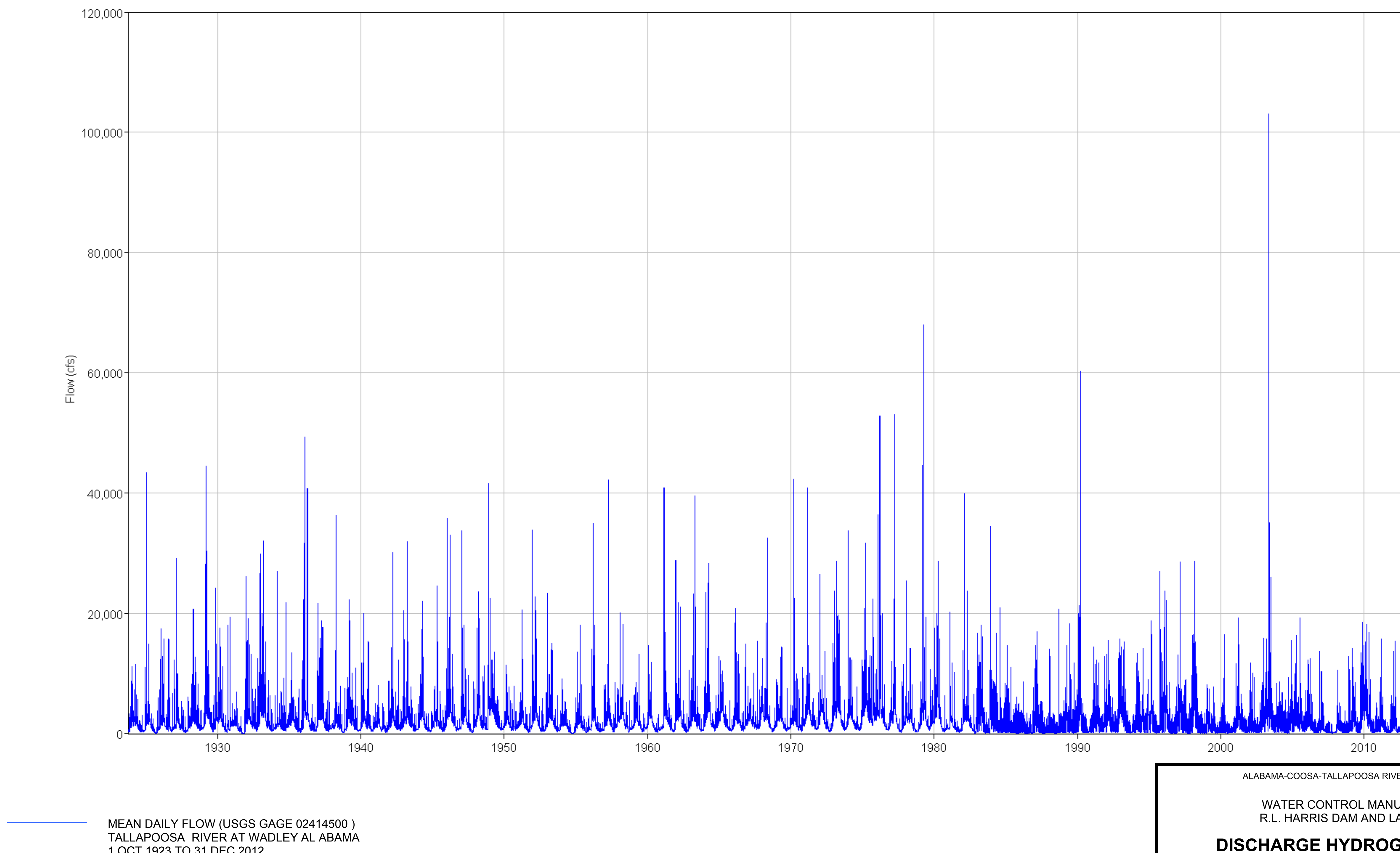


[1] Top of flood control
[2] Top of conservation
[3] Minimum conservation
[4] Spillway crest elevation
[5] Top of gates – closed position

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

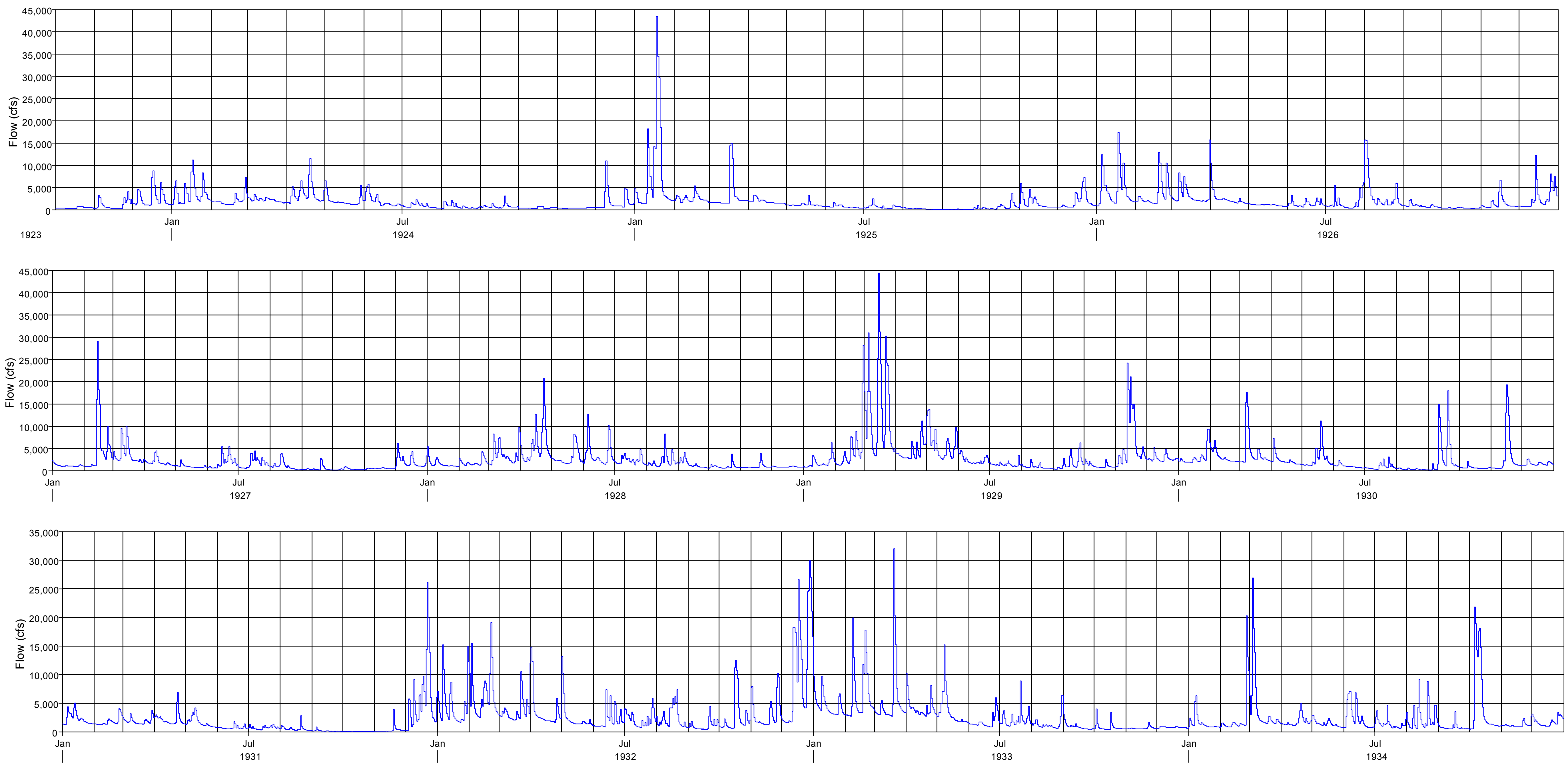
AREA CAPACITY CURVES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE HYDROGRAPHS
USGS GAGE 02414500

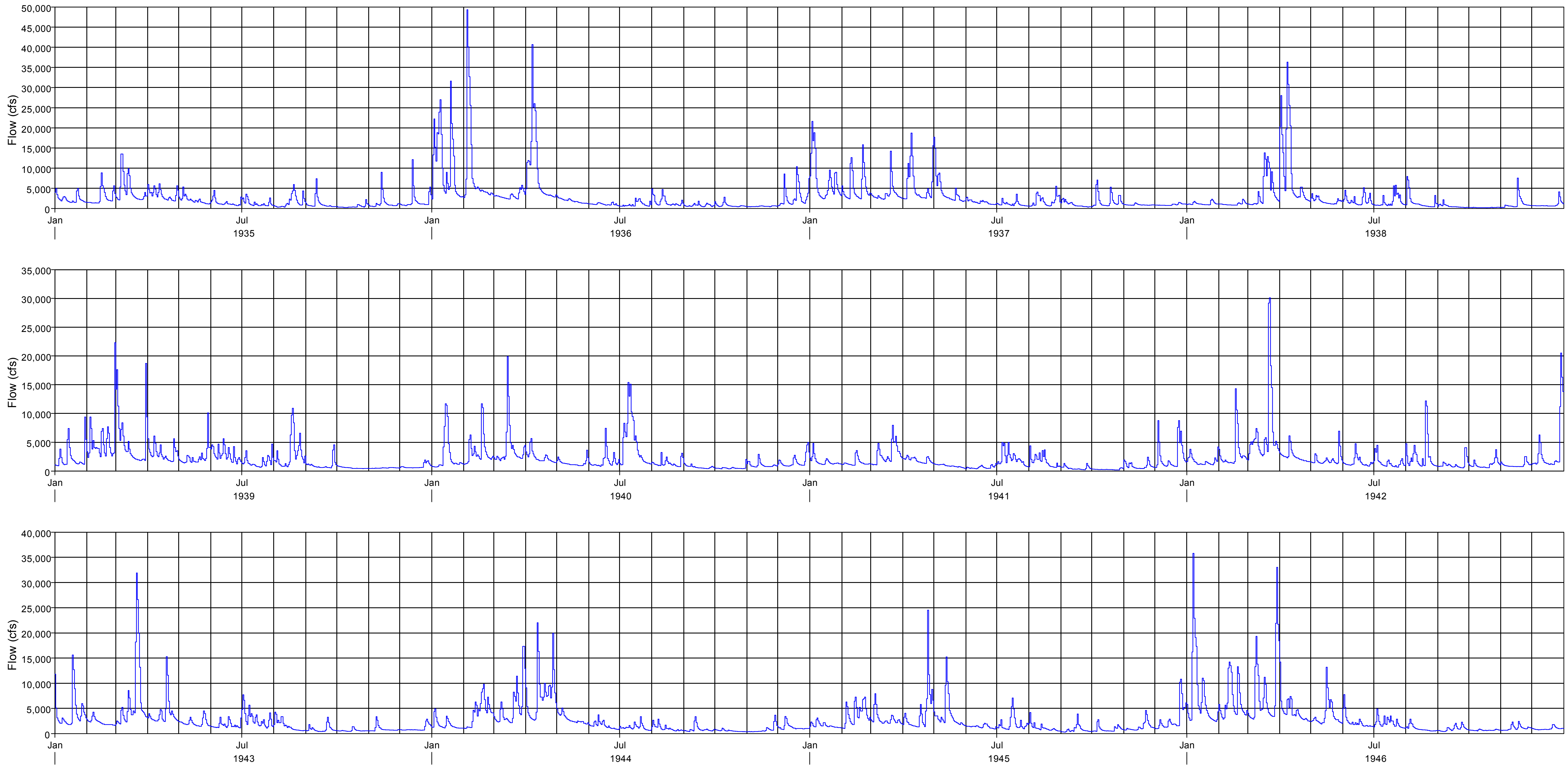


MEAN DAILY FLOW (USGS GAGE 02414500) TALLAPOOSA RIVER AT WADLEY AL ABAMA

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE HYDROGRAPHS
USGS GAGE 02414500

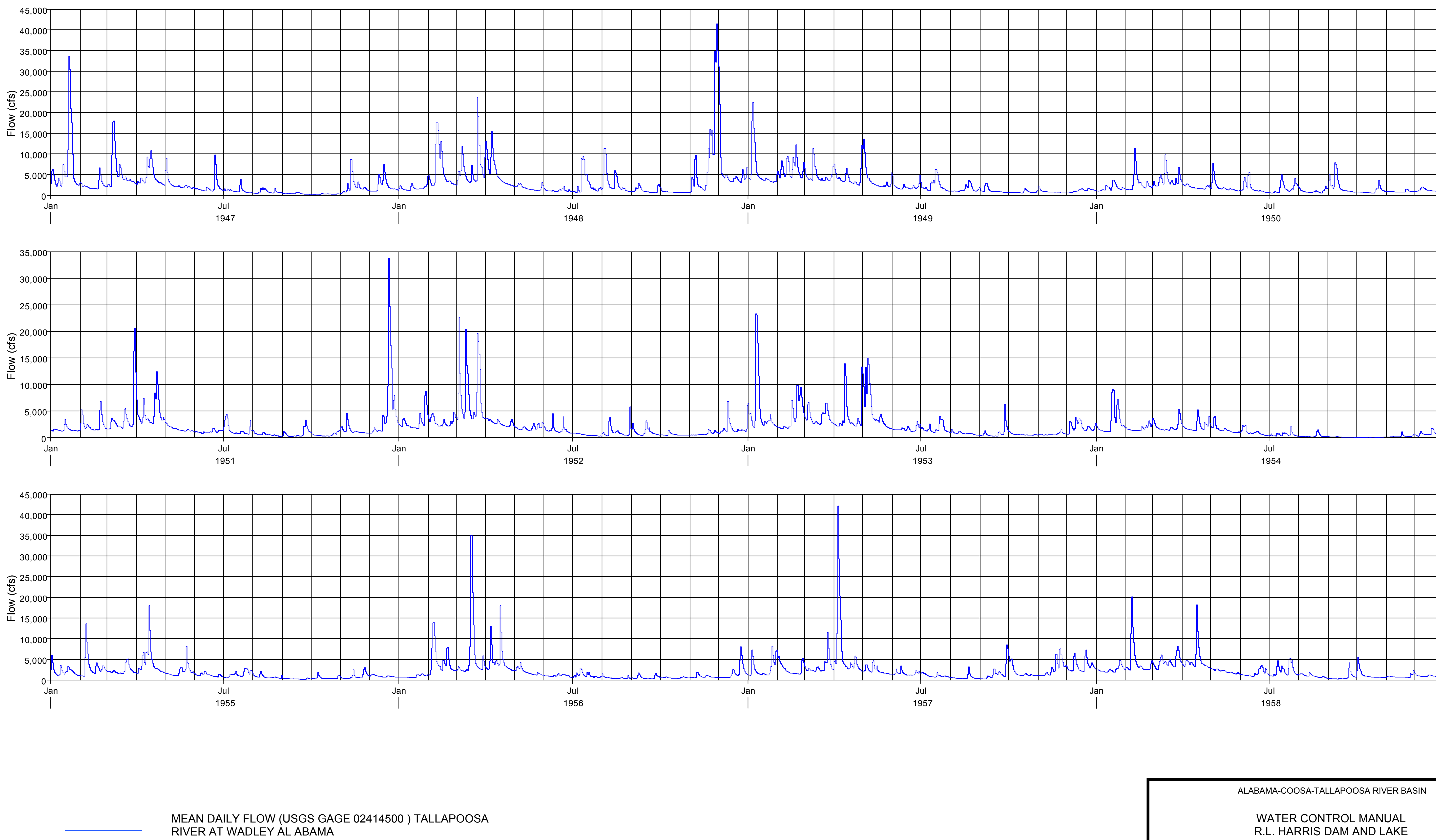


MEAN DAILY FLOW (USGS GAGE 02414500) TALLAPOOSA RIVER AT WADLEY AL ABAMA

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

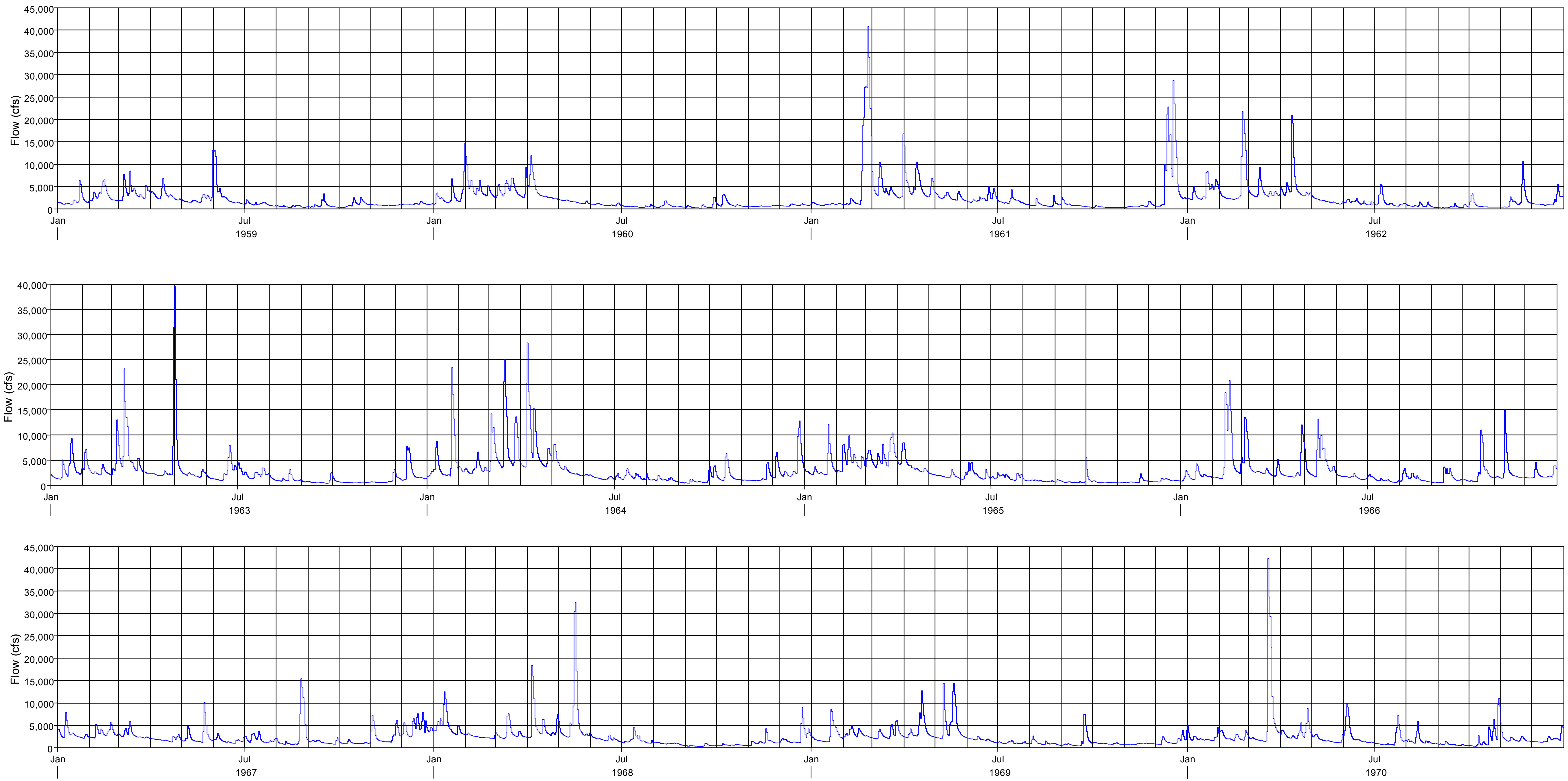
DISCHARGE HYDROGRAPHS
USGS GAGE 02414500



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE HYDROGRAPHS
USGS GAGE 02414500

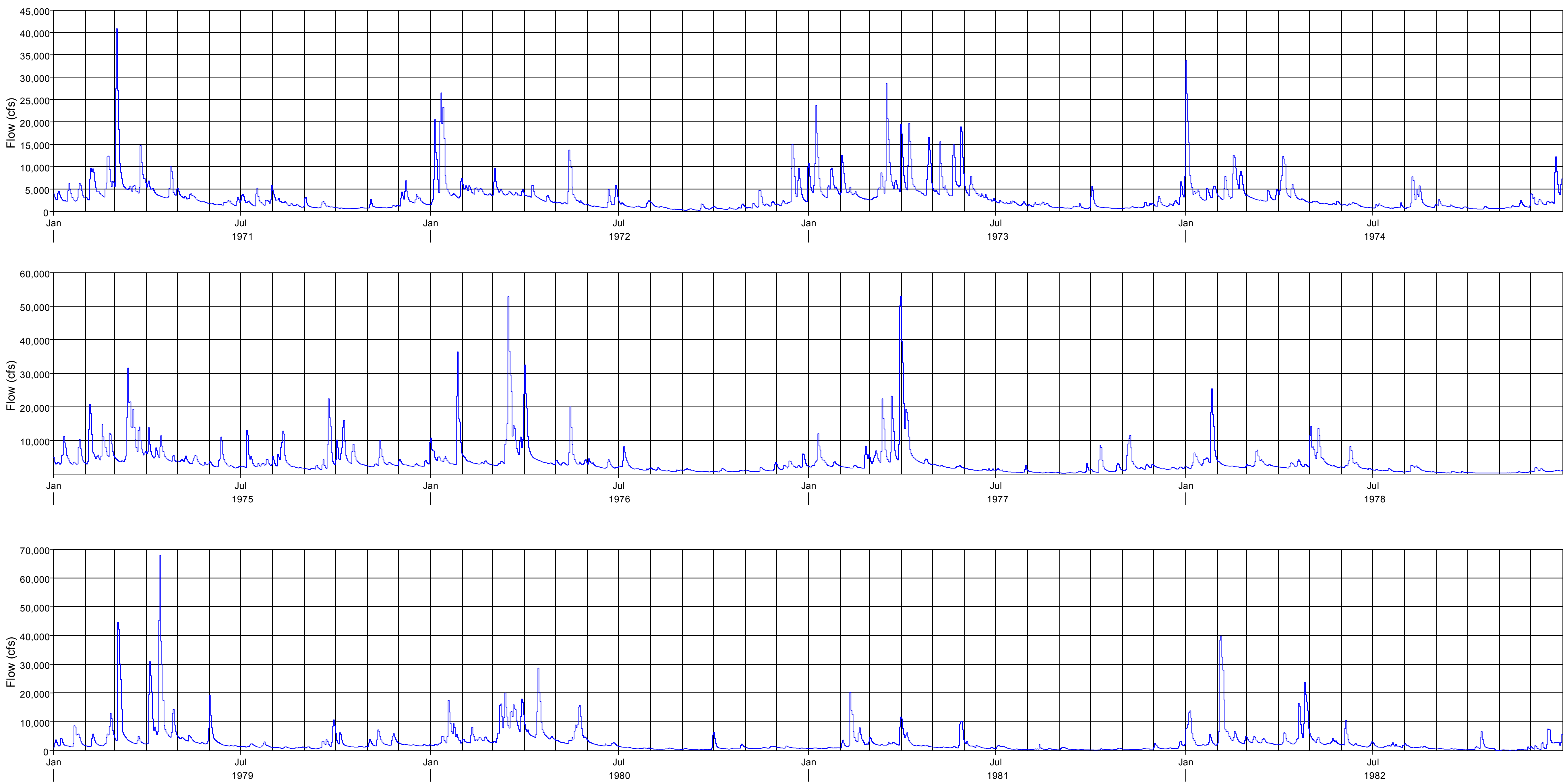


MEAN DAILY FLOW (USGS GAGE 02414500) TALLAPOOSA RIVER AT WADLEY AL ABAMA

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE HYDROGRAPHS
USGS GAGE 02414500



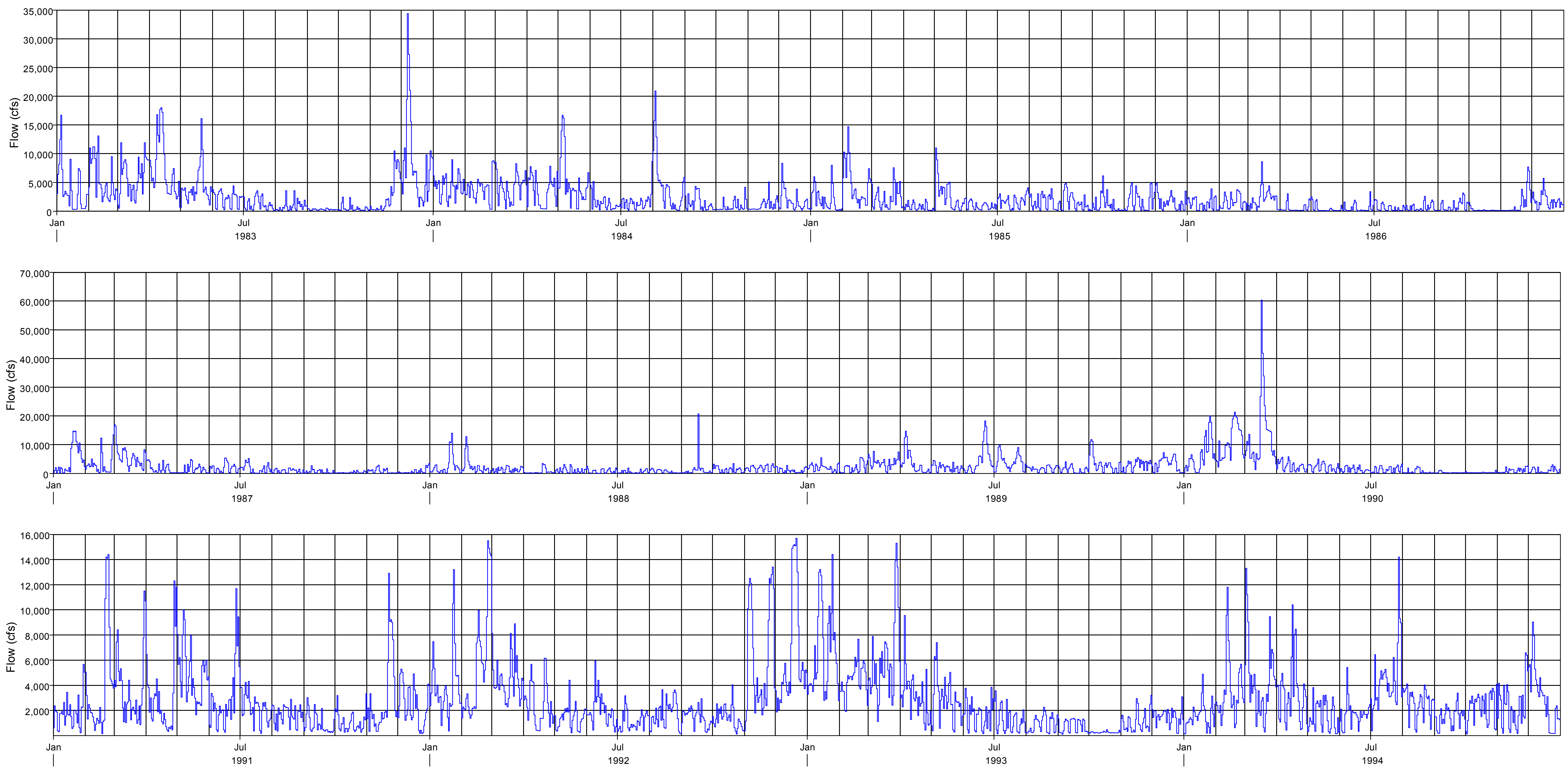
MEAN DAILY FLOW (USGS GAGE 02414500) TALLAPOOSA RIVER AT WADLEY AL ABAMA

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE HYDROGRAPHS

USGS GAGE 02414500

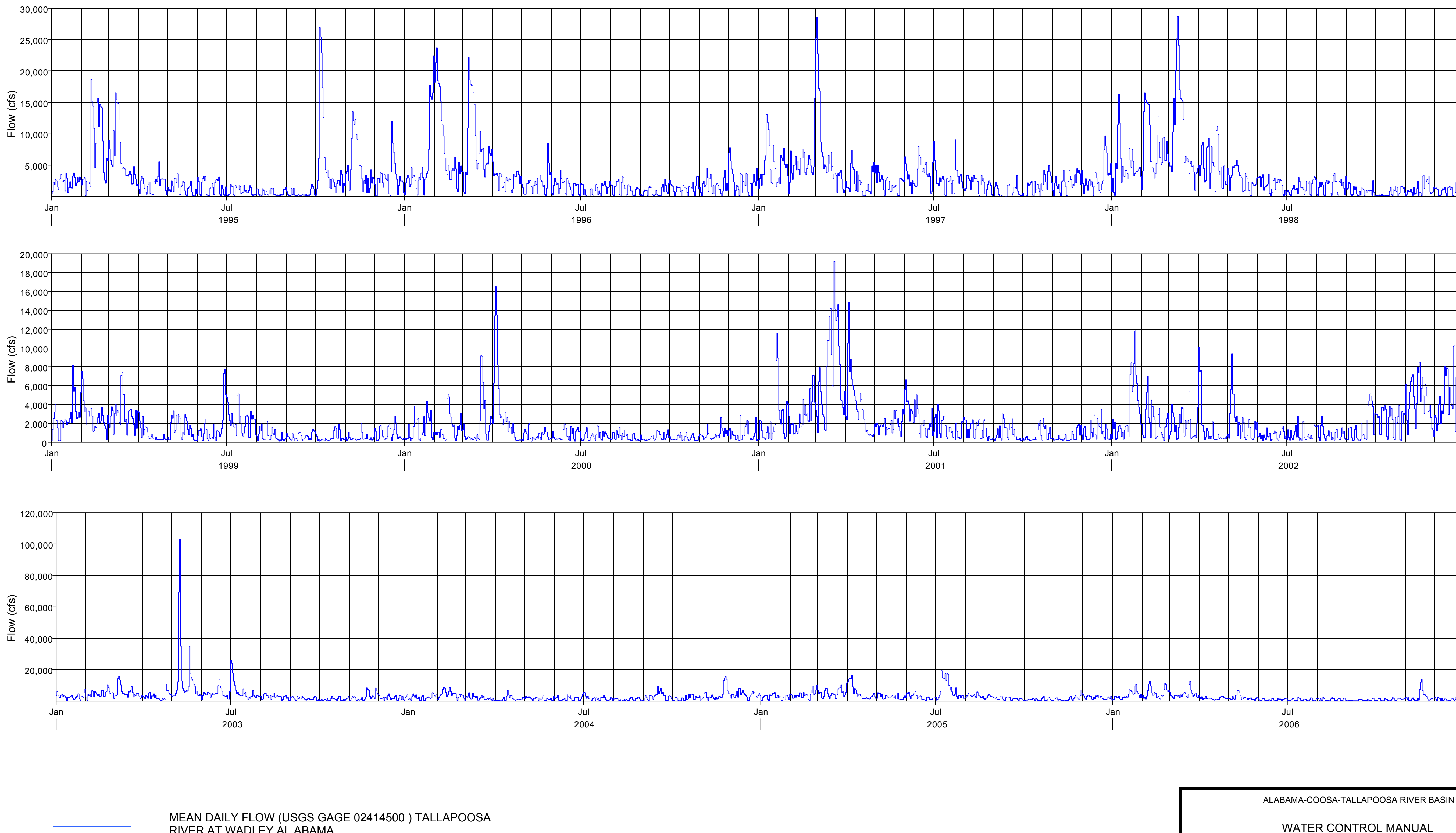


MEAN DAILY FLOW (USGS GAGE 02414500) TALLAPOOSA RIVER AT WADLEY AL ABAMA

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

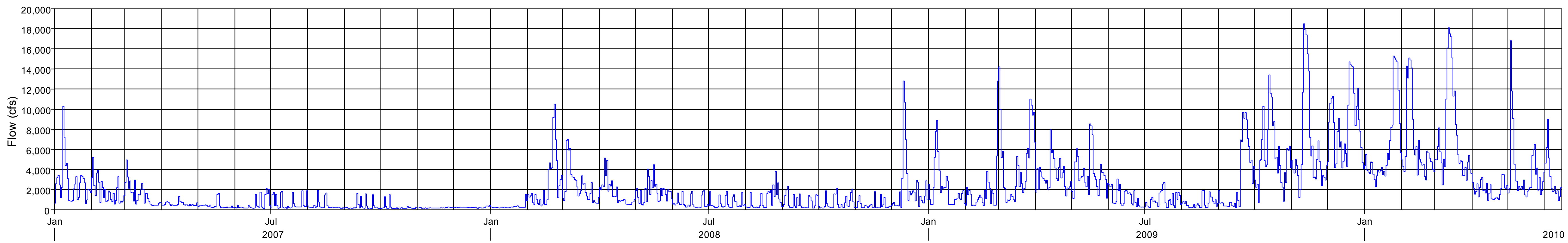
DISCHARGE HYDROGRAPHS
USGS GAGE 02414500

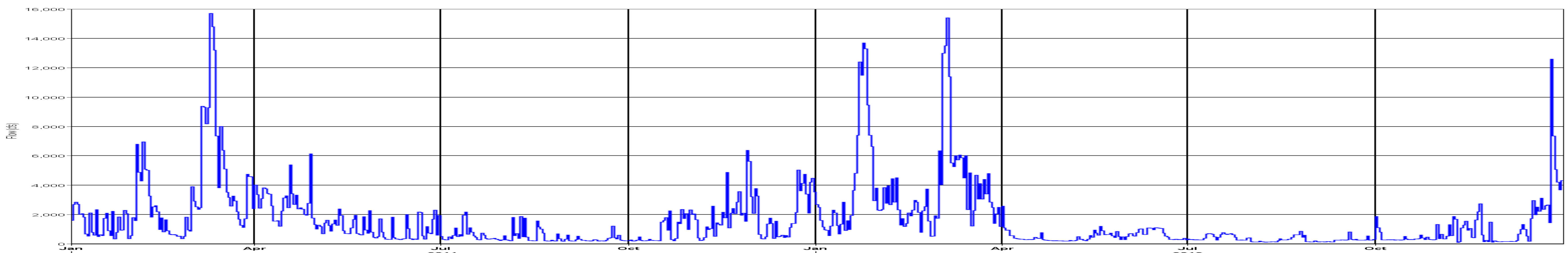


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE HYDROGRAPHS
USGS GAGE 02414500





MEAN DAILY FLOW (USGS GAGE 02414500) TALLAPOOSA RIVER AT WADLEY AL ABAMA

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE HYDROGRAPHS
USGS GAGE 02414500

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Ann	Max Monthly	Min Monthly	Max Daily	Min Daily
1924	3828	2148	2239	3668	2113	1950	883	755	800	435	395	1818	1753	3828	395	11500	280
1925	8240	2570	3105	1886	1141	721	689	224	160	682	1592	1883	1908	8240	160	43400	60
1926	4618	3679	3470	2563	1084	1384	1588	3478	924	418	1364	2844	2285	4618	418	17400	300
1927	1200	5260	3635	1904	998	1834	1709	1089	527	357	507	2040	1755	5260	357	29100	180
1928	1597	1916	3790	5886	3025	3859	2347	2186	1459	970	987	889	2409	5886	889	20700	580
1929	1842	4850	14087	4426	5977	2435	1444	900	1657	1183	6562	2820	4015	14087	900	44400	350
1930	3082	3143	4354	2332	2804	1042	939	366	3459	703	3301	1612	2261	4354	366	19300	150
1931	2313	1824	1928	2209	1679	730	735	562	182	85	363	5892	1542	5892	85	26100	70
1932	4844	6454	3859	3316	2485	2155	2220	2527	1107	2699	3353	11211	3853	11211	1107	29900	380
1933	4696	6553	5615	4229	3510	1762	2179	1484	905	839	645	786	2767	6553	645	32000	380
1934	1518	2644	4190	1798	1427	2511	1422	2528	777	5151	1221	1778	2247	5151	777	26900	380
1935	2394	2724	4562	3467	2056	1414	1308	1630	1134	508	1331	1927	2038	4562	508	13500	225
1936	10809	9381	3221	9214	1889	1049	1054	1669	775	777	527	2936	3608	10809	527	49300	405
1937	6903	5280	3676	5565	4355	1571	1133	1831	969	1879	896	930	2916	6903	896	21600	355
1938	1215	1108	4339	9696	1836	1974	1726	1553	548	224	1178	929	2194	9696	224	36300	166
1939	2346	5109	5217	3068	2406	2856	1550	2980	1051	564	524	827	2375	5217	524	22300	429
1940	2578	3492	3962	2400	1408	1716	4980	1397	697	532	1061	1647	2156	4980	532	19900	382
1941	1660	1467	2938	1914	896	647	2160	1703	529	300	902	2510	1469	2938	300	8760	200
1942	1728	3066	6889	2536	1979	1500	1469	2624	1178	1131	1076	3596	2398	6889	1076	30100	542
1943	4268	2279	6840	4061	2163	1690	2929	1530	905	611	918	1025	2435	6840	611	31900	404
1944	1794	4278	5364	7847	2877	1596	1251	1084	890	558	816	1273	2469	7847	558	22000	360
1945	1647	3910	2911	4238	3752	1384	1939	1135	815	894	1343	2921	2241	4238	815	24500	308
1946	7515	6538	8494	4475	3688	2311	2109	976	967	677	1121	990	3322	8494	677	35800	410
1947	7000	2410	5385	4499	2643	1996	1123	862	400	287	2234	2230	2589	7000	287	33700	231
1948	1803	6202	6619	5455	1793	1172	2800	3129	1212	785	9649	5898	3876	9649	785	41500	615
1949	5829	6551	4798	4267	3811	2099	2425	1483	1123	786	910	1158	2937	6551	786	22500	548
1950	1777	2920	3857	2016	1995	1712	1653	999	2257	1010	915	1285	1866	3857	915	11400	536
1951	1558	2515	4031	4749	1646	1125	1507	581	795	564	1375	5467	2159	5467	564	33800	231
1952	3007	3008	8288	2793	1890	1514	523	1151	1078	589	765	1958	2214	8288	523	22700	300
1953	5245	4247	3825	3804	5241	1656	1719	805	925	594	653	2045	2563	5245	594	23300	284
1954	2998	1761	2122	2172	1552	990	590	322	111	65	274	831	1149	2998	65	9080	45
1955	2124	3255	2345	4296	2132	1209	1454	776	287	507	930	909	1685	4296	287	18000	162
1956	888	4735	6185	4780	1970	1039	1141	535	623	545	833	1745	2085	6185	535	34900	269
1957	2846	2698	3279	7007	2330	1658	1048	597	1615	1860	2921	3409	2606	7007	597	42100	251
1958	2591	4601	4413	4773	2086	1653	2308	986	745	1185	888	1046	2273	4773	745	20100	201
1959	1844	3092	3813	3098	2380	3267	1125	554	834	1094	885	1106	1924	3813	554	13200	330
1960	3067	4613	4424	4046	1616	959	546	688	641	1125	651	838	1935	4613	546	14700	212
1961	1057	9562	4752	5402	2682	2403	1662	1059	881	397	700	7318	3156	9562	397	40800	316

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

SUMMARY FLOW DATA
USGS GAGE 02414500
TALLAPOOSA R. AT WADLEY, AL

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Ann	Max Monthly	Min Monthly	Max Daily	Min Daily
1962	3949	5321	3762	5285	1781	1469	1541	727	462	814	1992	1619	2394	5321	462	21800	230
1963	3028	3108	6224	3422	4419	2419	2380	1234	747	649	779	2393	2567	6224	649	39500	411
1964	4824	3306	8349	8237	3446	1599	1737	1189	722	2207	1457	3860	3411	8349	722	28300	430
1965	3435	4939	5801	4112	1964	2165	1683	894	674	887	772	935	2355	5801	674	12100	477
1966	1911	5643	4114	3203	4511	1654	1114	1448	1405	2356	2771	2081	2684	5643	1114	20800	477
1967	3156	3362	2905	1850	2551	1582	1901	2899	1273	1060	2676	4545	2480	4545	1060	15400	663
1968	4934	2447	3167	4971	6084	1947	1680	890	434	561	1305	2363	2565	6084	434	32500	264
1969	2735	3083	3128	4026	4937	1752	1077	999	1476	908	830	1582	2211	4937	830	14400	385
1970	2204	2454	6637	3333	1785	2671	1584	1570	690	2427	1956	1880	2433	6637	690	42300	318
1971	3554	6056	9305	4661	2953	1845	2468	1921	1294	721	1071	2655	3209	9305	721	40800	624
1972	8142	4601	4479	3153	3187	1843	1337	858	585	754	1639	4268	2904	8142	585	26500	253
1973	6905	4466	7335	8059	7447	3888	1875	1375	869	1266	1098	2344	3911	8059	869	28600	592
1974	6786	5731	3077	4484	1851	1337	1036	2275	1183	676	1101	3489	2752	6786	676	33700	544
1975	4801	8101	9576	6021	3717	3285	3616	3906	3977	5455	3315	3074	4904	9576	3074	31600	1330
1976	7131	3552	11143	6439	4521	2539	2319	1124	916	887	1183	2607	3697	11143	887	52800	600
1977	3588	2715	10518	8720	2211	1240	860	522	609	1849	3168	1767	3147	10518	522	53000	214
1978	5668	2421	3138	2489	5024	2671	985	1170	462	307	414	1023	2148	5668	307	25400	275
1979	3018	3872	7985	14755	3635	3362	1620	971	2298	2086	3187	1965	4063	14755	971	67900	574
1980	4682	3886	10641	7506	5268	2174	974	560	610	1282	951	968	3292	10641	560	28700	260
1981	868	4552	2905	2916	2265	1340	805	553	498	390	496	1227	1568	4552	390	20200	182
1982	4199	9219	3071	6748	3098	2576	1622	1140	539	1154	283	2490	3012	9219	283	39800	92
1983	3678	5556	5925	7390	4249	2252	1226	900	301	500	2707	8336	3585	8336	301	34400	104
1984	4286	3971	4191	3560	5111	1415	1604	4331	1362	840	1058	1740	2789	5111	840	20900	151
1985	1902	4752	2267	723	2703	892	1773	1533	1556	1135	1766	1593	1883	4752	723	14700	94
1986	1248	1607	2175	542	444	521	612	639	876	234	1313	1790	1000	2175	234	8610	70
1987	4628	3169	5848	1647	1305	1819	1596	872	594	313	767	729	1941	5848	313	17000	41
1988	2545	2437	1294	595	988	788	527	678	1384	1298	1832	1029	1283	2545	527	20700	54
1989	2023	1999	3727	3442	2073	4664	4066	1686	1271	3334	2833	3276	2866	4664	1271	18300	114
1990	6109	10893	13267	2472	2143	1283	1302	585	320	321	1009	967	3389	13267	320	60300	133
1991	1856	3927	3753	2995	4891	2960	2239	1634	920	1059	3030	2402	2639	4891	920	14400	151
1992	3945	5698	4515	2409	1443	1994	1160	1719	1481	1433	6246	6366	3201	6366	1160	15700	123
1993	6757	4491	6086	3159	2906	1693	1229	910	783	253	1091	1514	2573	6757	253	15300	106
1994	1553	3630	4410	3406	1529	1707	4497	2635	1498	2256	2381	3040	2712	4497	1498	14200	133
1995	2241	7359	6281	1910	1361	1542	922	629	504	5599	4946	3018	3026	7359	504	26900	94
1996	5257	8423	8557	2792	2081	1633	1051	1289	859	1374	1666	2592	3131	8557	859	23700	92
1997	4979	5220	7003	2280	2210	3644	2963	1955	894	1771	2227	3000	3179	7003	894	28500	74
1998	4868	8274	9682	5031	2829	1862	1495	1733	893	625	1184	1205	3307	9682	625	28700	89
1999	2616	2770	2992	816	1459	1549	2310	724	597	510	458	872	1473	2992	458	8180	109

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

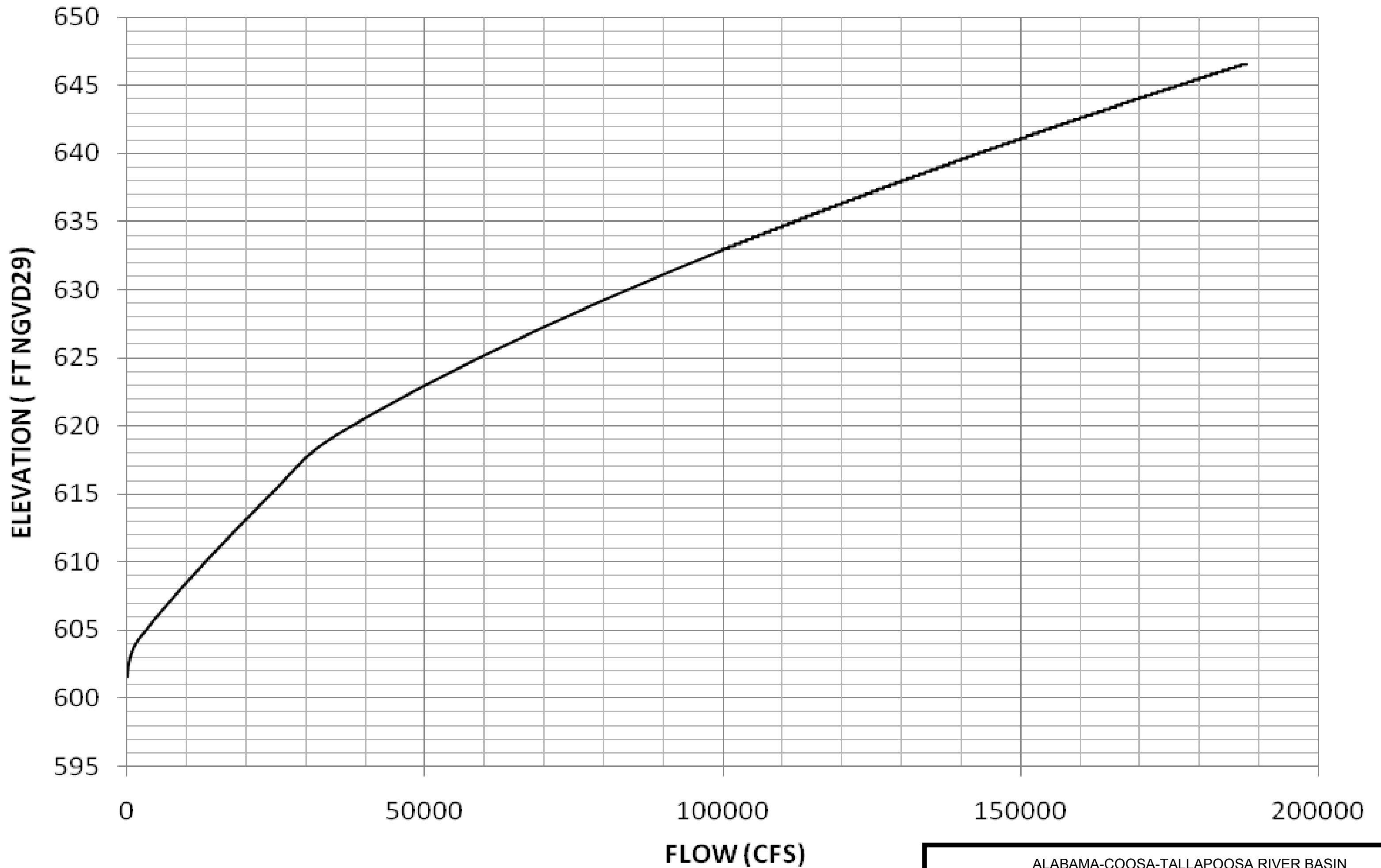
SUMMARY FLOW DATA
USGS GAGE 02414500
TALLAPOOSA R. AT WADLEY, AL

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Ann	Max Monthly	Min Monthly	Max Daily	Min Daily
2000	1452	1581	1745	3337	716	799	668	573	534	450	813	902	1131	3337	450	16500	111
2001	2379	2763	7440	3875	1882	2689	1465	1270	976	778	556	1114	2266	7440	556	19200	178
2002	3115	2106	1801	1455	2013	721	860	866	1585	2353	4471	6179	2294	6179	721	15800	126
2003	2926	4722	5426	3051	14319	4819	6027	2628	1548	1126	2652	2151	4283	14319	1126	103000	187
2004	2233	4159	1931	1494	1545	1560	1728	972	3180	1719	4493	3919	2411	4493	972	15500	105
2005	2555	4164	5128	5162	2526	2575	7058	3030	1418	952	1661	2198	3202	7058	952	19200	283
2006	3615	5104	4152	1638	2177	915	789	902	482	984	2599	1297	2055	5104	482	13700	137
2007	2624	1846	1466	555	381	538	651	383	375	254	185	220	790	2624	185	10300	96
2008	299	2581	2439	1656	1794	715	648	936	721	665	466	2183	1259	2581	299	12800	163
2009	2213	1819	4482	3435	3661	1199	979	655	3092	5477	6436	8426	3490	8426	655	18500	197
2010	6255	6638	7483	1956	3772	2158	1136	628	432	965	1259	1142	2819	7483	432	18100	173
2011	1417	2189	5305	2828	1148	886	585	574	325	818	2037	1993	1675	5305	325	15700	186
2012	4093	2327	5135	476	482	674	455	284	265	450	820	2165	1469	5135	265	15400	104
Average	**3485**	**4183**	**5024**	**3966**	**2776**	**1845**	**1710**	**1345**	**1019**	**1161**	**1743**	**2483**	**2562**	**6629**	**642**	**26278**	**279**

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

SUMMARY FLOW DATA
USGS GAGE 02414500
TALLAPOOSA R. AT WADLEY, AL



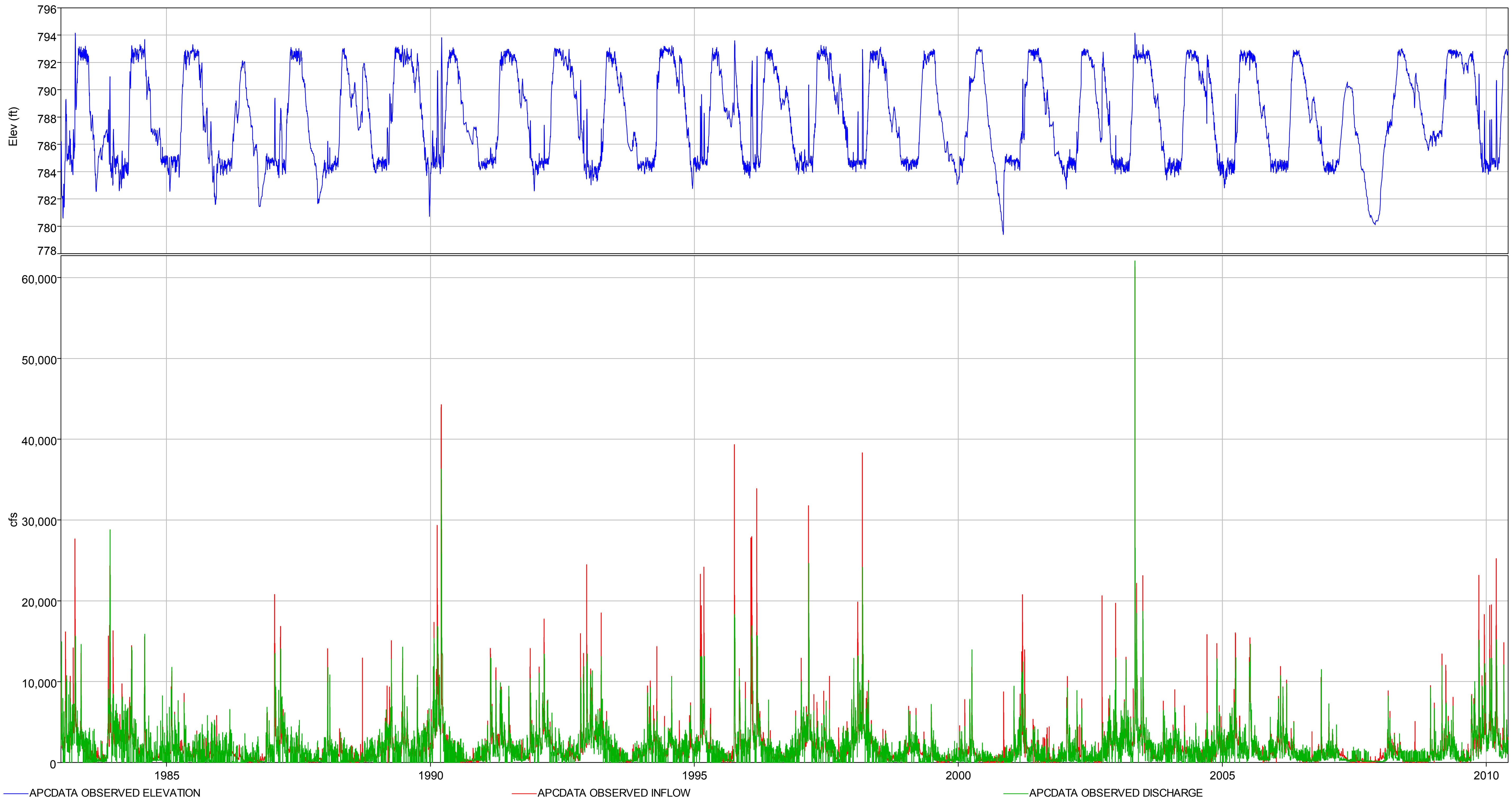
Rating Curve updated October 11, 2012

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

RATING CURVE

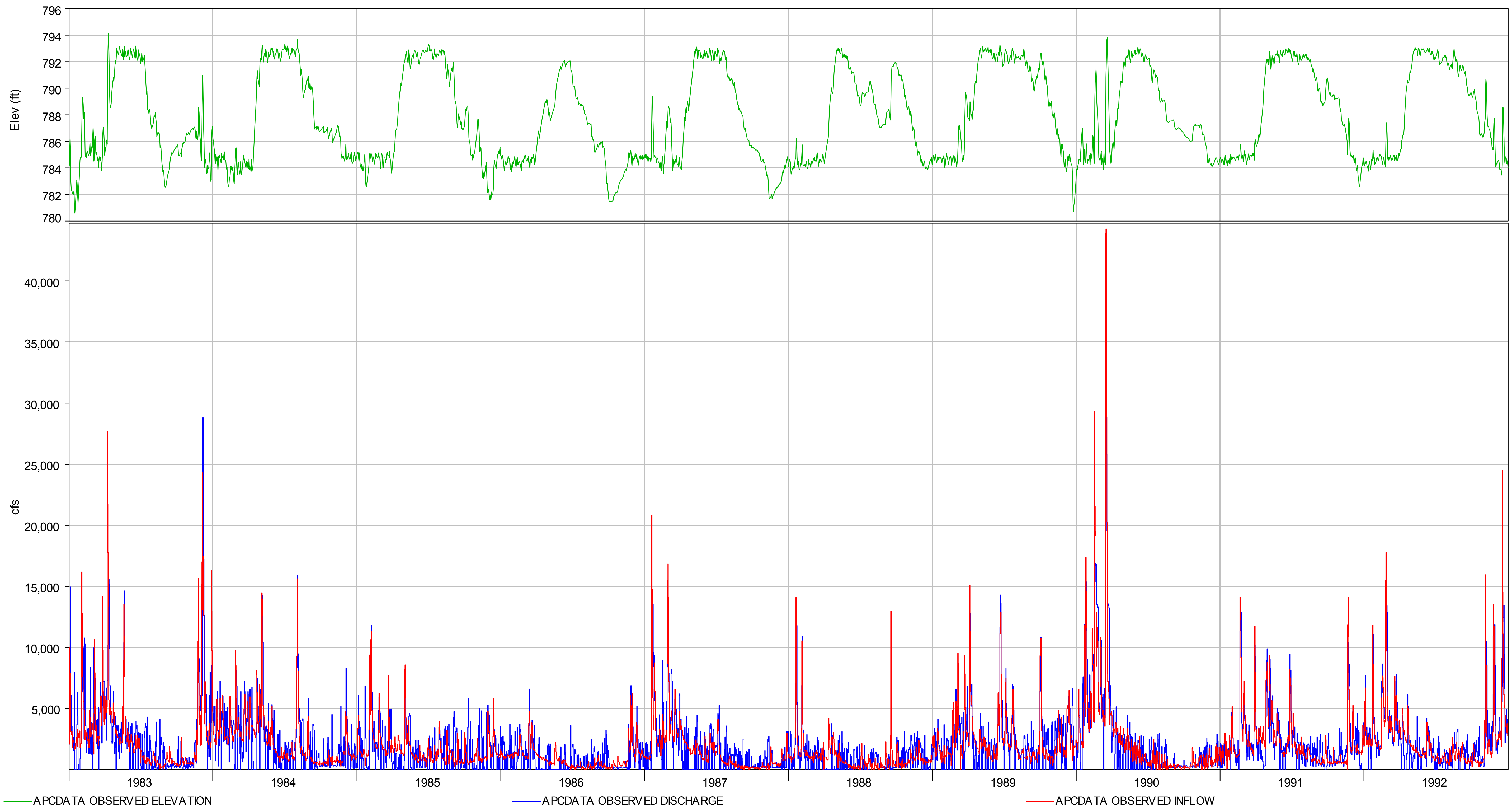
AT USGS 02414500 GAGE AT WADLEY, AL



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

INFLOW-OUTFLOW-POOL HYDROGRAPHS

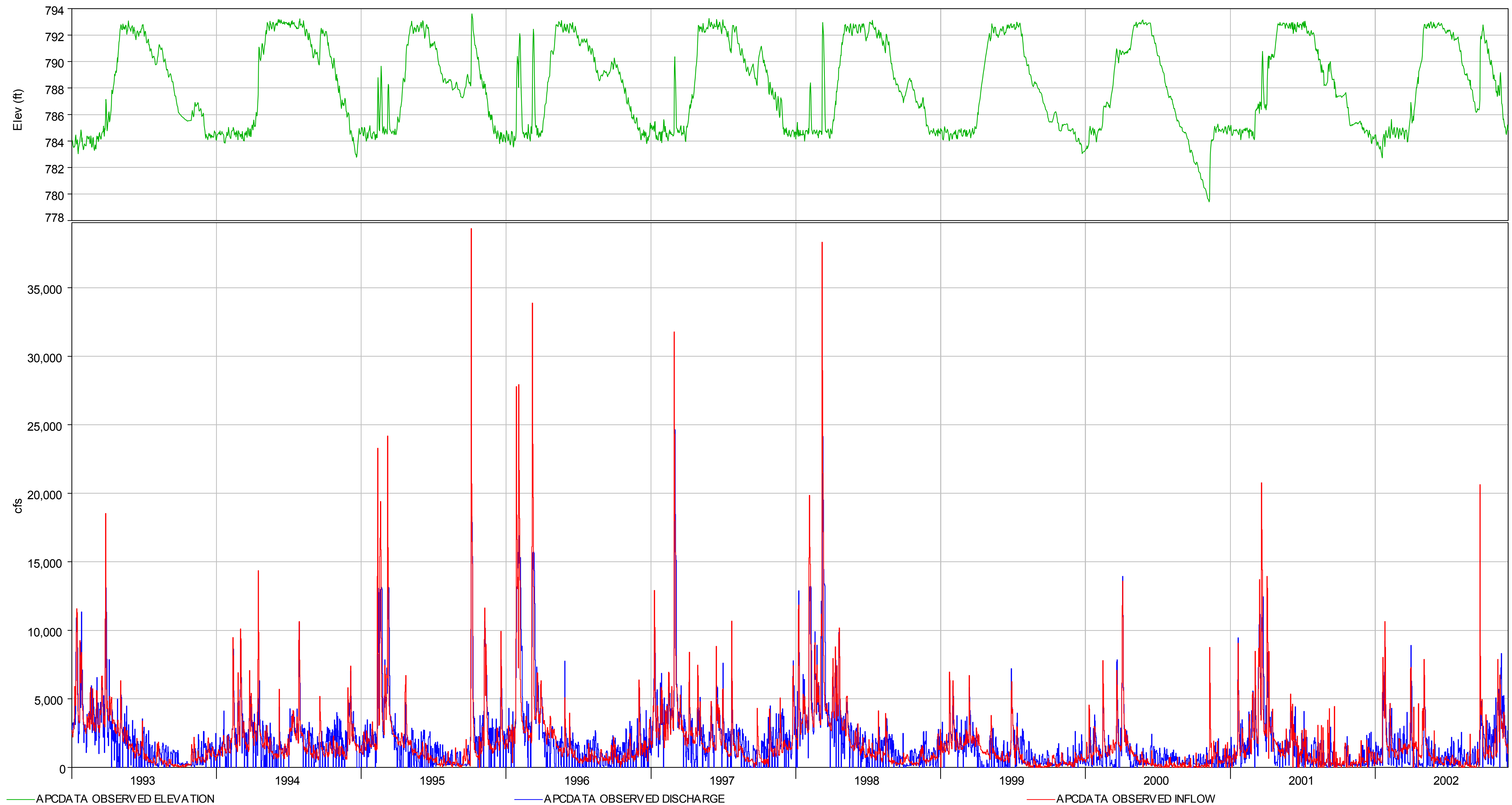


*Hydrographs represent daily midnight values

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

INFLOW-OUTFLOW-POOL HYDROGRAPHS

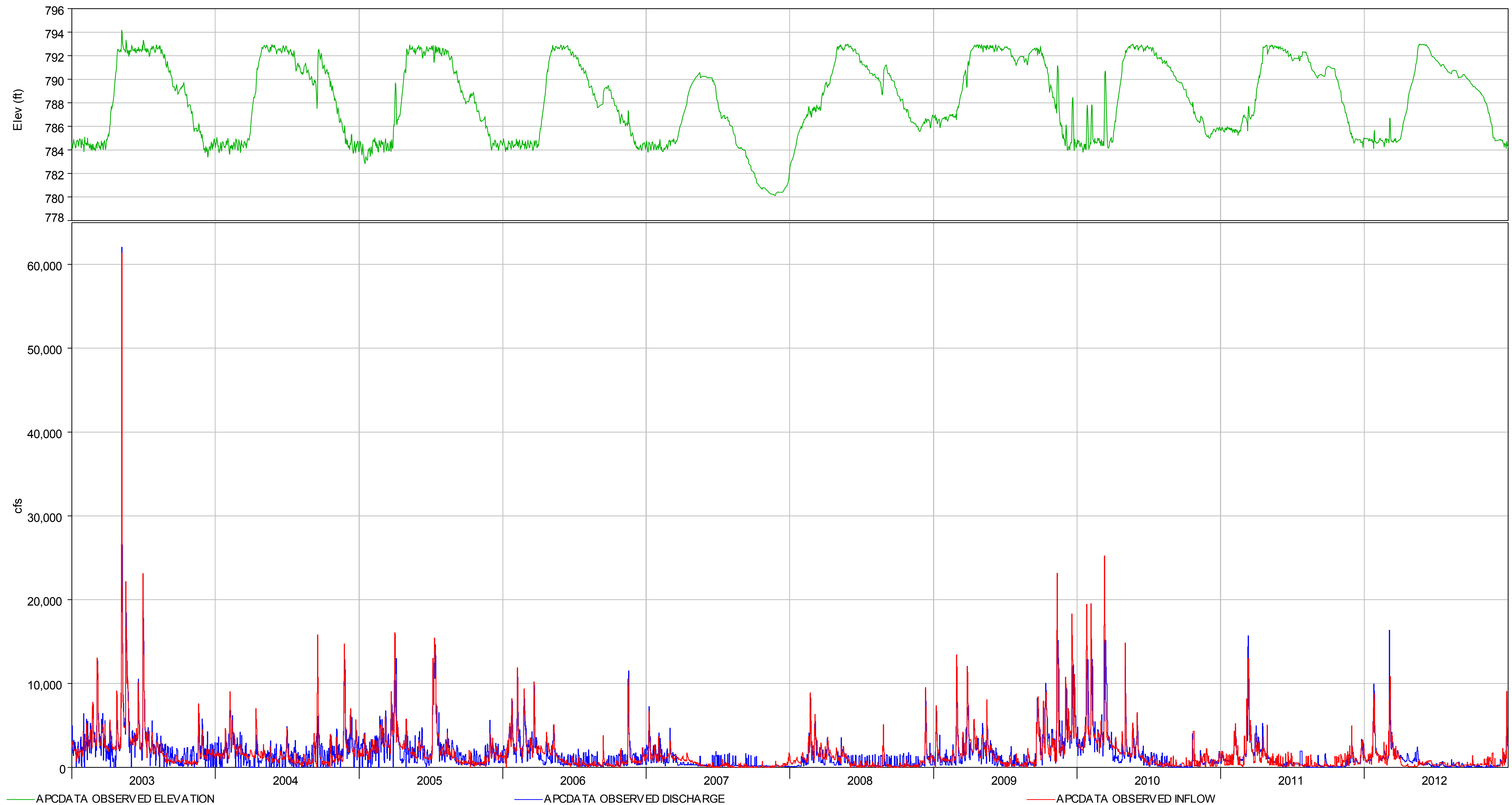


*Hydrographs represent daily midnight values

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

INFLOW-OUTFLOW-POOL HYDROGRAPHS

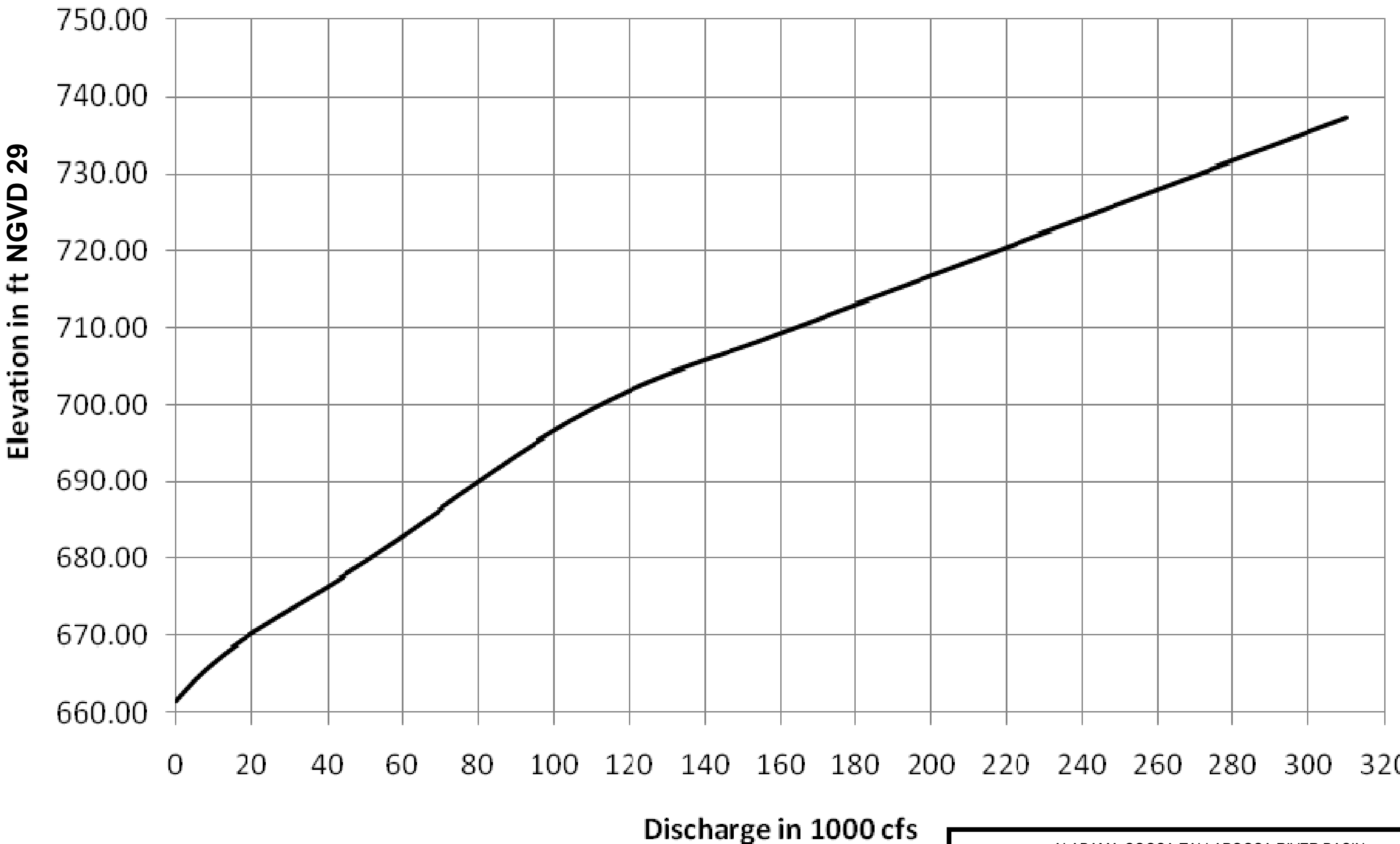


*Hydrographs represent daily midnight values

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

INFLOW-OUTFLOW-POOL HYDROGRAPHS



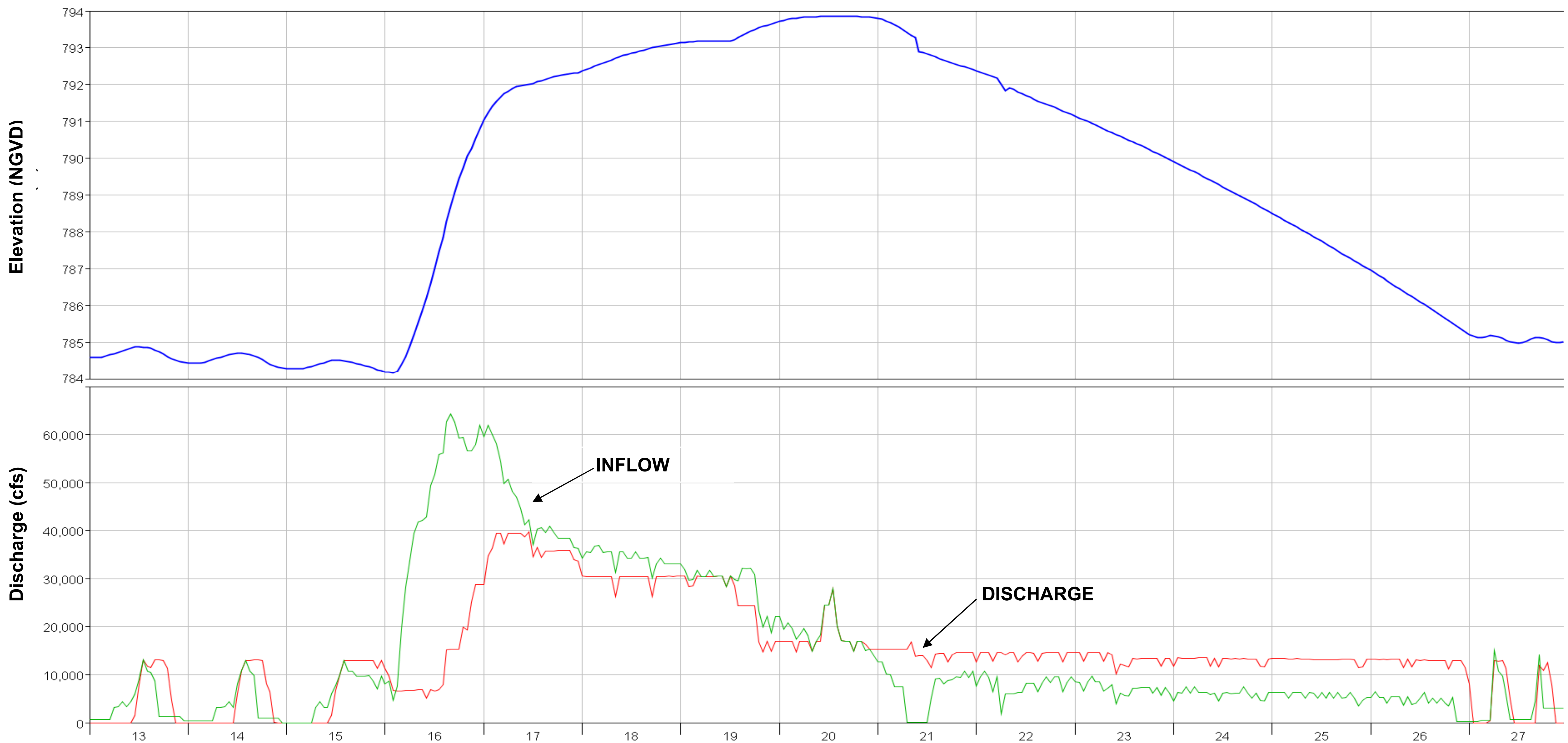
* *Data provided to Alabama Power to support ResSim model development*

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

TAILWATER RATING CURVE

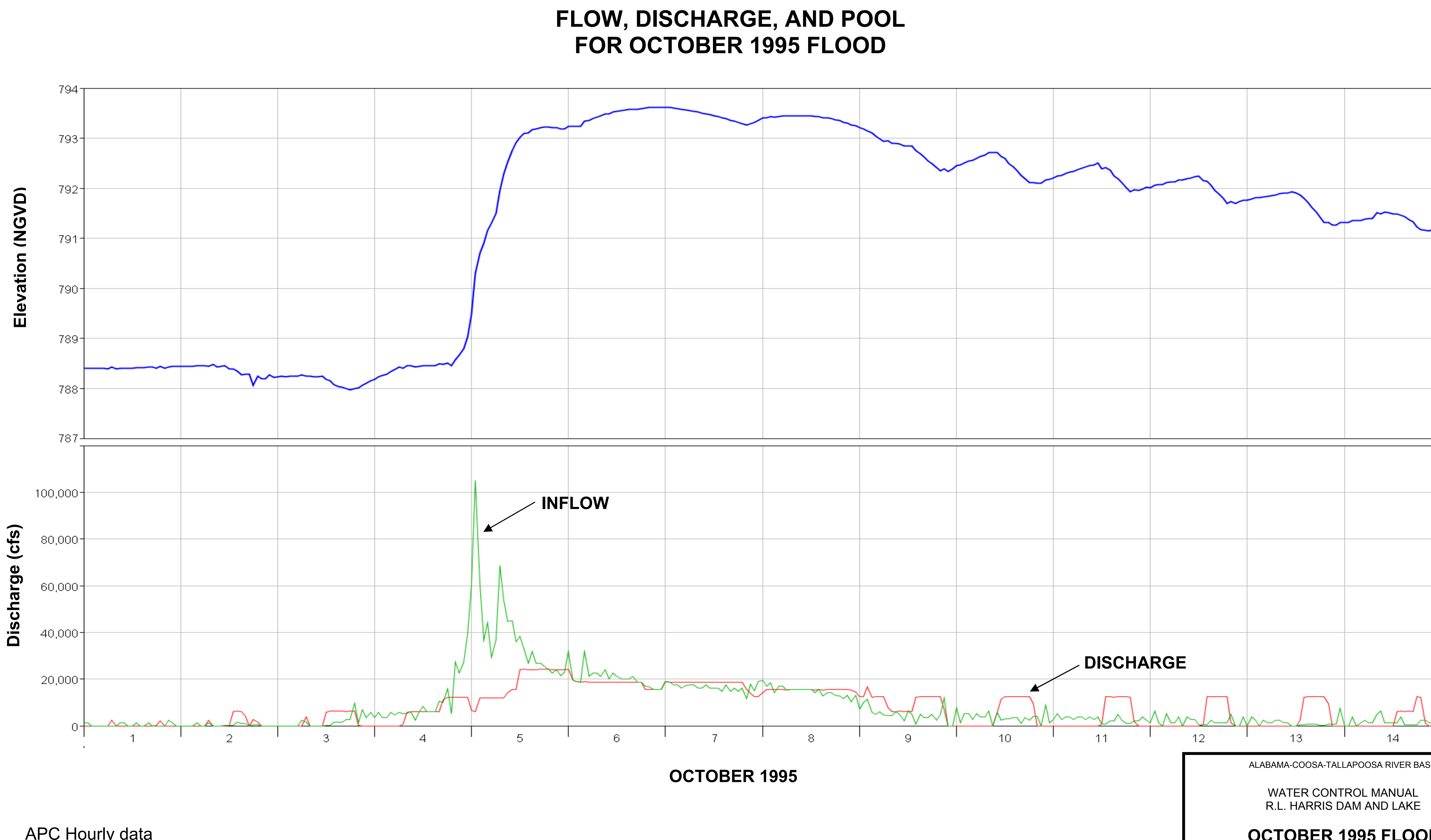
FLOW, DISCHARGE, AND POOL FOR MARCH 1990 FLOOD



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

MARCH 1990 FLOOD
FLOW, DISCHARGE, AND POOL



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

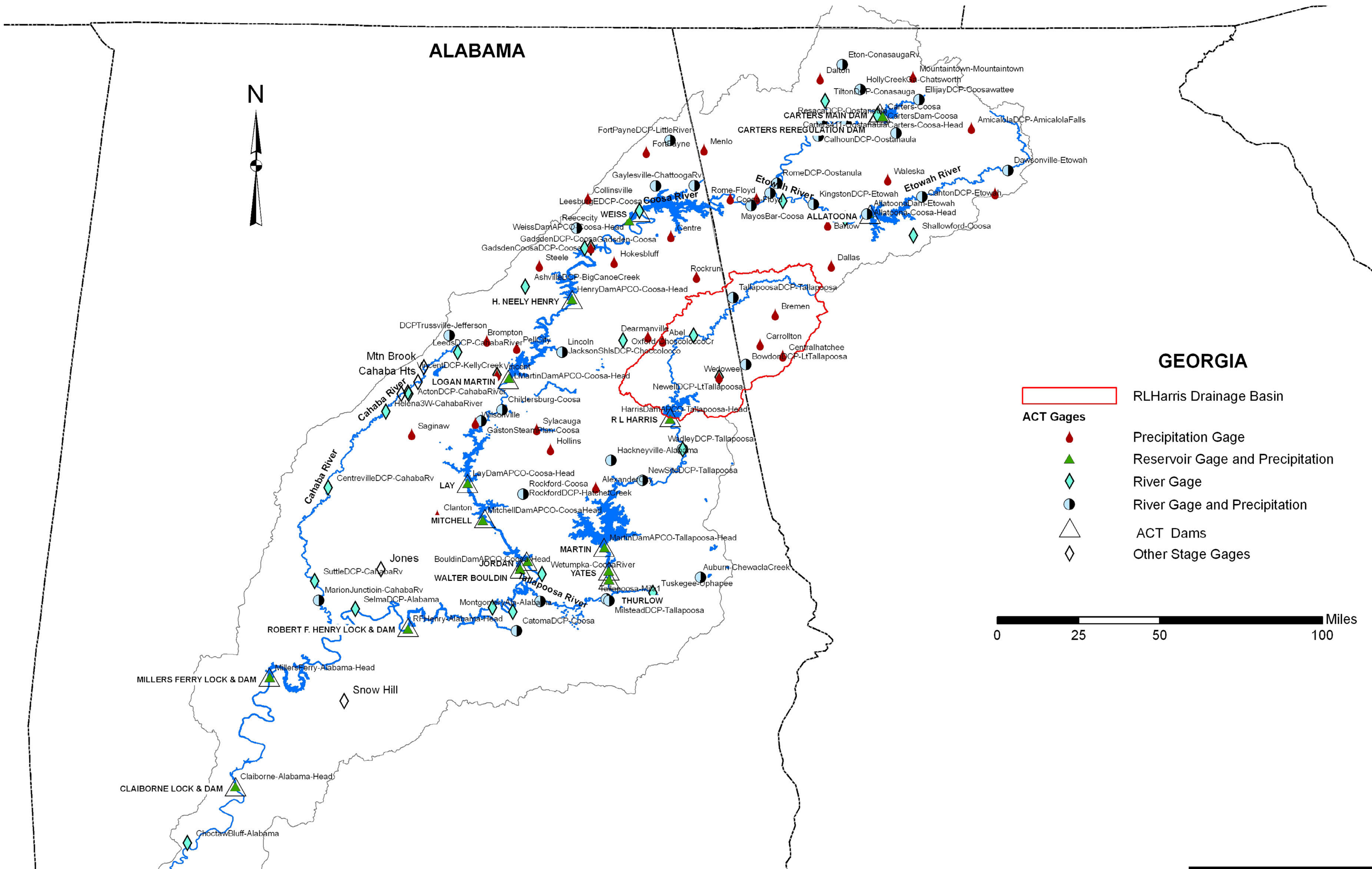
OCTOBER 1995 FLOOD
FLOW, DISCHARGE, AND POOL

Data from APC hourly values

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

FLOOD OF 2003
INDUCED SURCHARGE REGULATION
HOURLY VALUES

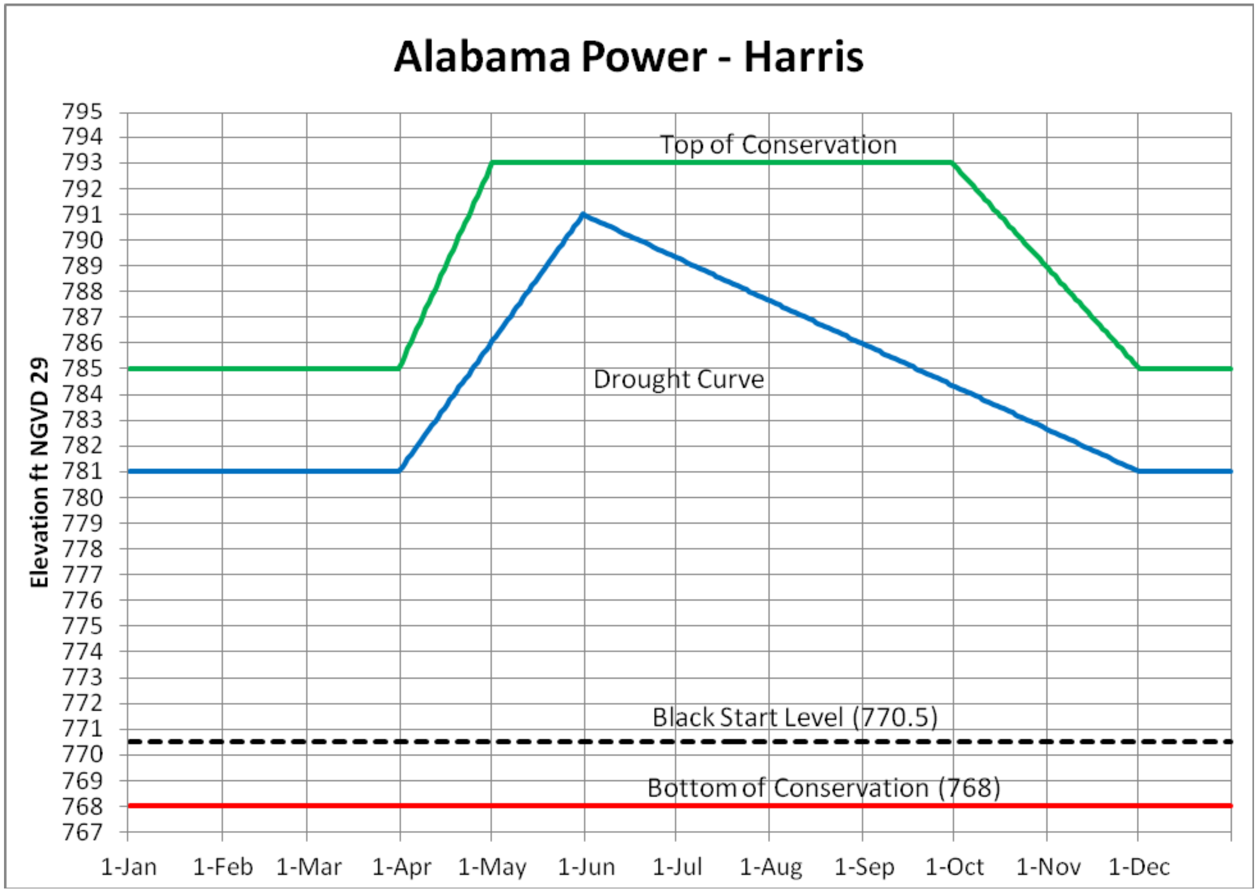


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

ACT REPORTING STATIONS

Guide Curve Elevation ft NGVD 29	Date Month*
785	J
785	F
785	M
785	A
793	M
793	J
793	J
793	A
793	S
793	O
789	N
785	D
785	J

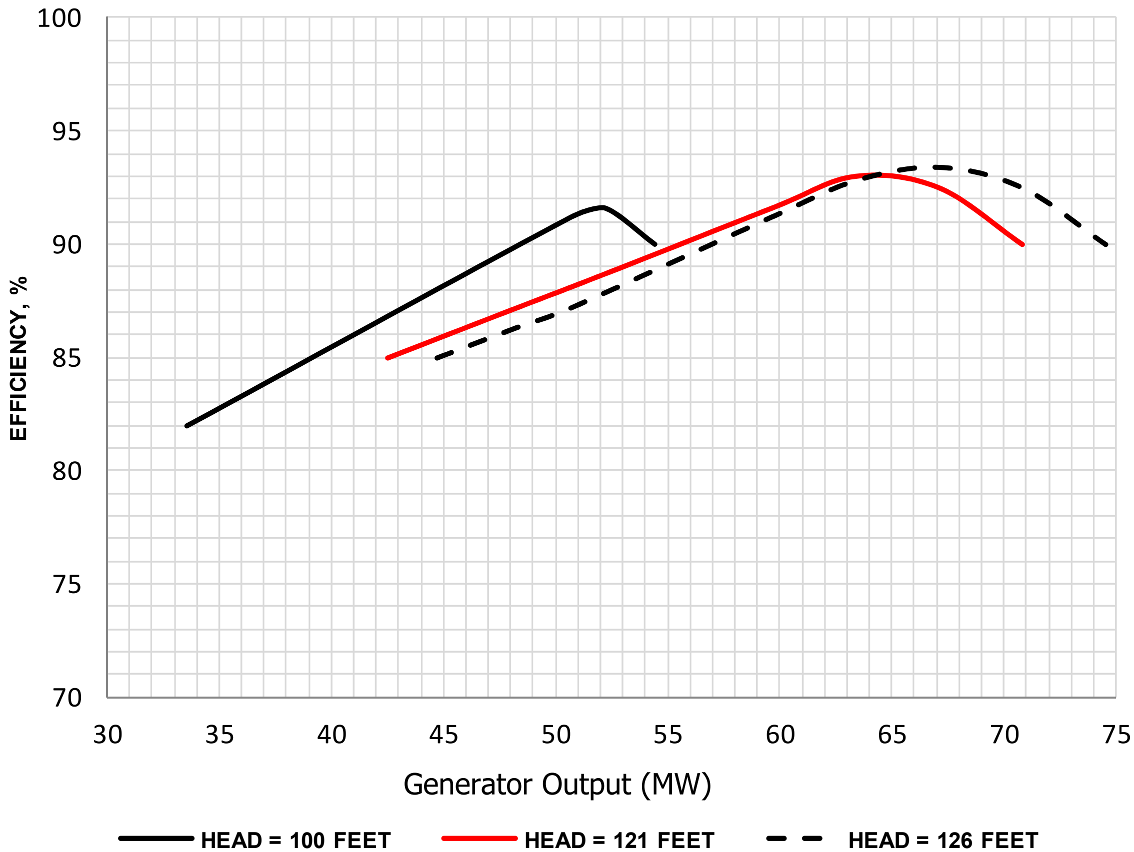


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

GUIDE CURVE

GUARANTEED HYDROPOWER PERFORMANCE CURVES



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

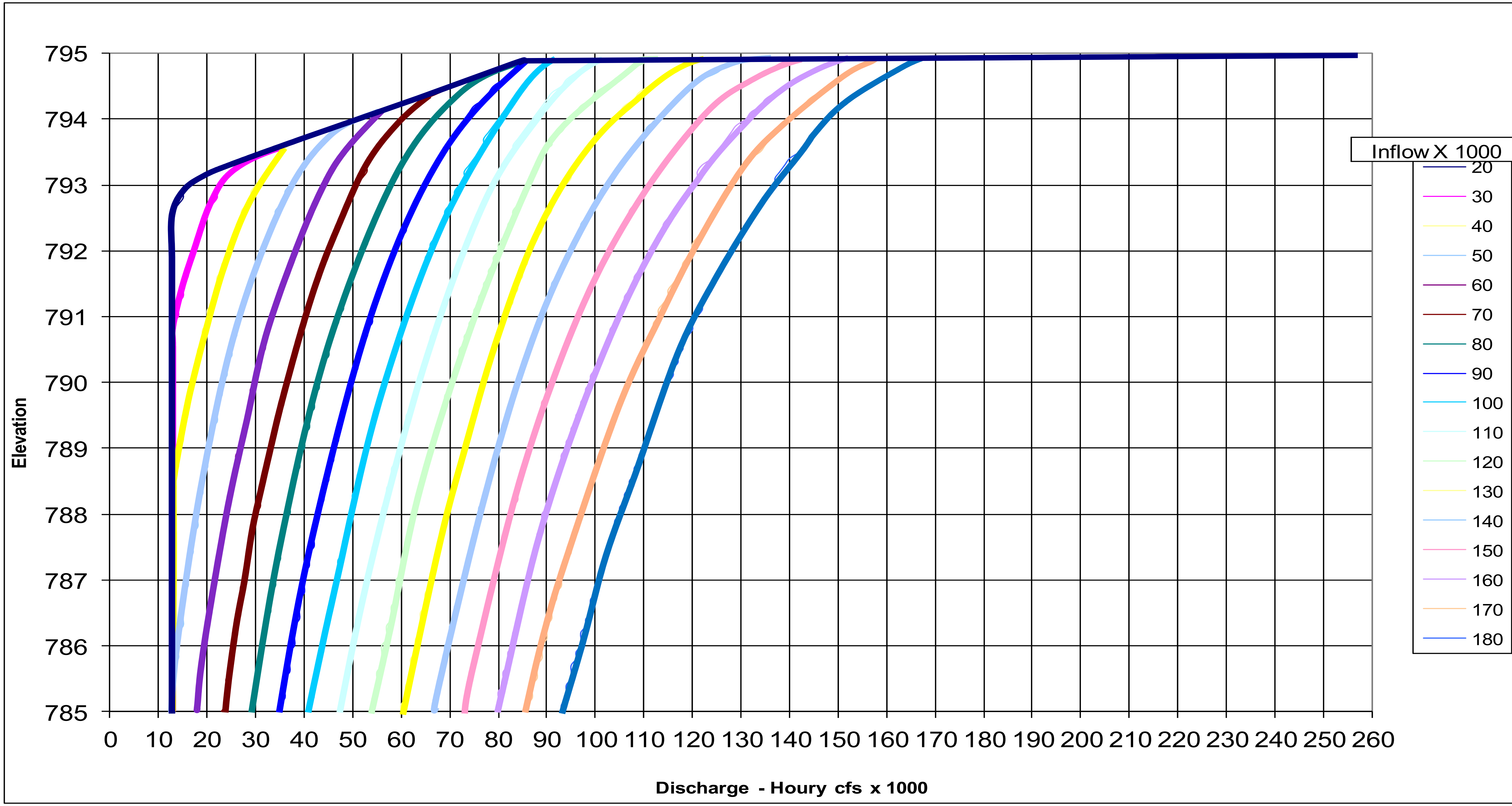
HYDROPWER PERFORMANCE CURVES

Rule	Condition	Harris Outflow	Operation
1	Below Guide Curve		Operate power plant to satisfy system load requirements.
2	At or above Guide Curve and below elev. 790.00	13,000 cfs or less depending on Wadley stage	Operate to discharge 13,000 cfs or an amount that will not cause the gage at Wadley to exceed 13.0 feet, unless greater discharge amounts are required by the Induced Surcharge Schedule. Discharge rates determined by the Harris real-time water control model may be substituted for those indicated by the Induced Surcharge Curves. If the model produces outflows in excess of those identified by the Induced Surcharge Schedule for three (3) consecutive periods, the operator shall notify the Water Management Section before making any further gate movements.
3	Above Guide Curve and rising	16,000 cfs or greater	Discharge 16,000 cfs or greater if required by the Induced Surcharge Curves Releases may be made through the spillway gates or powerhouse or a combination of both. Discharge rates determined by the Harris real-time water control model may be substituted for those indicated by the Induced Surcharge Curves. If the model produces outflows in excess of those identified by the Induced Surcharge Schedule for three (3) consecutive periods, the operator shall notify the Water Management Section before making any further gate movements.
4	Above Guide Curve and falling		When the reservoir begins to fall, maintain current gate settings and power- house discharge until the pool recedes to the Guide Curve, then return to normal operation.

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

FLOOD CONTROL REGULATION SCHEDULE



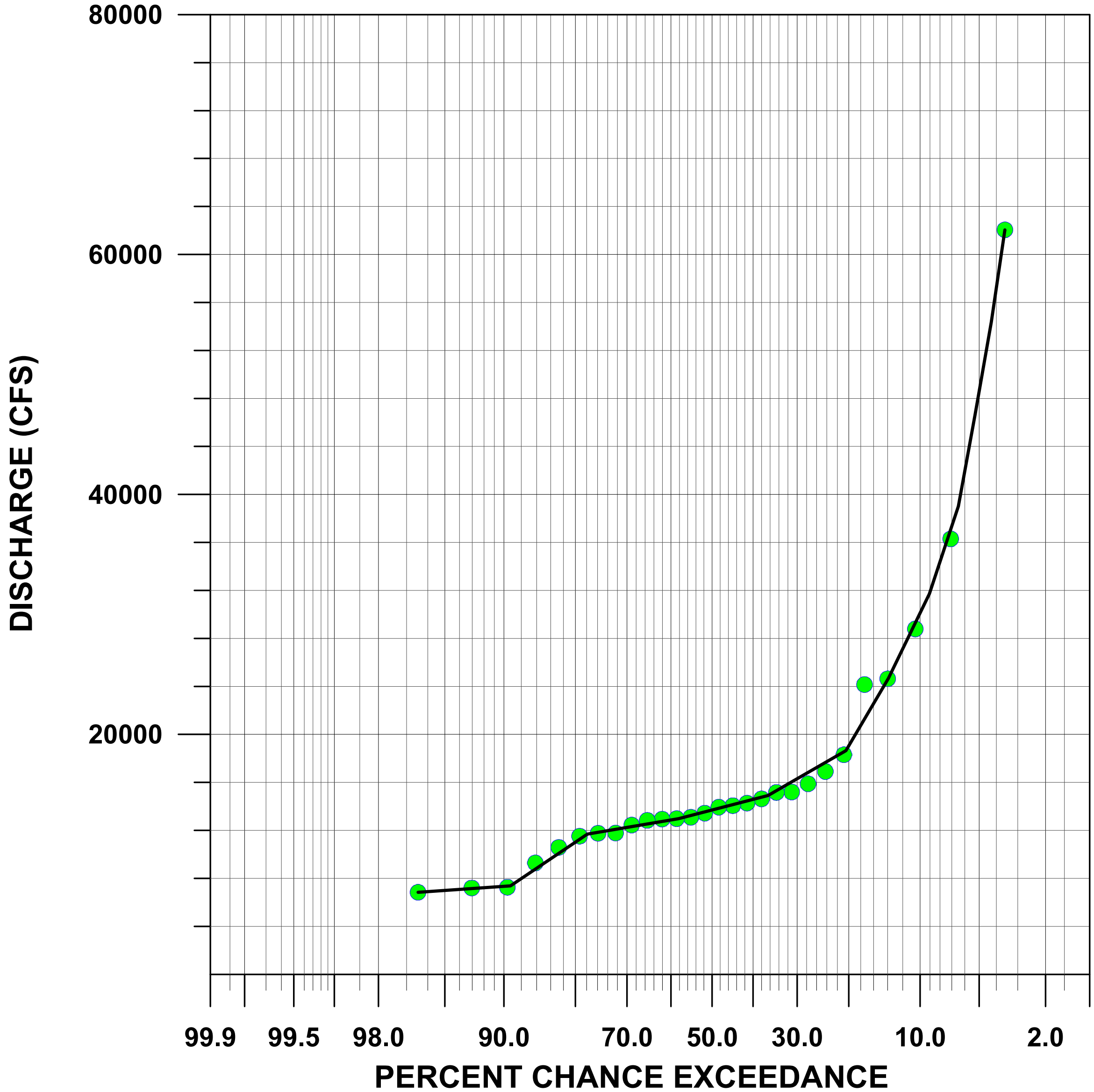
Operating Instructions:

1. Follow regular flood control regulation as shown on Plate 7-3 until releases are required by this schedule.
2. Adjust the outflow hourly based on the average inflow for the preceding three hours and the current reservoir level as indicated by these curves.
3. When the reservoir level begins to fall maintain the current gate openings and power plant discharge in effect at that time until the reservoir recedes to the top of the Power Guide Curve, then follow regular flood regulations.
4. The Spillway Gate will be opened in accordance with the gate opening schedule to produce a discharge as near as practical to those prescribed under this schedule.

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

INDUCED SURCHARGE CURVES

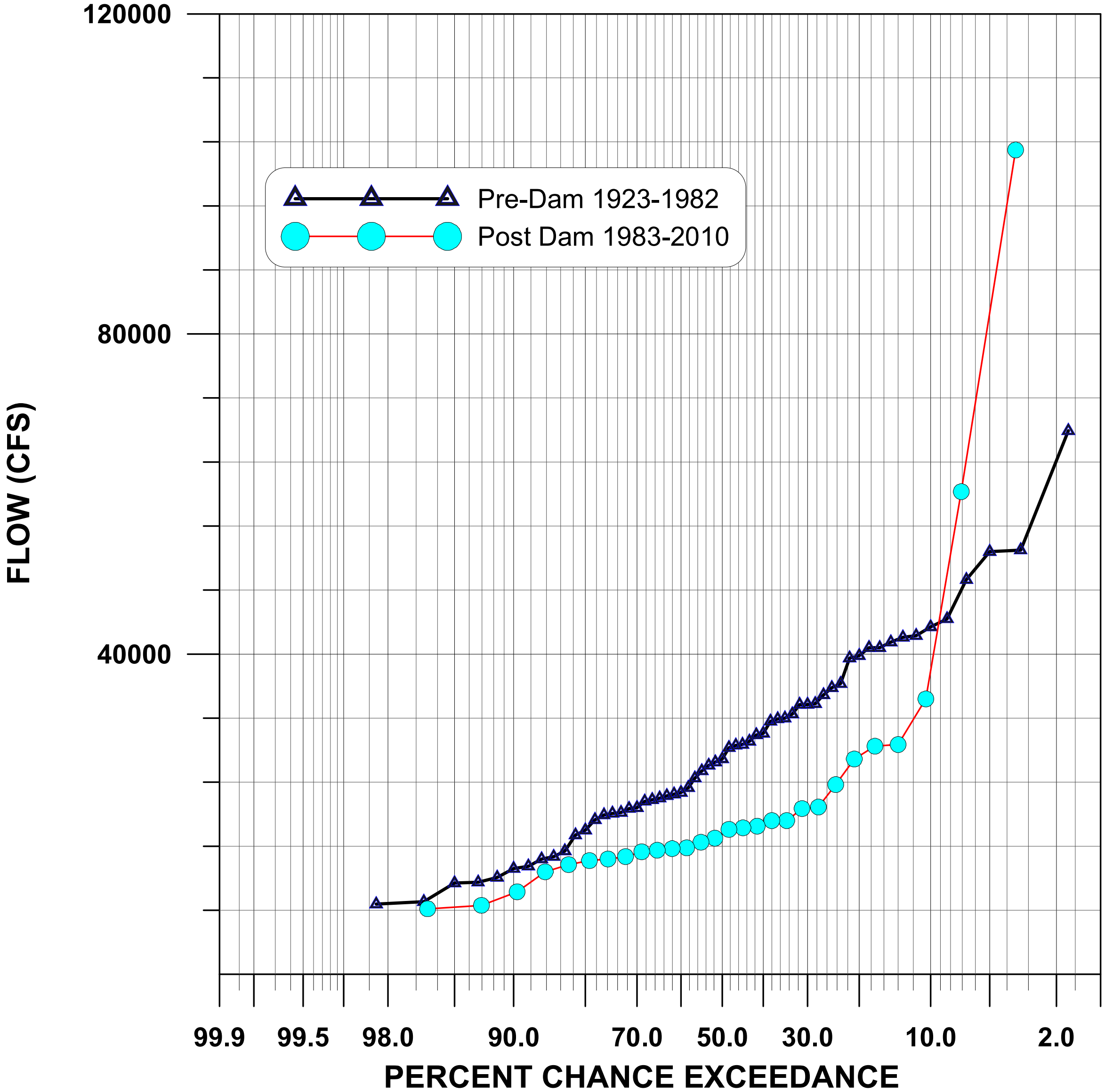


Developed from ave daily data from APC for period 1983 – 2010

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE FREQUENCY
AT R.L. HARRIS DAM

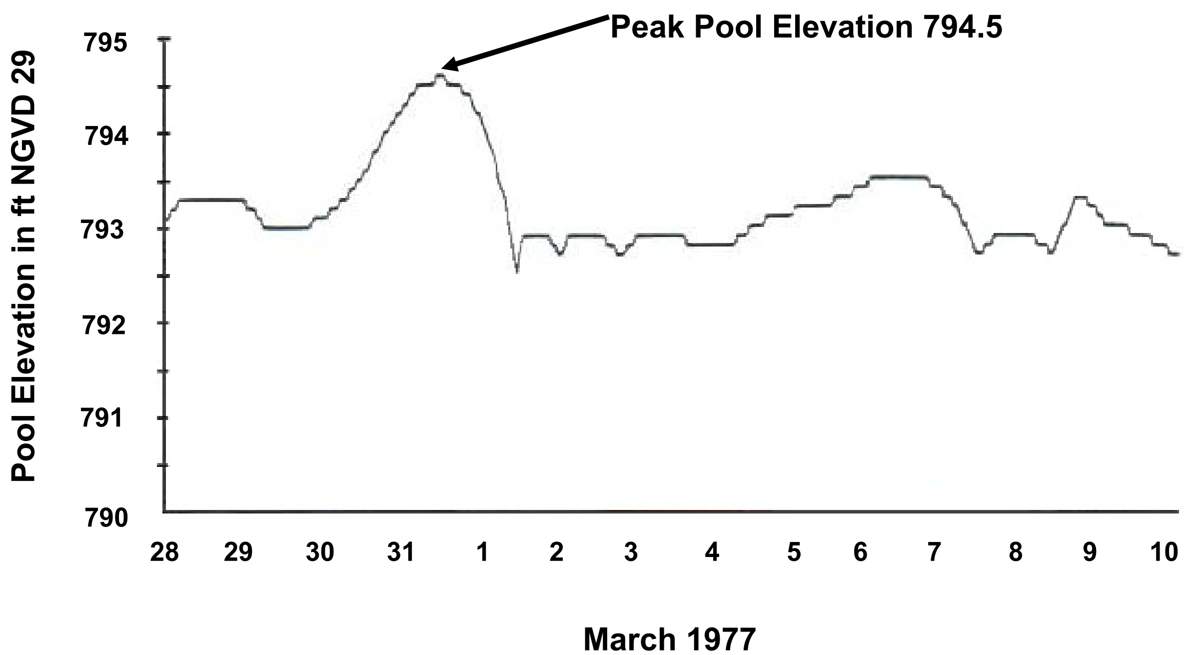


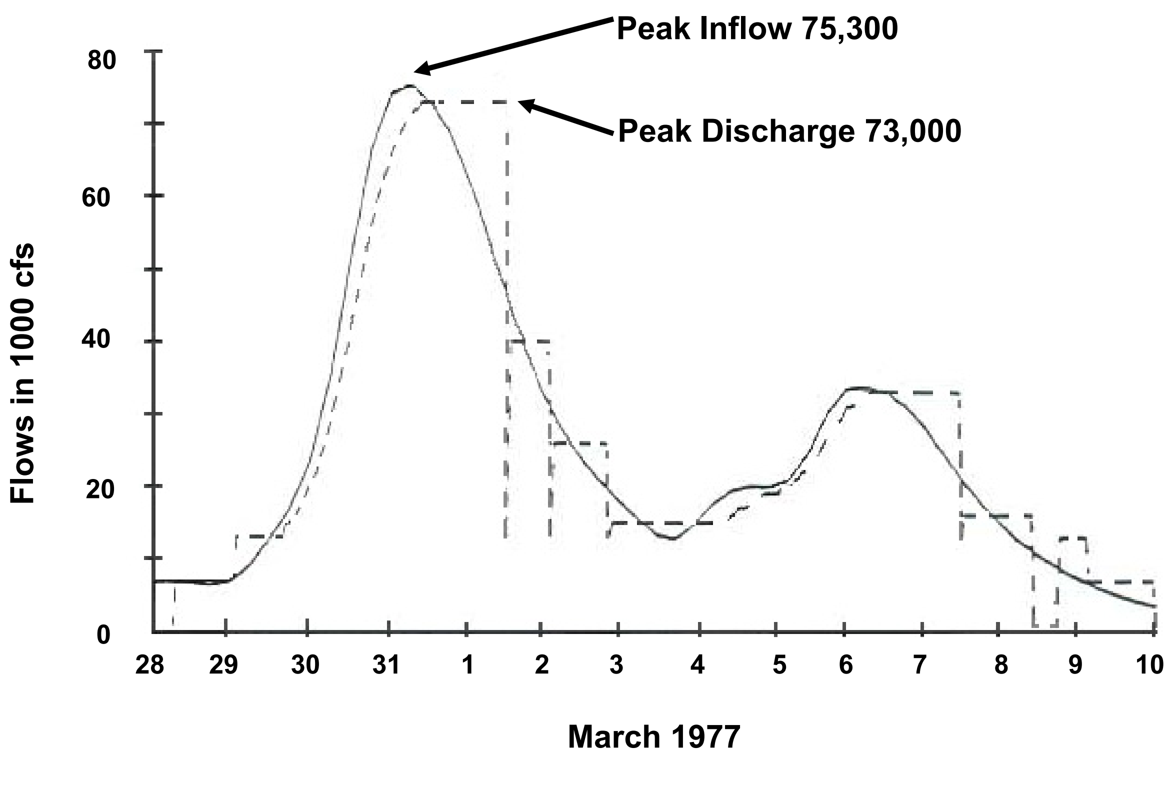
Data from average daily data at
USGS gage 02414500

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

DISCHARGE FREQUENCY
AT USGS GAGE 02414500 AT WADLEY, AL

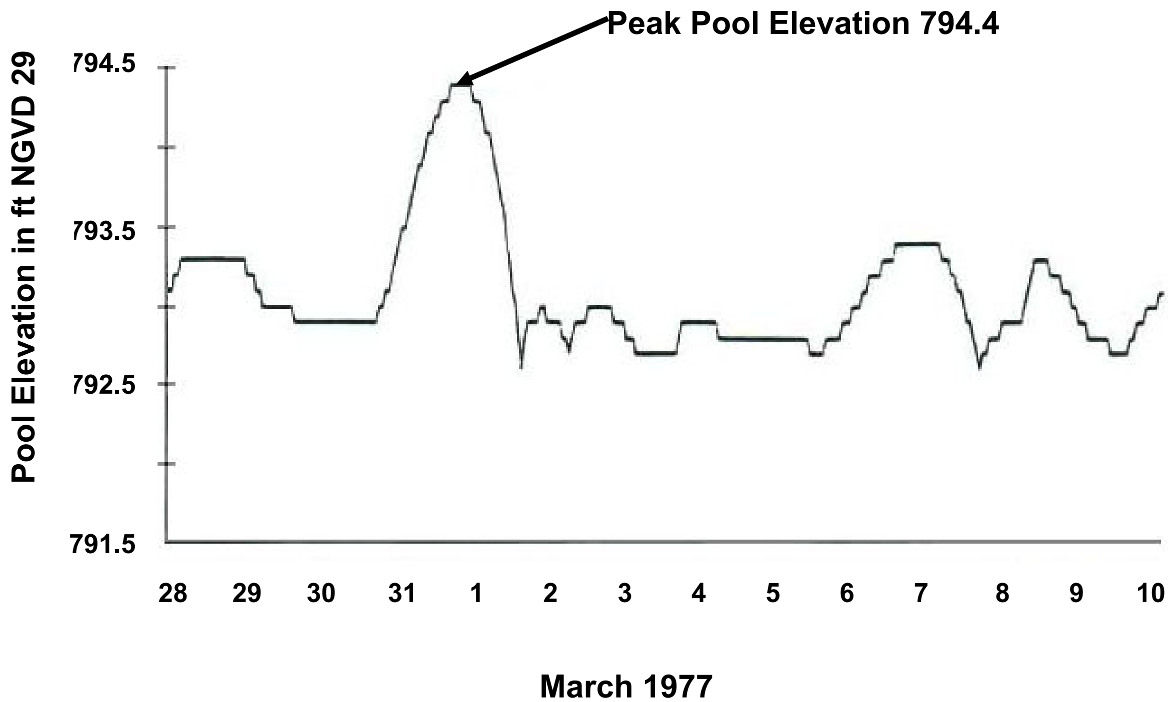


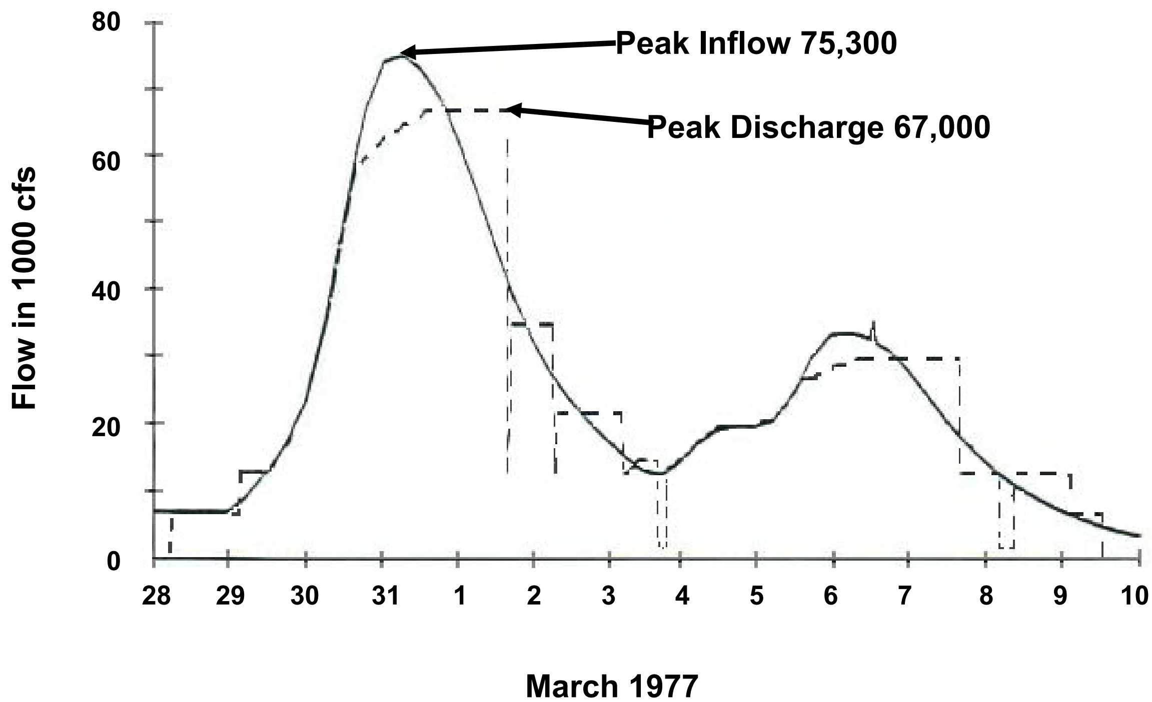


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

1977 FLOOD
INDUCED SURCHARGE REGULATION

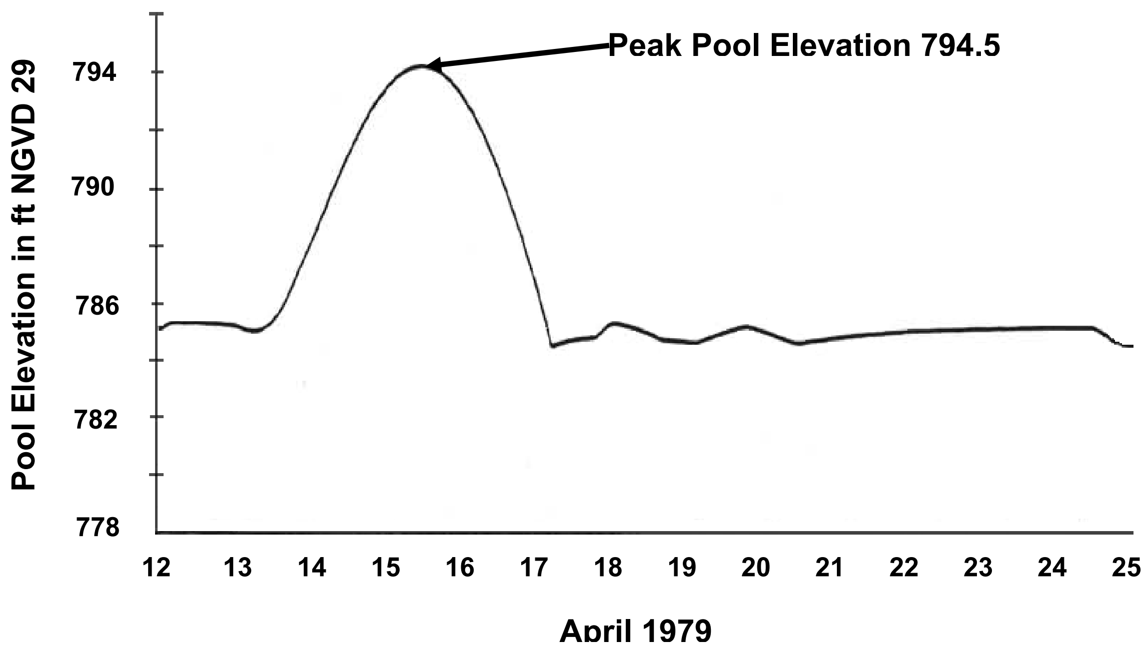


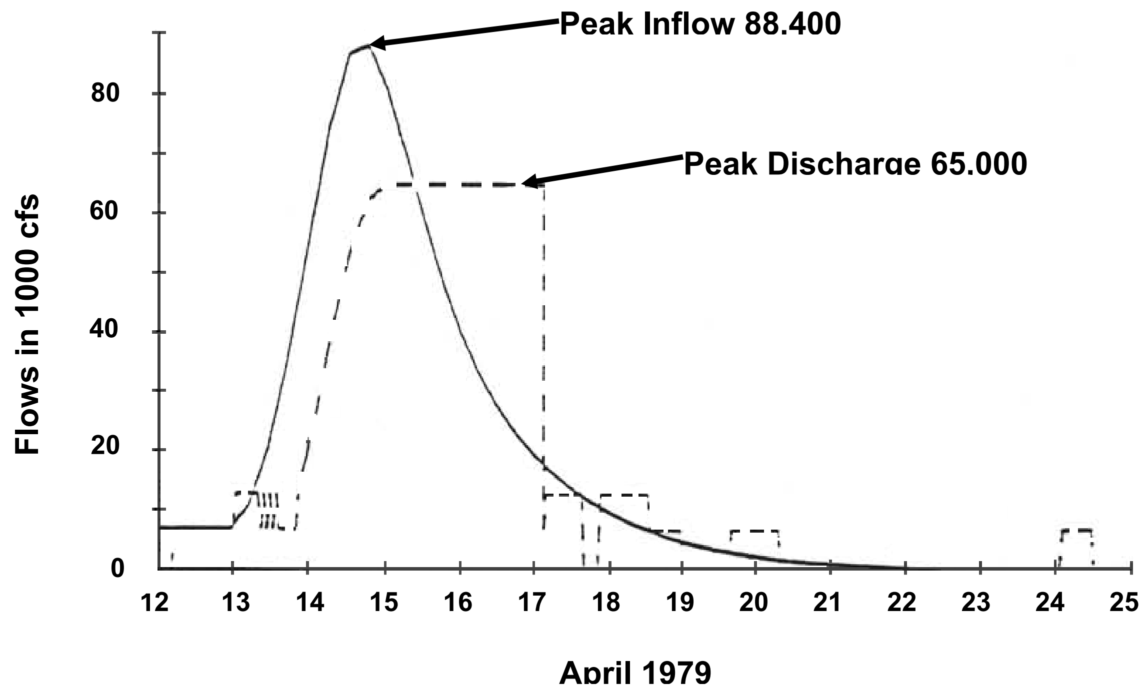


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

FLOOD OF 1977
BASIN MODEL REGULATION

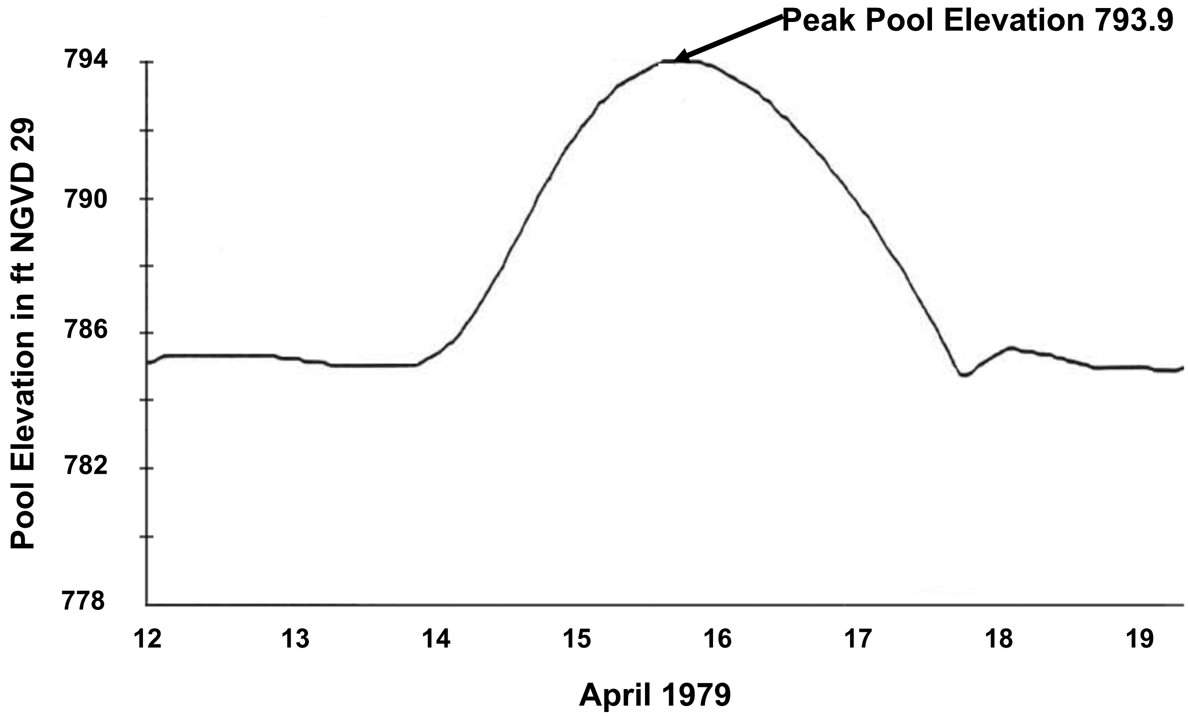


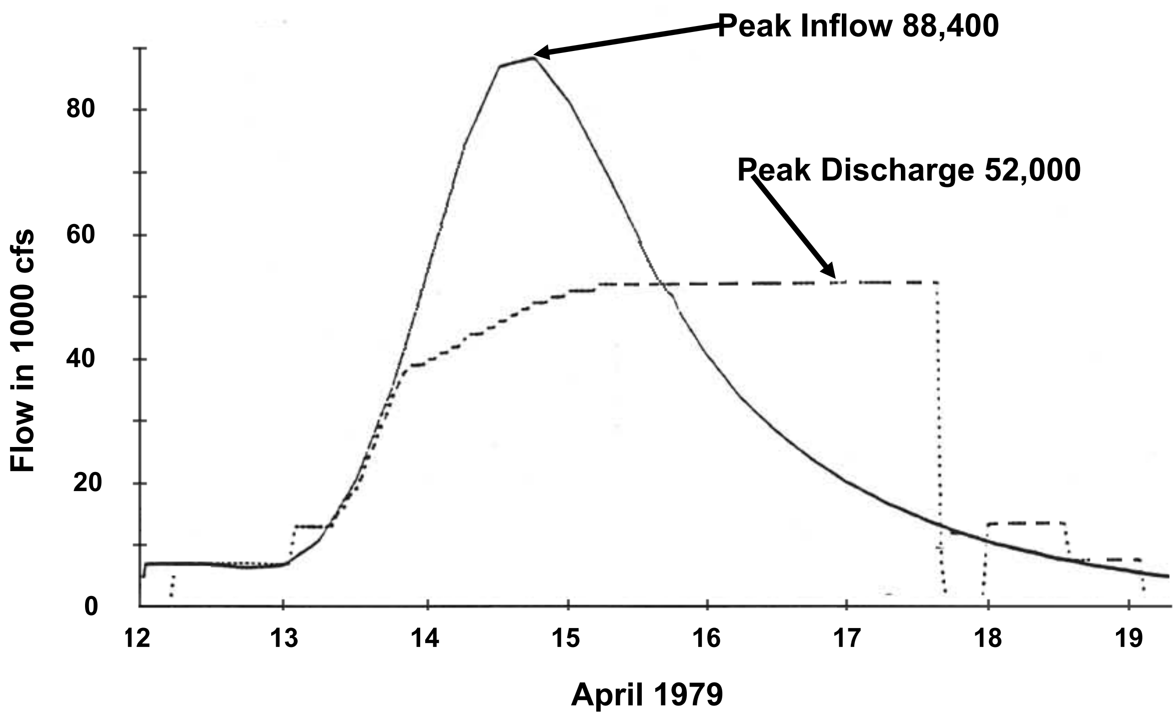


ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

FLOOD OF 1979
INDUCED SURCHARGE REGULATION

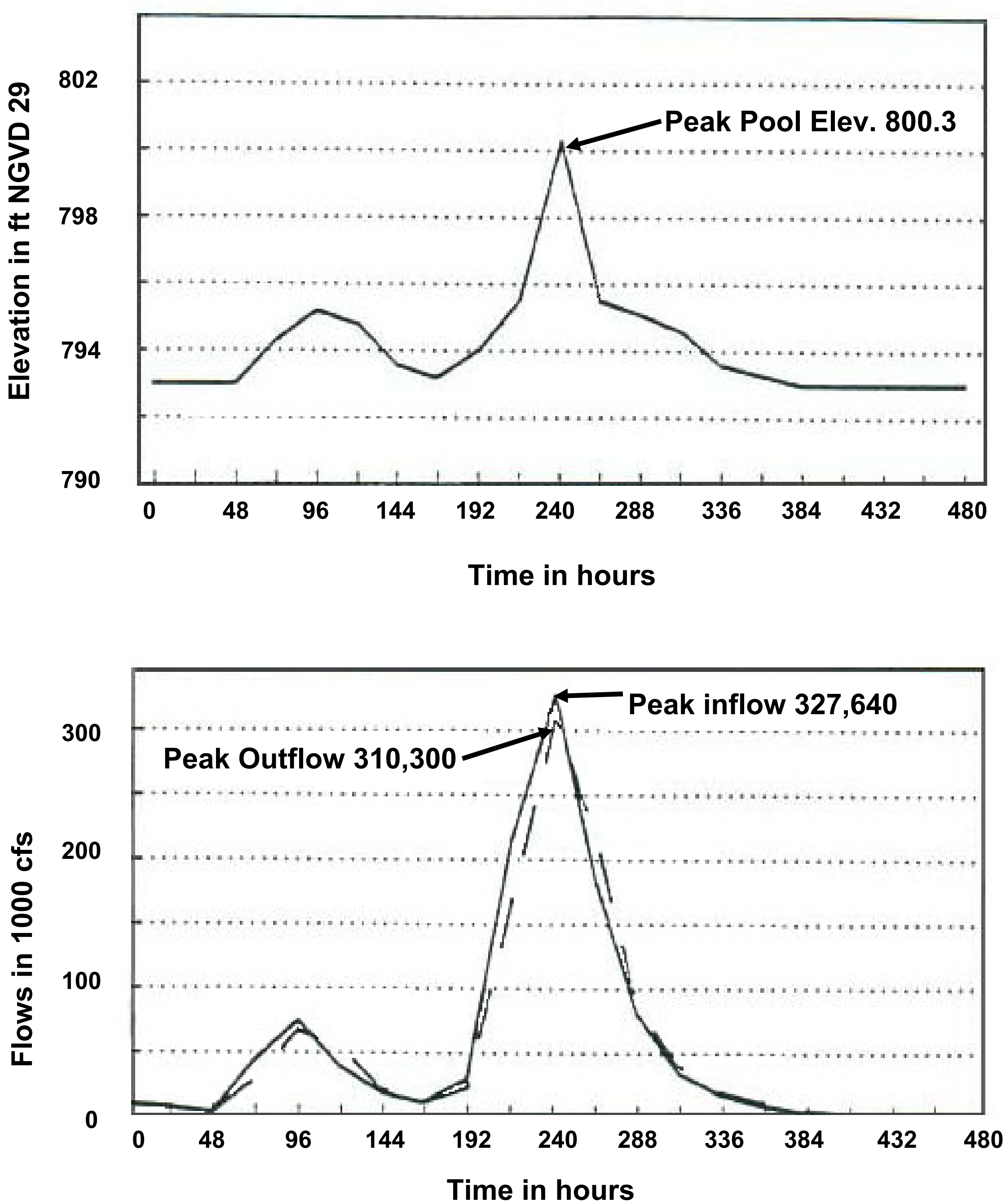




ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

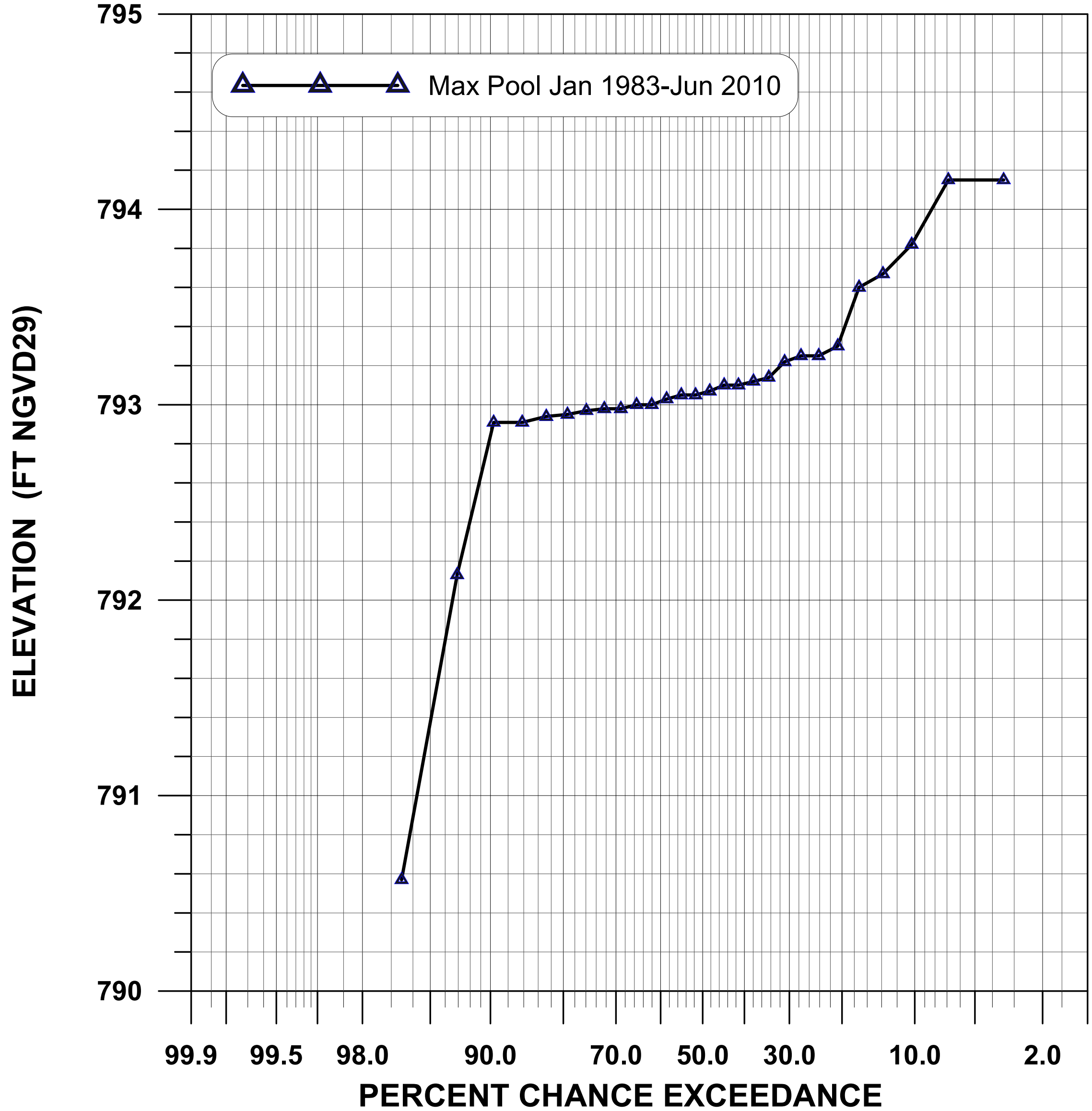
FLOOD OF 1979
BASIN MODEL REGULATION



ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

PROBABLE MAXIMUM FLOOD

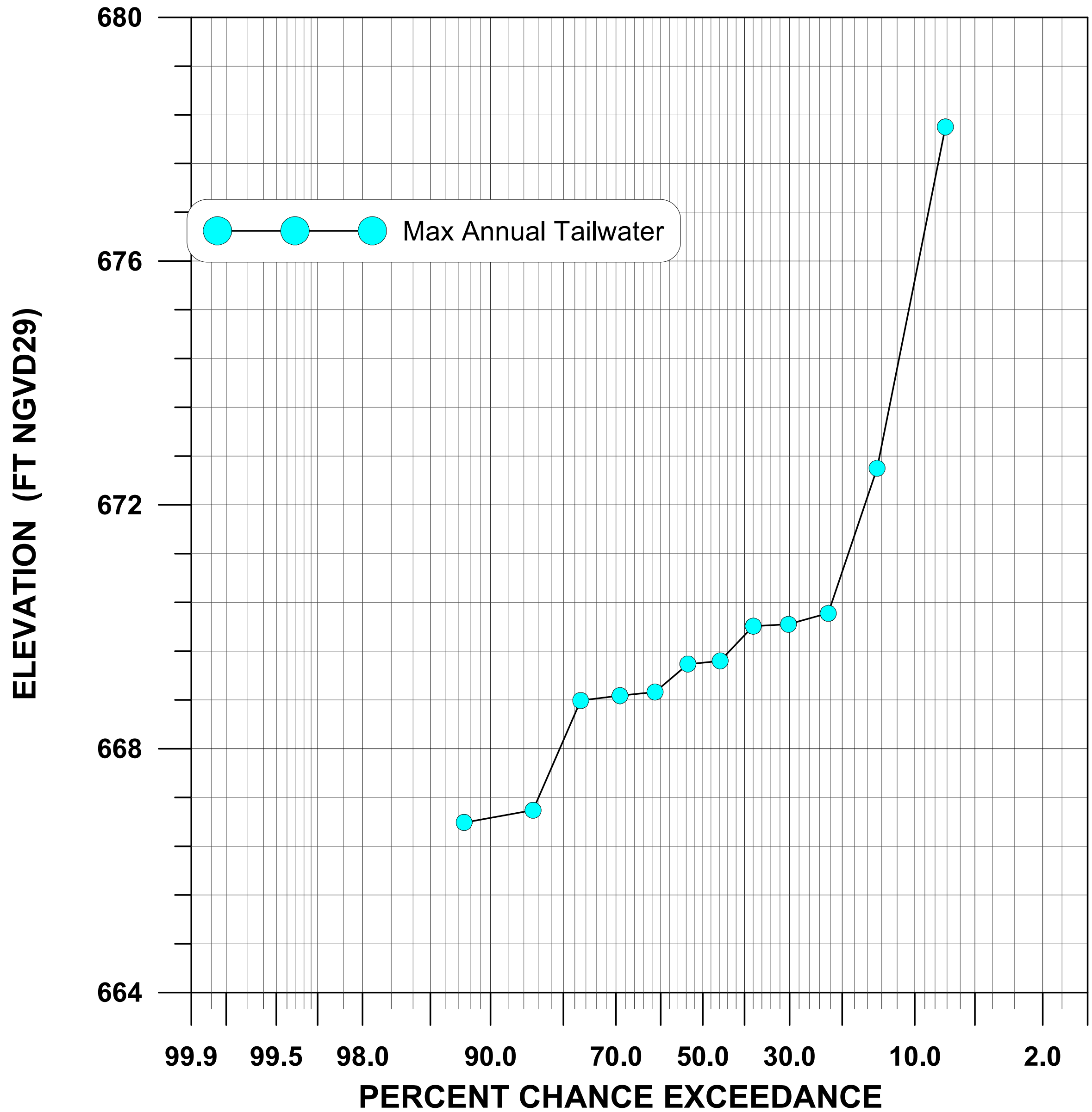


Data from APC
Midnight Readings

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

HEADWATER FREQUENCY CURVE



Data from APC
Midnight Readings
1999, 2000 - June 2010

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

TAILWATER FREQUENCY CURVE

3. 2016 REVISED ALABAMA-ACT DROUGHT RESPONSE OPERATIONS PLAN (ADROP)

Alabama-ACT Drought Response Operations Plan (ADROP)

Overview

Alabama Power Company (APC) operates eleven hydropower dams in the Alabama-Coosa-Tallapoosa (ACT) River Basin. On the Tallapoosa River, Alabama Power operates the Harris, Martin, Yates and Thurlow hydroelectric dams and their reservoirs. On the Coosa River APC operates the Weiss, Neely Henry, Logan Martin, Lay, Mitchell, Jordan, and Bouldin hydroelectric dams and their reservoirs. The Coosa and Tallapoosa Rivers converge to form the Alabama River at Montgomery, Alabama. Alabama Power operates no reservoirs on the Alabama River, but its upstream operations can impact Alabama River flows and elevations. In addition to requirements contained in Alabama Power's Federal Energy Regulatory Commission ("FERC") licenses for its dams, Alabama Power provides flows to the Alabama River consistent with the U.S. Army Corps of Engineers (USACE) Water Control Manual (WCM) for the ACT river basin.

The Alabama-ACT Drought Response Operations Plan (ADROP) provides a plan for managing APC's reservoirs within the ACT Basin during drought conditions. APC and the Alabama Office of Water Resources (OWR), along with state and federal resource agencies[1], will monitor defined rain and stream flow indicators within the ACT basin. When drought indicators reach specified levels, drought intensity level responses are triggered, resulting in pre-determined incremental reductions or increases of flow from APC's reservoirs.

ADROP provides for three incremental drought intensity level (DIL) and corresponding DIL responses based on the severity of drought conditions. These incremental DIL responses are not rigid but provide a bracketed range of operations allowing for flexibility and smoother transitions in and out of a drought and from level to level. ADROP's drought response triggers are primarily based on past operating experiences and lessons learned during 2007, the current drought of record for the basin. ADROP is a dynamic plan; it may evolve or be expanded in the future as requirements within the basin may shift. Moving forward, any substantive revisions made to ADROP will be made in consultation with OWR and the resource agencies. Any provisions that will affect APC's federal hydropower license requirements will be filed with the FERC for prior approval.

The following provides a snapshot of operations for normal water years, an explanation of ADROP's drought indicators, triggers for each of the three incremental drought response levels, and a summary of operations at each drought response level.

[1] Resource Agencies to be included are US Fish and Wildlife Service (USFWS), Alabama Department of Conservation and Natural Resources (ADCNR), Alabama Department of Environmental Management (ADEM) and US Army Corps of Engineers (USACE).

Normal Conditions

During a normal water year, APC releases a weekly target of 32,480 cubic feet per second-days (a measure of volume) out of Bouldin, Jordan and Thurlow dams into the Alabama River. This release equates to a 7 day average flow target of 4,640 cubic feet per second (cfs).

In accordance with FERC requirements to protect threatened and endangered species downstream of Jordan Dam on the Coosa River, APC provides a minimum continuous flow of 2,000 cfs from July through March. From April 1st through May 31st, in order to provide for recreation and attraction flows for fish spawning, APC releases a continuous base flow of 4,000 cfs for 18 hours per day and an 8,000 cfs pulse flow for the rest of the day. During the month of June, the base and pulse flows are reduced incrementally to a continuous base flow of 2,000 cfs. From April 1st to October 31st, and on weekends and special holidays, additional recreational flows are released from Jordan Dam as scheduled in APC's FERC license guidelines. APC provides a year-round minimum continuous flow release from Thurlow Dam on the Tallapoosa River.

Drought Indicators

Drought indicators are used to describe the onset, magnitude, duration, severity and extent of a drought. Because there is a well-established rain and stream gauging network in the ACT basin, ADROP relies on precipitation and stream flow indicators. Observations of precipitation and stream flow will be used to indicate when the ACT is entering into (or recovering from) a drought. ADROP's precipitation indicator is based on the average of normal monthly rainfall at the following airport rain gages: Rome, Anniston, Shelby County and Montgomery. ADROP's stream flow indicator is based on the U.S. Geological Survey ("USGS") real-time gauging system[2]. USGS gages to be monitored are as follows[3]:

On the Coosa River

- 02397000: Mayo's Bar – Coosa River
- 02397530 State Line, AL/GA – Coosa River
- 02398300: Gaylesville – Chattooga River
- 02399200: Blue Pond – Little River
- 02401390: Ashville - Big Canoe Creek
- 02401000: Crudup – Big Wills Creek
- 02404400: Jackson Shoals – Choccolocco Creek
- 02405500: Vincent - Kelly Creek
- 02407514: Westover – Yellowleaf Creek
- 02406500: Alpine – Talladega Creek
- 02408540: Rockford – Hatchet Creek

On the Tallapoosa River

- 02412000: Heflin – Tallapoosa River
- 02413300: Newell – Little Tallapoosa River
- 02415000: Hackneyville – Hillabee Creek

[2] Real-time data for each of these gages is available on the USGS's National Water Information System website at http://waterdata.usgs.gov/al/nwis/rt.

[3] Gages used as indicators may be added or removed in the future needs.

- 02418230: Loachapoka – Sougahatchee Creek
- 02418760: Chewacla – Chewacla Creek
- 02419000: Tuskegee – Uphapee Creek
- 02419890: Montgomery Water Works, Tallapoosa River

On the Cahaba, Alabama and Tensaw Rivers

- 02425000: Marion Junction – Cahaba River
- 02428400: Claiborne L&D – Alabama River
- 02471019: Mount Vernon – Tensaw River

Precipitation and stream flow indicators are outlined by month in Table 1. The top line shows the combined normal average precipitation at the ACT rainfall gages listed above. The second line shows ranges of flow percentiles that will be used to indicate when the ACT is entering a drought. The third line shows ranges of flow percentiles used to determine when the ACT is emerging from a drought.

ADROP Implementation and Notification

APC continually records and monitors the drought indicators within ADROP for its reservoirs located in the ACT basin for potential and ongoing drought operations. On the first and third Tuesday of each month, APC evaluates the DIL utilizing the ADROP Decision Tool. DIL are further explained below and can also be found in Table 2. The ADROP Decision tool was developed between APC and the Mobile USACE District to implement portions of the WCM into real time operations. The output from the decision tool shows the sum of the DILs that are true along with the corresponding Alabama River flow target. The results from the ADROP Decision Tool and the supporting data are sent to the Mobile USACE District.

As conditions begin to decline, OWR will schedule and facilitate meetings of the Alabama Drought Monitoring & Impact Group (MIG) a subcommittee of the Alabama Drought Assessment and Planning Team (ADAPT). The role of the MIG is to analyze data that reflects past and current drought efforts and to assist with decisions concerning drought declarations levels for the State of Alabama. The MIG is comprised of federal, state, and local agencies and other water resources professionals. During these meetings, APC will discuss current project operations, the results of the ADROP Decision Tool, and future changes to operations. In addition to these scheduled meetings, when a DIL is triggered, APC will provide OWR, USFWS, ADCNR and ADEM with a report containing the latest weather forecast, hydrologic conditions, operations for Coosa and Tallapoosa River projects, and an update of the most recent ADROP Decision Tool. Additionally, APC provides industrial users on the Alabama River the results of the ADROP Decision Tool. These notification paths will continue until the ADROP Decision Tool shows that the basin has returned to normal operations. When normal operations have returned for APC reservoirs, a final communication will be sent to OWR and the resource agencies that drought coordination has ended. APC will continue to participate and provide information to MIG meetings until the OWR declares the State of Alabama has emerged from drought conditions and the MIG meetings will end. At this time, APC and OWR will continue to monitor drought indicators for future drought development.

Explanation of Drought Intensity Level (DIL) Triggers

*DIL 1 Trigger: Low Basin Inflows **or** Low Composite Storage **or** Low State Line Flow*

The trigger for the DIL 1 response is one of the following criteria is met:

- Inflow into the basin is less than the total needed to meet the 7 day average flow target of 4,640 cubic feet per second ("cfs") and to fill APC's reservoirs (see Table 4)
- A basin-wide composite storage equal to or less than drought contingency elevation/volumes (see Figure 1)
- A flow at or below the 7Q10 flows for Rome, Georgia as measured at the Alabama/Georgia state line gage (see Table 5)

*DIL 2 Trigger: DIL 1 criteria **+** (Low Basin Inflows **or** Low Composite Storage **or** Low State Line Flow)*

The trigger for the DIL 2 response is two of the criteria in DIL1 are met.

*DIL 3 Trigger: Low Basin Inflows **+** (Low Composite Storage **+** Low State Line Flow)*

The trigger for DIL 3 is the combination of DIL 1 criteria and **both** of the following:

- A basin-wide composite storage equal to or less than drought contingency elevation/volumes (see Figure 1)
- A flow at or below the 7Q10 flows for Rome, Georgia as measured at the Alabama/Georgia state line gage (see Table 5)

Explanation of Drought Intensity Level (DIL) Responses

The following explains how flows will change throughout the year at the different drought intensity levels. Table 3 is a matrix of the operational response to drought intensity levels.

Drought Intensity Level 1 Response

- **Coosa River Operations:** From July 1st through March 31st, 2,000 cfs will be released from Jordan Dam. From April 1st through June 15th, 4,000 cfs will be released from Jordan Dam as base flows. From June 15th to July 1st, releases from Jordan Dam will be ramped down to the 2,000 cfs minimum flow. Any inflow into the Coosa River basin in excess of these Jordan Dam minimum releases may be used to refill upstream reservoirs or discharged through Jordan Dam or Bouldin Dam above the corresponding targeted Alabama River release. [4]
- **Tallapoosa River Operations:** From May 1st through December 31st, half of all inflows into Yates Dam will be released from Thurlow Dam. From January 1st through April 30th, the greater of either half the inflows into Yates Dam or two times inflows as

[4] In all drought intensity levels, fish attraction pulses and recreational releases are suspended; however, flows above those needed to fill and meet the base minimum flow may be used for pulsing, recreational or flushing releases.

measured at the Heflin, Alabama gage will be released. During this time, Thurlow Dam releases will be greater than 350 cfs. Any inflow into the Tallapoosa River basin in excess of these Thurlow Dam minimum releases may be used to refill upstream reservoirs or discharged through Thurlow Dam above the corresponding targeted Alabama River release.

- **Alabama River Flows:** A 10% reduction in APC's release into the Alabama River will be in effect from October 1st through April 30th. From May 1st through September 30th, the full targeted release will be maintained.
- **Rule Curve Variances:** APC will seek variances from the USACE and FERC as needed to improve the likelihood of filling APC's reservoirs to full summer pool elevations.

Drought Intensity Level 2 Response

- **Coosa River Operations:** From October 1st through March 31st, flows in a range between 1,600 and 2,000 cfs will be released from Jordan Dam. From April 1st through June 15th, 2,500 cfs will be released from Jordan Dam as base flows. From June 15th to July 1st, releases from Jordan Dam will be ramped down to the 2,000 cfs minimum flow. From July 1st to September 30th, flows will be 2000 cfs. Any inflow into the Coosa River basin in excess of these Jordan Dam minimum releases may be used to refill upstream reservoirs or discharged through Jordan Dam or Bouldin Dam above the corresponding Alabama River release target.
- **Tallapoosa River Operations:** Releases from Thurlow Dam will be 350 cfs from October 1st through April 30th. From May 1st through September 30th, half of the inflows into Yates Dam will be released. Any inflow into the Tallapoosa River basin in excess of these Thurlow Dam minimum releases may be used to refill upstream reservoirs or discharged through Thurlow Dam above the corresponding targeted Alabama River release.
- **Alabama River Flows:** A 20% reduction in APC's targeted release into the Alabama River will be in effect from October 1st through May 31st. From June 1st through September 30th, a 10% reduction in the targeted release will be in effect.
- **Rule Curve Variances:** APC will seek variances from the USACE and FERC as needed to improve the likelihood of filling APC's reservoirs to full summer pool elevations.

Drought Intensity Level 3 Response

- **Coosa River Operations:** From October 1st through November 30th, 1,800 cfs will be released from Jordan Dam. From December 1st through March 31st, 1,600 cfs will be released from Jordan Dam. From April 1st through June 30th, releases from Jordan Dam will be made in a range between 1,600 and 2,000 cfs. From July 1st through September 30th, 2,000 cfs will be released from Jordan Dam. Any inflow into the Coosa River basin in excess of these Jordan Dam minimum releases may be used to refill upstream reservoirs or discharged through Jordan Dam or Bouldin Dam above the corresponding targeted Alabama River release.
- **Tallapoosa River Operations:** From October 1st through June 30th, a flow of 400 cfs will be maintained at the Montgomery Water Treatment Plant. During this time, releases from Thurlow Dam may occasionally be less than 350 cfs. From July 1st through September 30th, 350 cfs will be released from Thurlow Dam. Any inflow into

the Tallapoosa River basin in excess of these Thurlow Dam minimum releases may be used to refill upstream reservoirs or discharged through Thurlow Dam above the corresponding targeted Alabama River release.

- **Alabama River Flows:** From October 1st through April 30th, APC's targeted release will be reduced to an average 2,000 cfs into the Alabama River. During May and June, a 20% reduction in the targeted release will be in effect. From July 1st through September 30th, a 10% reduction in the targeted release will be in effect.
- **Rule Curve Variances:** APC will seek variances from the USACE and FERC as needed to improve the likelihood of filling APC's reservoirs to full summer pool elevations.

Table 1: Indicators

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rain*	<5.3	<5.1	<6.1	<4.6	<4.0	<3.9	<4.7	<3.5	<3.6	<2.7	<4.3	<4.7
Flow**	10^{th} – 25^{th}	10^{th} – 25^{th}	10^{th} – 25^{th}	10^{th} – 25^{th}	10^{th} – 25^{th}	<10th	<10th	<10th	<10th	10^{th} – 25^{th}	10^{th} – 25^{th}	10^{th} – 25^{th}
	50^{th} –75^{th}	50^{th} –75^{th}	50^{th} –75^{th}	50^{th} –75^{th}	50^{th} –75^{th}	25^{th} –50^{th}	25^{th} –50^{th}	25^{th} –50^{th}	25^{th} –50^{th}	50^{th} –75^{th}	50^{th} –75^{th}	50^{th} –75^{th}

*Average normal rainfall of 4 meteorological stations within ACT Basin
**Lower range of percentiles indicates basin is moving into drought; Upper range of percentiles indicates basin is coming out of drought

Table 2: Drought Intensity Levels Triggers

DIL 1 Trigger	Low Basin Inflows **or** Low Composite Storage **or** Low State Line Flow
DIL 2 Trigger	DIL 1 criteria **+** (Low Basin Inflows or Low Composite Storage **or** Low State Line Flow)
DIL 3 Trigger	Low Basin Inflows + Low Composite Storage + Low State Line Flow

Table 3: Drought Intensity Level Response Matrix[1]

<table>
<tr><th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>June</th><th>July</th><th>Aug</th><th>Sept</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="4">Drought Intensity Level Triggers</td><td colspan="12">Normal Operations</td></tr>
<tr><td colspan="12">DIL 1: Low Basin Inflows or Low Composite Storage or Low State Line Flow</td></tr>
<tr><td colspan="12">DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite Storage or Low State Line Flow)</td></tr>
<tr><td colspan="12">DIL 3: Low Basin Flows + Low Composite Storage + Low State Line Flow</td></tr>
<tr><td rowspan="4">Coosa River Flow[2]</td><td colspan="3">Normal Operations 2000 cfs</td><td colspan="2">4000 (8000)</td><td>4000 - 2000</td><td colspan="6">Normal Operations 2000 cfs</td></tr>
<tr><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="2">Jordan
4000 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="3">Jordan
2000 +/- cfs</td></tr>
<tr><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="2">Jordan
2500 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="3">Jordan
2000 – 1600 +/- cfs</td></tr>
<tr><td colspan="3">Jordan
1600 +/- cfs</td><td colspan="3">Jordan
1600 - 2000 +/- cfs</td><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="2">Jordan
1800 +/- cfs</td><td>Jordan
1600 +/- cfs</td></tr>
<tr><td rowspan="4">Tallapoosa River Flow[3]</td><td colspan="12">Normal Operations 1200 cfs</td></tr>
<tr><td colspan="4">Greater of: ½ Yates Inflow or
2 x Heflin Gage (Thurlow releases > 350 cfs)</td><td colspan="5">½ Yates Inflow</td><td colspan="3">½ Yates Inflow</td></tr>
<tr><td colspan="4">Thurlow 350 cfs</td><td colspan="5">½ Yates Inflow</td><td colspan="3">Thurlow 350 cfs</td></tr>
<tr><td colspan="6">Maintain 400 cfs at Montgomery WTP
(Thurlow release 350 cfs)</td><td colspan="3">Thurlow 350 cfs</td><td colspan="3">Maintain 400 cfs at Montgomery WTP
(Thurlow release 350 cfs)</td></tr>
<tr><td rowspan="4">Alabama River Flow[4]</td><td colspan="12">Normal Operations 4640 cfs</td></tr>
<tr><td colspan="4">4200 cfs (10% Cut) - Montgomery</td><td colspan="5">4640 cfs - Montgomery</td><td colspan="3">Reduce 4640 cfs – 4200 cfs Montgomery</td></tr>
<tr><td colspan="5">3700 cfs (20% Cut) - Montgomery</td><td colspan="4">4200 cfs (10% Cut) - Montgomery</td><td colspan="3">Reduce: 4200 cfs - 3700 cfs Montgomery
(1 Week ramp)</td></tr>
<tr><td colspan="4">2000 cfs Montgomery</td><td colspan="2">3700 cfs Montgomery</td><td colspan="3">4200 cfs (10% Cut) Montgomery</td><td colspan="3">Reduce 4200 cfs - 2000 cfs Montgomery
(1 Month ramp)</td></tr>
<tr><td rowspan="4">Guide Curve Elevation</td><td colspan="12">Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)</td></tr>
<tr><td colspan="12">USACE Variances: As Needed; FERC Variance for Martin</td></tr>
<tr><td colspan="12">USACE Variances: As Needed; FERC Variance for Martin</td></tr>
<tr><td colspan="12">USACE Variances: As Needed; FERC Variance for Martin</td></tr>
</table>

1. **Note these are base flows that will be exceeded when possible**
2. **Jordan flows are based on a continuous +/- 5% of target flow**
3. **Thurlow flows are based on a continuous +/-5% of target flow; Flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates**
4. **Alabama River flows are 7-Day Average Flow**

Table 4: Low Basin Inflows Guide

Month	Coosa Filling Volume	Tallapoosa Filling Volume	Total Filling Volume	Montgomery Flow Target	*Total Basin Inflow Needed
January	628	0	628	4640	5268
February	626	120	747	4640	5387
March	603	2900	3503	4640	8143
April	1683	2585	4269	4640	8909
May	248	0	248	4640	4888
June	0	0	0	4640	4640
July	0	0	0	4640	4640
August	0	0	0	4640	4640
September	-612	-1304	-1916	4640	2724
October	-1371	-2132	-3503	4640	1137
November	-920	-2186	-3106	4640	1534
December	-821	0	-821	4640	3819

- Total Basin Inflow needed is sum of Total Filling Volume + 4640 cfs Release.
- All numbers are in cfs-days.
- Numbers are connected to reservoir rule curves; assumption that all are at top of rule curve elevation.
- When new rule curves are put into effect, numbers will need to be modified.

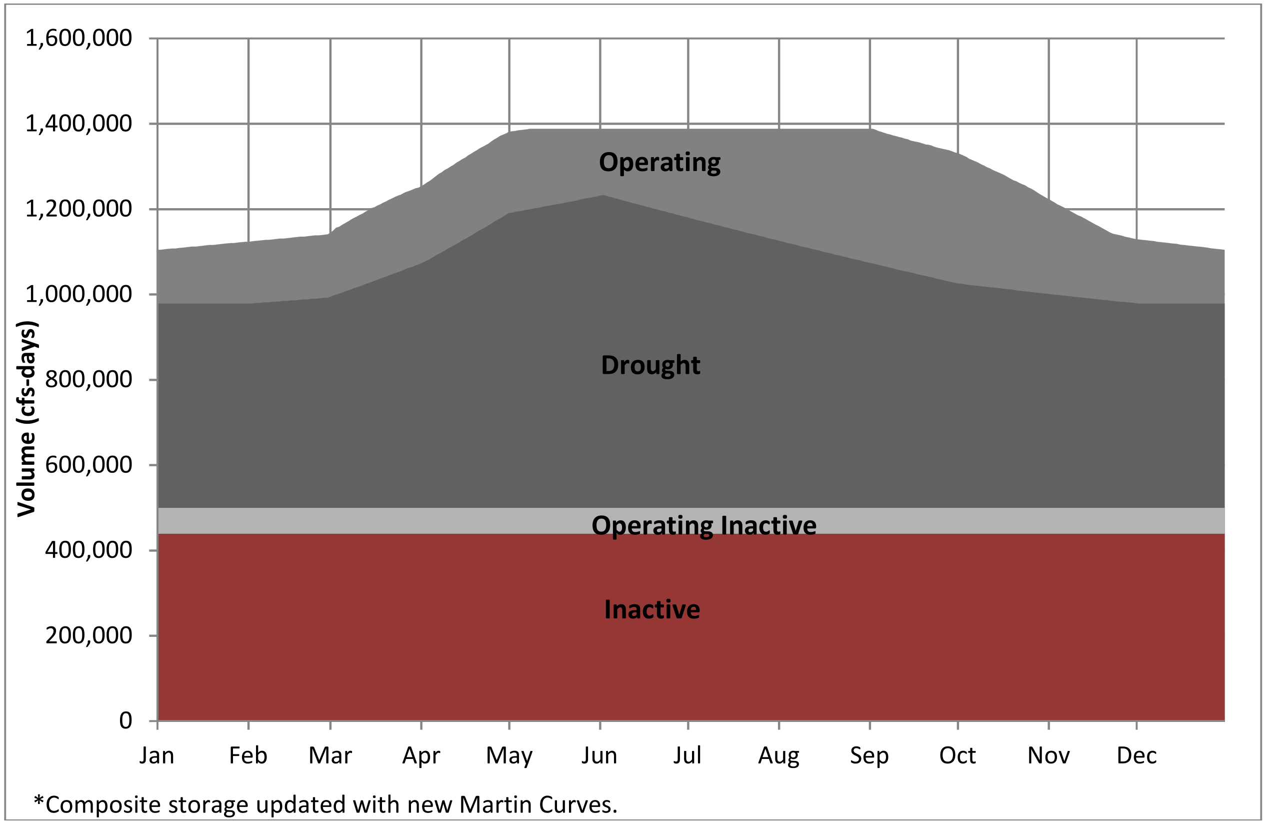
Table 5: Low State Line Flow

A Low State Line Flow occurs, when the Mayo’s Bar gage measures a flow below the monthly historical 7Q10 flow. 7Q10 is defined as the lowest flow over a 7 day period that would occur once in 10 years.

Month	Mayo's Bar (cfs-days)
January	2544
February	2982
March	3258
April	2911
May	2497
June	2153
July	1693
August	1601
September	1406
October	1325
November	1608
December	2043

USACE Computation 1949 - 2006

Figure 1: Low Composite Storage



Low Composite Storage occurs when APC composite storage is less than or equal to the storage available within the drought contingency curves for APC's reservoirs. Composite storage is the sum of the amounts of storage available at the current elevation for each reservoir down to the drought contingency curve at each APC plant.

4. FINAL R.L. HARRIS 2018 DOWNSTREAM FLOW ADAPTIVE MANAGEMENT HISTORY AND RESEARCH REPORT

DOWNSTREAM FLOW ADAPTIVE MANAGEMENT HISTORY AND RESEARCH

R.L. HARRIS HYDROELECTRIC PROJECT

FERC NO. 2628

Prepared for:

ALABAMA POWER COMPANY

BIRMINGHAM, ALABAMA

Prepared by:

Kleinschmidt

April 2018

ALABAMA POWER COMPANY
BIRMINGHAM, ALABAMA

R.L. HYDROELECTRIC HARRIS PROJECT
FERC NO. 2628

DOWNSTREAM FLOW ADAPTIVE MANAGEMENT HISTORY AND RESEARCH

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DOWNSTREAM FLOW ADAPTIVE MANAGEMENT HISTORY AND RESEARCH

1.0 INTRODUCTION

Alabama Power Company (Alabama Power) is initiating the Federal Energy Regulatory Commission (FERC) relicensing of the 135-megawatt (MW) R.L. Harris Hydroelectric Project (Harris Project), FERC Project No. 2628. The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources. These structures, lands, and water are enclosed within the FERC Project Boundary. Under the existing Harris Project license, the FERC Project Boundary encloses two distinct geographic areas, described below.

Harris Reservoir is the 9,870-acre reservoir (Harris Reservoir) created by the R.L. Harris Dam (Harris Dam). Harris Reservoir is located on the Tallapoosa River, near Lineville, Alabama. The lands adjoining the reservoir total approximately 7,392 acres and are included in the FERC Project Boundary. This includes land to 795 feet mean sea level (msl)[1], as well as natural undeveloped areas, hunting lands, prohibited access areas, recreational areas, and all islands.

The Harris Project also contains 15,063 acres of land within the James D. Martin-Skyline Wildlife Management Area (Skyline WMA) located in Jackson County, Alabama. These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigative Plan and Wildlife Management Plan. These lands are leased to, and managed by, the State of Alabama for wildlife management and public hunting and are part of the Skyline WMA (ADCNR 2016b).

For the purposes of this technical report, “Lake Harris” refers to the 9,870-acre reservoir, adjacent 7,392 acres of project land, and the dam, spillway, and powerhouse. “Skyline” refers to the 15,063 acres of project land within the Skyline WMA in Jackson County. “Harris Project” refers to all the lands, waters, and structures enclosed within the FERC Project Boundary, which includes both Lake Harris and Skyline. “Harris Reservoir” refers to the 9,870-acre reservoir only; Harris Dam refers to the dam, spillway, and powerhouse. The “Project Area” refers to the land and water in the Project Boundary and immediate geographic area adjacent to the Project Boundary (Alabama Power Company 2018).

Lake Harris and Skyline are located within two river basins: the Tallapoosa and Tennessee River Basins, respectively. The only waterbody managed by Alabama Power as part of their FERC license for the Harris Project is the Harris Reservoir.

[1] Also includes a scenic easement (to 800 feet msl or 50 horizontal feet from 793 feet msl, whichever is less, but never less than 795 feet msl)

The Harris Project is a peaking hydroelectric project that generally operates Monday through Friday to meet peak power demands. Although not a license requirement, in the late 1990s, Alabama Power worked with stakeholders including, among others, the Alabama Department of Conservation and Natural Resources (ADCNR), U.S. Fish and Wildlife Service (USFWS), and Alabama Cooperative Fish and Wildlife Research Unit (ACFWRU) at Auburn University, to develop a plan for specific daily and hourly releases to improve downstream fisheries conditions. In 2005, Alabama Power began implementing a pulsing operations scheme known as the "Green Plan," and the ACFWRU began monitoring conditions downstream of the dam. Since 2005, Alabama Power has continued these pulsing operations and, together with ADCNR, provided funding for monitoring and research on the effects of this operation scheme. This research has resulted in numerous theses, dissertations, reports, presentations at professional meetings, and articles in peer-reviewed journals.

To support the relicensing process and provide baseline information for the Pre-Application Document (PAD), Kleinschmidt Associates (Kleinschmidt) summarized the history of the development of the "Green Plan" and the research conducted from 2005-2017 as part of monitoring efforts in the Tallapoosa River below Harris Dam.

2.0 ADAPTIVE MANAGEMENT PROCESS HISTORY

The original operating license for the Harris Project, issued by FERC in 1973, required a minimum flow of 45 cfs at the Wadley gauge located downstream of Harris Dam. The original license also required Alabama Power to file a revised Exhibit S, FERC's environmental report of project effects and measures to mitigate impacts. Between 1973 and 1984, during consultation related to revising Exhibit S of the license application, resource agencies asserted that the 45 cfs minimum flow was inadequate and asked FERC to require Alabama Power to perform studies to determine an appropriate minimum flow. At the time, FERC denied the agencies' request, citing a lack of information that demonstrated a need for additional studies, and ordered that the minimum flow remain at 45 cfs (FERC 1984). The agencies noted that additional information was being developed but was not yet available at the time FERC was considering their request.

Example of Re-regulation Dam

Research was conducted by scientists from Auburn University, ACFWRU, and the U.S. Geological Survey (USGS) on the Tallapoosa River below Harris between 1983 and 1998. In the early 1990s, the Corps was beginning the process of updating the water control manual for the Alabama-Coosa-Tallapoosa (ACT) basin. As part of that process, the Corps was developing a formula to allocate water for various uses in the basin. In the late 1990s, ADCNR and USFWS requested that Alabama Power discuss minimum flows prior to formulation of the ACT allocations (ADCNR 1999). Agencies were concerned that not having a higher minimum flow at the Harris Project would result in smaller water allocation from Georgia. In a December 6, 1999 letter to Alabama Power, the USFWS asserted that the 45 cfs minimum flow license requirement was inadequate and that peaking operations had resulted in negative impacts to aquatic resources. The USFWS suggested higher minimum flows and periods of flow stabilization (USFWS 1999).

In the late 1990s, Alabama Power held informal discussions with resource agency personnel about operations at the Harris Project. In these initial discussions, Alabama Power explored potential methods to address resource agency concerns, including re-regulation dams (pictured above), geotubes (pictured below), installation of a "house" turbine, spillway gate modifications, and pulsing. However, these concepts did not move forward for further evaluation at that time.

Example of Geotube

On August 8, 2000, ADNCR organized and facilitated a public meeting in Wadley, Alabama, to discuss flows below the dam with interested stakeholders. At the meeting, Alabama Power presented conceptual plans for a re-regulation dam downstream of Harris. Elise Irwin, a fisheries biologist with ACFWRU, presented a conceptual plan to adaptively manage flows from Harris Dam. A later version of this plan was published in 2002 as an article in *Conservation Biology* (Irwin and Freeman 2002). The article cited depleted flows, flow instability, and thermal regime alteration as factors affecting fish abundance and diversity in the Tallapoosa River below Harris Dam. The proposed adaptive management process included four main steps: (1) develop and agree to management objectives; (2) model hypothesized relations between dam operations and management objectives; (3) implement changes in dam operations; and (4) evaluate biological responses and other stakeholder benefits.

On April 30 and May 1, 2003, stakeholders participated in a facilitated workshop at Auburn University. The workshop was attended by representatives from Alabama Power, state and federal resource agencies, local governments, and non-governmental organizations (NGOs). Attendees discussed membership in, and governance of, a "Stakeholder Board" as the formal entity to oversee the adaptive management process. Attendees also identified objectives for numerous resources, including a desire to maximize 1) economic development, 2) floral/faunal diversity, 3) reservoir water levels, 4) water quality, 5) boating and angling opportunities, and

6) operational flexibility. They also expressed a desire to minimize 1) downstream bank erosion, 2) river fragmentation, 3) consumptive uses, and 4) costs to Alabama Power.

Following the Auburn workshop, a Stakeholder Board was formed and held several meetings in 2003 to discuss potential methods to reduce the effects of peaking, including the construction of re-regulation dams and/or geotubes in the Tallapoosa River. Participants also discussed the components of a Bayesian belief network[2] model that would be used to select flow scenarios that optimized various overlapping and competing management objectives identified by stakeholders.

In 2004, Alabama Power evaluated the methods identified and proposed by the Stakeholder Board to provide continuous flows or re-regulation of peaking flows from Harris Dam. The evaluated methods included: geotubes; a re-regulation dam in the Tallapoosa River; and modifications to the dam, powerhouse, and trash gate. Alabama Power performed numerous hydraulic modeling runs (HEC-RAS) of various flow scenarios in evaluating potential re-regulation structures. Many of the methods evaluated were deemed unfeasible due to engineering (structural) or cost considerations. In the case of re-regulation structures, stakeholders indicated opposition to further impoundment and fragmentation of stream habitat. In addition, model results indicated that re-regulation structures would not result in the desired improvements to aquatic habitat.

After ruling out potential physical modifications to the dam and river downstream, in January 2005 the stakeholders met to discuss proposed modifications to operations at Harris Dam as part of the adaptive management process. The group formed a technical committee consisting of representatives from ADCNR, USFWS, ACFWRU, and Alabama Power. The group considered several continuous minimum flow and pulsing scenarios. Based on results of the decision support model that evaluated the operating scenarios, the group decided and Alabama Power agreed to implement a plan to provide flow pulses whose magnitude and duration were tied to unregulated flows measured at a gage upstream of Harris Reservoir (Heflin) and generation needs. This plan became known as the Harris "Green Plan[3]" and is included as Appendix A[4] of this report. Based on a monitoring plan developed by the technical committee and discussed at a stakeholder meeting in August 2005, ACFWRU began conducting research focused on detecting changes in the aquatic community downstream of Harris Dam associated with the Green Plan. This research was primarily funded by Alabama Power and ADCNR.

Stakeholders reconvened in August 2007 following two years of implementing the Green Plan flows and monitoring. The ACFWRU provided a summary of its research, and Alabama Power presented a summary of Green Plan operations since 2005. Stakeholders met again in May 2009, and ACFWRU, ADCNR, and Alabama Power provided updates on recent and ongoing research and operations.

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[2] A model that represents a set of variables and how they are affected by one another.
[3] When the scenarios were considered by the group at that time, they were color-coded to make comparison and discussion more expedient. A "red plan" and "blue plan" were also considered; the color coding had no relation to the merits of each plan.
[4] In 2007, the Green Plan was modified to include criteria for Green Plan operations during periods of drought.

In 2011, ACFWRU published a report examining results of monitoring efforts from 2005 to 2010. In the report, ACFWRU calculated index of biotic integrity (IBI) scores using a modified IBI developed by Bowen et al. (1996). The report noted IBI scores at sites downstream of Harris Dam were lower than reference site scores, although scores appeared highly variable among and within sites, seasons, and years. The report also suggested that periods of stable river flows might enhance fish spawning success (Irwin et al. 2011).

At a June 2013 stakeholder meeting, attendees noted positive ecosystem response in terms of increased physical habitat diversity resulting from implementing the Green Plan; however, concerns about the effects of water temperature on fish spawning and recruitment led to the formation of a small technical team. This technical team was tasked with examining potential optimizations to the Green Plan that could affect downstream water temperatures. In 2016 and 2017, Alabama Power experimented with the timing of pulses based on recommendations from the technical team.

On January 31, 2018, in preparation for the Harris relicensing process, Alabama Power held a Stakeholder Informational meeting. In this meeting, Alabama Power provided an overview of the Harris Project operations and the history of the adaptive management process. Appendix B includes a copy of the adaptive management process presentation.

3.0 IMPLEMENTATION AND RESEARCH

The descriptions and data presented in this section represent a summary of work that has been conducted since the implementation of Green Plan operations in 2005, and includes data through 2017, where available.

3.1 GREEN PLAN FLOWS

Alabama Power began operating the Harris Project according to the Green Plan in 2005. These operations are governed by a set of release criteria, which are provided in Appendix A. Additionally, the release criteria allow for a temporary suspension of these flows for flood control operations, fish spawning (lake-level stabilization), and when conditions exist that would jeopardize the ability to fill Harris Reservoir. Table 3-1 provides a summary of operations since implementation of the Green Plan in 2005.

TABLE 3-1 SUMMARY OF OPERATIONS AT R.L. HARRIS DAM SINCE IMPLEMENTATION OF THE GREEN PLAN

Year	Pulse	Non-Pulse	Spawn	Flood
2005	106	165	14	35
2006	175	164	20	6
2007	289	76	0	0
2008	244	122	14	0
2009	131	197	14	37
2010	134	194	14	23
2011	180	177	14	8
2012	270	64	14	18
2013	49	283	14	33
2014	120	190	14	41
2015	167	172	15	11
2016	247	71	14	34
2017	224	93	14	34
Average	**180**	**151**	**8**	**22**

3.2 FISHERIES STUDIES

The ACFWRU has sampled fish communities at 6 sites since 2005 (Figure 3-1). Four of the sites were located on the Tallapoosa River between Harris Dam and Lake Martin: Malone, Wadley, Griffin Shoals, and Peters Island (known collectively as Middle Tallapoosa or MT). Two unregulated sites were sampled as reference sites – one upstream of Harris on the Tallapoosa River near Heflin, Alabama (Upper Tallapoosa or UT) and one on Hillabee Creek (HC), a tributary to the Tallapoosa River near Alexander City, Alabama. The sites generally consisted of shallow reaches of riffles and shoals. The sites were sampled using pre-positioned area electrofishing (PAE; Bowen et al. 1998; Freeman et al. 2001) one to two times per year, typically in the late spring or early summer and/or late summer or fall. Fish specimens were identified to species and measured for total length.

Catch rates from ACFWRU samples ranged 1.3 to 81.6 fish per unit effort and were typically highest and most variable at the Upper Tallapoosa and Hillabee Creek sites. Among the Middle Tallapoosa sites, catch rates were generally highest at Wadley and lowest at the Griffin Shoals and Peters Island sites.

A list of the 51-fish species collected at all sites since 2005 is presented in Table 3-1. A total of 45 fish species were collected at the Hillabee Creek site, 43 species were collected at the Middle Tallapoosa sites, and 42 species were collected at the Upper Tallapoosa site. The most abundant species collected from 2005 - 2015 included Alabama Shiner (*Cyprinella callistia)* (n=12,949), Lipstick Darter (*Etheostoma chuckwachatte*) (n=12,710), and Bronze Darter (*Percina palmaris)* (n=11,730). Combined, these three species comprised almost 50 percent of all fish collected.

Alabama Power sampled fish communities in 2017 using standardized methods developed by the Geological Survey of Alabama (GSA) and ADCNR (O'Neil 2006). Briefly, this method involves 10 backpack electrofishing sampling efforts at 10 riffle, 10 run, and 10 pool reaches, as well as 2 shoreline sampling efforts. This sampling method is commonly referred to as the "30 + 2" method. Samples were collected at the Malone and Wadley sites along the Middle Tallapoosa in the spring and fall and the Upper Tallapoosa sites in July and October.

A total of 23 species, representing 7 families, were collected at the Middle Tallapoosa sites during the spring and fall of 2017 compared with a total of 31 species, representing 8 families, collected at the Upper Tallapoosa sites. The most common species collected along the Middle Tallapoosa were the Redbreast Sunfish (*Lepomis auritus*) (n=112), Lipstick Darter (*Etheostoma chuckwachatte*) (n=105), and the Bronze Darter (*Percina palmaris*) (n=62). The most common species collected at the upstream sites were Speckled Darter (*Etheostoma stigmaeum*) (n=98), Tallapoosa Shiner (*Cyprinella gibbsi*) (n=87), Redbreast Sunfish (*Lepomis auritus*) (n=61), Muscadine Darter (*Percina smithvanizi*) (n=56), and Lipstick Darter (*Etheostoma chuckwachatte*) (n=46). IBI scores at the Middle Tallapoosa sites during the spring and fall ranged from 30 (poor) to 38 (Fair). However, three of the four collections resulted in poor scores. Scores at the upstream sites were 40 (fair) and 36 (fair) during the summer and fall respectively.

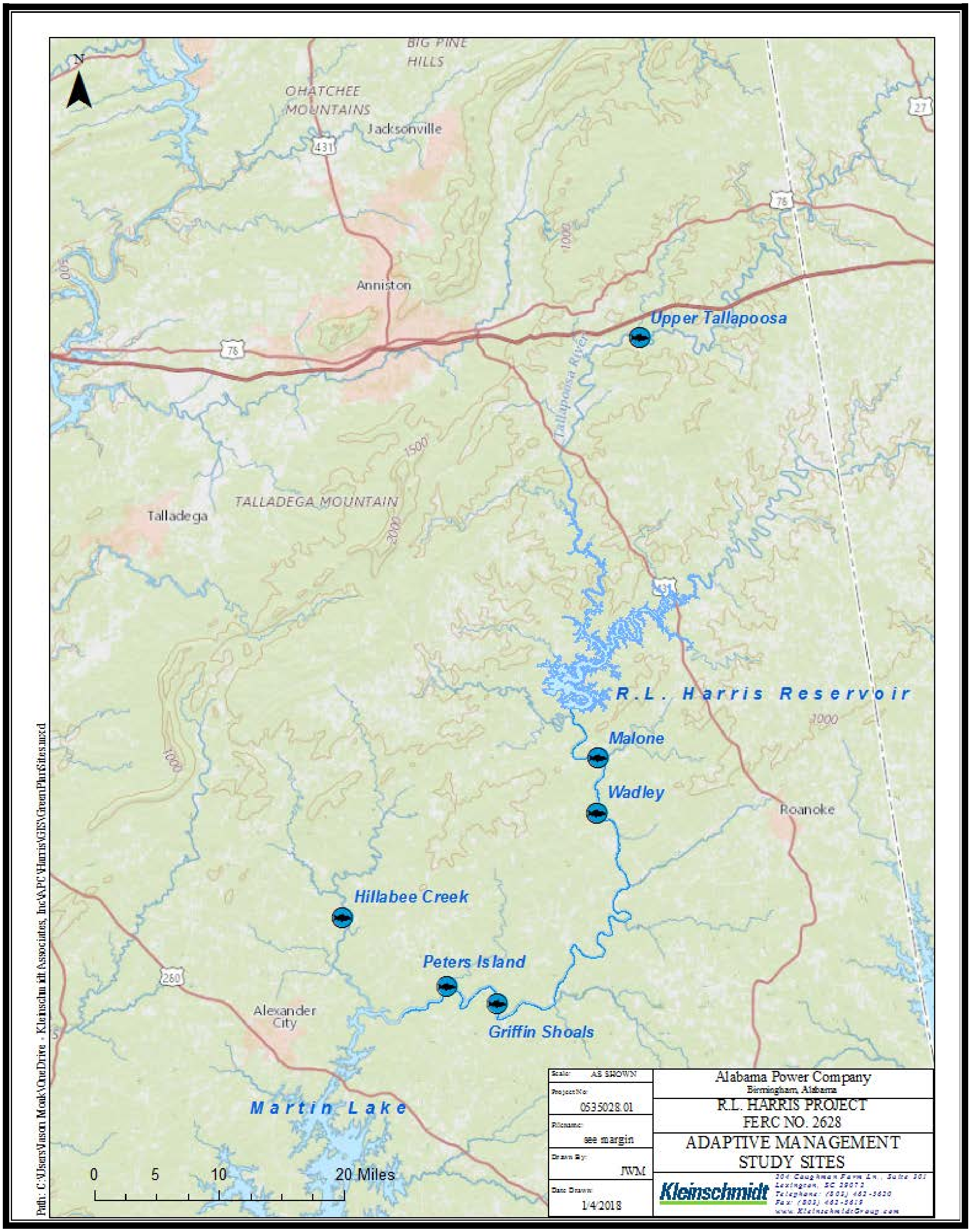
Alabama Power's 2017 sampling added new occurrence records for three species at the Upper Tallapoosa River site (Silverstripe Shiner, Weed Shiner, and Spotted Sucker) and two species at Middle Tallapoosa River sites (Silverstripe Shiner and Weed Shiner) that had not been previously collected during ACFWRU's sampling efforts from 2005 to 2015.

According to the GSA's protocols developed for the Ridge and Valley/Piedmont ichthyo-region (O'Neil and Shepard 2011), IBI scores were calculated based on ACFWRU fish collections at the upstream, downstream, and Hillabee Creek sites for each collection year[5]. Although ACFWRU's collection methods differed from the protocols required by the GSA, the methods were consistently applied at each site and over time. Therefore, IBI scores could be calculated and used to compare sites and years within this robust dataset. According to the protocol, IBI scores are classified into one of five ranges:

- Very Poor ≤ 26
- Poor 27 – 34
- Fair 35 – 42
- Good 43 – 50
- Excellent ≥ 50

IBI scores for the Upper Tallapoosa, Malone, and Wadley sites appeared similar, with Hillabee Creek having consistently higher scores (Figure 3-3). The Upper Tallapoosa site had an average score of 36 over the 11-year period, while the Malone and Wadley sites both had average scores of 35. Hillabee Creek had an average score of 43. No clear long-term trends were apparent, and IBI scores were variable within and among sites, seasons, and years.

[5] It should be emphasized that the IBI scores described here are separate from the scores described in Section 2.0 of this document.



Source: Kleinschmidt 2018

FIGURE 3-1 ADAPTIVE MANAGEMENT STUDY SITES

TABLE 3-2 FISH SPECIES COLLECTED DURING ADAPTIVE MANAGEMENT STUDIES (2005 – 2015; 2017)

Common Name	Scientific Name	UT	MT	HC
Clupeidae				
Gizzard Shad	*Dorosoma cepedianum*		X	
Threadfin Shad	*Dorosoma petenense*		X	
Cyprinidae				
Largescale Stoneroller	*Campostoma oligolepis*	X	X	X
Alabama Shiner	*Cyprinella callistia*	X	X	X
Tallapoosa Shiner	*Cyprinella gibbsi*	X	X	X
Blacktail Shiner	*Cyprinella venusta*	X	X	X
Lined Chub	*Hybopsis lineapunctata*	X	X	X
Striped Shiner	*Luxilus chrysocephalus*			X
Pretty Shiner	*Lythrurus bellus*	X		X
Coosa Chub	*Macrhybopsis etnieri*		X	X
Bluehead Chub	*Nocomis leptocephalus*	X		X
Golden Shiner	*Notemigonus crysoleucas*		X	
Burrhead Shiner	*Notropis asperifrons*			X
Rough Shiner	*Notropis baileyi*	X	X	X
Silverstripe Shiner	*Notropis stilbius*	X	X	X
Weed Shiner	*Notropis texanus*	X	X	
Riffle Minnow	*Phenacobius catostomus*	X	X	X
Creek Chub	*Semotilus atromaculatus*	X		X
Bullhead Minnow	*Pimephales vigilax*	X	X	X
Catostomidae				
Alabama Hog Sucker	*Hypentelium etowanum*	X	X	X
Spotted Sucker	*Minytrema melanops*	X		X
Black Redhorse	*Moxostoma duquesnei*	X	X	X
Golden Redhorse	*Moxostoma erythrurum*	X	X	X
Blacktail Redhorse	*Moxostoma poecilurum*	X	X	X
Ictaluridae				
Yellow Bullhead	*Ameiurus natalis*	X	X	X
Channel Catfish	*Ictalurus punctatus*	X	X	X
Speckled Madtom	*Noturus leptacanthus*	X	X	X
Black Madtom	*Noturus funebris*	X	X	X
Flathead Catfish	*Pylodictis olivaris*	X	X	X
Fundulidae				
Stippled Studfish	*Fundulus bifax*	X	X	X
Blackspotted Topminnow	*Fundulus olivaceus*	X	X	X
Poeciliidae				
Western Mosquitofish	*Gambusia affinis*	X	X	X
Cottidae				
Tallapoosa Sculpin	*Cottus tallapoosae*	X	X	X

Common Name	Scientific Name	UT	MT	HC
Percidae				
Lipstick Darter	*Etheostoma chuckwachatte*	X	X	X
Speckled Darter	*Etheostoma stigmaeum*	X	X	X
Tallapoosa Darter	*Etheostoma tallapoosae*	X	X	X
Yellow Perch	*Perca flavescens*	X		
Mobile Logperch	*Percina kathae*	X	X	X
Bronze Darter	*Percina palmaris*	X	X	X
Muscadine Darter	*Percina smithvanizi*	X	X	X
Centrarchidae				
Shadow Bass	*Ambloplites ariommus*	X	X	X
Redbreast Sunfish	*Lepomis auritus*	X	X	X
Green Sunfish	*Lepomis cyanellus*	X	X	X
Warmouth	*Lepomis gulosus*			X
Bluegill	*Lepomis macrochirus*	X	X	X
Longear Sunfish	*Lepomis megalotis*		X	X
Redear Sunfish	*Lepomis microlophus*	X	X	X
Tallapoosa Bass	*Micropterus tallapoosae*	X	X	X
Alabama Bass	*Micropterus henshalli*	X	X	X
Largemouth Bass	*Micropterus salmoides*	X	X	X
Black Crappie	*Pomoxis nigromaculatus*		X	
TOTAL # of SPECIES		**42**	**43**	**45**

TABLE 3-3 RELATIVE ABUNDANCE OF 10 MOST COMMON FISH SPECIES COLLECTED DURING SURVEYS, 2005-2015

Common Name	Upper Tallapoosa	Middle Tallapoosa	Hillabee Creek	Total
Alabama Shiner	12.59%	21.22%	16.92%	17.16%
Lipstick Darter	11.45%	19.64%	18.85%	16.84%
Bronze Darter	8.30%	25.72%	10.90%	15.54%
Largescale Stoneroller	16.01%	3.56%	7.45%	8.67%
Bullhead Minnow	12.59%	0.42%	8.32%	6.74%
Speckled Darter	11.89%	3.18%	3.67%	6.04%
Tallapoosa Shiner	3.10%	1.47%	9.27%	4.48%
Muscadine Darter	3.55%	6.01%	2.68%	4.18%
Silverstripe Shiner	1.87%	3.06%	6.02%	3.64%
Alabama Hog Sucker	6.43%	2.56%	1.29%	3.36%

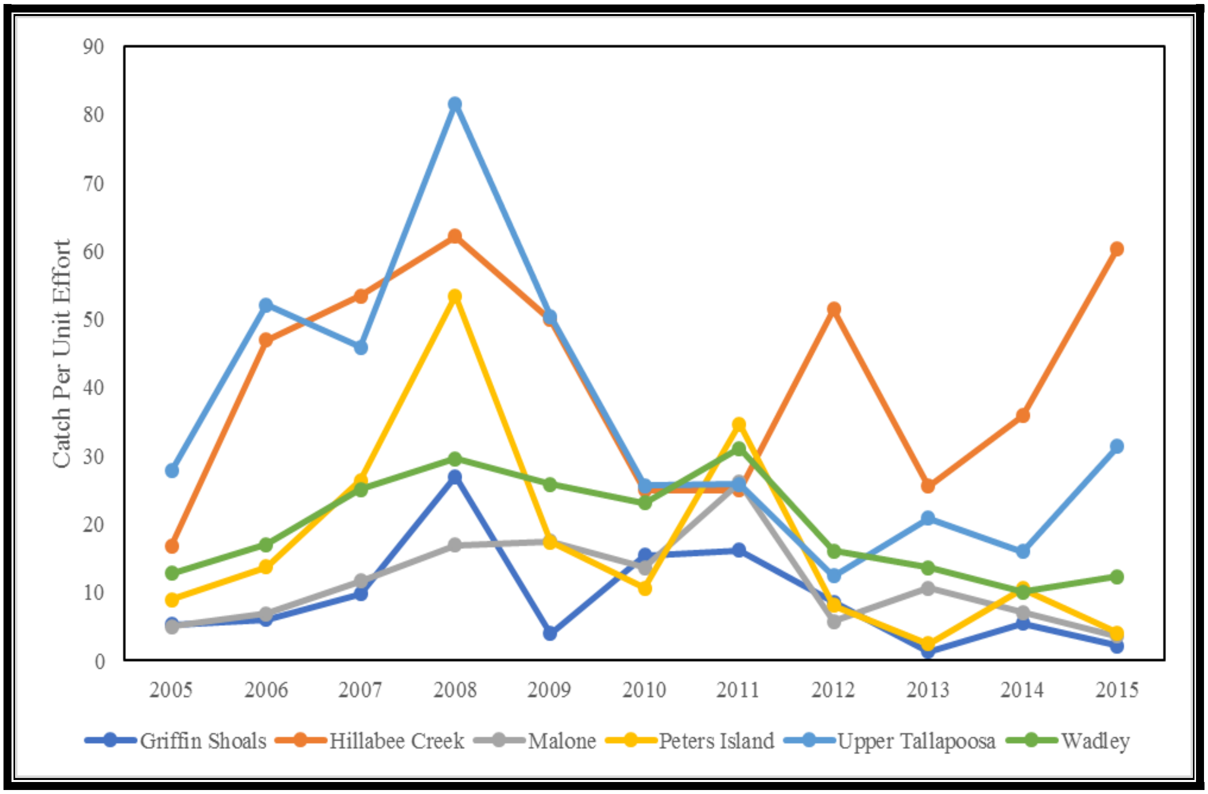


FIGURE 3-2 CATCH RATES FOR 2005-2015 FISH COMMUNITY SAMPLES AT ADAPTIVE MANAGEMENT STUDY SITES

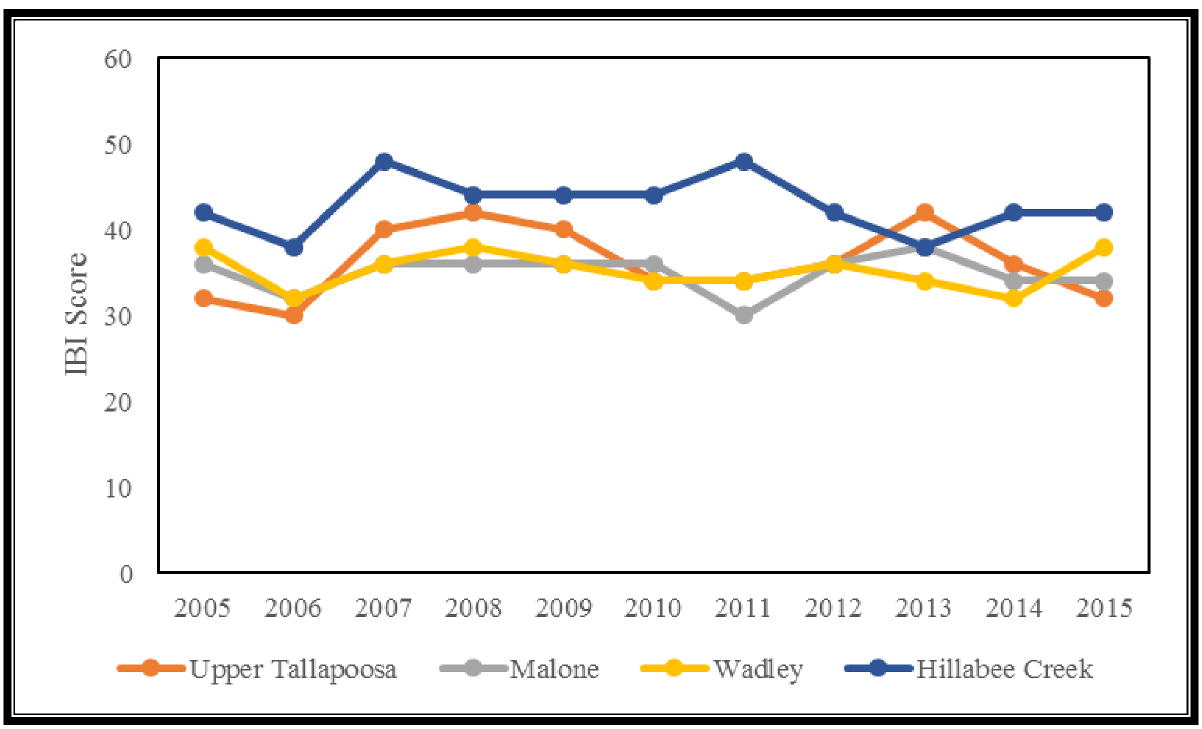


FIGURE 3-3 IBI SCORES FOR 2005-2015 FISH COMMUNITY SAMPLES

3.3 MACROINVERTEBRATE STUDIES

The ACFWRU has sampled benthic macroinvertebrate communities since 2005 at the same 6 sites where fish were sampled. The sites generally consisted of shallow reaches of riffles and shoals. The sites were sampled using a surber sampler, and macroinvertebrates were identified to the lowest practical taxonomic level. In 2017, the ACFWRU reported results from 2005 and 2014 samples for the Heflin (Upper Tallapoosa), Malone, Wadley, and Hillabee Creek sites.

A total of 151 taxa were identified in the 2005 and 2014 samples, 62 of which were from the family Chironomidae. Table 3-3 provides a summary of benthic macroinvertebrate taxa by class and order. In general, more individuals and taxa were collected in 2005 samples versus 2014. Differences in species composition between sites and years were variable. At the unregulated sites (Heflin and Hillabee), Plecoptera (stoneflies) made up a larger percentage of insect order composition in comparison with the regulated sites (Malone and Wadley) (Figure 3-4). The regulated sites appeared to consist of a higher percentage of Ephemeroptera (mayflies) in comparison with the regulated sites. The ACFWRU analysis found few significant differences between sites in the 2005 samples.

Regarding 2014 samples, significant differences in several metrics related to functional feeding groups/habits were noted. Percent scrapers, which are insects that eat algae, detritus, and submerged aquatic vegetation, were higher for the unregulated sites. Percent gatherers, which eat small benthic organic matter, and percent swimmers were higher for the regulated sites (Kosnicki et al. 2017).

TABLE 3-4 NUMBER OF INDIVIDUAL BENTHIC MACROINVERTEBRATES COLLECTED BY TAXON IN 2005 AND 2014

	Heflin		Hillabee		Malone		Wadley	
Taxa	**2005**	**2014**	**2005**	**2014**	**2005**	**2014**	**2005**	**2014**
Arachnida								
Trombidiformes	10		6		16	5	5	2
Bivalvia								
Veneroida	12	3	11	21	72	5	38	12
Clitellata								
Lumbriculida	1	2			37	37	17	16
Tubificida	17	4	12	8	216	28	19	17
Gastropoda								
Basommatophora	16							
Neotaenioglossa	5	27	6	95	1	3	90	14
Insecta								
Coleoptera	14	97	85	170	49	25	15	25
Diptera	331	23	230	87	648	113	109	96
Ephemeroptera	43	9	125	52	111	150	70	228
Megaloptera	1	2	3	1			2	
Odonata	2	1	5			1		1
Plecoptera	55	34	56	59	5		2	4
Trichoptera	53	22	129	19	103	96	56	29
Malacostraca								
Amphipoda					1			
Isopoda					5			
Nematoda	2		4		10		1	1
Turbellaria								
Tricladida					12			2
Total	**562**	**224**	**672**	**512**	**1286**	**463**	**424**	**447**

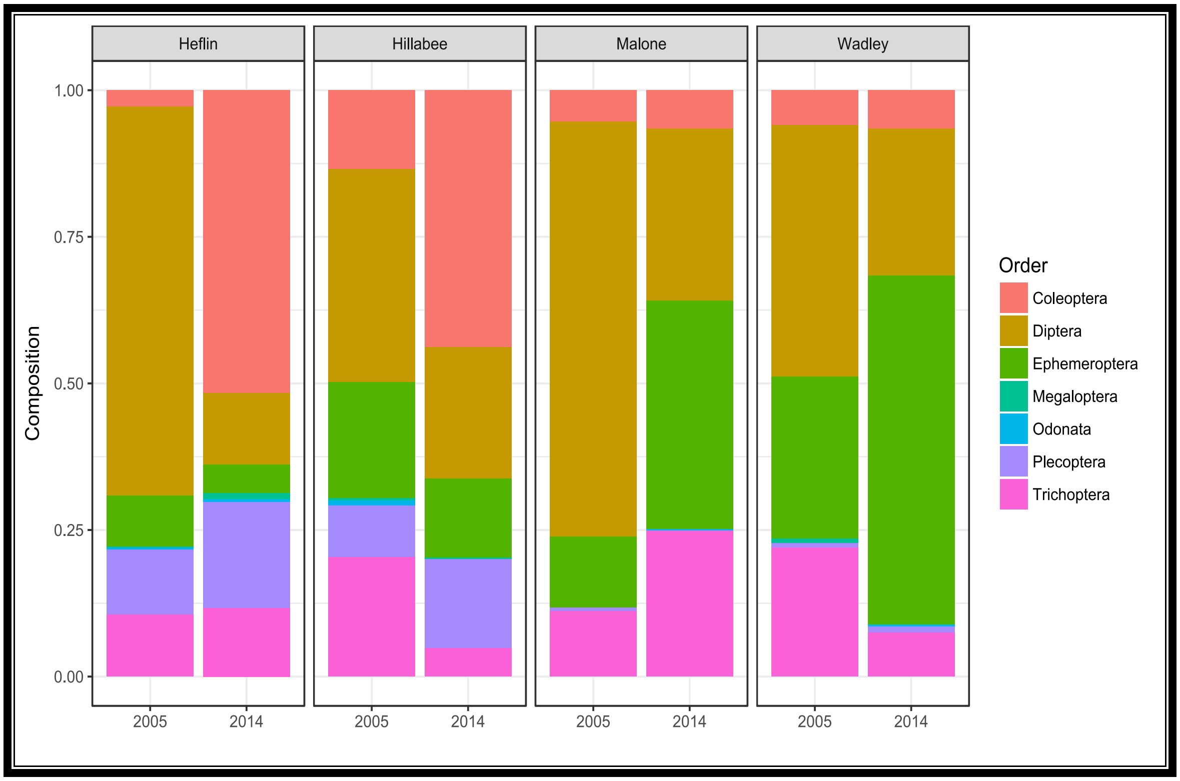


FIGURE 3-4 SUMMARY OF INSECT ORDER COMPOSITION FROM 2005 AND 2014 BENTHIC MACROINVERTEBRATE SAMPLES

3.4 TEMPERATURE STUDIES

Alabama Power has collected water temperature data at the Harris Dam Tailrace and at the Malone and Wadley sites since 2005. Measurements were collected at 1-hour intervals, typically from March through October. Generally, water temperatures were lowest at the tailrace location and highest at Wadley, with the warmest temperatures experienced during the month of August (Table 3-4; Figures 3-5 to 3-7).

TABLE 3-5 SUMMARY OF MEAN MONTHLY WATER TEMPERATURES (°C) IN THE TALLAPOOSA RIVER BELOW HARRIS DAM

Month	Tailrace	Malone	Wadley
March	11.04	11.71	11.89
April	14.73	15.36	16.15
May	17.80	18.99	19.92
June	20.79	22.76	23.80
July	22.66	24.74	25.57
August	24.11	25.72	26.45
September	23.46	24.12	24.73
October	20.50	19.93	20.04

Daily temperature ranges (the difference between the minimum and maximum temperature) were calculated for each site to determine the magnitude and frequency of temperature fluctuations at each site (Figures 3-8 to 3-10). Generally, daily temperature fluctuations ranged from 1 to 5 degrees C.

In 2016 and 2017, Alabama Power performed experimental assessments aimed at optimizing the pulsing scenarios that might result in more desirable temperature ranges for fish spawning. Testing in late March and early April 2017 yielded preliminary results that may be explored further in 2018. Alabama Power also examined the effects of operations on water temperatures and water levels in Crooked Creek and Cornhouse Creek to determine if they represented suitable refugia (Figure 3-11). Generally, there appeared to be few upstream effects on water temperature within the two tributaries. Water levels near the mouth of Crooked Creek showed some effect from pulsing operations due to its proximity to Harris Dam.

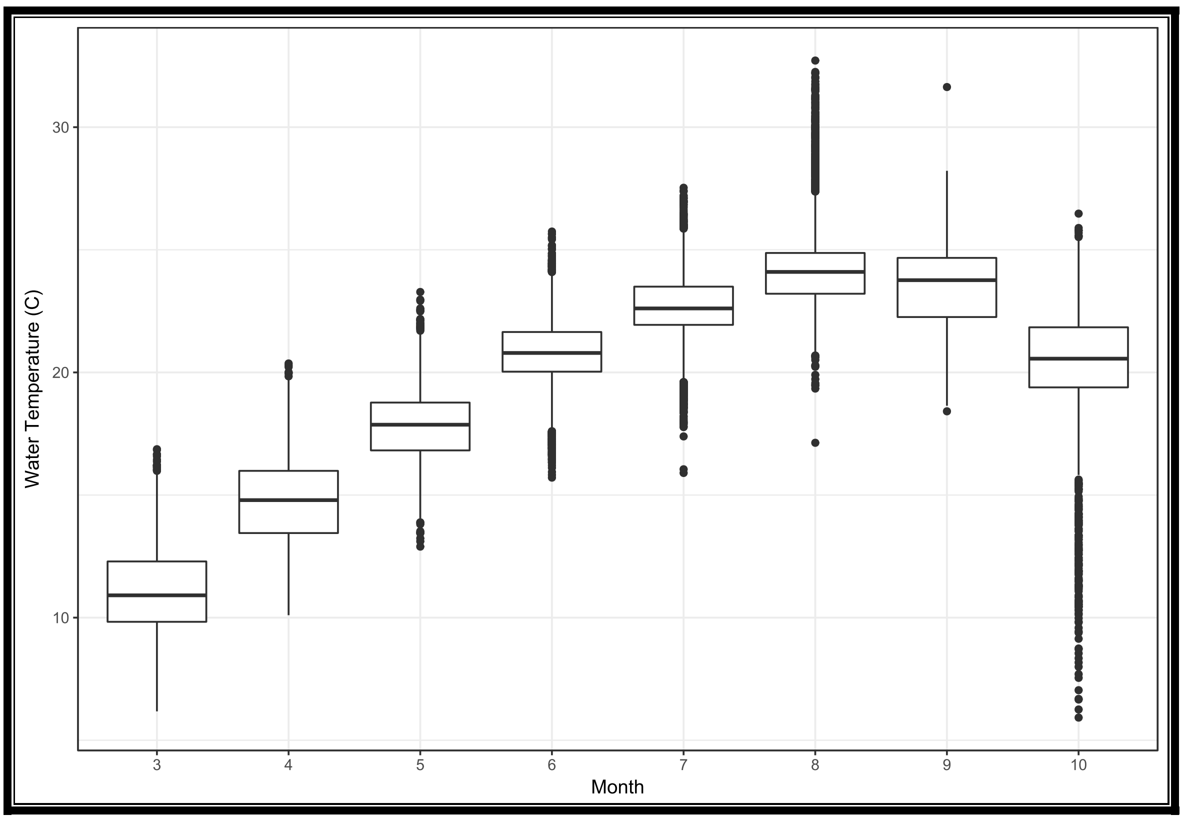


FIGURE 3-5 BOXPLOT OF WATER TEMPERATURE BY MONTH FOR HARRIS DAM TAILRACE (2005 – 2017)

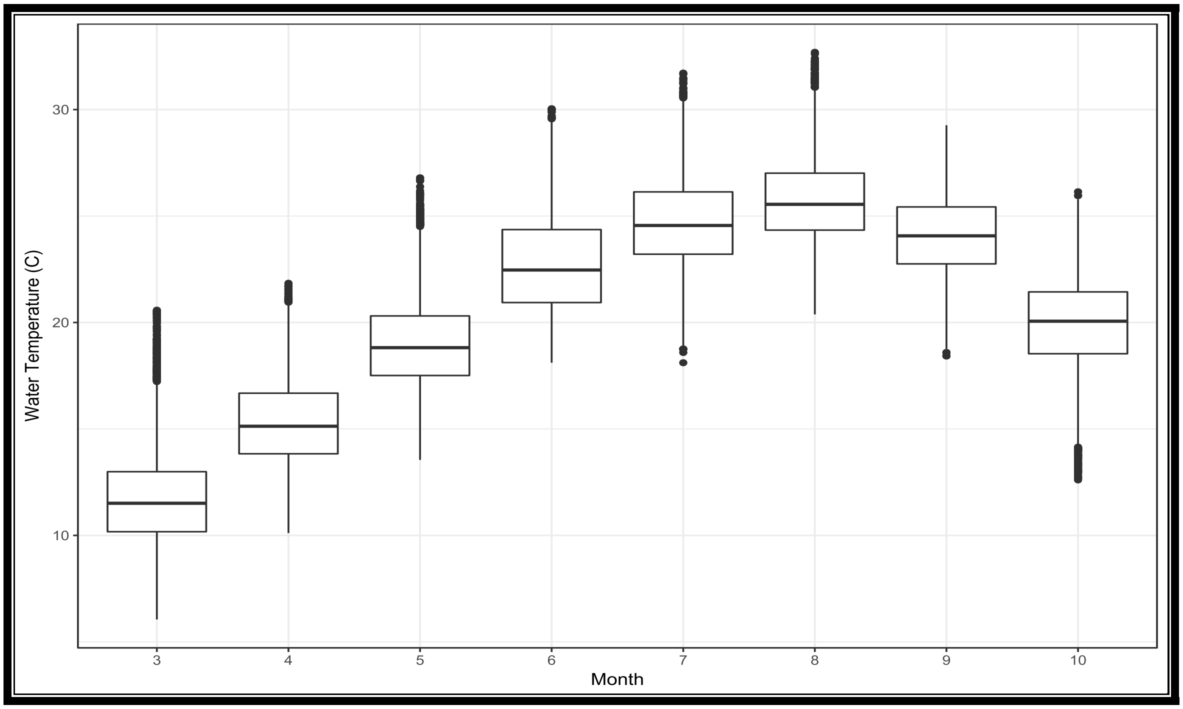


FIGURE 3-6 BOXPLOT OF WATER TEMPERATURE BY MONTH FOR TALLAPOOSA RIVER AT MALONE (2005 – 2017)

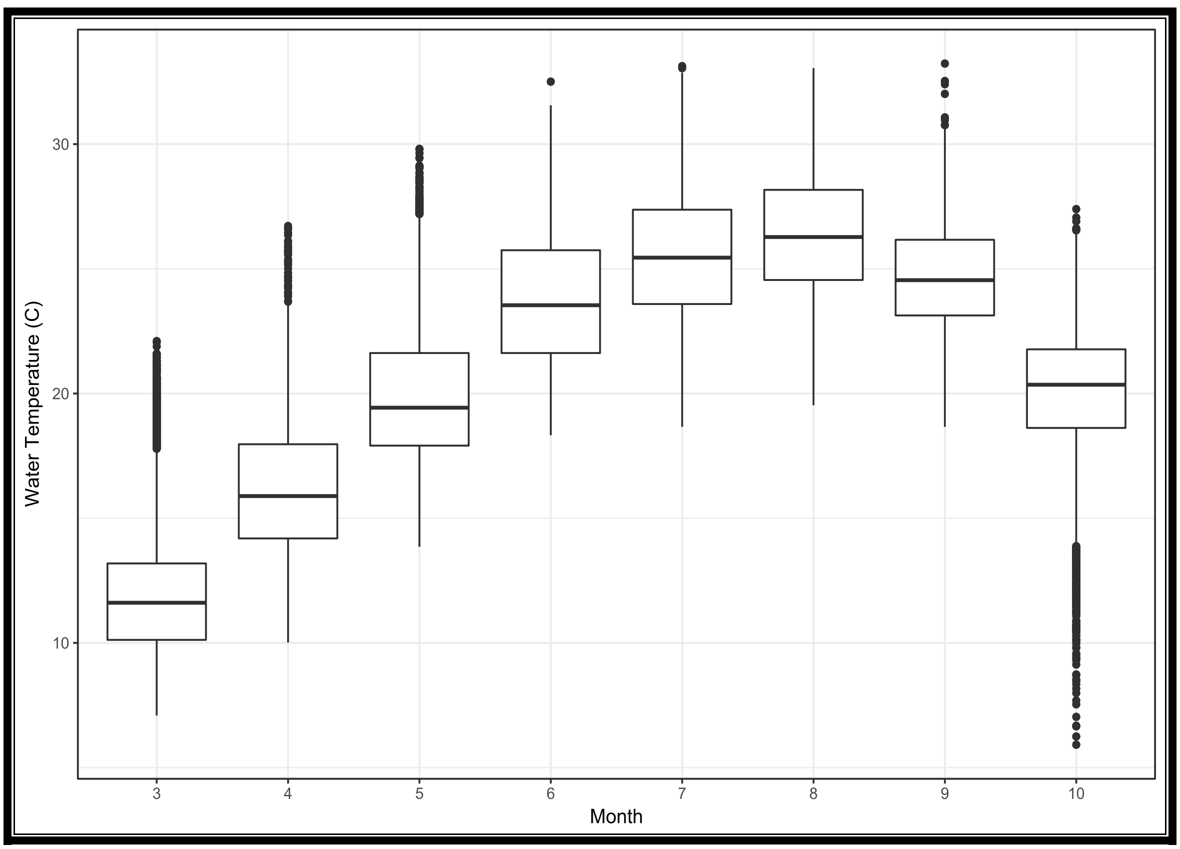


FIGURE 3-7 BOXPLOT OF WATER TEMPERATURE BY MONTH FOR TALLAPOOSA RIVER AT WADLEY (2005 – 2017)

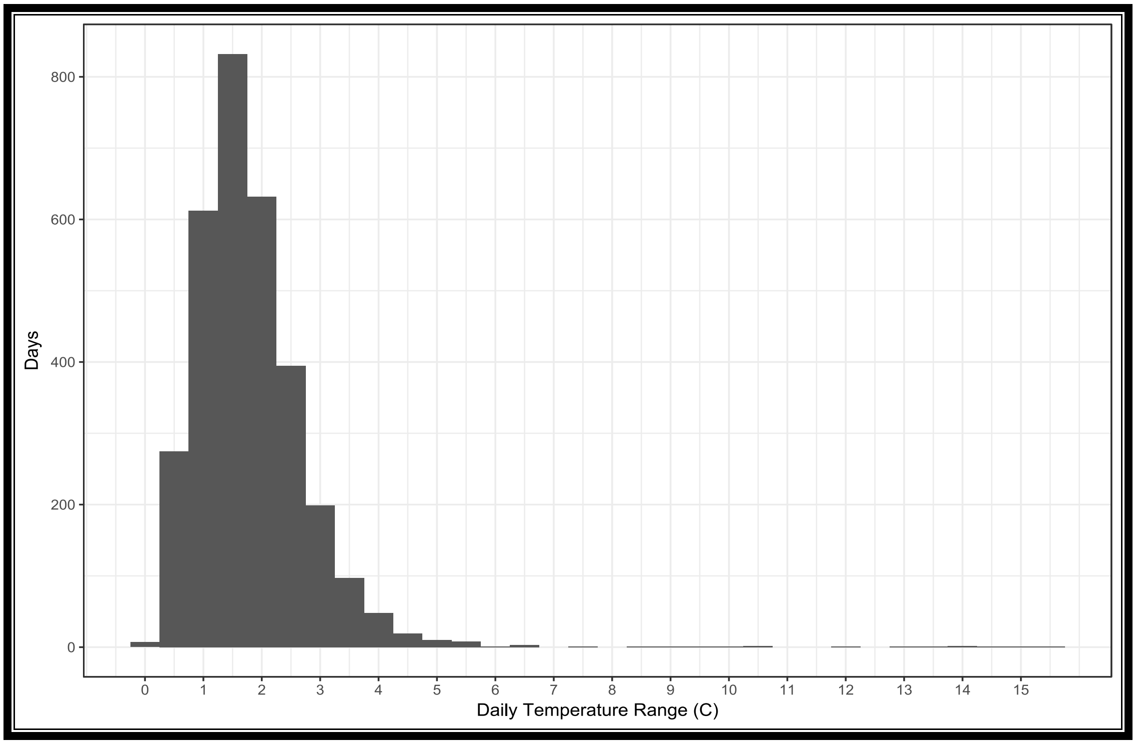


FIGURE 3-8 HISTOGRAM OF DAILY WATER TEMPERATURE RANGE FOR HARRIS DAM TAILRACE FROM 2005 THROUGH 2017

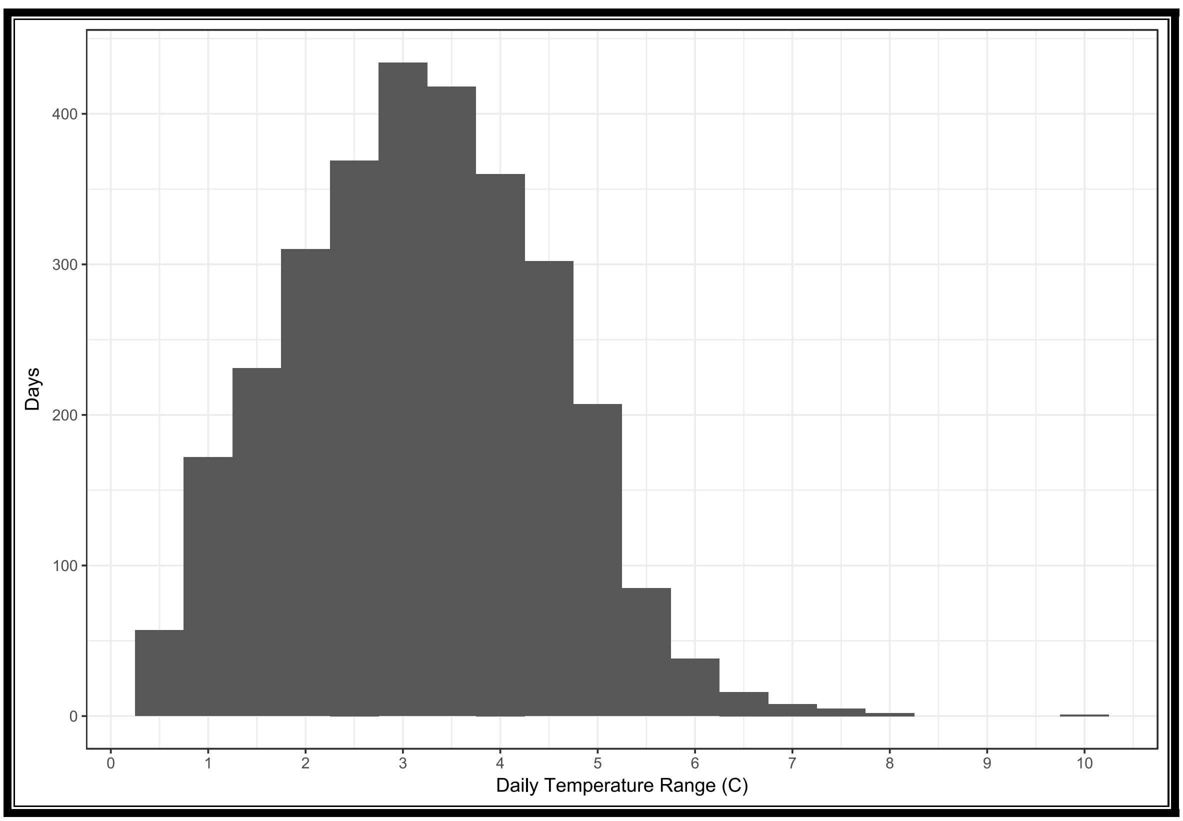


FIGURE 3-9 HISTOGRAM OF DAILY WATER TEMPERATURE RANGE FOR TALLAPOOSA RIVER AT MALONE FROM 2005 THROUGH 2017

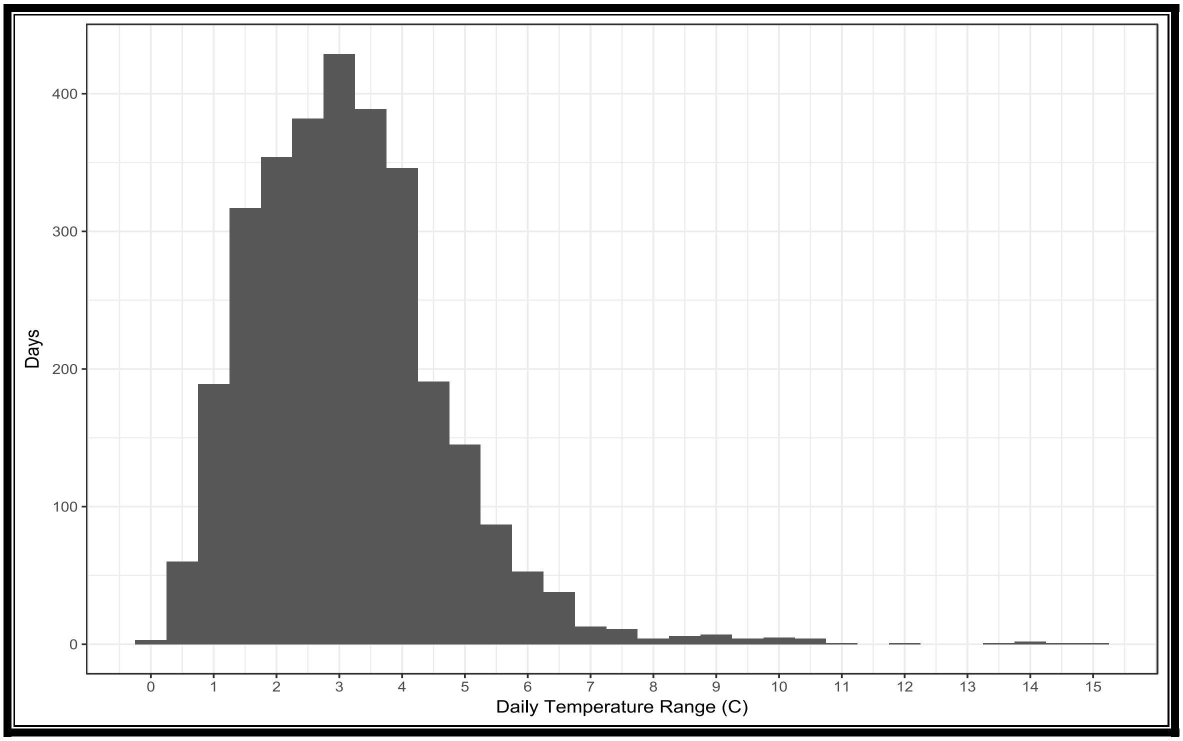
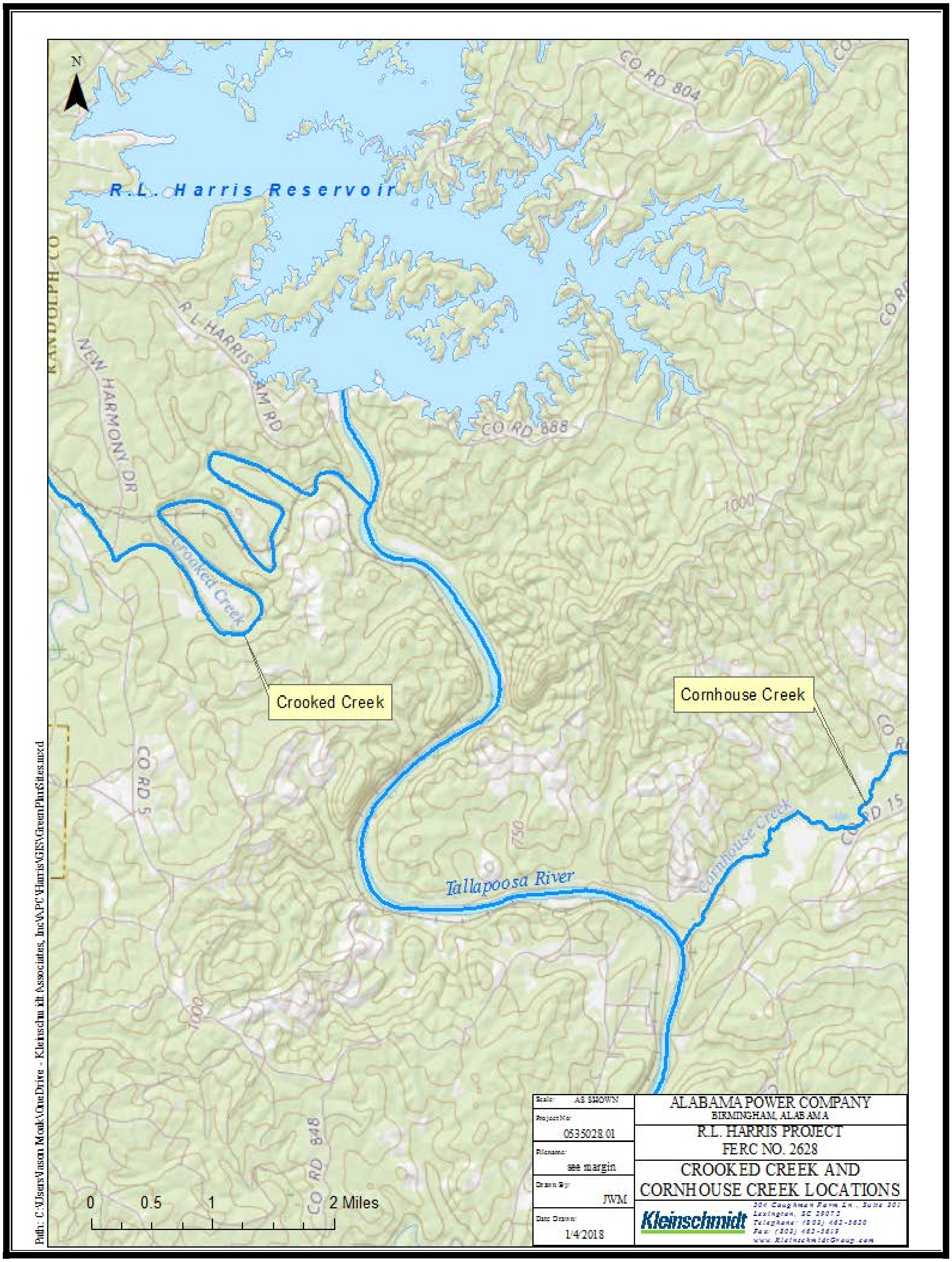


FIGURE 3-10 HISTOGRAM OF DAILY WATER TEMPERATURE RANGE FOR TALLAPOOSA RIVER AT WADLEY FROM 2005 THROUGH 2017



Source: Kleinschmidt, Alabama Power 2018

FIGURE 3-11 CROOKED CREEK AND CORNHOUSE CREEK LOCATIONS

4.0 PUBLICATIONS

This section provides a summary of available publications related to adaptive management of the Tallapoosa River below Harris Dam. These include articles from peer-reviewed technical journals, master's theses, doctoral dissertations, and unpublished reports. The publications are listed in chronological order according to publication date. Some of these abstracts contain spelling and/or grammatical errors; they appear in this text as they were published.

Travnicheck, Vincent H. and M.J. Maceina. 1994. **Comparison of Flow Regulation Effects on Fish Assemblages in Shallow and Deep Water Habitats in the Tallapoosa River**. Journal of Freshwater Ecology, 9(3): 207-216.

ABSTRACT: We measured species richness, diversity, and abundance of fish in both shallow and deep water areas in regulated and unregulated sections of the Tallapoosa River in Alabama from July 1990 through September 1992 to compare the effects of flow regulation on fish assemblages in shallow and deep water habitats. Flow regulation had a greater effect on shallow water fish assemblages than on deep water fish assemblages. Species richness and diversity of shallow water fishes were reduced below two hydroelectric dams compared with unmodified river segments, and we attribute this to a reduction in species adapted to fluvial environments below the two dams. Additionally, the density of fish in shallow water areas of unregulated portions of the river was significantly ($P<0.05$) higher than the density at most of the regulated sites. No reductions in species richness or diversity below the two dams were observed for species inhabiting deep water areas. However, we collected a significantly ($P<0.05$) higher number of catostomid species in the unmodified river sections compared to the flow-regulated sections.

Bowen, Zachary H., M.C. Freeman, and K.D. Bovee. 1998. **Evaluation of Generalized Habitat Criteria for Assessing Impacts of Altered Flow Regimes on Warmwater Fishes**. Transactions of the American Fisheries Society, 127(3): 455-468

ABSTRACT: Assessing potential effects of flow regulation on southeastern warmwater fish assemblages is problematic because of high species richness and poor knowledge of habitat requirements for most species. Our study investigated relationships between availability and temporal persistence of key habitats and fish assemblage structure at regulated and unregulated sites in the Tallapoosa River system. Fish assemblage characteristics at seven sites were quantified based on 1,400 electrofishing samples collected during 1994 and 1995. Physical Habitat Simulation (PHABSIM) programs were used to model availability and persistence of key habitats at regulated and unregulated sites. Associations between fish assemblages and availability or persistence of key habitats were identified via regression and analysis of variance. We found that hydropeaking dam operation reduced the average length of time that shallow-water habitats persisted and also reduced year-to-year variation in the persistence of shallow-water habitats compared with unregulated sites. Across sites and years, proportional representation of catostomids was positively correlated with persistence of shallow and slow-water habitats during spring. Proportion of individuals as cyprinids was positively correlated with median availability of deep–fast habitat whereas proportion of percids was inversely related to median availability of deep–fast habitat. Mean fish density was positively correlated with the persistence of shallow and slow-water habitats. Comparisons of key habitat measures and

fish abundances between 1994 and 1995 at each site indicated that higher abundances of percids, catostomids, and cyprinids were associated with increased availability and persistence of shallow and slow-water habitats in 1995. These findings demonstrate that the temporal and spatial availability of key habitats could serve as useful measures of the potential effects of flow alteration on lotic fish assemblages and suggest that both short-term persistence of key habitats as well as annual variation in key-habitat availability are important for maintaining diverse fish assemblages.

Irwin, Elise R. and A. Belcher. 1999. **Assessment of Flathead and Channel Catfish Populations in the Tallapoosa River**. ADCNR – Federal Aid to Fish and Wildlife Restoration, Job Performance Final Report Project F-40, Study 30.

INTRODUCTION: Gathering data on resource use by anglers allows for informed decisions regarding management options. The Tallapoosa River in the 1970's provided quality fishing for black basses (redeye bass *Micropterus coosae*, spotted bass *M. punctulatus*, largemouth bass *M. salmoides*; D. Catchings, personal communication) and catfishes (*Pylodictis olivarus* and *Ictalurus punctatus*; F. Butler, personal communication). In fact, a state record redeye bass was caught in the Tallapoosa River in 1974. More recently, anglers that fish the Tallapoosa River perceived declines in harvest of fish (primarily catfishes). Therefore, a project to assess catfish populations and angler harvest was initiated. To gather information on angler use of fishery resources at the Horseshoe Bend area of the Tallapoosa River, Alabama, a creel station was installed adjacent to the boat ramp in June 1997. The fixed creel station served as an on-site or access point type survey, only lacking the agent or creel clerk to conduct the survey (Pollock et al. 1994). Although a fixed station survey is not representative of most current statistically based survey designs (Van Den Avyle 1986), our survey had the same objectives as traditional creel surveys. Our objective was to gather creel data from the station to determine angler effort and attitudes, harvest rates, and other characteristics of the creel at Horseshoe Bend. To assess temporal changes in the fisheries, we compared angler catch-per-unit effort (CPUE) from the creel station to similar data from angler diaries reported in the 1970's. Angler diaries have proven to provide accurate estimates of fishing effort, harvest rates and other comparative information (Pollock et al. 1994). In addition, we stocked adult flathead catfish in the area in an attempt to monitor their contribution to the creel.

Freeman, Mary C. Z. H. Bowen, K. D. Bovee, and E. R. Irwin. 2001. **Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes**. Ecological Applications, 11(1):179-190.

ABSTRACT: Conserving biological resources native to large river systems increasingly depends on how flow-regulated segments of these rivers are managed. Improving management will require a better understanding of linkages between river biota and temporal variability of flow and instream habitat. However, few studies have quantified responses of native fish populations to multiyear (>2 year) patterns of hydrologic or habitat variability in flow-regulated systems. To provide these data, we quantified young-of-year (YOY) fish abundance during four years in relation to hydrologic and habitat variability in two segments of the Tallapoosa River in the southeastern United States. One segment had an unregulated flow regime, whereas the other was flow-regulated by a peak-load generating hydropower dam. We sampled fishes annually and explored how continuously recorded flow data and physical habitat simulation models (PHABSIM) for spring (April-

June) and summer (July-August) preceding each sample explained fish abundances. Patterns of YOY abundance in relation to habitat availability (median area) and habitat persistence (longest period with habitat area continuously above the long-term median area) differed between unregulated and flow-regulated sites. At the unregulated site, YOY abundances were most frequently correlated with availability of shallow-slow habitat in summer (10 species) and persistence of shallow-slow and shallow-fast habitat in spring (nine species). Additionally, abundances were negatively correlated with 1-h maximum flow in summer (five species). At the flow-regulated site, YOY abundances were more frequently correlated with persistence of shallow-water habitats (four species in spring; six species in summer) than with habitat availability or magnitude of flow extremes. The associations of YOY with habitat persistence at the flow-regulated site corresponded to the effects of flow regulation on habitat patterns. Flow regulation reduced median flows during spring and summer, which resulted in median availability of shallow-water habitats comparable to the unregulated site. However, habitat persistence was severely reduced by flow fluctuations resulting from pulsed water releases for peak-load power generation. Habitat persistence, comparable to levels in the unregulated site, only occurred during summer when low rainfall or other factors occasionally curtailed power generation. As a consequence, summer-spawning species numerically dominated the fish assemblage at the flow-regulated site; five of six spring-spawning species occurring at both study sites were significantly less abundant at the flow-regulated site. Persistence of native fishes in flow-regulated systems depends, in part, on the seasonal occurrence of stable habitat conditions that facilitate reproduction and YOY survival.

Irwin, Elise R. and M.C. Freeman. 2002. **Proposal for Adaptive Management to Conserve Biotic Integrity in a Regulated Segment of the Tallapoosa River, Alabama, U.S.A**. Conservation Biology, 16(5):1212-1222.

ABSTRACT: Conserving river biota will require innovative approaches that foster and utilize scientific understanding of ecosystem responses to alternative river-management scenarios. We describe ecological and societal issues involved in flow management of a section of the Tallapoosa River (Alabama, U.S.A.) in which a species-rich native fauna is adversely affected by flow alteration by an upstream hydropower dam. We hypothesize that depleted low flows, flow instability, and thermal alteration resulting from pulsed flow releases at the hydropower dam are most responsible for changes in the Tallapoosa River biota. However, existing data are insufficient to prescribe with certainty minimum flow levels or the frequency and duration of stable flow periods that would be necessary or sufficient to protect riverine biotic integrity. Rather than negotiate a specific change in the flow regime, we propose that stakeholders—including management agencies, the power utility, and river advocates—engage in a process of adaptive-flow management. This process would require that stakeholders (1) develop and agree to management objectives; (2) model hypothesized relations between dam operations and management objectives; (3) implement a change in dam operations; and (4) evaluate biological responses and other stakeholder benefits through an externally reviewed monitoring program. Models would be updated with monitoring data and stakeholders would agree to further modify flow regimes as necessary to achieve management objectives. A primary obstacle to adaptive management will be a perceived uncertainty of future costs for the power utility and other stakeholders. However, an adaptive, iterative approach offers the best opportunity for improving flow regimes for native biota while gaining information critical to guiding management decisions in other flow-regulated rivers.

Irwin, Elise R. and K.D. Mickett. 2005. **Development of a monitoring plan for adaptive management below R.L. Harris Dam**. Presented at R.L. Harris Stakeholder Board Meeting, August 23, 2005.

ABSTRACT: Adaptive management requires a scientifically based monitoring plan to assess both cause and effect and status and trends of biological and physical components of the system under management (Walters 1986; Yoccoz et al. 2001). Components of the monitoring plan were developed by the Science Committee after considering goals and objectives out1ined by the Stakeholders. The monitoring plan for the Tallapoosa River below Harris Dam should be implemented immediately to coincide with the beginning of active adaptive flow management of the river. Because adaptive management provides a true experimental context, careful design of monitoring protocols is needed. Shortcomings of many monitoring plans include vague objectives that are often unrelated to management actions, neglect of analysis of underlying mechanisms, lack of a priori hypotheses regarding how management will affect the state and change of variables, and use of methods and or sampling designs that do not incorporate measures of detectability (Yoccoz et al. 2001). With these potential pitfalls illuminated, we propose the following approach for monitoring ecosystem response to adaptive management of the middle Tallapoosa River.

Kennedy, Kathryn M., E.R. Irwin, M.C. Freeman, and J. Peterson. 2006. **Development of Decision Support Tool and Procedures for Evaluating Dam Operation in the Southeastern United States**. Available: <http://www.rivermanagement.org/decision_support_final_report.pdf>.Accessed December 11, 2017.

EXECUTIVE SUMMARY: Riverine systems in the Southeast are highly fragmented and managed for hydropower, navigation, flood control and recreational needs. These multiple-use systems require innovative approaches for management of both natural and water resources for societal needs. Adaptive management has been recommended as a framework for managing complex riverine systems because 1) management goals are often conflicting and 2) system uncertainty is great. Adaptive management is different from other types of management because it includes all stakeholders in the process (versus policy makers only), uses resource optimization techniques by incorporating competing objectives, and recognizes and focuses on the reduction of uncertainty inherent in natural resource systems by attempting to reduce it via knowledge acquisition. Stakeholders negotiate a starting point for management actions, the effects of management are monitored and compared with predicted results, and management strategies are adjusted: then the process is iterative through the "monitor-compare-adjust" routine. State and Federal agencies in the Southeast U.S. region will be involved with the re-licensing of more than 200 dams that are regulated by the Federal Energy Regulatory Commission (FERC) through 2010. Tools are needed to engage stakeholders and develop strategies for defining starting management protocols. Our objectives were to develop a template for incorporating adaptive management and decision support into the FERC re-licensing process.

We conducted a workshop to incorporate stakeholder values and objectives into the template. Participants engaged in an open discussion for building consensus on management objectives and values. Presentations by experts in adaptive management of natural resources were followed by a professionally facilitated forum. Suggested objectives were judged in an electronic poll by one representative from 23 participating stakeholder groups. Eleven fundamental objectives were developed and discussed by stakeholders; it was agreed that they were complete and representative of all involved parties. It was also agreed that the framework of adaptive management would be adopted for future discussions and management decisions. Objectives were used in the development of a decision support model to assist stakeholders in defining the first flow prescription in the adaptive management process. In addition, the stakeholders developed a governance structure; the R.L. Harris Stakeholders Board.

The study reach (Tallapoosa River below R. L. Harris Dam) represents one of the longest and highest quality segments of Piedmont river habitat remaining in the Mobile River drainage, one of the most biologically diverse river drainages in North America. Extensive areas of shoal habitat, river features that typically support high faunal diversity and that have been replaced by impoundments throughout much of the Southeast, are characteristic along this portion of the river. The native fish assemblage includes at least 57 species, including at least five species endemic to the Tallapoosa River system. The invertebrate fauna is less well-known; however, the fine-lined pocketbook (*Hamiota altilis*), which is listed as Threatened under the Endangered Species Act, and at least two endemic species of crayfishes occur in the piedmont reach.

A decision support model was developed based on fundamental objectives and hypothesized relations between flow and system response. Hypothesized features of flow that affected faunal response in the system were 1) depleted low flows, 2) flow instability, and 3) thermal-regime alteration. We constructed a Bayesian network for use as a decision support model to both quantify uncertainty regarding the response of state variables to management actions and to make hypotheses relative to predicted response. Modeled decisions included four alternative primary flow regimes, the provision of spawning windows (periods during which flows are minimized to allow for hypothesized increased spawning success), and increased weekend flows in October for recreational boating. Relations between flow and system response were modeled using probabilistic dependencies derived from long-term empirical data from multiple projects and expert opinion; whereas, relations between system response and stakeholder satisfaction (i.e., utility values) were modeled using probabilistic dependencies based upon stakeholder opinion. The optimal decision was determined by examining the expected value associated with each alternative decision, which was the sum of the probability-weighted utility values.

The decision support model was comprised of three primary decisions, five stakeholder satisfaction functions, and ten uncertainty nodes. The primary decisions were daily flow operations at dam, provision and timing of stable flows (i.e., "spawning windows") and provision of enhanced October flows for recreational boaters. Satisfaction functions were included for river boater satisfaction, river landowner satisfaction, reservoir user satisfaction, fish population value, and power generation. The uncertainty nodes were as follows; reservoir inflow, lake levels, boatable days, erosion, shallow-fast habitat, slow-cover habitat, flow-through pools, degree days, small fish abundance, bass recruitment, and redbreast spawning success. The uncertainty nodes (except erosion) were parameters linked directly to fundamental objectives of stakeholders and hypotheses related to system function.

After the model was compiled, sensitivity analysis was conducted and allowed for a better understanding of the influence carried by variables on utility values and the modeled decisions. This analysis also allowed for recommendations relative to allocation of resources for management and monitoring purposes. For example, given the empirical data, periods of stable flows (versus daily flow regime) appear to be most beneficial for the integrity of the fish populations. Therefore, natural resource managers could focus efforts on further defining functional relations between stable flow windows and recruitment of biota.

Freeman et al. (2001) called for flow manipulations in an adaptive management context, coupled with continued biological monitoring to "elucidate how hydrologic variation influences species persistence." This project was successful in developing a template for adaptive management that can be applied to other regulated systems. Active adaptive management began in the study system in spring of 2005 and a monitoring program is in place. The decision support model built and adopted by the stakeholders facilitated decision making and assisted scientists with development of the monitoring plan. Key elements for success were: 1) use of a professional and neutral facilitator to engage stakeholders in objective and value identification; 2) use of a visual decision support model that allowed for stakeholder input and optimization of values associated with various decisions; 3) development of a governance structure for future involvement and ownership in the process; and 4) recognition of a long-term commitment to learning the effects of management through system monitoring and adjustment of management regimes.

Sakaris, Peter C. 2006. **Effects of hydrologic variation on dynamics of channel catfish and flathead catfish populations in regulated and unregulated rivers in the southeast USA** (Ph.D. Dissertation).Available: < https://etd.auburn.edu/bitstream/handle/10415/621/SAKARIS_PETER_47.pdf?sequence=1&isAllowed=y>. Accessed December 11, 2017.

ABSTRACT: Altered flow regimes resulting from dam construction can have negative impacts on growth and recruitment of fishes in regulated river systems. The effects of hydrologic variation on channel catfish *Ictalurus punctatus* and flathead catfish *Pylodictis olivaris* populations were examined in regulated and unregulated river systems. The objectives of this dissertation were to: 1) develop and validate methods for daily aging age-0 channel catfish, 2) examine the effects of hydrologic variability on growth and hatching success of age-0 channel catfish in regulated and unregulated reaches of the Tallapoosa River Basin, Alabama, and 3) incorporate the effects of variable hydrology on recruitment and variable mortality as stochastic factors influencing the population growth of native and introduced flathead catfish populations from the Coosa (Alabama) and Ocmulgee (Georgia) rivers.

In validation studies, mean daily ring counts from sagittal otoliths and known ages of channel catfish were strongly related, indicating that daily ring deposition occurred in the otoliths of age-0 channel catfish. Daily ring counts were accurate for 107 - 119 days post-hatch. In the Tallapoosa River System, growth of age-0 channel catfish was generally highest among age-0 fish from unregulated sites in the Coastal Plain, intermediate among fish from regulated sites in the Piedmont, and lowest among fish from unregulated sites in the Piedmont. All age-0 fish that hatched in September originated from the regulated site, indicating that fish in the regulated reach had a protracted spawning season. Multiple regression models indicated that positive relations existed between growth of age-0 channel catfish and hydrologic variables including mean discharge, minimum discharge, number of high pulses, and rise rate. In addition, growth was negatively affected by high fall rates. Age-0 channel catfish typically hatched during periods with low and stable flow conditions.

Size classified matrix models were constructed for native and introduced flathead catfish populations from the Coosa (Alabama, USA) and Ocmulgee (Georgia, USA) rivers, respectively. Recruitment of flathead catfish in the Coosa River was positively related to mean spring discharge and November low flow. In the Ocmulgee River, year-class strength was negatively related to mean March discharge and positively related to June low flow. Incorporation of variable hydrology as a stochastic factor in the matrix model had a negative effect on population growth in the Coosa River. In contrast, incorporation of hydrologic variation as a stochastic factor resulted in stable population growth in the Ocmulgee River. By variably decreasing the mortality of flathead catfish with the highest reproductive values, population growth improved over a 50-year period in the Coosa River. Simulation of increased mortality of harvestable sized flathead catfish in the Ocmulgee River resulted in a substantial decline in population size.

Managers are encouraged to use models described in this dissertation as tools in adaptive-flow management programs in the Alabama River System. Specifically, these models can be used to prescribe flow regimes in regulated river systems. Researchers should continually improve models by collecting more data and closely monitoring responses of fish populations to variable flow conditions in regulated river systems.

Martin, Benjamin M. 2008. **Nest survival, nesting behavior, and bioenergetics of redbreast sunfish on the Tallapoosa River, Alabama** (Master's thesis). Available:<https://etd.auburn.edu/bitstream/handle/10415/1458/Martin_Benjamin_10.pdf?sequence=1&isAllowed=y>. Accessed December 11, 2017.

ABSTRACT: Adaptive management has been implemented in the Tallapoosa River, Alabama; one objective of the process is to determine how discharge and temperature affect redbreast sunfish reproductive success. Nesting male redbreast sunfish *Lepomis auritus* were monitored via snorkeling and video during 2006 and 2007 to estimate nest survival and quantify nesting behavior in a regulated reach of the Tallapoosa River (Alabama) below R.L. Harris Dam. In addition, males were collected during 2007 to determine if metabolic constraints were evident when caloric contents and bioenergetic models from the regulated Tallapoosa River and an unregulated tributary were compared.

A priori hypotheses were constructed relative to how biological and environmental factors might affect nest survival. Nest survival estimates were determined in Program MARK and competing environmental and biological models were evaluated using Akaike's information criterion (AIC). These data allowed for assessment of the functional response of daily survival rate of nests in relation to discharge. One year in the study was an extreme drought year (2007) allowing for nest survival estimates during an atypical water management year. Findings from this study support use of spawning windows (e.g., low flow releases from dam) to increase reproductive success for redbreast sunfish. Spawning window timing could be as early as mid-May, which is earlier than previously suggested. Spawning flows provided earlier in the year could enhance reproductive success for other fish species.

Video of nesting behavior indicated that male redbreast sunfish primarily exhibited the defend and leave behavior during 'baseflow' (e.g., low flow conditions) observations. During higher discharge events (i.e., one-unit or turbine ~ 200 cms) spawning behaviors (e.g., milt and court) ceased and the defend behavior decreased; whereas, the leave and the clean behaviors increased. Behavior observations indicated that increased flow caused disruption of spawning and nest abandonment. Behavior during two-unit discharge events was only minimally observed because of drought conditions; however, data did indicate detrimental effects of two-unit discharge on nests (i.e., destruction).

Bioenergetic modeling predicted decreased growth, and weight for males during the spawning season at both the regulated and unregulated sites. At the unregulated site consumption rates increased as temperature increased; when the thermal maximum was reached (33ºC), consumption decreased precipitously. In contrast, consumption rates at the regulated site were always positively related to temperature and did not decline when the thermal maxima was reached (28ºC) suggesting that thermal mitigation occurred from hypolimnetic releases from the dam. Reducing uncertainty regarding how biota respond to management actions is a goal of adaptive management and results from this study are applicable to flow management and its subsequent effects on nesting centrarchids.

Martin, Molly Ann Moore. 2010**. Shoal occupancy estimation for 3 lotic crayfish species in the Tallapoosa River basin, Alabama** (Master's thesis). Available: < https://etd.auburn.edu/bitstream/handle/10415/2087/Shoaloccupancyestimationfor3loticcrayfishspecies_Martin_Final.pdf?sequence=2&isAllowed=y>. Accessed December 11, 2017.

ABSTRACT: The greatest diversity of crayfishes in the world is in the southeastern United States; however, many species are at risk and lack of information on habitat requirements and the effects of habitat alteration hamper crayfish conservation efforts (Jones and Bergey 2007, Taylor et al. 2007). Two priority level 2 species (P2; ADCNR) of crayfish are endemic to the piedmont region of the Tallapoosa River Basin; *Cambarus englishi*, and closely related *Cambarus halli*, (Schuster et al. 2008). Additionally, widespread priority level 5 (P5) species, *Procambarus spiculifer*, have been documented in the region (Ratcliffe and DeVries 2004). Conservation of native fauna in large rivers is increasingly dependent on flow management therefore native fauna of the middle Tallapoosa are potentially strongly affected by flow management employed by Harris Dam (Irwin and Freeman 2002).

Occupancy was estimated using methods outlined by Mackenzie et al. 2002 for crayfishes as part of adaptive management of the Tallapoosa River to gain understanding on how flow dynamics affect biota. Specific objectives were to determine variables affecting species specific detection probabilities and compare site level occupancy estimates between regulated and unregulated reaches. Additionally, catch data were examined for differences in size structure among sites. Lotic crayfishes were collected from shoals at 3 regulated and 2 unregulated reaches of the Tallapoosa River basin using pre-positioned area electrofishers (PAE). Detection probability and occupancy were modeled from presence- absence data as a function of a priori covariates and estimated in

Program PRESENCE using the custom single-season single-species models. Model selection was based on the principle of parsimony and superfluous models were eliminated. Weighted model-averaged parameter estimates and unconditional sampling variances were calculated (Burnham and Anderson 2002). Multiple PAE's (i.e. spatial replication; n= 5-20) were collected with habitat characters depth, velocity, percent vegetation, and substrate composition recorded and used to model detection. Site level occupancy covariates were based on the a priori hypotheses that occupancy was lower in regulated reaches due to negative impacts of hydropeaking on recruitment and /or occupancy varied along a linear downstream recovery gradient from Harris Dam and one a posteriori hypothesis that occupancy differed among the 5 reaches.

Detection was low for all species in most years which affected precision of occupancy estimates. A few sites consistently had a high number of detections while others consistently had few. Variation in number of detections likely reflected changes in relative underlying populations of crayfishes potentially related to differences in habitat quality, food quality, number of available refuges, or predation risk. At least one individual of *P. spiculifer*, *C. englishi*, and *C. halli* were collected from almost every shoal at least once in the five-year sampling period; however, occupancy estimates varied spatially and temporally. Modeling results suggested occupancy was similar in regulated and unregulated reaches of the basin in a 'wet' year while spatial differences were observed among reaches in all other years. Temporal differences were potentially related to basin hydrology. Data supports occupancy of *P. spiculifer* was close to one ($\Psi \approx 1$) throughout the basin and occupancy of *C. englishi* was higher in the regulated reaches ($\Psi \approx 1$) than unregulated reaches ($\Psi \approx 0.50 - 0.60$) in most years. Extremely low detection due to [sic] (i.e., sparse data) resulted in model uncertainty making estimates for *C. halli* variable and difficult to interpret. Further investigation of distribution and habitat use for *C. halli* is warranted and *C. halli* may be more abundant in tributaries (Ratcliffe and DeVries 2004). Understanding habitat use of endemic species is important for recommending management actions directed towards conservation of crayfishes.

Habitat covariates supported predicted biological responses, were sensitive to annual basin hydrology, and supported evidence of habitat partitioning among species. Vegetation was important for all species demonstrating a positive effect on detection. Depth influenced detection probabilities in 'wet' year and velocity influenced detection in a 'drought' year. Catch data also supported evidence of population level responses to drought including changes in size structure and potential density reductions and variation in recovery time among reaches. No evidence supported that the closely related *Cambarus* species competitively exclude one another; however, size differences were observed between species and *C. halli* may limit their use of shoals in the presence of *C. englishi* which may have resulted in consistently low detection of *C. halli* in our study. In addition, depth having a strong influence on detection of *C. halli* and the observed inverse relation to substrate size between the *C. halli* and *C. englishi* may be evidence of habitat partitioning among these closely related species.

Knight II, John Richard. 2011. **Age, growth, home range, movement, and habitat selection of redeye bass (*Micropterus coosae*) from the middle Tallapoosa River tributaries (Alabama, USA)** (Master's thesis). Available: <https://etd.auburn.edu/bitstream/handle/10415/2473/Knight_john_May_11.pdf?sequence=2&isAllowed=y>. Accessed December 11, 2017.

ABSTRACT: Redeye bass *Micropterus coosae* is a common, but underutilized sport fish resource in Alabama. This species is the most attractive of all the black basses, and has a reputation as a formidable catch on light tackle. Redeye bass are typically abundant in rivers and streams only navigable by canoes or kayaks. The purpose of this study was to determine age and growth, movement, home range, and habitat selection of redeye bass from the middle Tallapoosa Watershed, in Alabama.

Age and growth was determined using validated hard structures (otoliths). Additionally, alternative non-lethal structures (spines) were also investigated. Results indicated there were minimal differences in age assignment between structures when data were combined; however, variation was observed when individual age classes were examined. Spine aging tended to underestimate actual age, but this structure may be useful to gain a general understanding of age class structure if euthanasia is not desired. Differences in age and growth between tributary and mainstream resident redeye bass were not observed.

Movement, home range, and habitat selection were determined using radio telemetry methods. Proper tagging procedures were determined prior to initiation of this study. Redeye bass generally showed some evidence of site fidelity during hydrologically stable periods, but did not show fidelity during high flow periods. Movement rates were more variable for smaller redeye bass, while larger fish moved less. On average redeye bass moved 705 m during the ten weeks they were monitored.

Home range estimates were difficult to determine due to limited battery life of transmitters. Fifty percent (core) kernel density estimates were similar to what was reported for other black bass species. Ninety-five percent kernel density estimates were calculated, but this research lacked sufficient samples sizes to conclude any valid biological inferences. Future research should focus on tagging larger fish that can be tagged with larger transmitters to gain a better understanding of home range for the species.

Habitat research indicated that there appeared to be some intra-specific competition between redeye bass. Tagged fish were never associated with one another, and juvenile fish appear to occupy sub-optimal habitats. Results from habitat selection analysis indicated that the presence of canopy cover and interactions between specific variables were important predictor variables of redeye bass selection. Some differences were observed between adult and juvenile habitat selection. Adult fish selected locations with an interaction between interactions between relative depth and presence of instream features, interactions between boulders and canopy cover, and presence of instream features reduced distances to shore interactions. Juvenile fish also selected areas with increasing canopy cover, increasing relative depth, interactions between the presence of instream features and depth, and a complex interaction between boulder and sand substratum, that had increased depths. Results from this research will assist managers with gaining a greater understanding of life history requirements of redeye bass, and facilitate management of this potentially valuable fisheries resource.

Irwin, Elise R., K.M. Kennedy, T.C. Goar, B.M. Martin, and M.M. Martin. 2011. **Adaptive management and monitoring for restoration and faunal recolonization of Tallapoosa River shoal habitats**. Alabama Cooperative Fish and Wildlife Research Unit Report 2011-1, 49 pp. Available:<
http://www.outdooralabama.com/sites/default/files/Tallapoosa%20Shoals%20Final%20Report.pdf>. Accessed December 11, 2017.

EXECUTIVE SUMMARY: The widespread fragmentation and alteration of riverine habitat by dams require management options that both address restoration and conservation of native aquatic biota and fisheries and increase knowledge of the relations between faunal processes and flow variability. Since 2005, flow management changes from R.L. Harris Dam on the Tallapoosa River, Alabama, have been implemented as part of an adaptive management project to determine optimal flows for multiple competing management objectives. The main objective of the current project was to evaluate the effects of these management flows on the recovery of shoal-dwelling species of greatest conservation need (GCN) and the persistence of functional shoal habitats in the Tallapoosa River.

Faunal sampling was conducted in spring (May-June) and fall (September-November) 2005-2009 using prepositioned area electrofishers (PAEs). Specific microhabitat variables (depth, velocity, percent vegetation, and substrata composition) were measured for each PAE sample. Index of biotic integrity (IBI) was calculated for spring and summer samples in each year for each site. Crayfish catch data were examined for differences in catch per effort, size distribution, and species composition for differences between regulated and unregulated sites using non-parametric K-S tests and paired t-tests.

Estimates of detection, occupancy, extinction, and colonization were calculated for fourteen selected fish species; estimates of detection and occupancy were calculated for all collected crayfish species. These estimates were calculated using maximum likelihood methods and modeled as a function of measured covariates using the logit link function. Competing models of species dynamics were compared using Akaike's information criterion (AIC).

To examine reproductive condition, a random subsample of fish from each shoal in each year were examined for presence of viable reproductive organs. Percent mature females was determined for each of nine species as an indicator of reproductive condition. To assess hatch date of Centrarchid sport fish, young-of-year (YOY) redbreast sunfish, spotted bass, and redeye bass were collected approximately 30, 60, and 90-days after the onset of spawning in 2005 and 2007, and daily ages and hatch dates were estimated from extracted otoliths. Hydrologic data from USGS gage stations were examined against hatch frequencies to determine optimal flow conditions for spawning and subsequent recruitment.

Overall, IBI values were lower among regulated sites; however, IBIs varied widely among sites, within and among river reaches, between seasons, and among years. Nine of the fourteen species examined for species occupancy dynamics had parameters that varied between regulated and unregulated sites. Two of the six GCN fish species, both darters, were apparently unaffected by the impact of Harris Dam; lipstick darter appeared to have a slight positive response to regulation. Occupancy estimates of the remaining three GCN species suggested that these species are either in decline or absent altogether in the regulated reach below Harris Dam. For all crayfish species, detection was a function of habitat variables; vegetation and velocity affected detection positively, while depth had a negative effect on detection.

Proportion of mature female fish varied among years and sites. No mature largescale stoneroller *Campostoma oligolepis* females were observed at any sites or years. Mature female Tallapoosa shiners *Cyprinella gibbsi* and bullhead minnows *Pimephales vigilax* were observed in the unregulated reaches only. There were no significant differences in total length of YOY Centrarchids found among sites. Hatch dates of YOYs were not correlated to prolonged stable flow periods in 2005, but were correlated in 2007, when the majority of hatches occurred during or up to 3 days after periods of stable, low flows. Stable flow periods may provide for greater availability of suitable spawning and juvenile habitat which allows for recruitment to a stage and size where fish can withstand daily fluctuating discharges.

In general, our results indicated that the Tallapoosa River fish and crayfish assemblage varies considerably, not only between the regulated and unregulated river, but also within the unregulated reaches, both between seasons and among years. These results suggest that there is a natural level of variability that should be expected, and even perhaps managed for. Maximizing conservation potential in free-flowing sections of rivers of Alabama will require, at minimum, clear evidence of effects of regulated flow regimes on river biota. An adaptive management approach holds substantial promise for improving management of regulated rivers by allowing managers and scientists to address the uncertainty in predicting and measuring faunal response to flow alterations.

Early, Laurie Anne. 2012. **Hydro-peaking Impacts on Growth, Movement, Habitat Use and the Stress Response on Alabama Bass and Redeye Bass, in a Regulated Portion of the Tallapoosa River, Alabama** (Master's thesis). Available: < https://etd.auburn.edu/bitstream/handle/10415/3189/Earley_Thesis.pdf?sequence=2&isAllowed=y>. Accessed December 11, 2017.

ABSTRACT: Altered flow regimes caused by dam construction and operation can affect aquatic organisms in a variety of ways. The Tallapoosa River, in east-central Alabama, has been extensively impounded for flood control, navigation in the Alabama River, hydropower and water supply. None the less, the river still supports an important sport fishery. There has been previous research on the Tallapoosa River studying fish community responses to the altered flow regime. However, there has been minimal work on sportfish, including the black bass found within the river system. The objective of this research was to investigate the impacts of the altered flow regime on growth, movement, habitat use and the stress response on Alabama Bass *Micropterus henshalli* and Redeye Bass *Micropterus coosae*.

Dams and altered flow regimes may impact growth of aquatic organisms. Using incremental growth techniques, annual growth of Alabama Bass and Redeye Bass in the Tallapoosa River was evaluated in response to variation in flow regime. Age was the best explanatory variable that described growth in all models, although flow variables were included in more than half the models. Growth was higher for age-1 fish in years with less flow variation; however, growth was similar among years for age-2 and age-3 fish. Overall growth rates for Alabama Bass and Redeye Bass were higher in the unregulated sites, than either regulated sites. Alabama Bass had higher growth rates than Redeye Bass at the Middle and Lower sites; however, growth was similar between species the upper site. From this study, it appeared that growth was not severely impacted by the altered flow regime.

Little is known about the movement and habitat use of Alabama Bass and Redeye Bass in the Tallapoosa River, specifically below R.L. Harris Dam, which operates as a hydropeaking facility. With the use of radio telemetry both species were tracked over 37 weeks to better understands movement and habitat use of these two species. Movement was strongly associated to season, with both species having the highest movement in the spring. No major difference was observed in movement based on the altered flow regime. However, shifts in habitat use were observed during the altered flows, which may be due to fish relocating to more suitable habitat or for better foraging.

Lastly, stressors, such as alteration in temperature, oxygen or hydrology, can induce acute or chronic stress, which in turn can impact the overall fitness of an organism. Cortisol response is a good indicator of acute stress and additional measurements of stress include leukocyte profiles, with neutrophils increasing and lymphocytes decreasing (N:L). The physiological stress response was studied in both Alabama Bass and Redeye Bass, to determine if the altered flow regime has any impact. Results showed that there is a trend for both baseline cortisol levels and N:L to be higher in the fish found at the disturbed location. Additionally, the percent change of cortisol was higher at the reference site. Results suggest that fish in the treatment site have an altered stress response that may be due to the non-natural flow regime.

Goar, Taconya Piper. 2013. **Effects of hydrologic variation and water temperatures on early growth and survival of selected age-0 fishes in the Tallapoosa River, Alabama** (Ph.D. dissertation). Available: < https://etd.auburn.edu/bitstream/handle/10415/3604/Taconya%20Goar_Dissertation_2013b.pdf?sequence=2&isAllowed=y>. Accessed December 11, 2017.

ABSTRACT: Altered flow regimes resulting from the construction of hydropower dams can negatively affect aquatic organisms in a variety of ways. The effects of flow and temperature variation on early growth, survival, and hatching success were examined at regulated and unregulated sites in the Tallapoosa River, Alabama. Previous research on the Tallapoosa River has focused on community responses to altered flow regimes in adult populations. However, very little information exists on specific impacts and responses of fish in early life stages. The objectives of this study were to: 1) estimate daily incremental growth rate and back calculate hatch dates of age-0 Redbreast Sunfish *Lepomis auritus* 2) examine relations between average daily incremental growth rate and age, hydrology, temperature, site type (regulated or unregulated) and year; and 3) examine relations between hatch success and frequency and hydrology at regulated and unregulated sites in the Tallapoosa River; and 4) quantify the effects of fluctuating water flow and decreased water temperatures on early daily growth and survival of age-0 Channel Catfish *Ictalurus punctatus* and Alabama Bass *Micropterus henshalli* through a series of laboratory experiments.

Effects of hydrology on early growth and hatching success of age-0 Redbreast Sunfish were examined at regulated and unregulated sites in the Tallapoosa River. Average daily incremental growth techniques were used to back calculate daily incremental growth and estimate hatch dates and predict hatch success. Early growth was impacted by site type and year and hatching success was impacted by flow and temperature variables. Overall daily growth rate and incremental growth rate varied among years and was higher at regulated sites than unregulated sites. Model comparison indicated that the best overall model that described average daily incremental growth included: site type, age, year, the number of hours discharge was greater than 220 cms (FLOW1), the number of cumulative degree days, and the day of year that the growth increment occurred as independent variables. However, overall model fit was poor. Additional models, with flow and temperature variables excluded, were evaluated and compared with Akaike's Information Criterion (AICc). The best overall model included site type, age, and year as independent variables and explained 33% of the variation in average daily incremental growth rate. These results suggest flow and temperature regimes are important predictors of hatching success, and that early growth is impacted more by site type and year. The number of reversals, number of hours discharge was between 0 – 60 cms, number of cumulative degree days, and year were predictors of hatch success. Hatch frequency was higher and occurred earlier in unregulated sites compared to later hatching in regulated sections. Managing instream flows to provide periods of low-stable flows and temperatures should positively affect growth rates, increase hatching success, and increase subsequent recruitment of redbreast sunfish downstream of R. L. Harris Dam.

In experimental studies, results suggest that strong fluctuating flows and decreased water temperatures negatively affected daily growth rates and survival of age 0 Channel Catfish and Alabama Bass. Mortality was highest in treatments with decreased water temperatures. Daily growth rates were lower in treatments with decreased water temperatures. Older fish had higher daily growth rates and decreased mortality, and were not as susceptible to the negative effects of treatments. These data also suggest that growth and survival may be impacted more by fluctuations in temperature (Δ10 °C) versus flow variation. However, treatments with high flow also exhibited decreased growth and some mortality. Management efforts should consider both flow and temperatures regimes together in an effort to increase growth rates, survival, and increase subsequent recruitment of fish in regulated rivers.

Managers are encouraged to use models and conclusions described in this dissertation as part of their decision-making and objective-setting processes, in an adaptive management framework, to manage flow regimes in regulated rivers. Specifically, we recommend 1) thermal modification technologies at hydropeaking dams be investigated for suitability and feasibility; 2) instream flow management include thermal regimes and variation as part of management objectives; and 3) spawning and rearing windows continue to be employed, with evaluations on an annual basis, as a management tool to increase recruitment of fish in regulated rivers. The models and variables herein described should be continually improved upon and updated as more information is learned and uncertainty reduced. Additional data collection and experimentation is necessary to monitor fish populations and their response to the flow and temperature regimes in regulated rivers.

Sammons, Steven M. L.A. Early, and C.E. McKee. 2013. **Sportfish Dynamics in the Regulated Portion of the Tallapoosa River between Harris Dam and Lake Martin**, Alabama. Report to Alabama Department of Conservation and Natural Resources. F11AF00570 (AL F-40-40) Study 60.

EXECUTIVE SUMMARY: The Tallapoosa River, in east-central Alabama, has been extensively impounded for flood control, navigation in the Alabama River, hydropower and water supply. However, the river still supports an important sport fishery for species such as channel catfish, largemouth bass, redbreast sunfish, redeye bass, and Alabama bass. There has been previous research on the Tallapoosa River studying fish community responses to the altered flow regime, but there has been minimal work on sportfish, especially the black bass found within the river system. This study was conducted in the 79-km portion of the Tallapoosa River regulated by Harris Dam. The target species were the four principal sportfish species found in this section: Alabama bass *Micropterus henshalli*, channel catfish *Ictalurus punctatus*, redbreast sunfish *Lepomis auritus*, and redeye bass *M. coosae*. Our objectives were to (1) describe age and growth of the four target species and determine any impacts on these metrics by the altered flow regime, (2) examine behavior and habitat use of Alabama bass and redeye bass in response to altered flow regimes, (3) describe first-year dynamics of age-0 Alabama bass, redbreast sunfish, and redeye bass and determine influences of flow on hatch-date distribution and growth, and (4) develop a successful standardized sampling protocol for sampling the Tallapoosa River between Lake Martin and Harris Dam that can be used by ADCNR biologists in the future to monitor important sport fish populations.

<u>Age and Growth of the Four Target Species.</u> Anthropogenic factors such as dam construction and hydropower generation can dramatically alter the flow regime of rivers and may impact growth of aquatic organisms. Age and growth of Alabama bass *Micropterus henshalli*, redeye bass *Micropterus coosae*, channel catfish *Ictalurus punctatus*, and redbreast sunfish *Lepomis auritus* were described in the Tallapoosa River, Alabama. Fish were collected from Hillabee Creek and the Tallapoosa River above Harris Dam (unregulated areas) and at two sites downstream of the dam (regulated areas). Using incremental growth techniques and residual analysis, growth and recruitment of these species were evaluated across these areas in response to variation in flow regime. Flow variables were created for each growth year and recruitment year and the best model that described growth and recruitment of each species at each location was chosen using Akaike's Information Criterion. Additionally, growth increments at age 1, 2 and 3 were compared between a less variable flow year and one of a higher variation. Lastly, an analysis of covariance was used to compare growth rates of these species across the three sampling areas. Alabama bass and channel catfish were collected up to age 12, redeye bass up to age 8, and redbreast sunfish only up to age 5 during the study. Annual mortality of these species was relatively low, and approximated likely natural mortality values. Age was the best explanatory variable that described growth in all models, although flow variables were included in more than half the models for black bass. However, flow variation explained < 2% of the variation in growth in every instance. Growth of age-1 Alabama bass and redeye bass was higher in years with less flow variation; however, growth was similar among years for age-2 and age-3 fish. Growth of most species was highest in the middle area, which had the highest hydrologic variation. Recruitment of each species was relatively consistent over the time period examined in each area. Recruitment of Alabama bass and channel catfish was lower in years with high flow

variability in the unregulated portion of the Tallapoosa River, but was not affected by flows in the regulated areas. Recruitment of redeye bass was unaffected by hydrologic variation in any area, but the short lifespan of the species may have obscured any relationships. Overall, this study did not provide strong evidence that growth, mortality, or recruitment of any species was heavily influenced by flow.

<u>Behavior and Habitat Use of Alabama Bass and Redeye Bass.</u> Alabama bass *Micropterus henshalli* and redeye bass *Micropterus coosae*, are two native game fish in the state of Alabama, but little is known about the movement and habitat use of these species, especially in response to altered flow regimes resulting from hydropeaking operation. Therefore, 22 Alabama bass and 20 redeye bass were implanted with radio tags and tracked for 37 weeks, from December 2010 to September 2011 in the Tallapoosa River, Alabama, below R.L. Harris Dam, which operates as a hydropeaking facility. All fish were located regularly to describe seasonal patterns in movement and habitat use. Additionally, 8-9 fish were tracked weekly every 2 h over the course of 10 h to assess the effects of altered flows on movement and habitat use by the two species during different aspects of the hydrograph (base, rising, peak, and falling flows). Movement of both species was strongly associated to season, with the highest movement observed in the spring. Total home range (95%) and core areas (50%) of both species were similar; however, redeye bass total home range size decreased as fish size increased. Alabama bass were typically found in fine sediment substrates but increasingly used more woody debris for cover from winter to summer. Redeye bass were typically found in rocky substrate but less rocky cover and more woody debris in summer months. Both Alabama bass and redeye bass daily movement did not appear to be affected by the altered flow; however, Alabama bass were found closer to shore in vegetated or woody debris habitat during high flows in spring and summer, but farther away in rocky habitat during winter. In contrast, redeye bass showed little lateral movement in the river or change in habitat use in response to higher flows in most seasons, but, similar to Alabama bass, were found in shoreline vegetated habitats more often during high flows in spring. These shifts in habitat during different flows should be further investigated to evaluate possible consequences to overall fitness.

<u>First-year Dynamics of Alabama Bass, Redeye Bass, and Redbreast Sunfish.</u> In 2010-2011, age-0 black bass (309 Alabama bass and 216 redeye bass) and redbreast sunfish (N = 272) were collected from three areas in the Tallapoosa River, Alabama, to describe hatch-date distributions and daily incremental growth rates and determine if relative timing of hatching or growth was affected by altered flow regimes from Harris Dam. Across species and areas, black bass hatch dates ranged from April 5 to June 30 in 2010 and April 24 to June 19 in 2011. Mean hatch dates of these species were generally later in the upper, unregulated area than the lower regulated areas in 2010; timing was more variable among areas in 2011, but mean hatch dates were generally later in the middle area (closest to the dam) than the other areas. Successful hatching of all species generally occurred after water levels stabilized following large spates of water moving through the system; however, some spawning disruption was evident in all species in 2010, especially in the middle area. Flows were lower and more stable in 2011, and hatching distribution of all species was more consistent in all areas. Mean growth rates of black bass ranged from 0.51 to 0.92 mm/d across years and areas during the study; whereas, redbreast sunfish was slower, ranging from 0.40 to 0.62. Growth of Alabama bass was generally greater than redeye bass, and both were greater than redbreast sunfish. Results of this study found little evidence to support the theory that hydropeaking flows cause large spawning disruptions

or affect first-year growth of these species; however this study was conducted in two years of below average precipitation and flows. Future research of spawning and recruitment of these species should be conducted in years with higher precipitation to more clearly define the effects of hydropeaking flows on first-year dynamics of sportfish in the Tallapoosa River.

Optimizing a Standardized Sampling Program for Sportfish in the Tallapoosa River. A two-year electrofishing study was initiated in a 79-km section of the Tallapoosa River to identify an optimal standardized sampling program for four principal resident sport fish: Alabama bass *Micropterus henshalli*, channel catfish *Ictalurus punctatus*, redbreast sunfish *Lepomis auritus*, and redeye bass *Micropterus coosae*. Fish were collected from four sites, which were grouped into two areas: Price Island and Wadley (Upper Area) and Germany Ferry and Horseshoe Bend (Lower Area). Samples were conducted in spring (May), summer (July), and fall (October) in 2010 and 2011. Two habitat types were sampled: shoal areas, characterized by large rock substrate and cover, shallow (< 1.5 m) water, and noticeably faster flows, and riverbank area, characterized by variable substrate, lower gradient, and abundant woody debris cover. Riverbank collections consisted of 1-h transects along the shoreline; whereas, shoal habitats were sampled using 2-3, 10-min transects conducted throughout the habitat. Sampling at Horseshoe Bend and Germany Ferry was conducted along two, 1-h riverbank transects and 3, 10-min shoal collections. Sampling at Wadley also consisted of two riverbank transects but only 2, 10-min shoal collections, due to limited habitat. Similarly, sampling at Price Island consisted of only one, 1-h riverbank transect and no shoal collections due to limited accessible habitat. 4 Also, the precision of 10-60-min electrofishing transect durations was evaluated using riverbank transects for estimating relative abundance of Alabama bass, redbreast sunfish, and redeye bass. The goal of this analysis was to optimize transect duration so that catch rates may be estimated precisely and with the least sample effort. A total of 1,240 Alabama bass, 172 channel catfish, 5,257 redbreast sunfish, and 187 redeye bass were collected during this study. Mean CPE across areas, seasons, and habitats ranged from 9.5-33.6 fish/h for Alabama bass, 0.1-8.3 fish/h for channel catfish, 28.7-139.6 fish/h for redbreast sunfish, and 0-2.2 fish/h for redeye bass. Little seasonal differences were observed in catch-per-effort (CPE) or size structure for any species, although few channel catfish were captured in spring. However, flows during both years of this study were low, due to below-average annual precipitation, thus in normal years spring sampling is likely to be less effective due to higher flows. Channel catfish CPE was higher in shoal habitat than riverbank habitat; whereas, the reverse was true for redeye bass. Otherwise, little differences in CPE or size structure were observed among habitats. The CPE of Alabama bass ≥ 300 mm total length (TL) was higher in the upper area than the lower area; whereas, overall CPE of channel catfish was higher in the lower area in summer and fall, which also appeared to have more channel catfish > 400 mm TL. However, overall CPE of all species other channel catfish was similar between areas. Body condition of most species was higher in spring than the other seasons, and was generally similar among areas. Mean CPE of Alabama bass, redbreast sunfish, and redeye bass in riverbank transects was independent of transect duration. The variation in CPE among samples of equal duration increased as CPE and transect duration decreased for all three species, resulting in the need for more samples, especially at higher CPEs. The total effort (i.e., time spent electrofishing and processing fish) needed to estimate a mean CPE with a specified precision was a function of transect duration and CPE. More effort was needed as CPE decreased for most species, but the relation between transect duration and total effort was parabolic, especially at higher CPEs for Alabama bass and lower CPEs for redbreast sunfish. A precision of within 10% of the mean CPE was unattainable for most species due to space and logistic considerations. Based on the results of this study, it appears that fall is the optimal time to sample this section of the Tallapoosa River, which is historically the time of the lowest flows in southeastern rivers. Based on the results of the sample size portion of this study, the optimal transect duration for monitoring mean CPE of Alabama bass, redbreast sunfish, and redeye bass is likely 10 min. At a precision level of 20% of the mean, the number of 10-min transects required ranged from 5-40, with a total sample time for each individual species of 0.82-7.16 h. However, because all species would likely be collected simultaneously, the overall sample protocol should likely be a maximum of 40 riverbank transects of 10 min duration. This will result in an estimated total sample time on the water of approximately 12 h. Shoal habitat may be omitted from standardized sampling due to the limited amount of this habitat, and the lack of differences observed in population metrics between habitats. Likewise, channel catfish CPE and size structure is unlikely to be reliably estimated using this protocol, due to the low CPE and specific habitat preferences of this species.

Gerken, Clark N. 2015. **A Hook and Line Assessment and Angler Survey of the Tallapoosa River Fishery (Alabama, USA)** (Master's thesis). Available: < https://etd.auburn.edu/bitstream/handle/10415/4925/GerkenThesisThree.pdf?sequence=2&isAllowed=y>. Accessed December 11, 2017.

ABSTRACT: Angler satisfaction is one of many fundamental objectives in the adaptive evaluation of flow prescriptions below R. L. Harris Dam on the Tallapoosa River in Alabama. We have collected fishery specific information to inform future management decisions related to flow regimes. Quantification of the fishery resource below R.L. Harris Dam was conducted using hook and line sampling from canoes and kayaks by multiple anglers during several seasons and three years and over a range of flow conditions. This allowed for an assessment of conditions that may have influenced angler catch statistics in the river. Regulated and unregulated reaches of the river were fished by 2-4 anglers during three different seasons: spring, summer and fall (2013 and 2014). Angling was conducted during different water conditions including river hydrology, water temperature, and weather conditions. Small spinner baits were trolled behind the boats in an attempt to present lures to most species of sport fish (i.e., *Micropterus spp*., *Lepomis spp*., *Morone spp*. and *Ictalurus punctatus*). We recorded each capture encounter in the river during each sampling trip; individual fish were weighed and measured and harvest-per-unit-effort (# fish/angler hour) was calculated by species and by angler. Water temperature was recorded at beginning of sampling trips using a thermometer. Hydrologic data were collected from USGS gages and various metrics were summarized for the angling days. Stepwise multiple regression models were constructed to evaluate impacts of environmental and physical variables on angler catch. Results indicated that water temperature was positively correlated with harvest-per-unit-effort at all study sites and discharge was negatively correlated. The unregulated reach above the dam had the most diverse catch consisting of eight species. Catch rates varied among seasons and river reach; highest catch rates were observed in the spring in the middle reach below Harris Dam (4.21 fish/h); whereas, the lowest catch rates were also observed in the spring at the site most downstream from the dam (0.38 fish/h).

A mail survey was used to quantify Tallapoosa River angler demographics, preferences and desired fishing conditions. The mail survey was sent to 2000 fishing license holders in counties surrounding the Tallapoosa River between the Georgia state line and Lake Martin, Alabama. An online survey was also available for those anglers who did not receive a mail survey. Signs were posted at access points along the river with instructions for anglers to take the online survey.

Surveyed anglers targeted catfishes and black basses; 55% of the survey respondents were satisfied with the catch rates that averaged 2.04 fish per hour. The average angler was an older white male. Anglers would like to have more days where the river was more suitable to boating. Fishing the Tallapoosa River was an important tradition to the participants in the survey; they do it to be outdoors, to enjoy nature, and for relaxation. Time, lack of access, and unknown water flow conditions were top reasons for not fishing on the Tallapoosa River.

The results of both the fishery independent and angler survey for this river will help inform decisions related to management of the fishery and toward maintaining or increasing angler satisfaction. The models constructed can assist anglers to decide the river conditions and seasons for targeting certain species. Results from this study indicate that temperature and flow from R.L. Harris dam may influence recreation and angler satisfaction on the river.

Kennedy, Kathryn Dawn Mickett. 2015. **Quantitative methods for integrating instream biological monitoring data into aquatic natural resource management decision making** (Ph.D. dissertation). Available: < https://etd.auburn.edu/bitstream/handle/10415/4496/Kennedy_Dissertation_final.pdf?sequence=2&isAllowed=y>. Accessed December 11, 2017.

ABSTRACT: Freshwater aquatic resource management is fraught with challenges, as managers of multiple-use, highly diverse systems must frequently make management decisions with limitations including unclear management objectives and inadequate knowledge of system state and response. In this dissertation, I present three different freshwater aquatic resource management problems and examine the application of quantitative methods to address specific limitations in each.

The first management context was a small wildlife refuge faced with making land use decisions that consider impacts to aquatic resource objectives. I examined hypotheses relating fish species occupancy to land use using multiple model comparison. Four species – striped shiner *Luxilus chrysocephalus*, redbreast sunfish *Lepomis auritus*, orangespotted sunfish *L. humilis*, and longear sunfish *L. megalotis* – had strong support for land use as a predictor of occupancy. However, only orangespotted sunfish had an estimated occupancy probability that was predicted to decrease with increasing urban and agricultural land use. Results suggest both the dominance of a mainstem reservoir in defining patterns of fish species distribution and the tolerance to urban and agricultural land use of most encountered species.

The second management context was a hydropower-regulated river in which an adaptive management program has been initiated. Also using multiple model comparison, I examined patterns of fish species occupancy to evaluate the potential response to an implemented management action and to inform the next adaptive management iteration. Nine of 13 fish species had distributions that reflected downstream impacts of the hydropower dam. Model results for three species – two minnows and one darter – indicated a potential positive response to management action, whereas up to five species – largescale stoneroller *Campostoma oligolepis*, Alabama hogsucker *Hypentelium etowanum*, speckled madtom *Noturus leptacanthus*, redbreast sunfish Lepomis auritus, and muscadine darter *Percina smithvanizi* – demonstrated potential negative responses. I hypothesize that an altered thermal regime may be inhibiting occupancy of several fish species, and recommend that the next iteration of adaptive management focus on thermal restoration.

The final management context considered statewide management of aquatic resources. In many states, established biomonitoring programs are expected to inform decision making. However, use of these data is often restricted to site classification decisions. To facilitate broader use, I provide a general framework to incorporate the index of biotic integrity (IBI), a widely used multi-metric index, into aquatic resource management decision making. I demonstrate use of the framework for a specific decision context wherein the IBI provides a basis for informing the selection of instream flow management alternatives that meet defined objectives of a state resource agency.

Data collected as part of a freshwater monitoring program may be used to inform and support management decision making by adding to our knowledge of system state and of system response to management actions. However, the most successful freshwater aquatic resource management program will include explicit definition of management objectives and hypotheses of system response, a monitoring plan linked directly these objectives and hypotheses, and a flexible management framework, such as adaptive management, that allows for the integration of monitoring data to update hypotheses and improve future management decision making.

Irwin, E.R. and T.P. Goar. 2015. **Spatial and temporal variation in recruitment and growth of Channel Catfish Alabama bass and Tallapoosa Bass in the Tallapoosa River and associated tributaries**. U.S. Department of Interior, Fish and Wildlife Service, Cooperator Science Series FWS/CSS -116, Washington, D.C.

ABSTRACT: Effects of hydrology on growth and hatching success of age-0 black basses and Channel Catfish were examined in regulated and unregulated reaches of the Tallapoosa River, Alabama. Species of the family Centrarchidae, *Ictalurus punctatus* Channel Catfish and *Pylodictis olivaris* Flathead Catfish were also collected from multiple tributaries in the basin. Fish were collected from 2010-2014 and were assigned daily ages using otoliths. Hatch dates of individuals of three species (*Micropterus henshalli* Alabama Bass, *M. tallapoosae* Tallapoosa Bass and Channel Catfish) were back calculated, and growth histories were estimated every 5 d post hatch from otolith sections using incremental growth analysis. Hatch dates and incremental growth were related to hydrologic and temperature metrics from environmental data collected during the same time periods. Hatch dates at the regulated sites were related to and typically occurred during periods with low and stable flow conditions; however, no clear relations between hatch and thermal or flow metrics were evident for the unregulated sites. Some fish hatched during unsuitable thermal conditions at the regulated site suggesting that some fish may recruit from unregulated tributaries. Ages and growth rates of age-0 black basses ranged from 105 to 131 d and 0.53 to 1.33 mm/day at the regulated sites and 44 to 128 d and 0.44

to 0.96 mm/d at the unregulated sites. In general, growth was highest among age-0 fish from the regulated sites, consistent with findings of other studies. Mortality of age-0 to age-1 fish was also variable among years and between sites and with the exception of one year, was lower at regulated sites. Multiple and single regression models of incremental growth versus age, discharge, and temperature metrics were evaluated with Akaike's Information Criterion (AICc) to assess models that best described growth parameters. Of the models evaluated, the best overall models predicted that daily incremental growth was positively related to low flow parameters and negatively related to the number of times the hydrograph changed direction (e.g., reversals). These results suggest that specific flow and temperature criteria provided from the dam could potentially enhance growth and hatch success of these important sport fish species.

Kosnicki, Ely, K. Ouellette, C. Lloyd, and E. Irwin. 2017. **Harris AMP Invertebrate Analysis Summary Report 2016**. Unpublished Report by Alabama Cooperative Fish and Wildlife Research Unit.

INTRODUCTION: Benthic macroinvertebrates are excellent biological monitoring units because they are diverse, easy to sample, their taxonomy and life-histories traits are well known, and they respond to a wide range of environmental impacts and disturbances (Metcalfe 1989; Barbour et al. 1999; Wright et al. 2000; Poff et al. 2006; Merritt et al. 2008). As the term "benthic" implies, they are generally relegated to the stream bottom from which they are sampled and although mobility exists in the form of drifting downstream, few species have significant dispersal capabilities in their immature phases. Thus, benthic macroinvertebrates communities are affected by acute as well as chronic disturbances, opposed to fishes which have the ability to swim to a refuge and return after an acute disturbance has subsided.

Macroinvertebrate life histories are directly linked to temperature thresholds (Vannote and Sweeney, 1980; Sweeney, 1984; Ward, 1992; Williams and Feltmate, 1992; Kosnicki and Burian 2003; Kosnicki and Sites 2011). Furthermore, community structures are greatly influenced by hydrological regimes (McElravy et al., 1989; Power et al. 1995; Hart and Finelli 1999; Bunn and Arthington 2002). Therefore, macroinvertebrate communities should show profound demarcations between regulated and non-regulated reaches in the Tallapoosa River basin.

The objective of this analysis is to explore the utility of using macroinvertebrate community characterization from regulated and unregulated reaches in the Tallapoosa River basin to provide 1) inference regarding the impacts of river regulation on macroinvertebrate assemblages and 2) identify measurable attributes (e.g., community similarity indices; presence-absence of specific taxa) that could be useful in determining "success" of prescribed flow and temperature changes at the dam. Surber samples taken from reaches of the Harris Dam project and provide some recommendations for research going forward. To meet project goals we needed to: 1) provide a standard operating procedure for efficiently processing Surber samples; 2) characterize the taxonomic assemblages from regulated and non-regulated reaches; 3) identify a suitable number of Surber samples necessary to quantify macroinvertebrate communities; 4) examine the utility of a suite of macroinvertebrate metrics for identifying differences between regulated and non-regulated reaches; 5) perform gradient analysis of metrics with distance from dam; and 6) give some recommendations for processing and analysis of the remaining samples.

Lloyd, M. Clint, Q. Lai, S. Sammons, and E. Irwin. 2017. **Experimental stocking of sport fish in the regulated Tallapoosa River to determine critical periods for recruitment**. U.S. Department of Interior, Fish and Wildlife Service, Cooperator Science Series FWS/CSS-128-2017, Washington, D.C.

ABSTRACT: The stocking of fish in riverine systems to re-establish stocks for conservation and management appears limited to a few species and often occurs in reaches impacted by impoundments. Stocking of sport fish species such as centrarchids and ictalurids is often restricted to lentic environments, although stocking in lotic environments is feasible with variable success. R. L. Harris Dam on the Tallapoosa River, Alabama is the newest and uppermost dam facility on the river (operating since 1983); flows from the dam have been managed adaptively for multiple stakeholder objectives since 2005. One of the stakeholders' primary objectives is to provide quality sport fisheries in the Tallapoosa River in the managed area below the dam. Historically, ictalurids and cyprinids dominated the river above Lake Martin. However, investigations after Harris Dam closed have detected a shift in community structure to domination by centrarchids. Flow management (termed the Green Plan) has been occurring since March 2005; however, sport fish populations as measured by recruitment of age-1 sport fishes below the dam has not responded adequately to flow management. The objectives of this research were to: (1) determine if stocking Channel Catfish *Ictalurus punctatus* and Redbreast Sunfish *Lepomis auritus* influences year-class strength; (2) estimate vital rates (i.e. growth, mortality, and recruitment) for Channel Catfish populations for use in an age-based population model; and (3) identify age-specific survivorship and fecundity rates contributing to Channel Catfish population stability. No marked Redbreast Sunfish were recaptured due to poor marking efficacy and therefore no further analysis was conducted with this species. Stocked Channel Catfish, similarly, were not recaptured, leaving reasons for non-recapture unknown. Matrix models exploring vital rates illustrated survival to age-1 for Channel Catfish to be less than 0.03% and that survival through ages 2 – 4 had equal contribution to overall population growth, indicating recruitment limitation may impact population size and stability. Results from this study indicate stock enhancement of sport fish populations below Harris Dam may not be an effective management technique at this time.

5.0 REFERENCES

Alabama Department of Conservation and Natural Resources (ADCNR). 1999. Charles Kelley, and Larry Goldman USFWS. "Instream flows in the Tallapoosa River between Harris Dam and the headwaters of Martin Reservoir." Received by Alabama Power Company, January 14, 1999, Birmingham, Alabama.

Alabama Department of Conservation and Natural Resources (ADCNR). 2016b. Wildlife Management Areas. Available at: http://www.outdooralabama.com/wildlife-management-areas. Accessed November 2016.

Alabama Power Company. 2018. Pre-Application Document for the Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Bowen, Zachary H., M.C. Freeman, and K.D. Bovee. 1998. Evaluation of Generalized Habitat Criteria for Assessing Impacts of Altered Flow Regimes on Warmwater Fishes. Transactions of the American Fisheries Society, 127(3): 455-468.

Bowen, Z.H., M.C. Freeman, and D.L. Watson. 1996. Index of biotic integrity applied to a flow-regulated river system. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 50:26-37.

Freeman, Mary C. Z. H. Bowen, K. D. Bovee, and E. R. Irwin. 2001. Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes. Ecological Applications, 11(1):179-190.

Irwin, Elise, K.M. Kennedy, T.P. Goar, B. Martin, M.M. Martin. 2011. Adaptive management and monitoring for restoration and faunal recolonization of Tallapoosa River shoal habitats. Alabama Cooperative Fish and Wildlife Research Unit. Available: http://www.outdooralabama.com/sites/default/files/Tallapoosa%20Shoals%20Final%20Report.pdf. Accessed March 19, 2018.

Irwin, Elise R. and M.C. Freeman. 2002. Proposal for Adaptive Management to Conserve Biotic Integrity in a Regulated Segment of the Tallapoosa River, Alabama, U.S.A. Conservation Biology, 16(5):1212-1222.

Kosnicki, Ely, K. Ouellette, C. Lloyd, and E. Irwin. 2017. Harris AMP Invertebrate Analysis Summary Report 2016. Unpublished Report by Alabama Cooperative Fish and Wildlife Research Unit.

O'Neil, Patrick E., T.E. Shepard, and M.R. Cook. 2006, Habitat And Biological Assessment Of The Terrapin Creek Watershed And Development Of The Index Of Biotic Integrity For The Coosa And Tallapoosa River Systems. Geological Survey of Alabama. Tuscaloosa, Alabama. Open-File Report 0601. 217 pp.

O'Neil, Patrick E. and T.E. Shepard. 2011. Calibration of the Index of Biotic Integrity for the Ridge and Valley/Piedmont Ichthyoregion in Alabama. Geological Survey of Alabama. Tuscaloosa, Alabama. Open-File Report 1109.

U.S. Fish and Wildlife Service (USFWS). 1999. Larry Goldman. "Information for your consideration regarding our perspective of the outstanding minimum flow issues at the Alabama Power Company's R. L. Harris Dam Hydroelectric Project (FERC No. 2628) on the Tallapoosa River in Alabama." Received by Alabama Power Company, December 6, 1999, Birmingham, Alabama.

Appendix A

Green Plan

R L HARRIS RELEASE CRITERIA – *Effective March 1, 2005*

1. Daily Release Schedule
    a. The required Daily Volume Release will be at least 75% of the prior day's flow at the USGS Heflin Gauge.
    b. In the event that the Heflin Gauge is not in service, the required Daily Volume Release will be at least one-fourth of the previous day's inflow into R L Harris Reservoir.
    c. The Daily Volume Release will not to be below 100 DSF.
    d. Operations to ensure that flows at Wadley remain above the 45 cfs minimum mark shall continue.
    e. The required Daily Volume Release will be suspended if R L Harris is engaged in flood control operations.
    f. The required Daily Volume Release will be suspended if it jeopardizes the ability to fill R L Harris.
2. Hourly Release Schedule
    a. If less than two machine hours are scheduled for a given day, then the generation will be scheduled as follows:
        i. One-fourth of the generation will be scheduled at 6 AM.
        ii. One-fourth of the generation will be scheduled at 12 Noon.
        iii. One-half of the generation will be scheduled for the peak load.
        iv. If the peak load is during the morning, one-fourth of the generation will be scheduled at 6 PM.
    b. If two to four machine hours are scheduled for a given day, then generation will be scheduled as follows:
        i. Thirty minutes of generation will be scheduled at 6 AM.
        ii. Thirty minutes of generation will be scheduled at 12 Noon.
        iii. The remaining generation will be scheduled for the peak load.
        iv. If the peak load is during the morning, thirty minutes of the generation will be scheduled at 6 PM.
3. Two Unit Operation
    a. On the average, there will be more than 30 minutes between the start times between the two units.
    b. Two units may come online with less than 30 minute difference in their start times if there is a system emergency need.
4. Spawning Windows

    Spring and Fall spawning windows will scheduled as conditions permit. The operational criteria during spawning windows will supersede the above criteria.

R L Harris Release Criteria – *Effective March 1, 2005*

1. Daily Release Schedule

   a. The required Daily Volume Release will be at least 75% of the prior day's flow at the USGS Heflin Gauge.

   b. In the event that the Heflin Gauge is not in service, the required Daily Volume Release will be at least one-fourth of the previous day's inflow into R L Harris Reservoir.

   c. The Daily Volume Release will not to be below 100 DSF.

   d. Operations to ensure that flows at Wadley remain above the 45 cfs minimum mark shall continue.

   e. The required Daily Volume Release will be suspended if R L Harris is engaged in flood control operations.

   f. The required Daily Volume Release will be suspended if it jeopardizes the ability to fill R L Harris.

Drought 2007-2008 R L Harris Release Criteria

a. If the flows at Wadley are at or above 100 cfs, there will be one pulse per day, which will result in a Daily Volume Release of approximately 50 DSF.

b. The flows at Wadley will not be lower than the flows at Heflin.

R L HARRIS MINIMUM FLOW PROCEDURE

STEP 1: CREATE SCHEDULE BASED ON PRIOR DAY'S HEFLIN FLOW

Prior Day's Heflin Flow (DSF)	Generation At 6 AM	Generation At 12 Noon	Generation As System Needs	Total Machine Time	R L Harris Total Disch (DSF)
0 < HEFLIN Q < 150	10 MIN	10 MIN	10 MIN	30 MIN	133
150 < HEFLIN Q < 300	15 MIN	15 MIN	30 MIN	1 HR	267
300 < HEFLIN Q < 600	30 MIN	30 MIN	1 HR	2 HRS	533
600 < HEFLIN Q < 900	30 MIN	30 MIN	2 HRS	3 HRS	800
900 < HEFLIN Q	30 MIN	30 MIN	3 HRS	4 HRS	1,067

STEP 2: ADD ADDITIONAL PEAK GENERATION AS NEEDED

STEP 3: ADJUST SCHEDULE IF NECESSARY

TOTAL SCH GENERATION	Generation At 6 AM	Generation At 12 Noon	Generation As System Needs	Total Machine Time	R L Harris Total Disch (DSF)
IF GENERATION = 1 MACH HR	15 MIN	15 MIN	30 MIN	1 HR	267
IF GENERATION = 2 MACH HRS	30 MIN	30 MIN	1 HR	2 HRS	533
IF GENERATION = 3 MACH HRS	30 MIN	30 MIN	2 HRS	3 HRS	800
IF GENERATION = 4 MACH HRS	30 MIN	30 MIN	3 HRS	4 HRS	1,067
IF GENERATION = 5+ MACH HRS			ALL		

<u>NOTES</u>

1. SCHEDULING OF GENERATION DOES NOT PRECLUDE THE ADDITION OF GENERATION AT ANY TIME.

2. ALL START TIMES ARE APPROXIMATE.

3. WHEN PULSING, IF THE SYSTEM DOES NOT DICTATE GENERATION DURING THE PM, A PULSE WILL BE SCHEDULED AT 6 PM.

4. R L HARRIS MIN FLOW PROCEDURE WILL BE SUSPENDED DURING ANY OF THE FOLLOWING CONDITIONS:
   - A) TALLAPOOSA RIVER HAS BEEN PLACED UNDER FLOOD CONTROL OPERATIONS.
   - B) FISH SPAWNING OPERATIONS HAVE BEEN SCHEDULED.
   - C) APC HAS DECLARED THAT CONDITIONS EXIST THAT THREATEN THE SPRING FILLING OF R L HARRIS RESERVOIR.

5. JANUARY 31, 2018 PRESENTATION - ADAPTIVE MANAGEMENT OF DOWNSTREAM FLOWS

R.L. Harris Dam Relicensing
FERC No. 2628

Adaptive Management of Downstream Flows

January 31, 2018
Stakeholder Informational Meeting

Agenda

- Harris Project Overview
- Harris Original License History
- Harris Adaptive Management Timeline

R.L. Harris Project Overview

Alabama Power Company's Hydroelectric Developments

HARRIS DAM RELICENSING

14 Developments

Warrior River

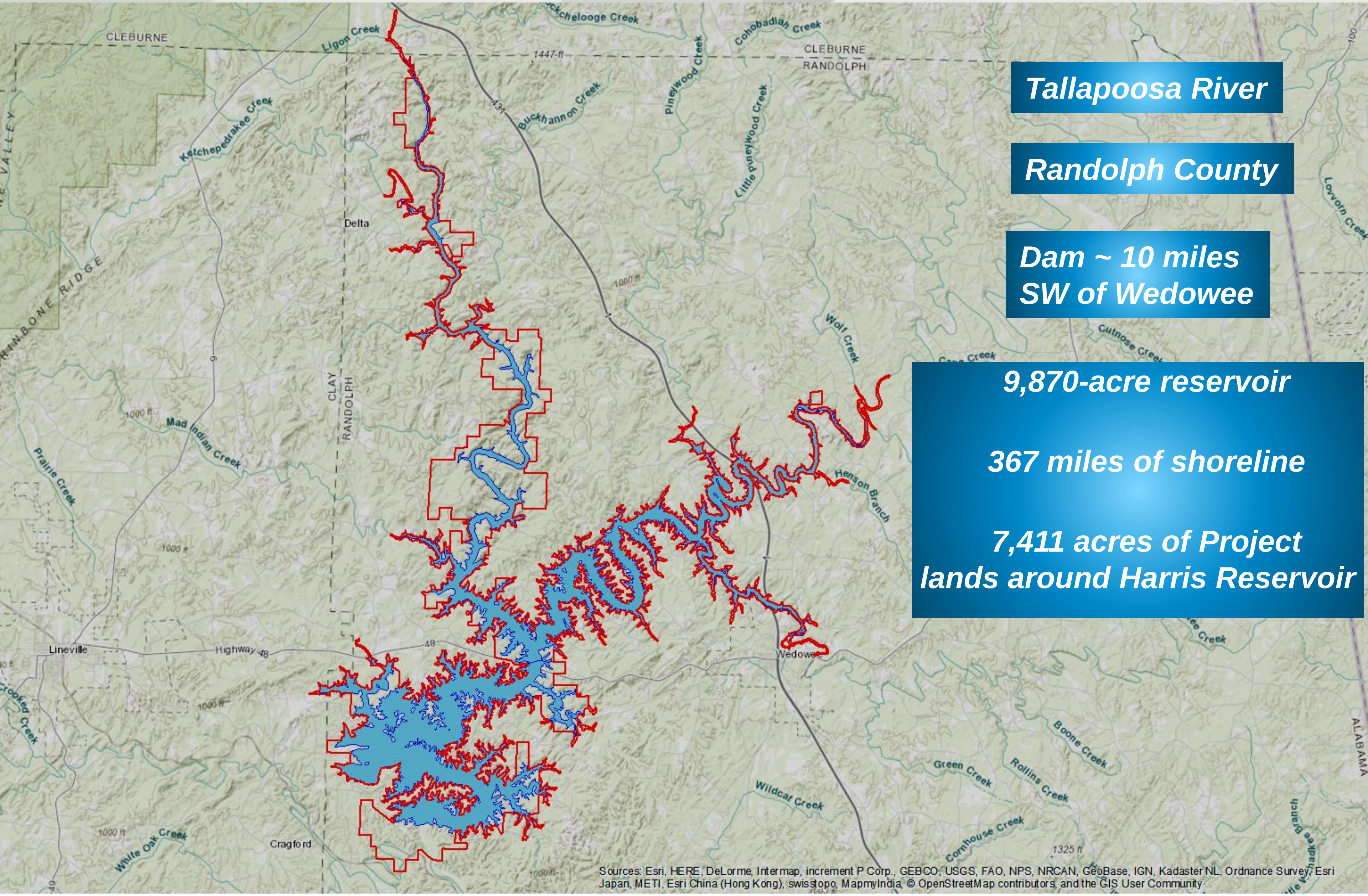
Coosa River

Tallapoosa River

Generation – 1,600 MW
Project Waters – 155,700 Acres
Project Lands – 119,500 Acres
Shoreline – 3,100 Miles
River Miles – 430 Miles
*All numbers approximate

Harris Project Overview

HARRIS DAM RELICENSING



Tallapoosa River

Randolph County

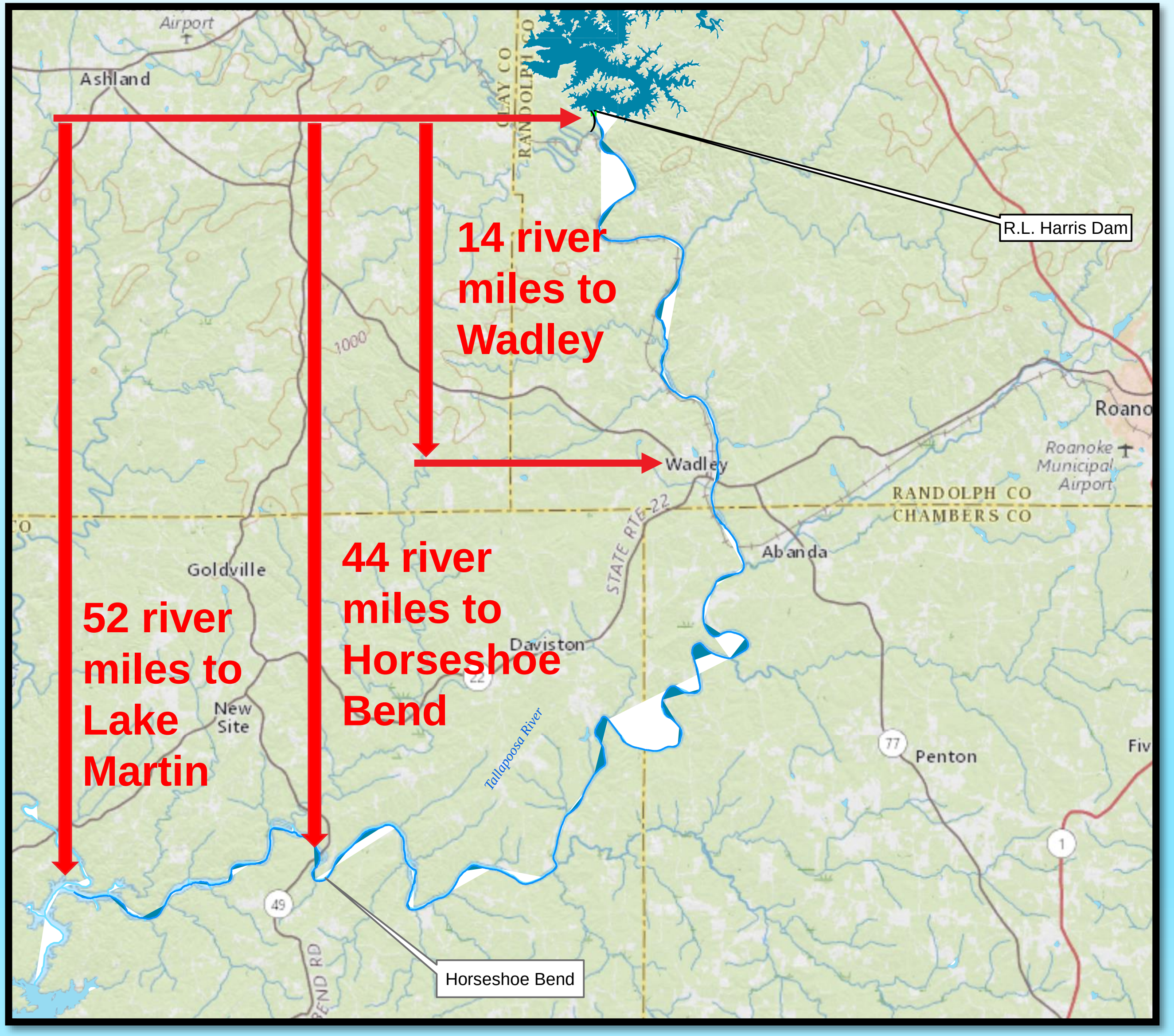
Dam ~ 10 miles SW of Wedowee

9,870-acre reservoir

367 miles of shoreline

7,411 acres of Project lands around Harris Reservoir

Distances

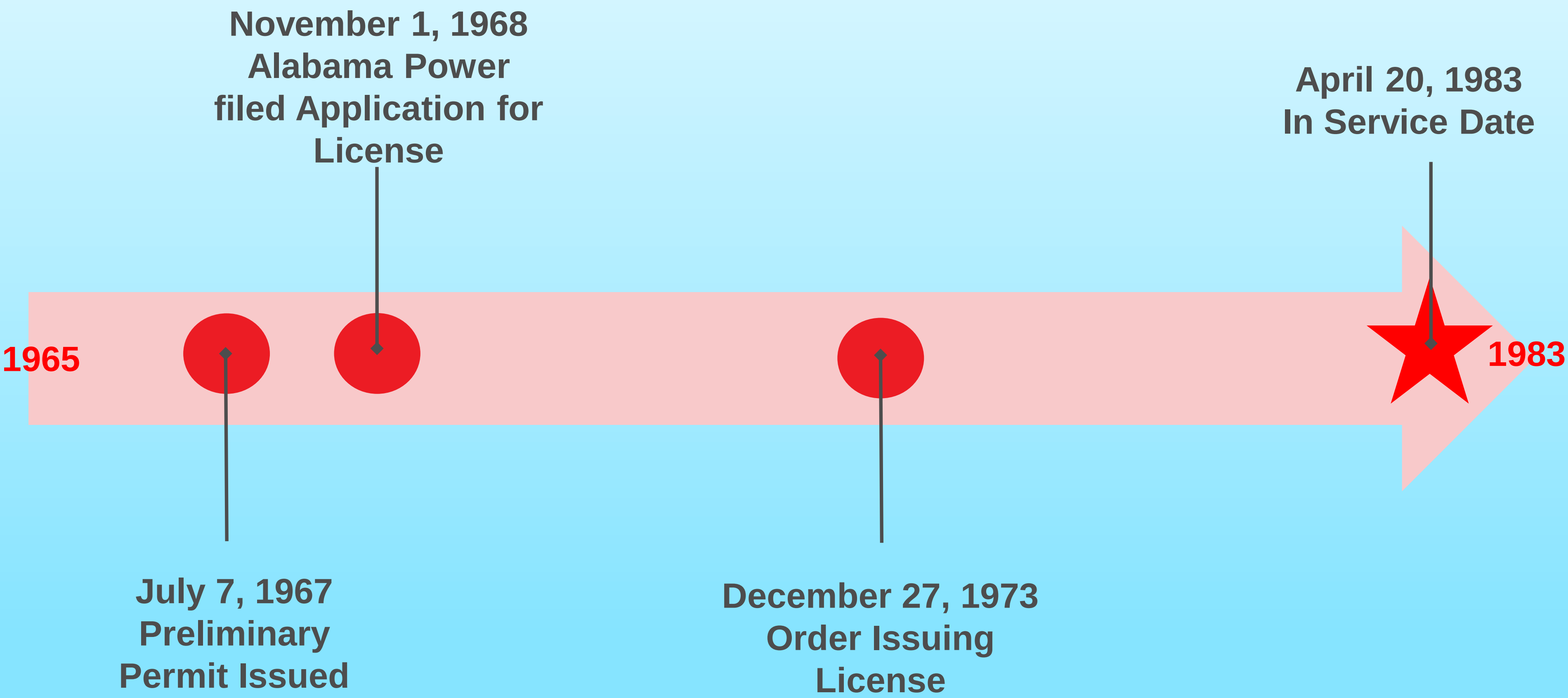


14 river miles to Wadley
44 river miles to Horseshoe Bend
52 river miles to Lake Martin
R.L. Harris Dam
Horseshoe Bend
Ashland
Airport
CLAY CO
RANDOLPH CO
Wadley
Goldville
Daviston
New Site
Abanda
Penton
Roanoke Municipal Airport
RANDOLPH CO
CHAMBERS CO
STATE RTE-22
Tallapoosa River
1000
49
77
22
1

License Timeline

Alabama Power

Harris Original License Timeline



Order Issuing License – December 27, 1973

In another issue relating to reservoir operating procedures, three agencies, the Environmental Protection Agency, the Alabama Department of Conservation and Natural Resources, and the U.S. Army Corps of Engineers, in letters to the Commission made inquiries and recommendations concerning the need to maintain adequate river flows. In addition, the Alabama Water Improvement Commission (AWIC) requested certain license conditions to insure that the construction and operation of the project would not contravene State water standards and recommended that a minimum continuous flow in the Tallapoosa River at the Wadley Gage be not less than 45 cfs. The AWIC water quality certificate issued to the Company included a provision for maintenance of this amount of flow. The Company has agreed to a minimum continuous flow of 45 cfs. We are requiring a minimum continuous flow of 45 cfs as measured at the Wadley Gage located several miles below the proposed dam.

Revised Exhibit S

1973 – 1980
Filing Extensions

March 1980
Alabama Power filed Revised Exhibit S

March 1981
Agency Comments filed

October 1981
FPC requests Alabama Power file revision

April 1982
Alabama Power submits for approval of a revised Exhibit S

September 1984
FPC issues order conditionally approving Revised Exhibit S

Adaptive Management Timeline 1998 - 2004

Alabama Power

Timeline: 1998 - 2004

Talks Begin
ADCNR and Alabama Power begin discussions about downstream flows

1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004

Timeline: 1998 - 2004

1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004

Talks Begin (1998)
ADCNR and Alabama Power begin discussions about downstream flows

USFWS Letter (1999)
Lays out perspective on outstanding minimum flow issues

Initial Discussions

- Re-regulation dams
- Geotubes
- House turbine
- Spillway gate modifications
- Pulsing operations

Timeline: 1998 - 2004

1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004

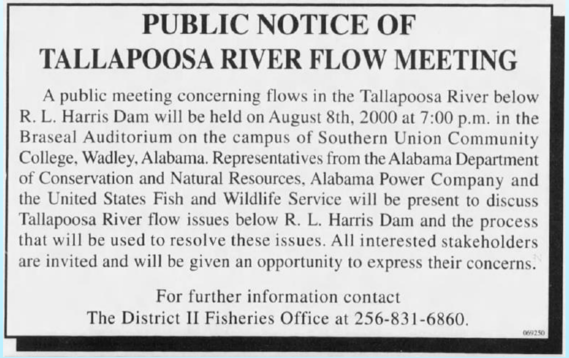
Talks Begin (1998)
ADCNR and Alabama Power begin discussions about downstream flows

USFWS Letter (1999)
Lays out perspective on outstanding minimum flow issues

Wadley Meeting (2000)
Over 100 attendees

Public Meeting on August 8, 2000

- Organized and facilitated by ADCNR
- FERC attended – encouraged collaboration
- Elise Irwin (ALCFWRU) presented Adaptive Flow Management concept.
- APC presented proposal for building a re-regulation dam within a seven-mile stretch below Harris Dam.

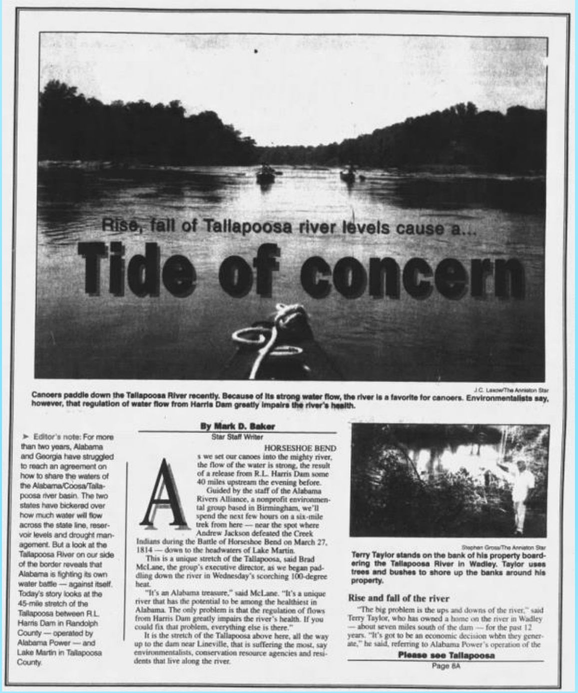


PUBLIC NOTICE OF TALLAPOOSA RIVER FLOW MEETING

A public meeting concerning flows in the Tallapoosa River below R. L. Harris Dam will be held on August 8th, 2000 at 7:00 p.m. in the Braseal Auditorium on the campus of Southern Union Community College, Wadley, Alabama. Representatives from the Alabama Department of Conservation and Natural Resources, Alabama Power Company and the United States Fish and Wildlife Service will be present to discuss Tallapoosa River flow issues below R. L. Harris Dam and the process that will be used to resolve these issues. All interested stakeholders are invited and will be given an opportunity to express their concerns.

For further information contact
The District II Fisheries Office at 256-831-6860.

Anniston Star August 20, 2000



Rise, fall of Tallapoosa river levels cause a...

Tide of concern

J.C. Lesow/The Anniston Star

Canoers paddle down the Tallapoosa River recently. Because of its strong water flow, the river is a favorite for canoers. Environmentalists say, however, that regulation of water flow from Harris Dam greatly impairs the river's health.

➤ Editor's note: For more than two years, Alabama and Georgia have struggled to reach an agreement on how to share the waters of the Alabama/Coosa/Tallapoosa river basin. The two states have bickered over how much water will flow across the state line, reservoir levels and drought management. But a look at the Tallapoosa River on our side of the border reveals that Alabama is fighting its own water battle — against itself. Today's story looks at the 45-mile stretch of the Tallapoosa between R.L. Harris Dam in Randolph County — operated by Alabama Power — and Lake Martin in Tallapoosa County.

By Mark D. Baker
Star Staff Writer

HORSESHOE BEND

As we set our canoes into the mighty river, the flow of the water is strong, the result of a release from R.L. Harris Dam some 40 miles upstream the evening before.

Guided by the staff of the Alabama Rivers Alliance, a nonprofit environmental group based in Birmingham, we'll spend the next few hours on a six-mile trek from here — near the spot where Andrew Jackson defeated the Creek Indians during the Battle of Horseshoe Bend on March 27, 1814 — down to the headwaters of Lake Martin.

This is a unique stretch of the Tallapoosa, said Brad McLane, the group's executive director, as we began paddling down the river in Wednesday's scorching 100-degree heat.

"It's an Alabama treasure," said McLane. "It's a unique river that has the potential to be among the healthiest in Alabama. The only problem is that the regulation of flows from Harris Dam greatly impairs the river's health. If you could fix that problem, everything else is there."

It is the stretch of the Tallapoosa above here, all the way up to the dam near Lineville, that is suffering the most, say environmentalists, conservation resource agencies and residents that live along the river.

Stephen Gross/The Anniston Star

Terry Taylor stands on the bank of his property boardering the Tallapoosa River in Wadley. Taylor uses trees and bushes to shore up the banks around his property.

Rise and fall of the river

"The big problem is the ups and downs of the river," said Terry Taylor, who has owned a home on the river in Wadley — about seven miles south of the dam — for the past 12 years. "It's got to be an economic decision when they generate," he said, referring to Alabama Power's operation of the

Please see Tallapoosa
Page 8A

Page 8A Sunday, August 20, 2000

TIDE OF CONCERN

Tallapoosa: *River's inconsistency has eaten away shorelines*

Timeline: 1998 - 2004

1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004

1998 – Talks Begin
ADCNR and Alabama Power begin discussions about downstream flows

1999 – USFWS Letter
Lays out perspective on outstanding minimum flow issues

2000 – Wadley Meeting
Over 100 attendees

2002 – Journal Article
Proposal for Adaptive Management to Conserve Biotic Integrity in a Regulated Segment of the Tallapoosa River, Alabama, U.S.A

Conservation Biology – February 2002 (Vol. 11, No. 1)

Proposal for Adaptive Management to Conserve Biotic Integrity in a Regulated Segment of the Tallapoosa River, Alabama, U.S.A.

ELISE R. IRWIN* AND MARY C. FREEMAN†

*Alabama Cooperative Fish and Wildlife Research Unit, U.S. Geological Survey, 108 M. White Smith Hall, Auburn University, AL 36849, U.S.A., email eirwin@acesag.auburn.edu
†Patuxent Wildlife Research Center, U.S. Geological Survey, University of Georgia, Athens, GA 30602, U.S.A.

- Low fish abundance and diversity
- Low mussel species richness
- Caused by
  - Depleted low flow – limits habitat suitability
  - Flow instability – reduces reproductive success and recruitment
  - Thermal regime alteration – delays spawning, reduces hatching success and slows larval development

Adaptive Management Process

1. Develop and agree to management objectives

2. Model hypothesized relations between dam operations and management objectives

3. Implement changes in dam operations

4. Evaluate biological responses and other stakeholder benefits

Timeline: 1998 - 2005

1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004

1998 — Talks Begin
ADCNR and Alabama Power begin discussions about downstream flows

1999 — USFWS Letter
Lays out perspective on outstanding minimum flow issues

2000 — Wadley Meeting
Over 100 attendees

2002 — Journal Article
Proposal for Adaptive Management to Conserve Biotic Integrity in a Regulated Segment of the Tallapoosa River, Alabama, U.S.A

2003 — Auburn Workshop
44 individuals from 21 organizations

2003 Workshop Participants

AL Dept. Conservation & Natural Resources	Lake Wedowee Property Owners Association
AL Coop. Fish and Wildlife Research Unit	Mobile Bay Watch
Alabama Power Company	Mobile Register
Alabama Rivers Alliance	OK Coop. Fish and Wildlife Research Unit
Coalition of Associations at Lake Martin	Randolph County Commission
Conservation Unlimited	Tennessee Valley Authority
Emerald Triangle Commission	University of Georgia
Environmental Insight	Upper Tallapoosa Watershed Committee
Federal Energy Regulatory Commission	United States Fish and Wildlife Service
GA Coop. Fish and Wildlife Research Unit	United States Geological Survey
GA Department of Natural Resources	

2003 Workshop Topics

Maximize

- Economic development
- Diversity of flora and fauna
- Reservoir water levels
- Water quality in reservoir and downstream
- Boating and angling opportunities
- Operational flexibility

Minimize

- Downstream bank erosion
- River fragmentation
- Cost to APC
- Consumptive uses

Timeline: 1998 - 2005

1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004

Talks Begin (1998)
ADCNR and Alabama Power begin discussions about downstream flows

USFWS Letter (1999)
Lays out perspective on outstanding minimum flow issues

Wadley Meeting (2000)
Over 100 attendees

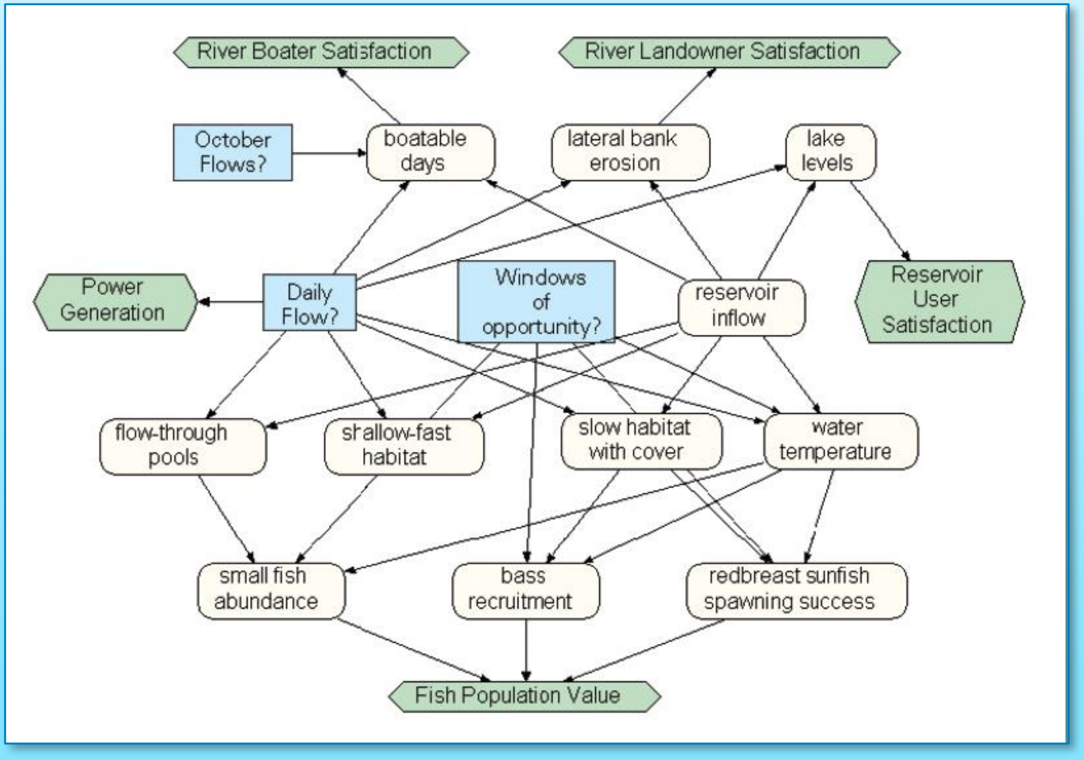
Journal Article (2002)
Proposal for Adaptive Management to Conserve Biotic Integrity in a Regulated Segment of the Tallapoosa River, Alabama, U.S.A

Auburn Workshop (2003)
44 individuals from 21 organizations

Stakeholder Meetings
May, June, August, & November

2003 Stakeholder Meetings

- Continuous Minimum flows
- Re-regulation Dams
- Geotubes
- House Turbine
- Models/NETICA
- Model components



Timeline: 1998 - 2005

1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004

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2003 – Auburn Workshop
44 individuals from 21 organizations

Stakeholder Meetings
May, June, August, & November

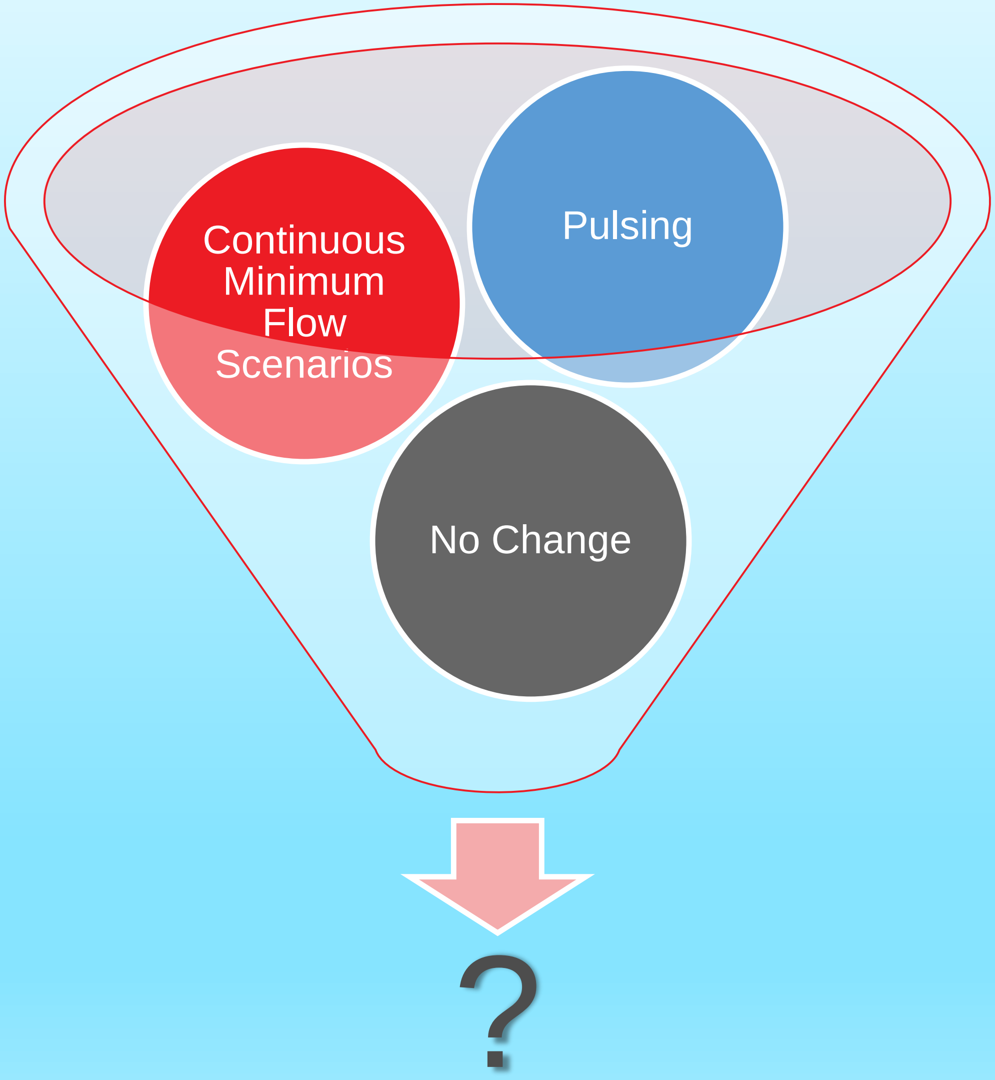
2004 – Stakeholder Meeting
December

December 2004 Stakeholder Meeting

- Alabama Power presents activities since November 1, 2003

Item Evaluated	Outcome
Trash Gate Modifications	Not capable of passing less than 500 cfs
Penstock Drain System	Insufficient space for piping and valves.
Penetration Through Headworks Structure	Not possible due to location of concrete piers and construction joints.
East Non-Overflow Structure Siphon	Not possible to west. Possible to east. Could deliver 150 cfs via 4-ft pipe; but had significant financial implications
Geotubes & Re-regulation dam(s)	Ruled out due to stakeholder opposition and lack of benefits to resources

Ongoing Discussions



Adaptive Management Timeline 2005 - 2010

Alabama Power

Timeline

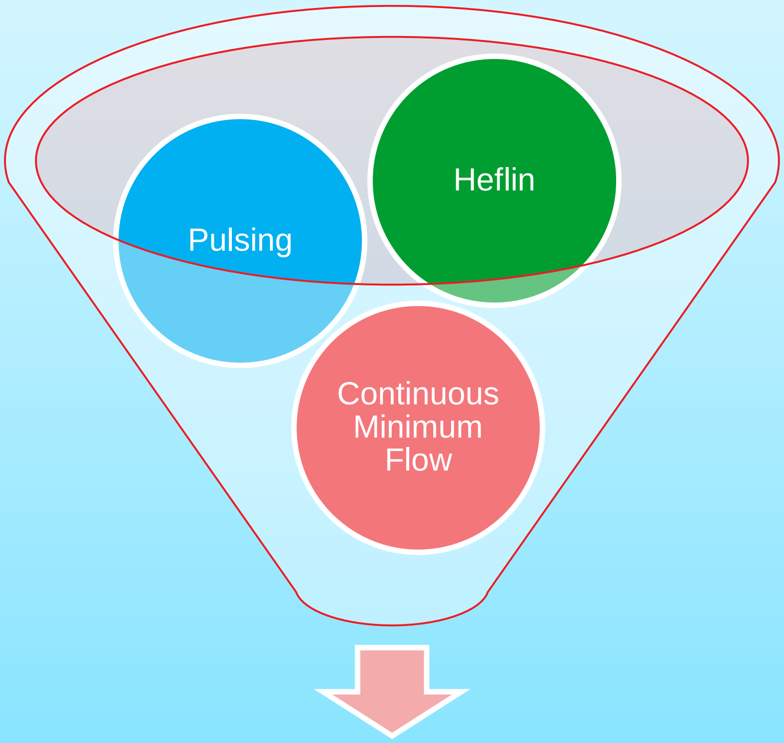
Stakeholder Meetings

January & August

2005 | 2006 | 2007 | 2008 | 2009 | 2010

2005 Meetings

- Decision Model presented
- Technical Committee formed*
- Green Plan selected
- Draft monitoring plan discussed
- Funding discussed



Pulsing based on Heflin

*ACFWRU, ADCNR, USFWS, Alabama Power

Timeline

Stakeholder Meetings
January & August

Green Plan Implemented
March

2005 | 2006 | 2007 | 2008 | 2009 | 2010

The Green Plan – Daily Release Schedule

Prior Day's Heflin Flow (DSF)	Generation @ 6 AM	Generation @ 12 PM	Generation as needed	Total Machine Time	Total Harris Discharge (DSF)
0 – 150	10 min	10 min	10 min	30 min	133
150 – 300	15 min	15 min	30 min	1 hr	267
300 – 600	30 min	30 min	1 hr	2 hrs	533
600 – 900	30 min	30 min	2 hrs	3 hrs	800
>900	30 min	30 min	3 hrs	4 hrs	1,067

DSF = day second feet

The **volume** of water represented by a flow of 1 cubic foot per second for 24 hours; equal to 86,400 cubic feet and approximately 2 acre feet.

The Green Plan – Hourly Release Schedule

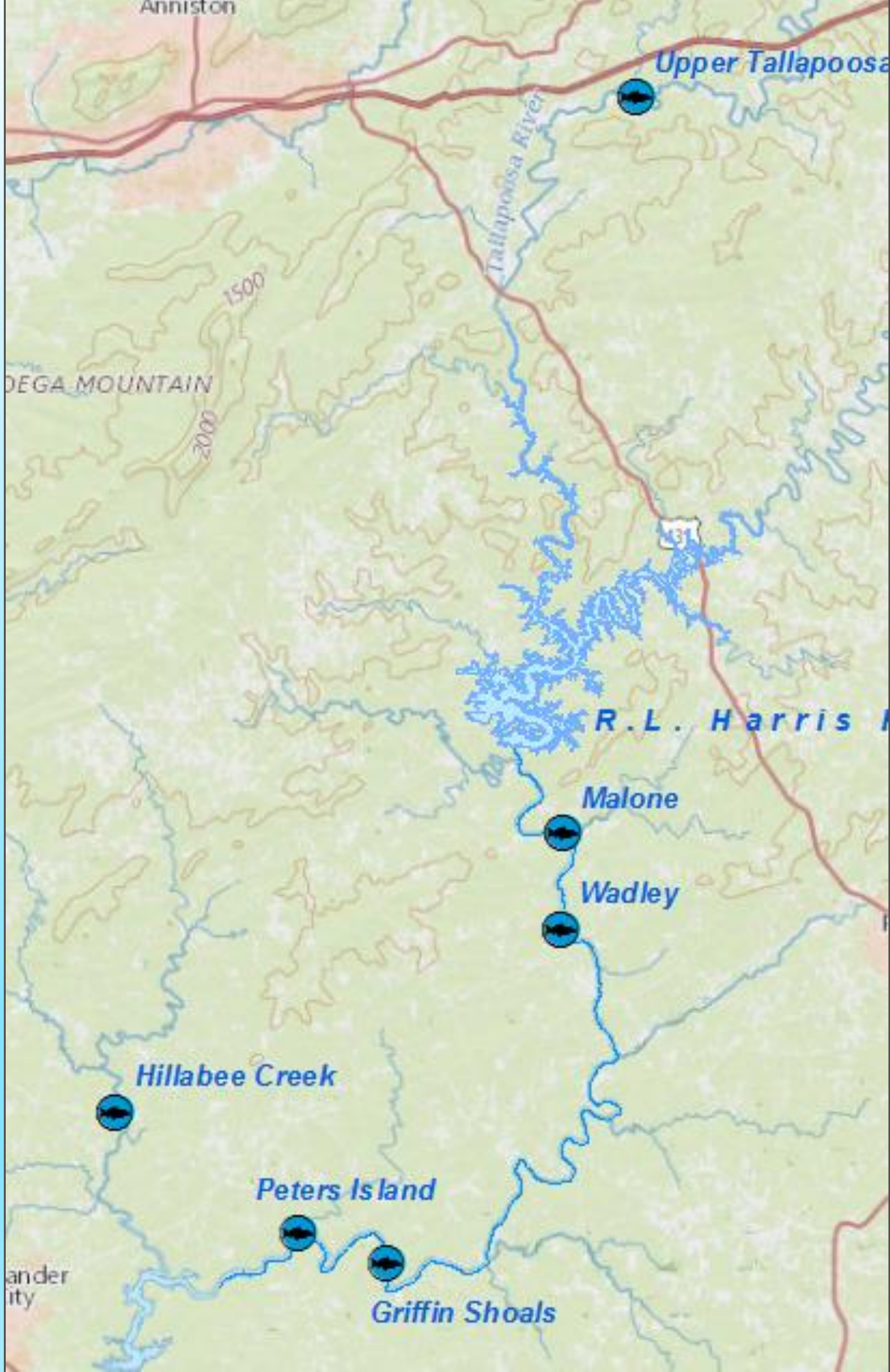
Total Scheduled Generation	Generation @ 6 AM	Generation @ 12 PM	Generation as needed	Total Machine Time	Total Harris Discharge (DSF)
1 machine hr	15 min	15 min	30 min	1 hr	267
2 machine hrs	30 min	30 min	1 hr	2 hrs	533
3 machine hrs	30 min	30 min	2 hrs	3 hrs	800
4 machine hrs	30 min	30 min	3 hrs	4 hrs	1067
5+ machine hrs			all		

Study Reaches

- Upper Tallapoosa @ Heflin
- Malone
- Wadley
- Griffin Shoals
- Peters Island
- Hillabee Creek

Study Components

- Spring and Fall fish sampling
- Fall benthic macroinvertebrate sampling
- Habitat measurements (substrate, depth, velocity, temperature, etc.)



Timeline: 2005 - 2010

Stakeholder Meetings
January & August

Green Plan Implemented
March

2005 | 2006 | 2007 | 2008 | 2009 | 2010

Stakeholder Meeting
Some preliminary results presented

August 2007 – Stakeholder Meeting

Results of 2005 Monitoring
for Adaptive Management of the
Tallapoosa River below R.L. Harris Dam

Elise Irwin
USGS

Kathryn Mickett Kennedy
Alabama Cooperative Fish and Wildlife Research Unit

Alabama Power Company's
Review of the RL Harris 'Green Plan'

R L Harris Adaptive Management Meeting
Alexander City, AL
August 2, 2007

Timeline: 2005 - 2010

Stakeholder Meetings
January & August

Green Plan Implemented
March

Report
2002 - 2009

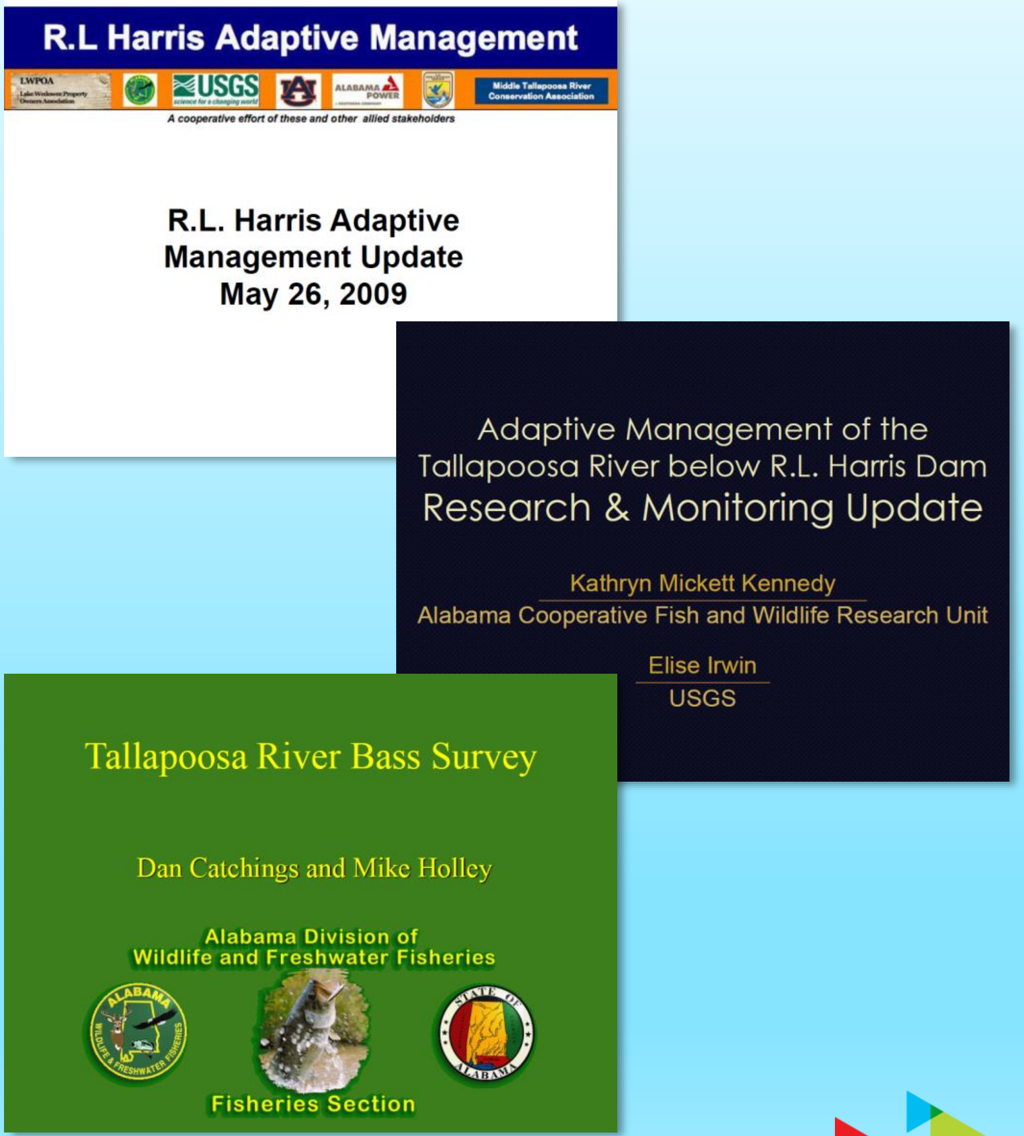
Stakeholder Meeting
May

2005 | 2006 | 2007 | 2008 | 2009 | 2010

Stakeholder Meeting
Some preliminary results

May 2009 Stakeholder Meeting

- Alabama Power provided update on flow management
- ADCNR summarized results of the Tallapoosa sport fish study
- ALCFWRU presented a research and monitoring update



Adaptive Management Timeline 2011 - 2017

Alabama Power

Timeline: 2011 - 2017

Report

Report on 2005-2010

2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017

2011 Report

Adaptive management and monitoring for restoration and faunal recolonization of Tallapoosa River shoal habitats.

Prepared by:

Elise Irwin, Kathryn Mickett Kennedy,

Taconya Piper Goar, Benjamin Martin, and Molly Moore Martin

Alabama Cooperative Fish and Wildlife Research Unit

- IBI scores lower at regulated sites, but varied widely
- Fish assemblages vary considerably, in regulated and unregulated reaches
- Stable flows may enhance spawning

Lipstick Darter (*Etheostoma chuckwachatte)*

Timeline

Report

Report on 2005-2010

Technical Committee Meeting

Focus on temperature

2013 Technical Committee Meeting

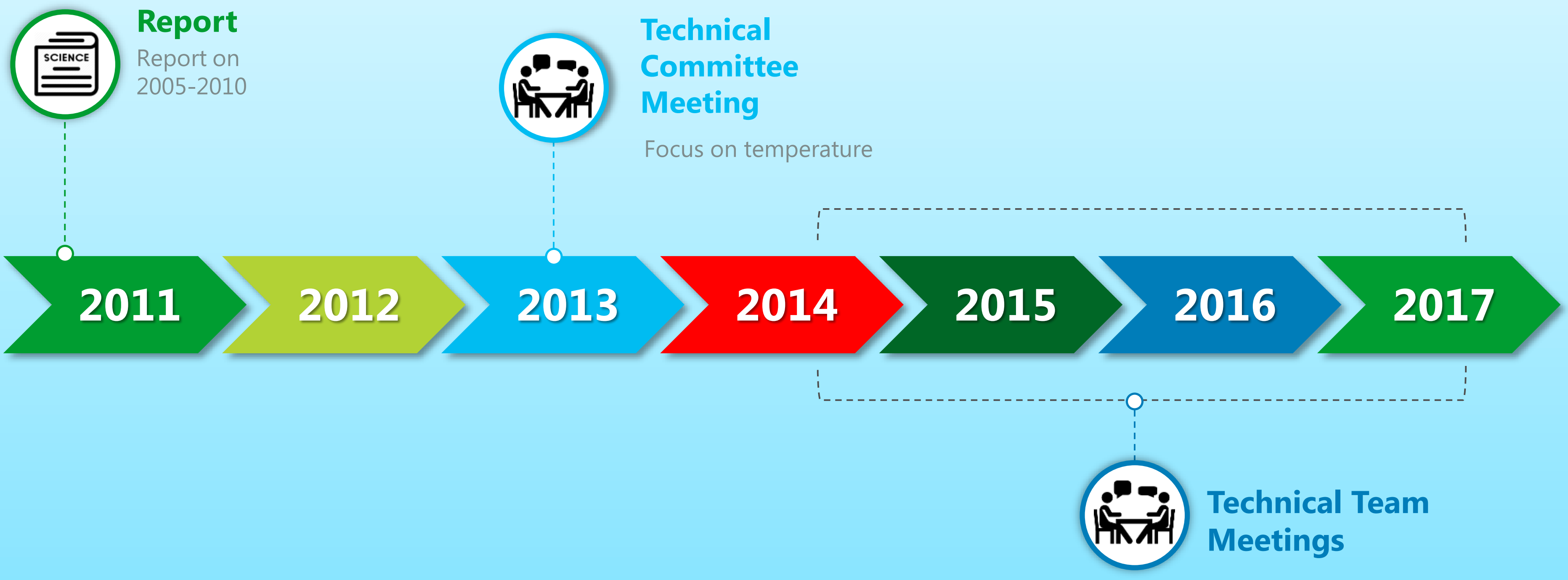
Increased habitat diversity and positive ecosystem response to Green Plan

Temperatures can be "too cold" for certain fish

Formation of technical team – modelers and biologists

Reconvene when technical committee formulates proposal for addressing temperature issue

Timeline


Report
Report on 2005-2010
SCIENCE
Technical Committee Meeting
Focus on temperature
2011
2012
2013
2014
2015
2016
2017
Technical Team Meetings

2013 - 2017 Technical Meetings

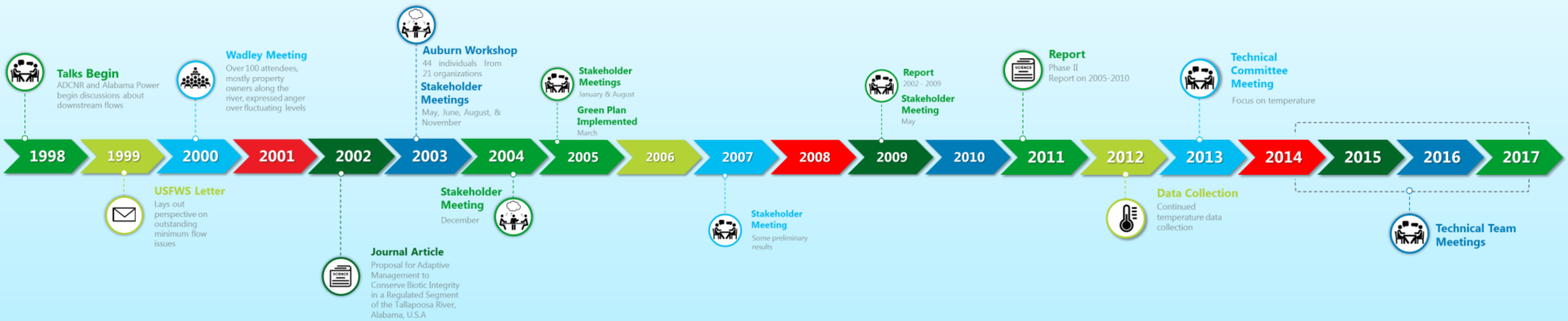
- Focused on temperature below dam
- Participants note that Green Plan has improved habitat
- Proposed and discussed variations to pulse timing and effects on temperature
- Macroinvertebrate processing and analysis
- Alabama Power samples fish via 30+2 methodology
- Discussion of potential future creel studies

Alabama Shiner (*Cyprinella callistia)*

Largescale Stoneroller
(*Campostoma oligolepis)*

Bronze Darter (*Percina palmaris)*

Summary



- 20+ years of collaboration
- 13 years of implementation, research, monitoring, & evaluation

HARRIS DAM
RELICENSING

2018 – 2021: Relicensing Process

WE ARE HERE

2018
- NOI & PAD Filed
- Study Plans Filed with FERC

2019
- Study Plans Approved
- Studies Begin

2020
- Draft Study Reports
- Some Studies Continue, if necessary

2021
- Final Study Report(s)
- License Application Filed

6. JANUARY 31, 2018 PRESENTATION - RESERVOIR OPERATIONS ON THE APC HYDRO SYSTEM

R.L. Harris Dam Relicensing - FERC No. 2628
Reservoir Operations on the
APC Hydro System

Presented by:

Alan Peeples
Manager – Reservoir Management

January 31, 2018
Wedowee Marina South

HARRIS DAM
RELICENSING

First Things First

Power

Power - Capacity

- Installed capacity is the maximum instantaneous power that a generating unit can produce, and is expressed in megawatts (mw)
  - the power the unit is generating at any one moment in time
  - Harris installed capacity is 66mw per unit

- Instantaneous Load (mw)
  - Electricity is a demand product
  - Instantaneous Load is the instantaneous demand for electricity on the system.
  - Harris' installed capacity supports the instantaneous demand (load) on the Southern Electric bulk power system

Power - Energy Generation

- the electricity generated over a period of time (one hour), expressed as megawatt hours.
  - 1 mwh = 1,000 kwh
  - Your power bill is based on electricity usage, measured in kwh

Hydroelectric Dams are both producers and consumers of energy

Production

- Generating electricity for consumer end use

Consumption

- Station service – measured in mwh
  - The local energy needed at the dam to run pumps, lights, compressors, etc. for operations
- “Motoring” – a big heat sink
  - Systemwide benefits for electric grid stabilization

HARRIS DAM
RELICENSING

Hydraulics

Hydraulic Capacity

There are 2 primary ways to pass water from the dam:

1. Hydroelectric Generating Unit Operation
   - Electricity is generated
2. Spill Gate Operation
   - No electricity is generated, only passing water

Under normal conditions, spill gates are not operated until all of the available generating units are at full gate flow

Hydraulics

Hydraulic Capacity - Hydroelectric Generating Unit Operation

- Hydraulic capacity is the flow, cubic feet per second (cfs), that a hydroelectric generating unit is designed to pass
  - Best Gate flow – the amount of flow from the unit at the most efficient wicket gate position
    - This is where the unit is operated under normal conditions
      - ~6500 cfs
      - Optimum balance between power and flow
      - Best MPG
  - Full Gate flow – the amount of flow from the unit with wicket gates in the 100% (wide open) position
    - ~8000 cfs
    - Moves the most water but not most efficient generating point, less energy production
      - i.e., non-optimal MPG
    - Operated when there is a greater need to move larger quantities of water
      - High flow situations

Hydraulics

Hydraulic Capacity – Spill Gate Operation

- The spillway section where the spill (tainter) gates are located is 310 feet long and contains six tainter gates, each 40.5 feet wide and 40.0 feet high.
- The spillway crest is at elevation 753.0 msl
- The top of the tainter gates is elevation 793.5 msl, one-half foot above full summer pool
- At elevation 795.0 msl, the upper limits of the Induced Surcharge Curve, the spillway has a capacity of almost 270,000 cfs.

HARRIS DAM RELICENSING

Flow versus Volume

- **Flow** is a volume of water per unit of time
  - For example
    - Cubic feet per second, cfs
    - 1 cfs = 448.8 gallons per minute (gpm)

- **Volume** is the result of flow over time
  - For Hydro, it is calculated as day-second-feet or dsf
    - 1 cubic foot per second for one day
    - 1 dsf = 1 cfs x 86400 seconds/day = 86400 cubic feet
    - 1 dsf = 646,272 gallons
    - 1dsf = 1.983 acre-feet (1.983 feet deep over an acre)
    - also referred to as cfs-day

Example

- Harris Unit 1 operates for 12 hours of the 24 hour day
- Volume is 6500 cfs x 12 hours / 24 hours = 3250dsf
- Could also consider this 3250cfs average for day

Water:

the Leading Renewable Energy Source

According to the U.S. Energy Information Administration (EIA):

- **Generation from Renewable Fuels**
  - "**Hydroelectric**. Water is currently the leading renewable energy source used by electric utilities to generate electric power".
  - Hydropower accounted for **6.5%** of total U.S. electricity generation and **44%** of generation from renewables in 2016.

Source: U.S. Department of Energy – Energy Information Administration

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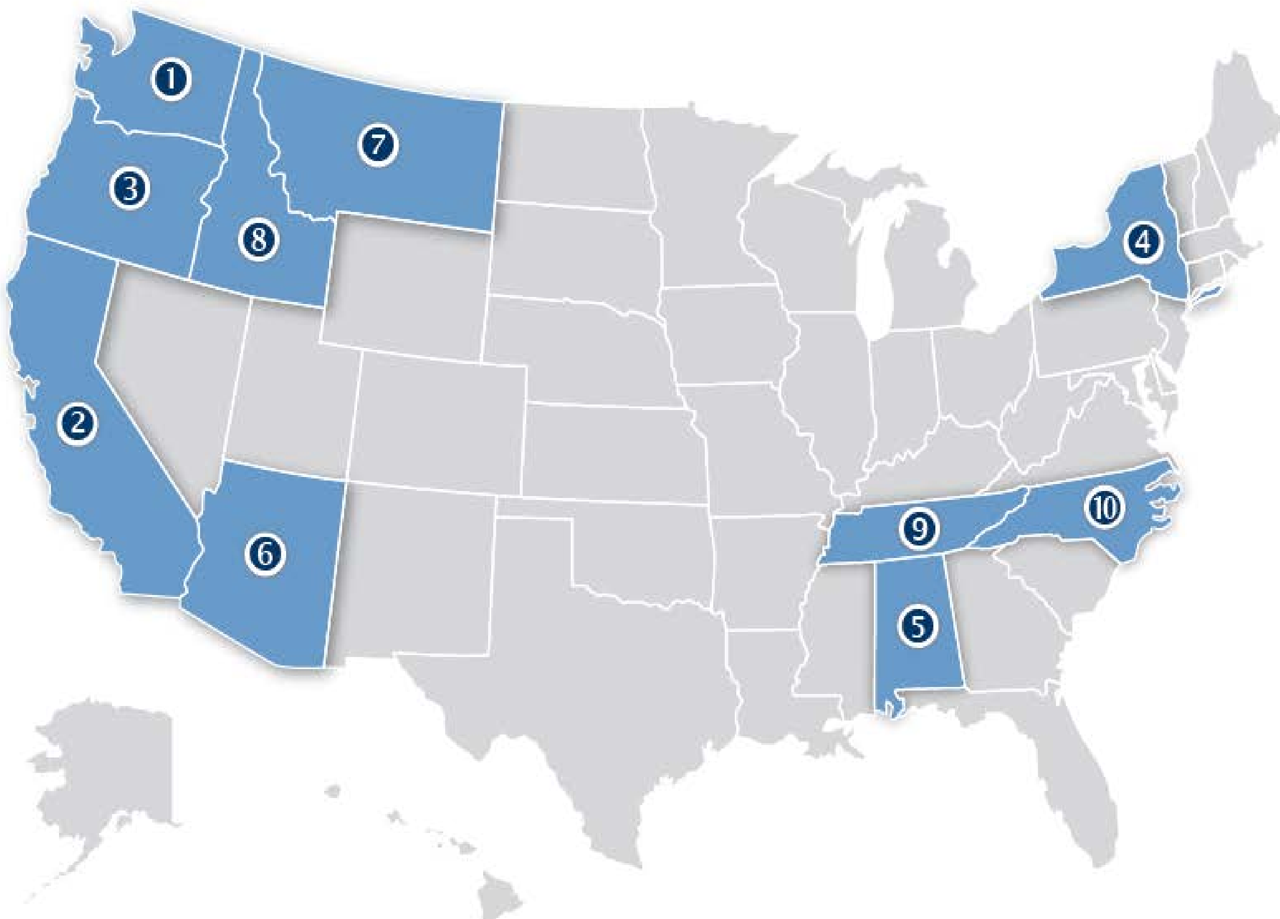
Hydropower Installed Capacity

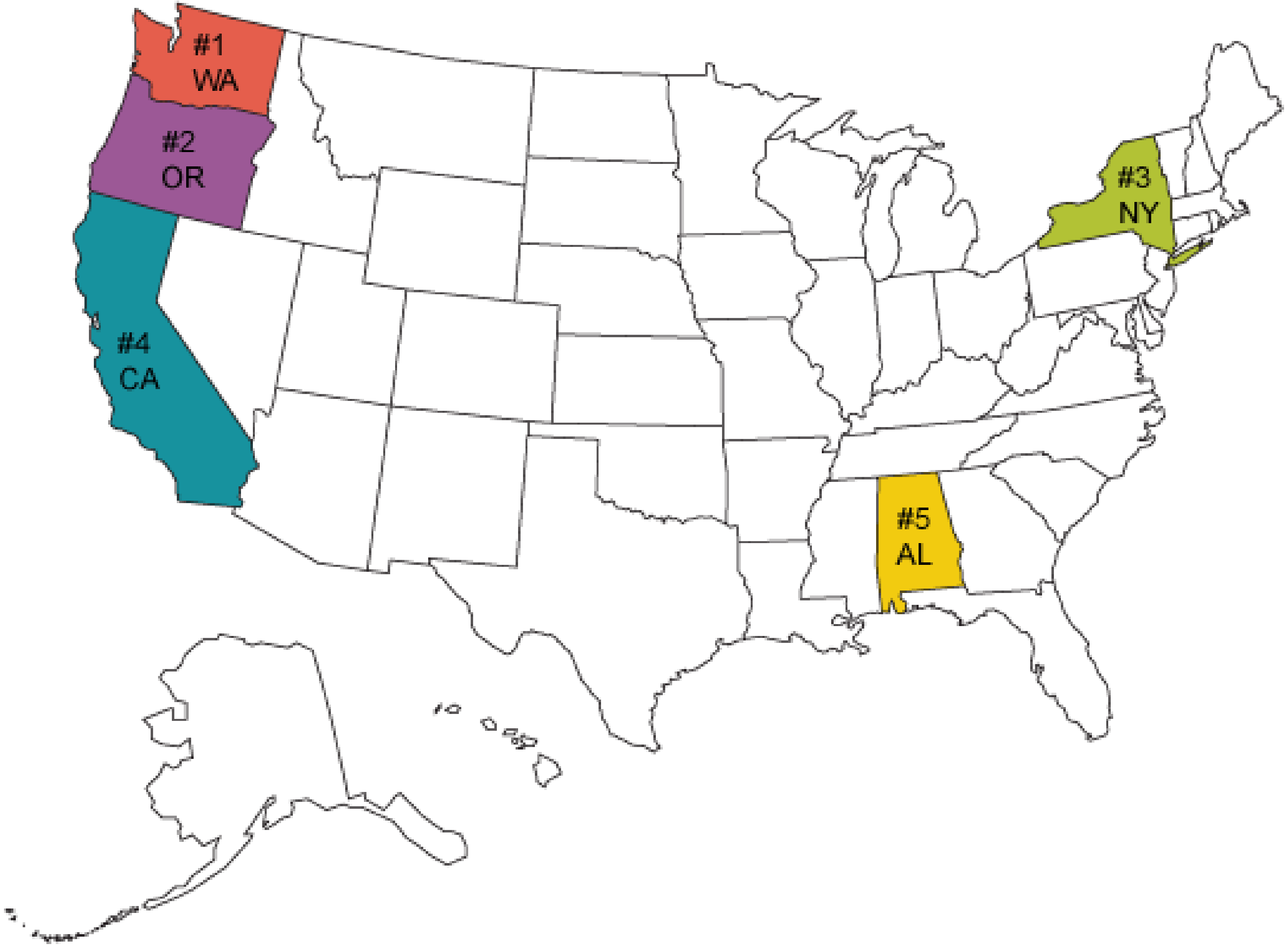


2012 Capacity (MW)	
1 Washington	21,112
2 California	10,057
3 Oregon	8,241
4 New York	4,657
5 Alabama	3,280
6 Arizona	2,718
7 Montana	2,655
8 Idaho	2,540
9 Tennessee	2,499
10 North Carolina	1,939

Source: EIA

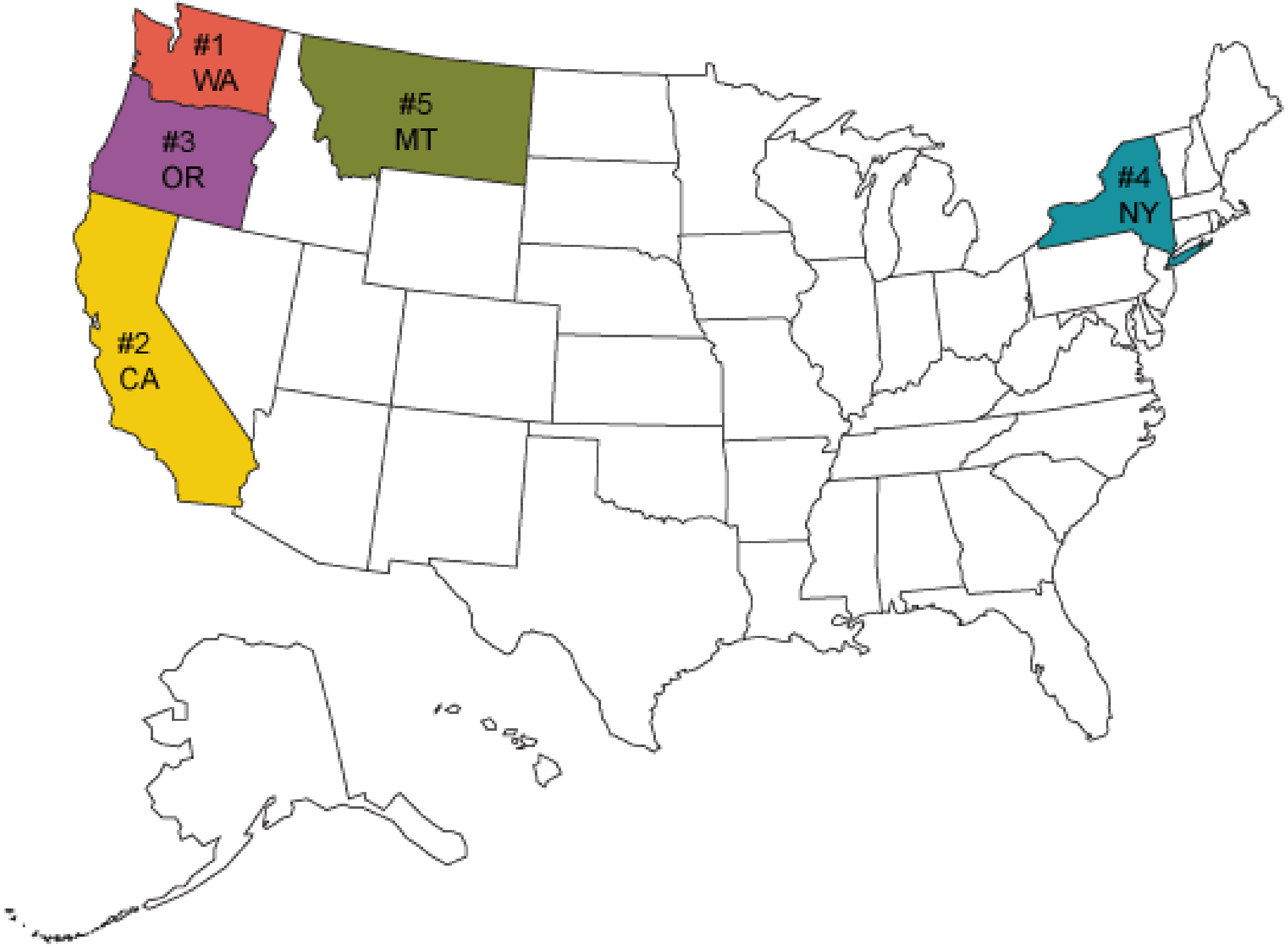
HARRIS DAM RELICENSING

Top Hydropower Producing States, 2009



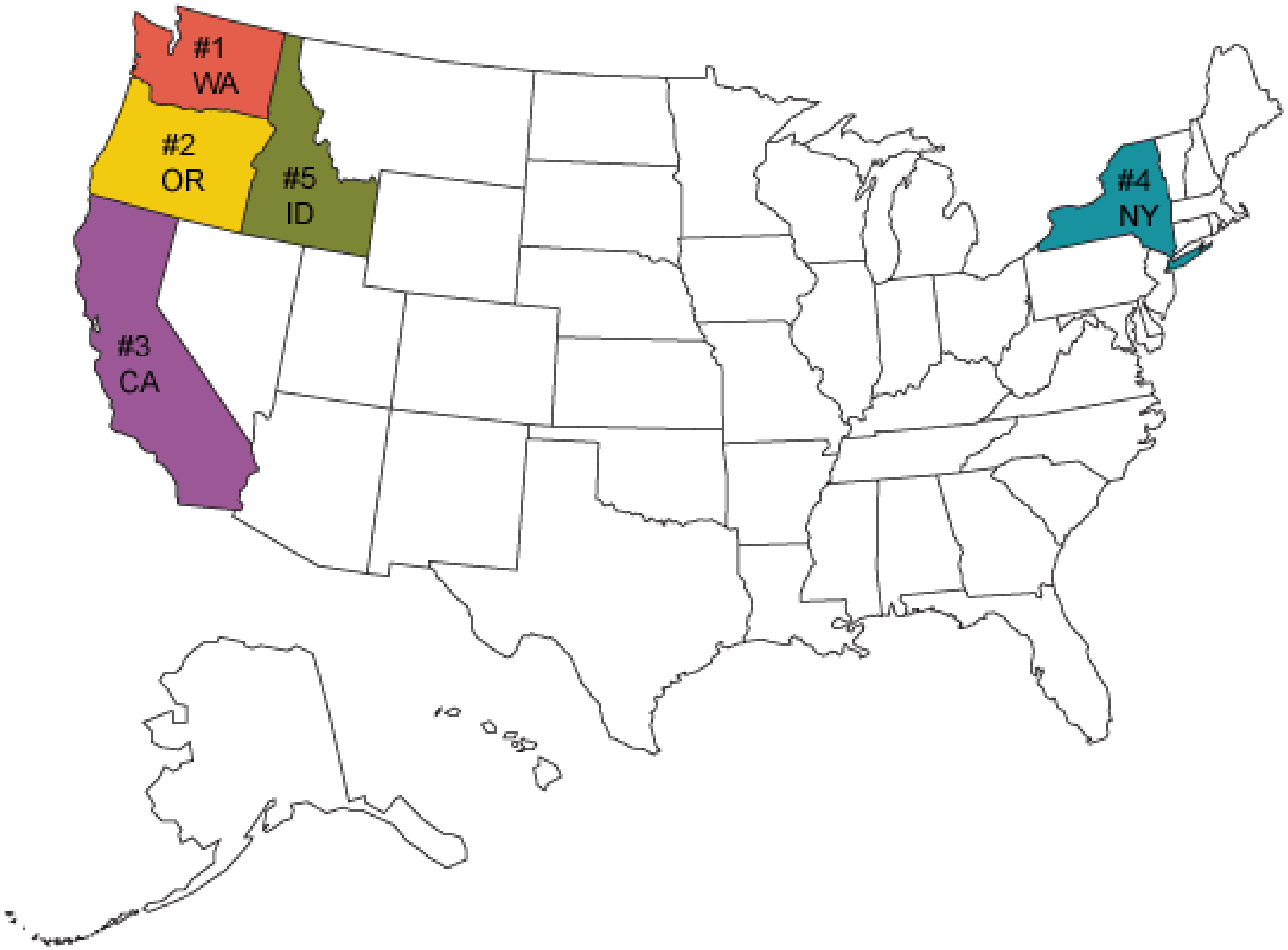
Source: U.S. Energy Information Administration, *Renewable Energy Consumption and Electricity Preliminary 2009 Statistics* (August 2010).

Top Hydropower Producing States, 2010



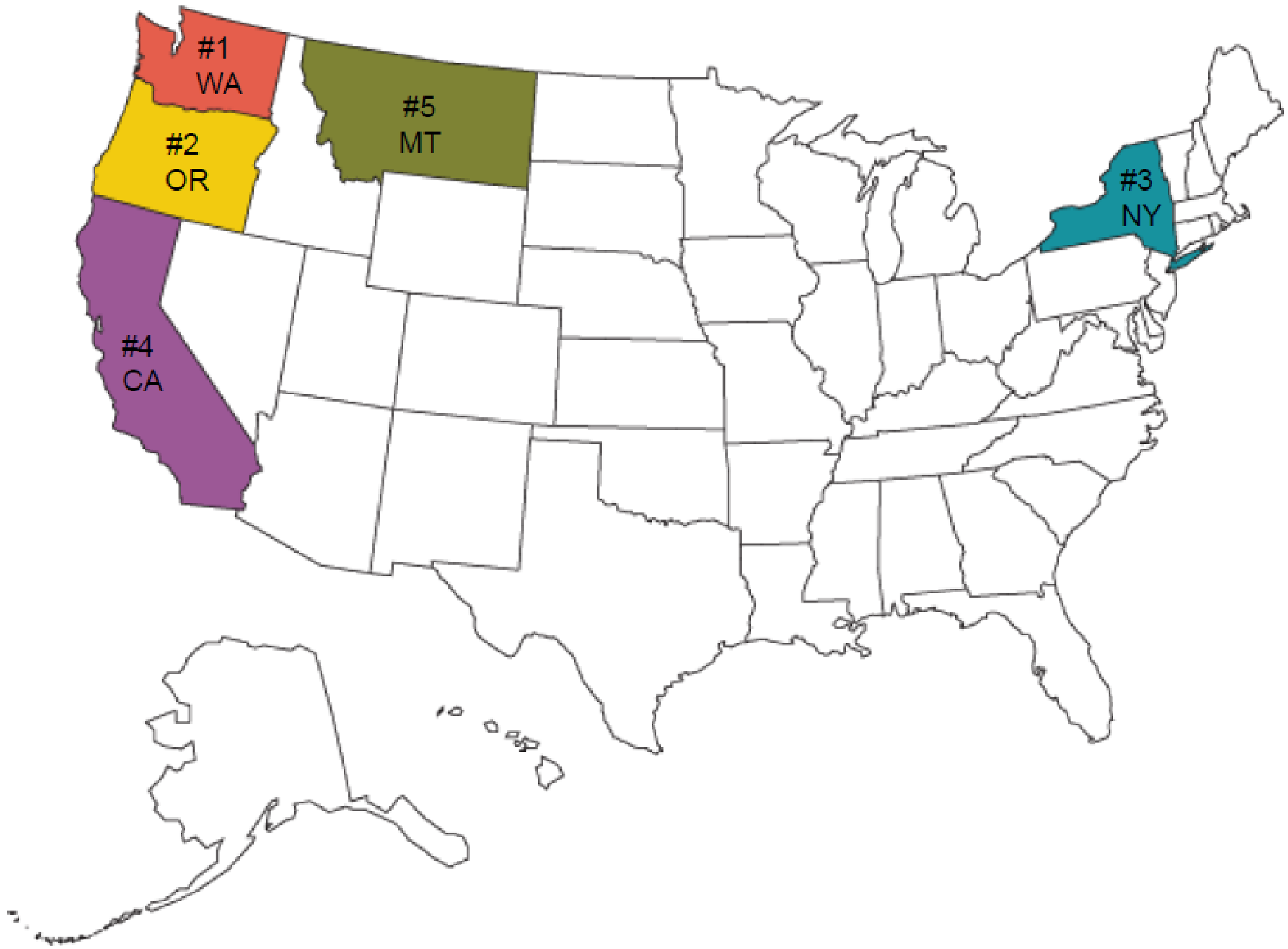
Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 13.B (March 2011).

Top Hydropower Producing States, 2011



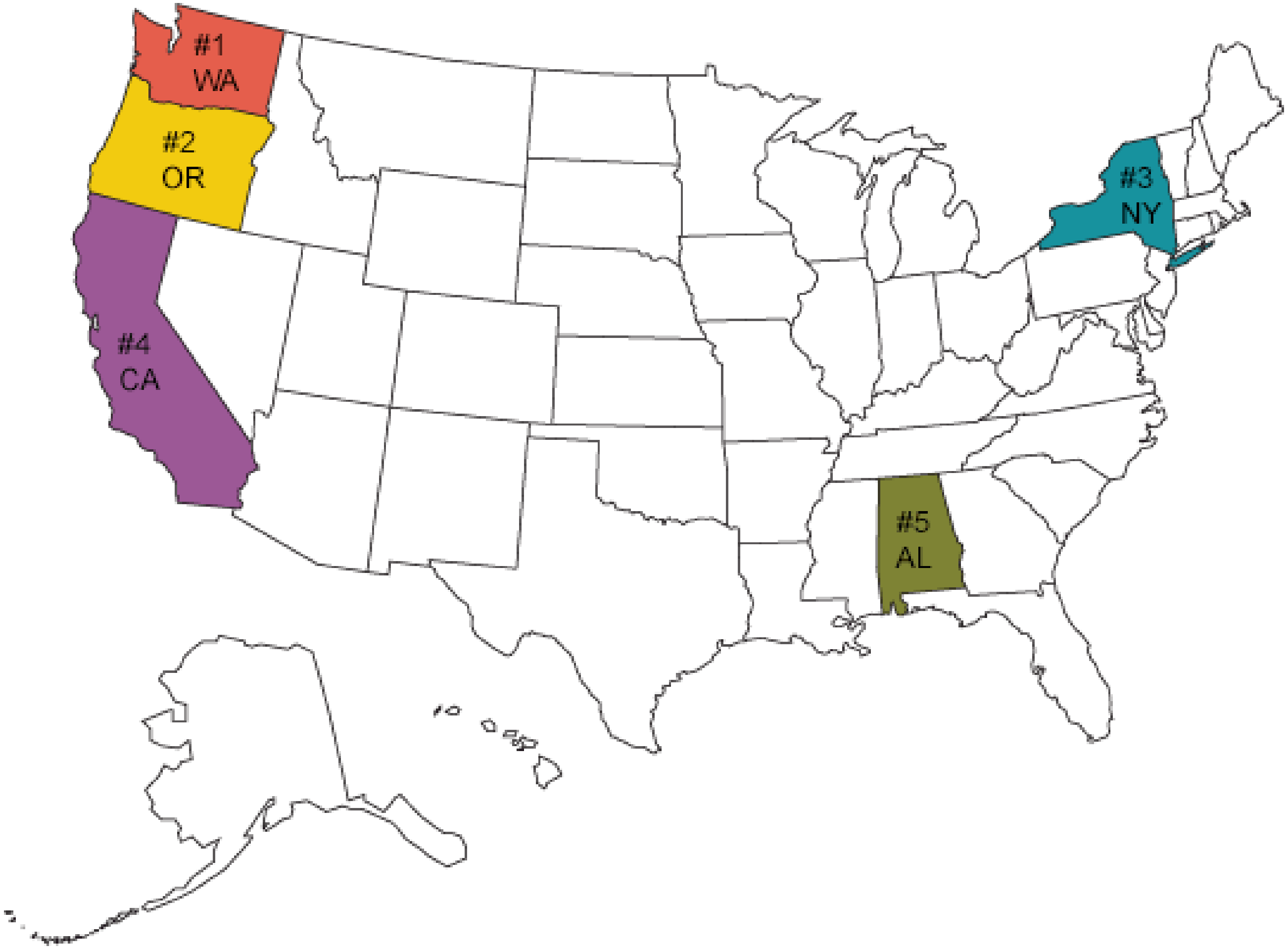
Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 1.13.B (February 2012).

Top Hydropower Producing States, 2012



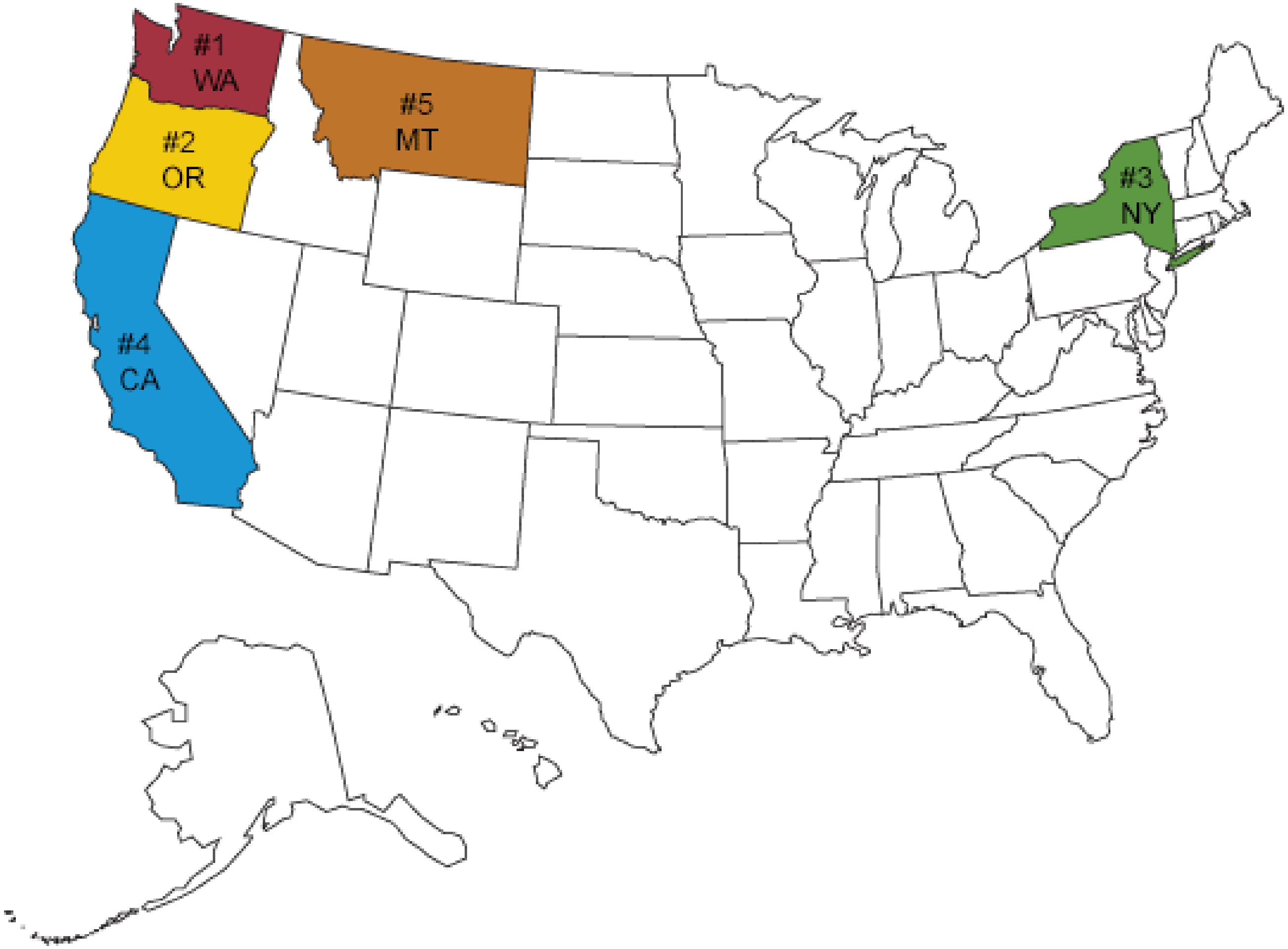
Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 1.13.B (February 2014).

Top hydropower producing states, 2013



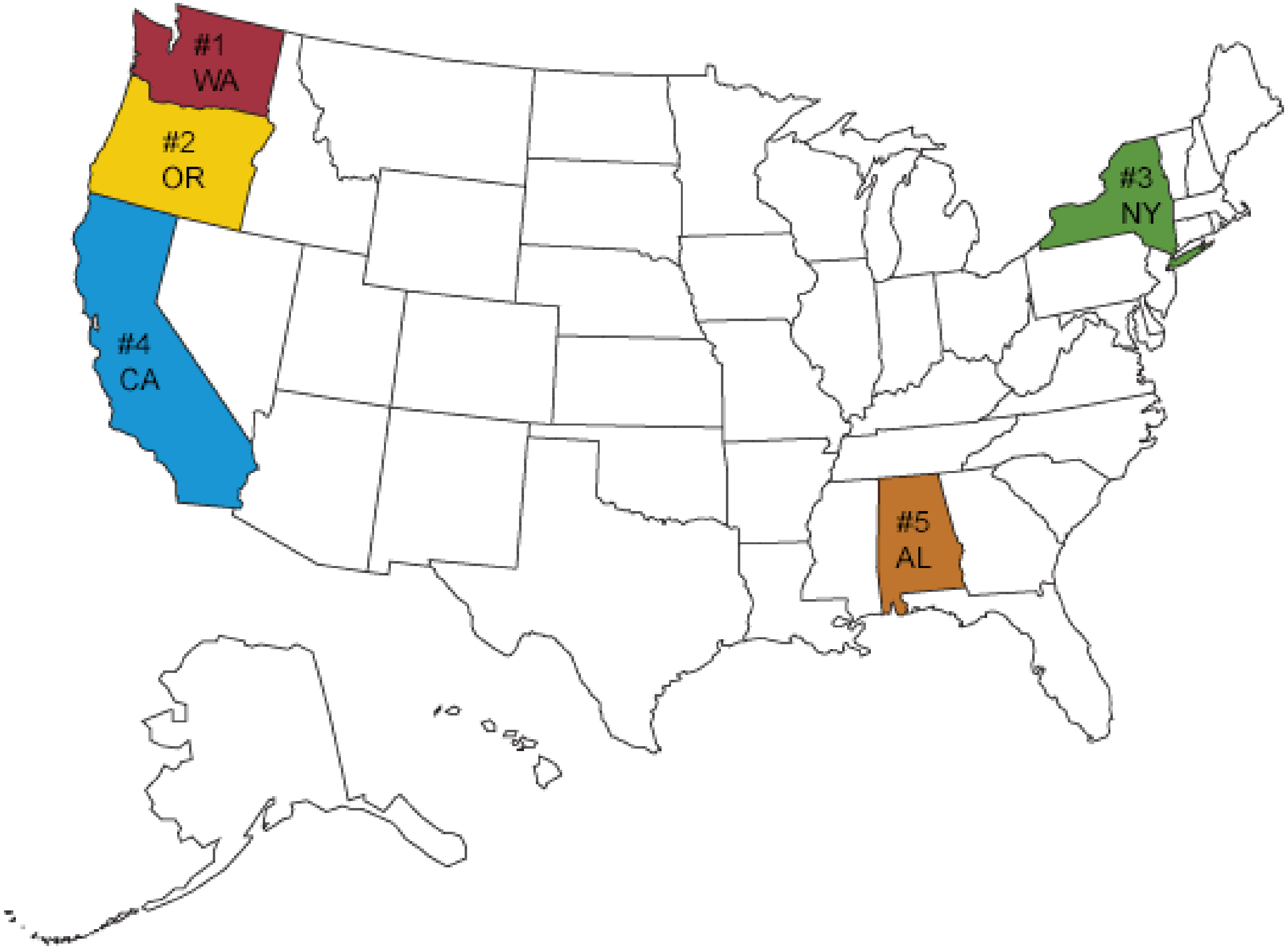
Source: U.S. Energy Information Administration, *Electric Power Monthly,* Table 1.13.B (February 2014).

Top hydropower producing states, 2014



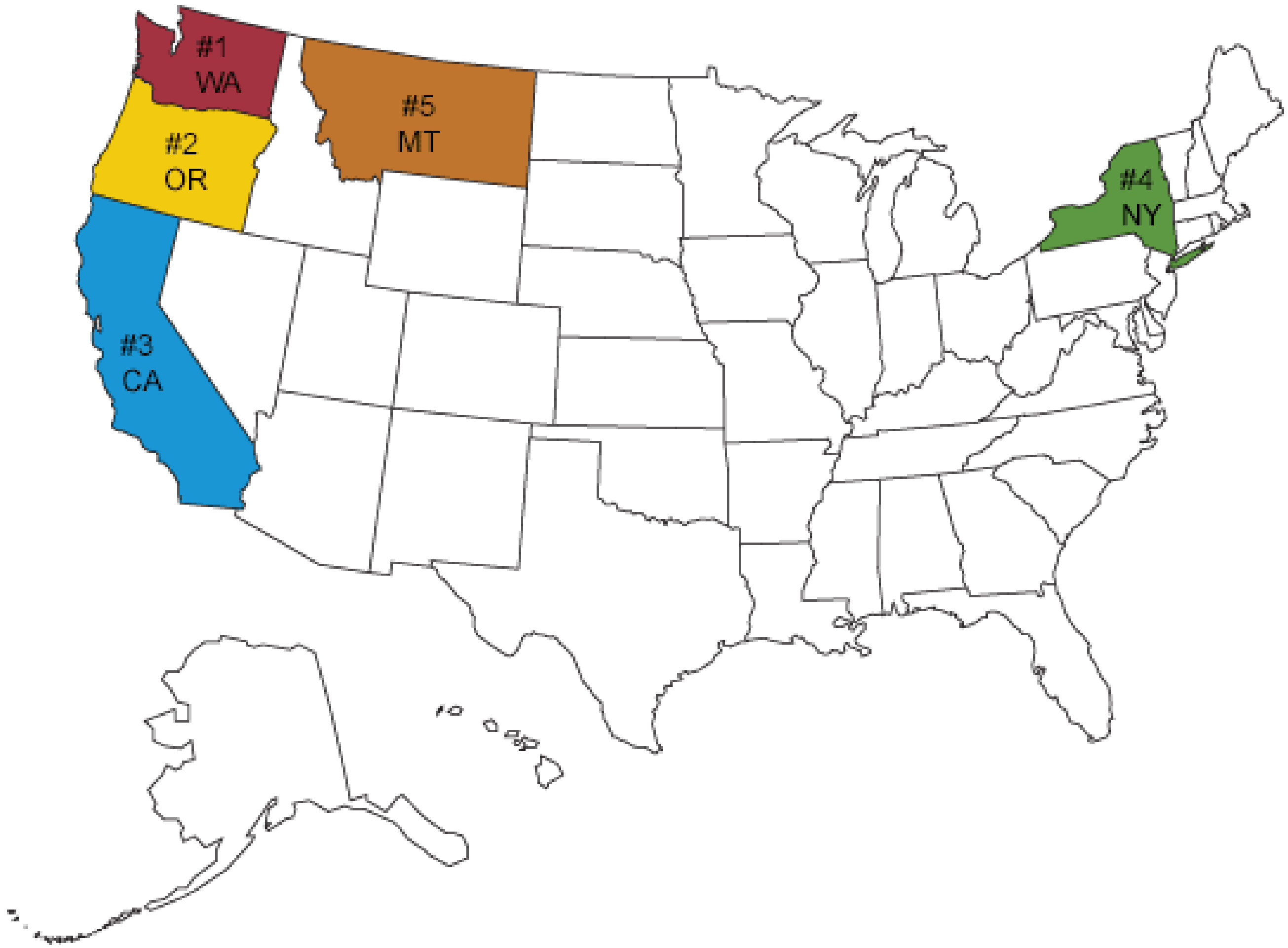
Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 1.13.B (February 2015)

Top hydropower producing states, 2015



Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 1.13.B, preliminary data, February 2016

Top hydropower producing states, 2016

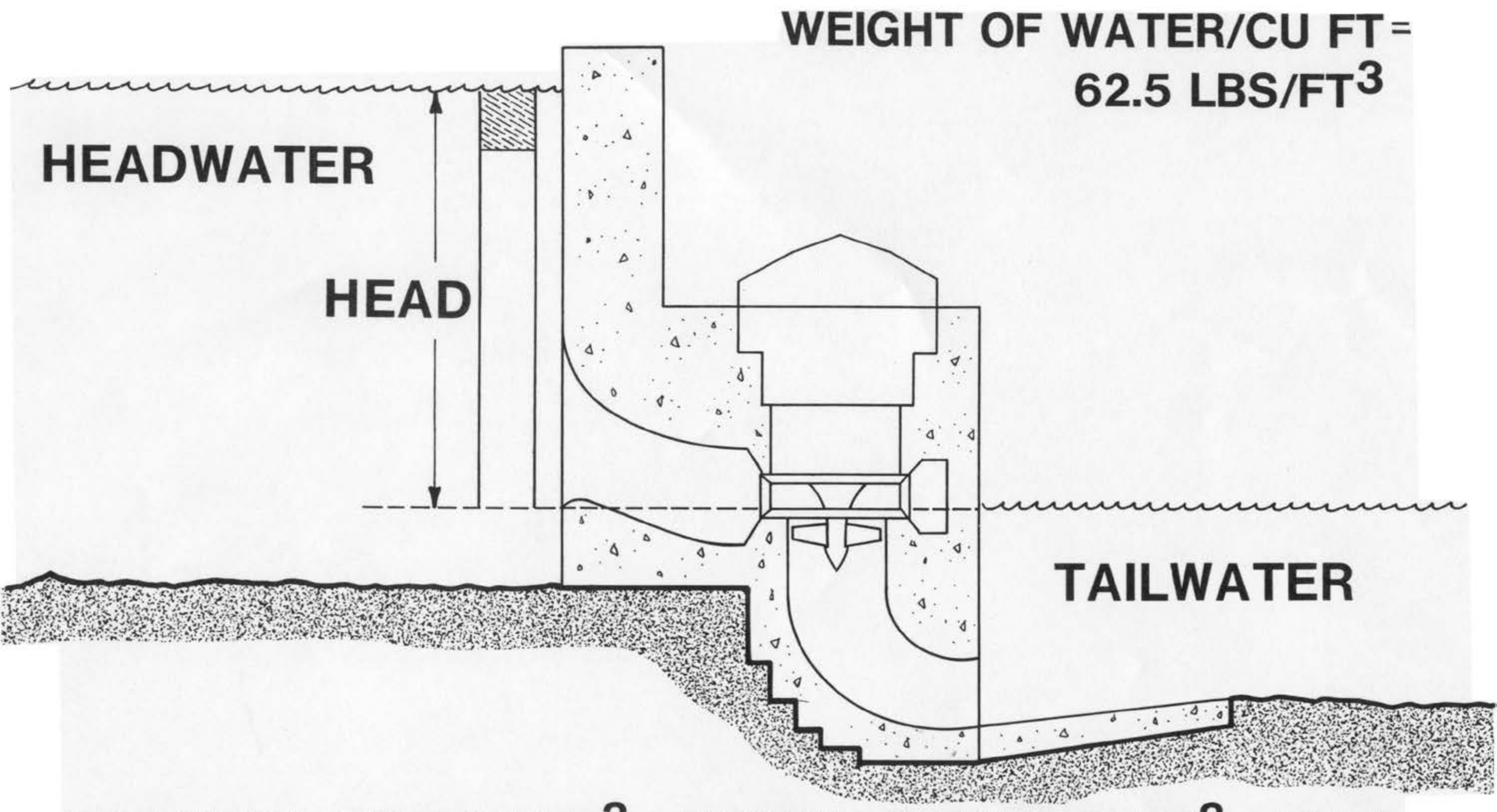


Source: U.S. Energy Information Administration, *Electric Power Monthly*, Table 1.10.B, February 2017, preliminary data

Alabama Power 2016 Energy Mix

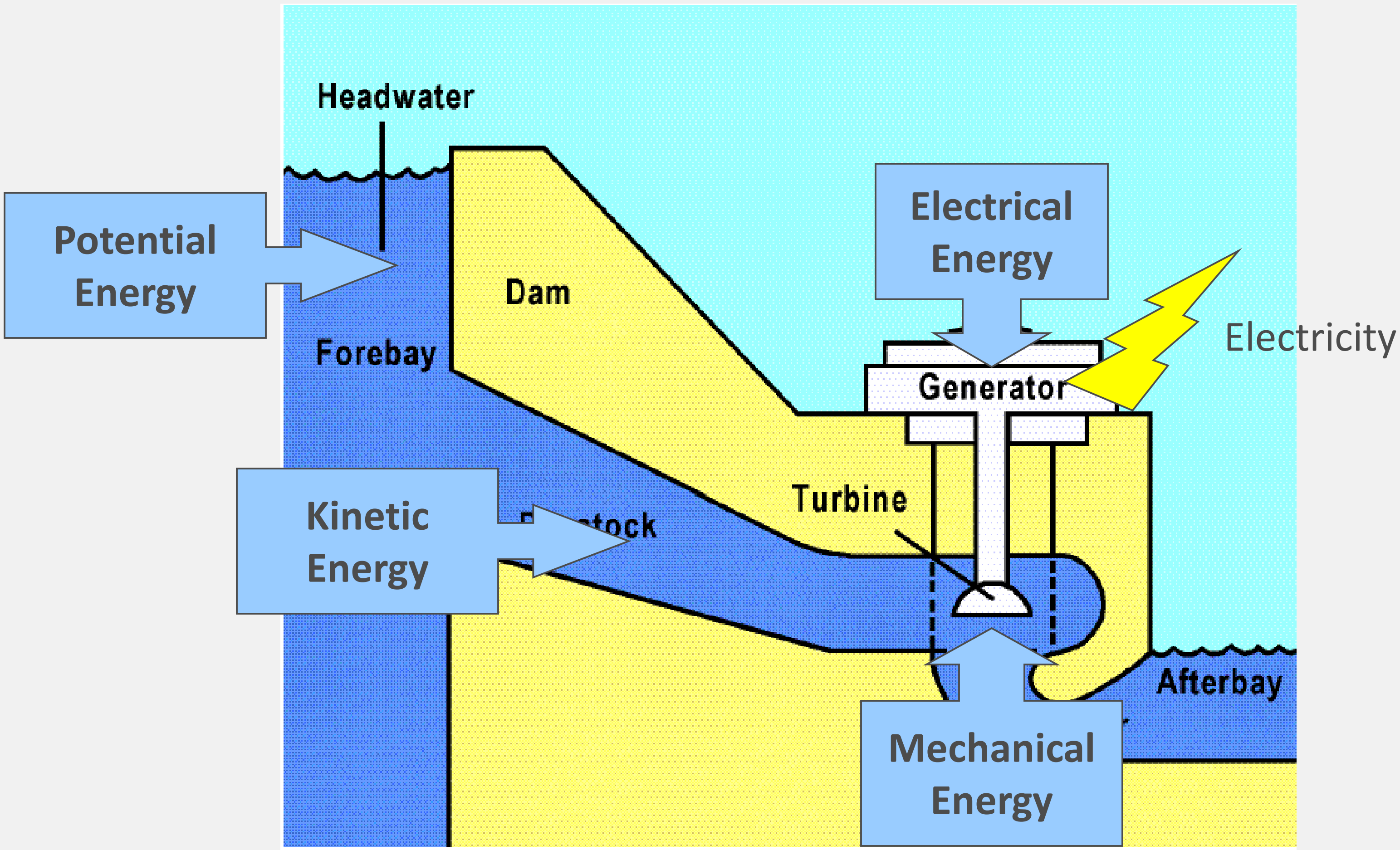
Generation (kilowatt-hours) percentages*	
Coal	52.50%
Nuclear	22.66%
Oil and Gas	19.54%
Hydro	5.30%

POTENTIAL ENERGY



POTENTIAL ENERGY/FT^3 = WEIGHT OF WATER/FT^3 x HEAD

From Water to Electric Power



Hydropower Calculations

$$P(kW) = (WxHxQxT)/737xT$$

$$P(kW) = (62.5xHxQxT)/737xT$$

$$P(kW) = (HxQ)/11.8$$

Two factors dictate
how much power is available for production:

H (Head) and Q (Flow)

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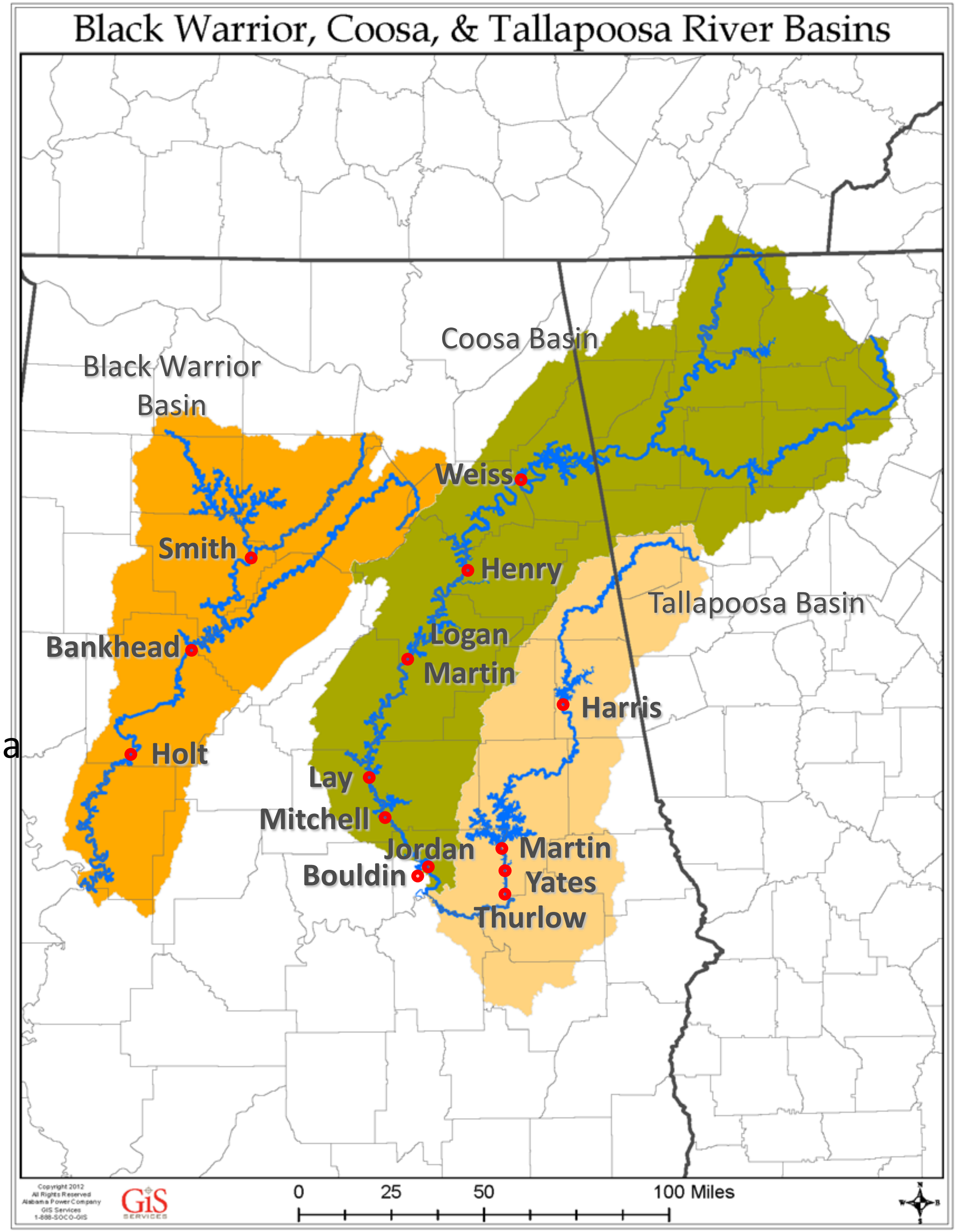
RELICENSING

Alabama Power Company

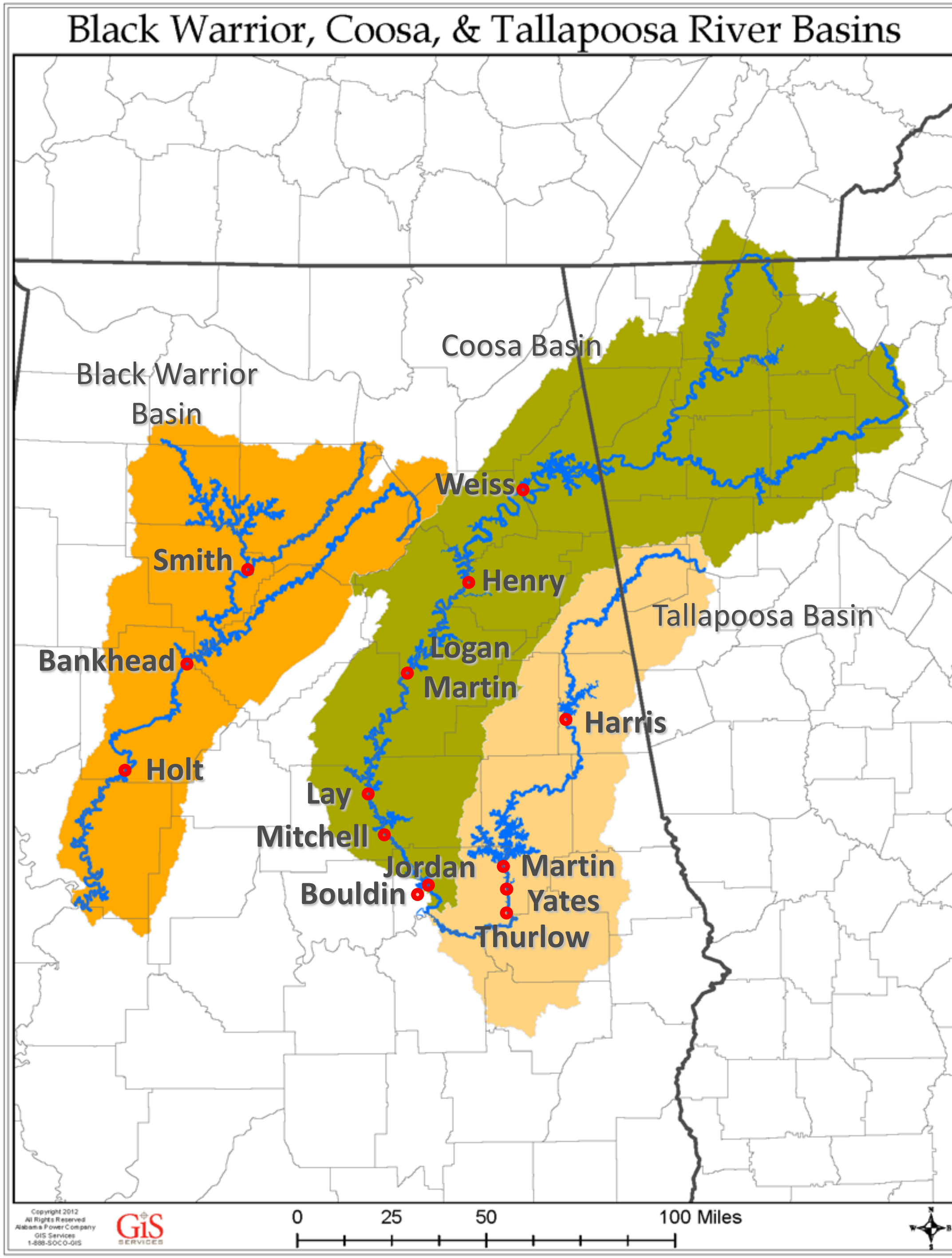
Hydroelectric Generation

- 14 Powerhouses
  - 41 Units
  - ~ 1600 megawatts of capacity
- 11 Reservoirs
  - 170,000 acres of pool area
  - 3,500 miles of shoreline
- Located in the Black Warrior, Coosa and Tallapoosa Basins



Competing Needs

- Power Generation
  - Energy
  - Bulk Power System Dynamic Benefits
- Flood Control
- Navigation
- Recreation
- Ecological / Water Quality
- Water Supply
  - Municipal
  - Industrial
  - Agricultural



Regulatory Flows

FERC

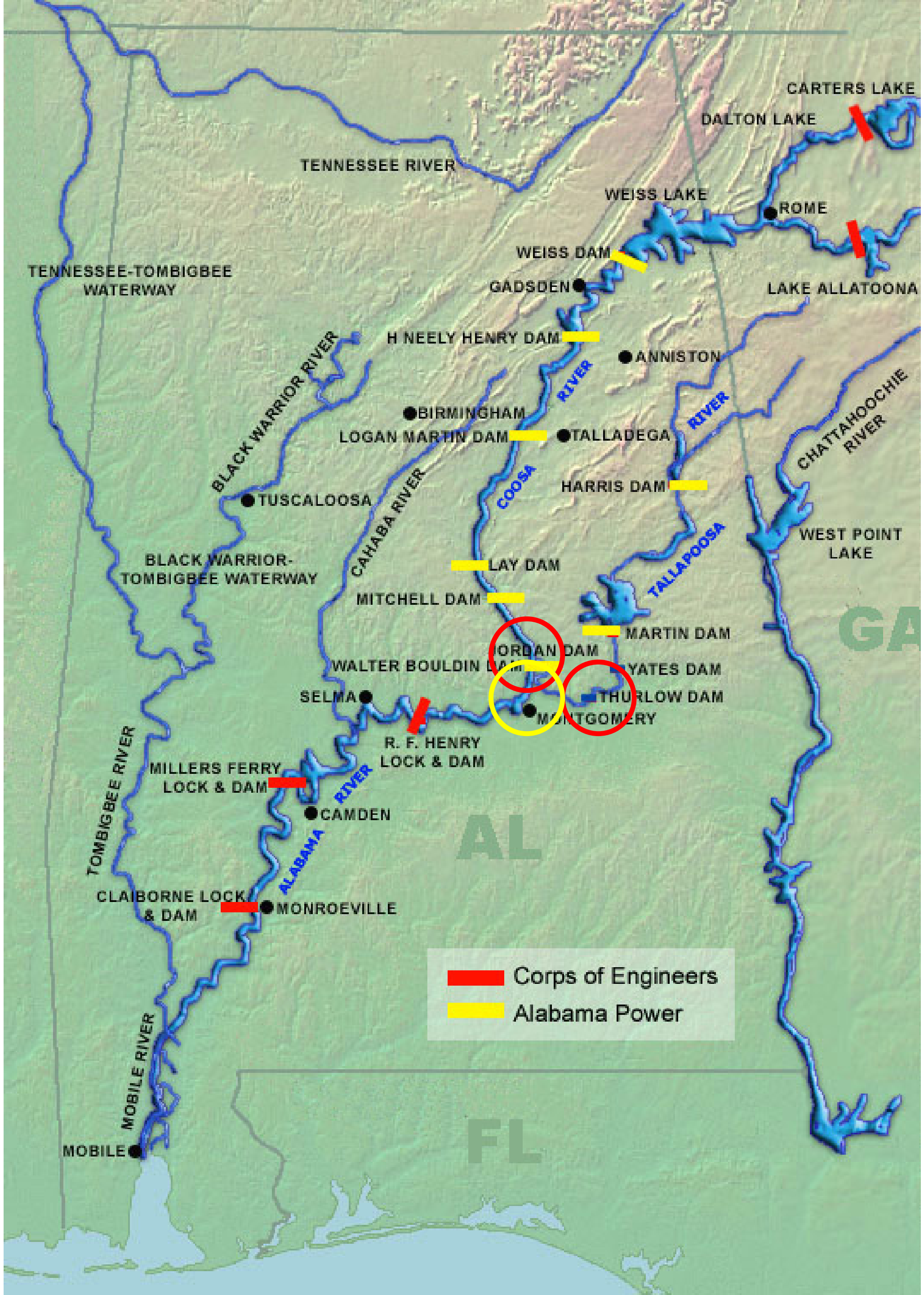
Project License

- Minimum Flows
  - *Coosa*
    - Jordan 2000+ cfs
    - Recreation Flows
  - *Tallapoosa*
    - Harris (Wadley) 45cfs
    - Thurlow 1200 cfs
  - *Warrior*
    - Smith 50cfs

U.S. Army Corps of Engineers

Reservoir Regulation Manuals

- Operate for Flood Control
- Provide for Navigation
  - Alabama River
    - 4,640 cfs
  - Warrior River
    - 245 cfs (Smith)



Flood Control License Articles

Coosa

- Article 402. *Flood Control Operations at Weiss, Neely Henry, and Logan Martin Developments*. The purpose of this article is to provide for flood control in accordance with rules and regulations prescribed by the Secretary of the Army pursuant to Public Law 83-436.

Warrior

- Article 403. *Flood Control Operations*. Upon issuance of this license, the licensee shall operate the Smith development in accordance with the U.S. Army Corps of Engineers (Corps) March 1965 Black Warrior-Tombigbee River Basin Reservoir Regulation Manual, Appendix A, for the Lewis M. Smith Reservoir (Manual), unless otherwise directed by the Corps

Harris

- Article 13(c) Operate the reservoir for flood control in accord with the agreement between the Chief of Engineers Department of the Army…

Martin

- Article 404. *Flood Control Operations.* The licensee must operate the project such that Lake Martin does not exceed elevation 491 feet mean sea level (msl) to assist in flood control. Flood control operation must be guided by the following: …

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RELICENSING

…as Prescribed by Secretary of the Army

- U.S. Army Corps of Engineers, Mobile District
  - Basin-wide Master Reservoir Regulation Manuals
- Alabama–Coosa-Tallapoosa River Basin Reservoir Regulation Manual
  - Appendix B – Weiss
  - Appendix C – Logan Martin
  - Appendix D – Henry
  - Appendix I – Harris
- Black Warrior – Tombigbee River Basin Reservoir Regulation Manual
  - Appendix A - Smith

Navigation Support Releases

Table 7-2. Basin Inflow above APC Projects Required to meet a 9.0-Foot Navigation Channel

Month	APC navigation Target (cfs)	Monthly historic storage usage (cfs)	Required basin inflow (cfs)
Jan	9,280	–994	10,274
Feb	9,280	–1,894	11,174
Mar	9,280	–3,028	12,308
Apr	9,280	–3,786	13,066
May	9,072	–499	9,571
Jun	8,648	412	8,236
Jul	8,232	749	7,483
Aug	7,808	1,441	6,367
Sep	7,600	1,025	6,[illegible]5
Oct	7,600	2,[illegible]18	[illegible],4[illegible]2
Nov	8,024	[illegible],263	5,7[illegible]1
Dec	8,864	1,789	7,0[illegible]5

4640

Table 7-3. Basin Inflow above APC Projects Required to meet a 7.5-Foot Navigation Channel

Month	APC navigation Target (cfs)	Monthly historic storage usage (cfs)	Required basin inflow (cfs)
Jan	7,960	–994	8,954
Feb	7,960	–1,894	9,854
Mar	7,960	–3,028	10,988
Apr	7,960	–3,786	11,746
May	7,856	–499	8,355
Jun	7,648	412	7,236
Jul	7,432	749	6,683
Aug	7,224	1,441	5,783
Sep	7,120	1,025	6,095
Oct	7,120	2,118	5,002
Nov	7,328	2,263	5,065
Dec	7,752	1,789	5,963

Reservoir Operations in a Bulk Power Electric System

What are the issues to be considered?

During certain storm trouble, hydro can quickly resolve associated line overloads

Provide “backup generation” during sudden loss of a generating unit

Provide “blackstart” capabilities to system

Provide “voltage stabilization” as system load changes throughout the day

Operating flexibility is important in APC’s ability to provide low cost , reliable electric service to its customers

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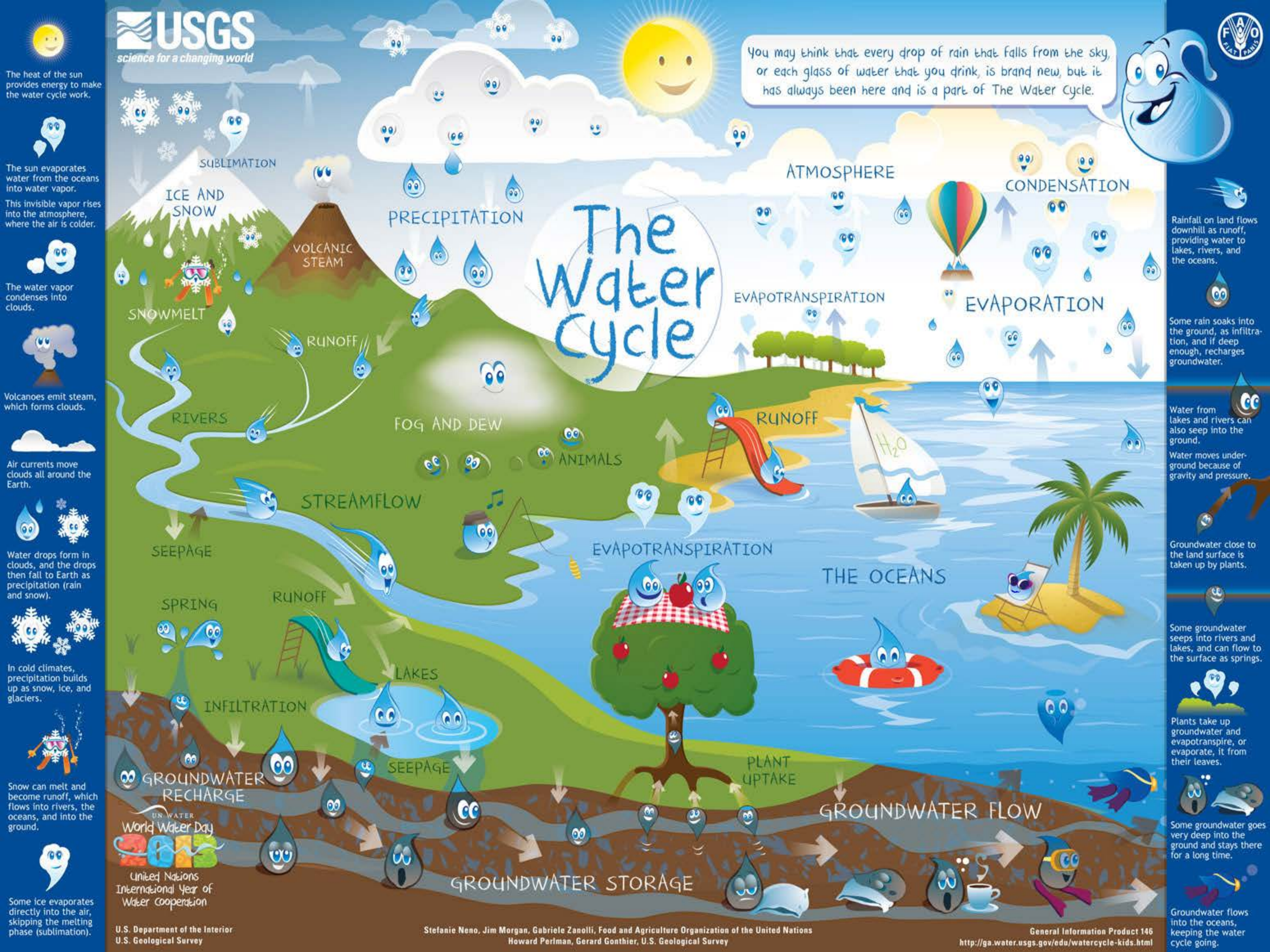
RELICENSING

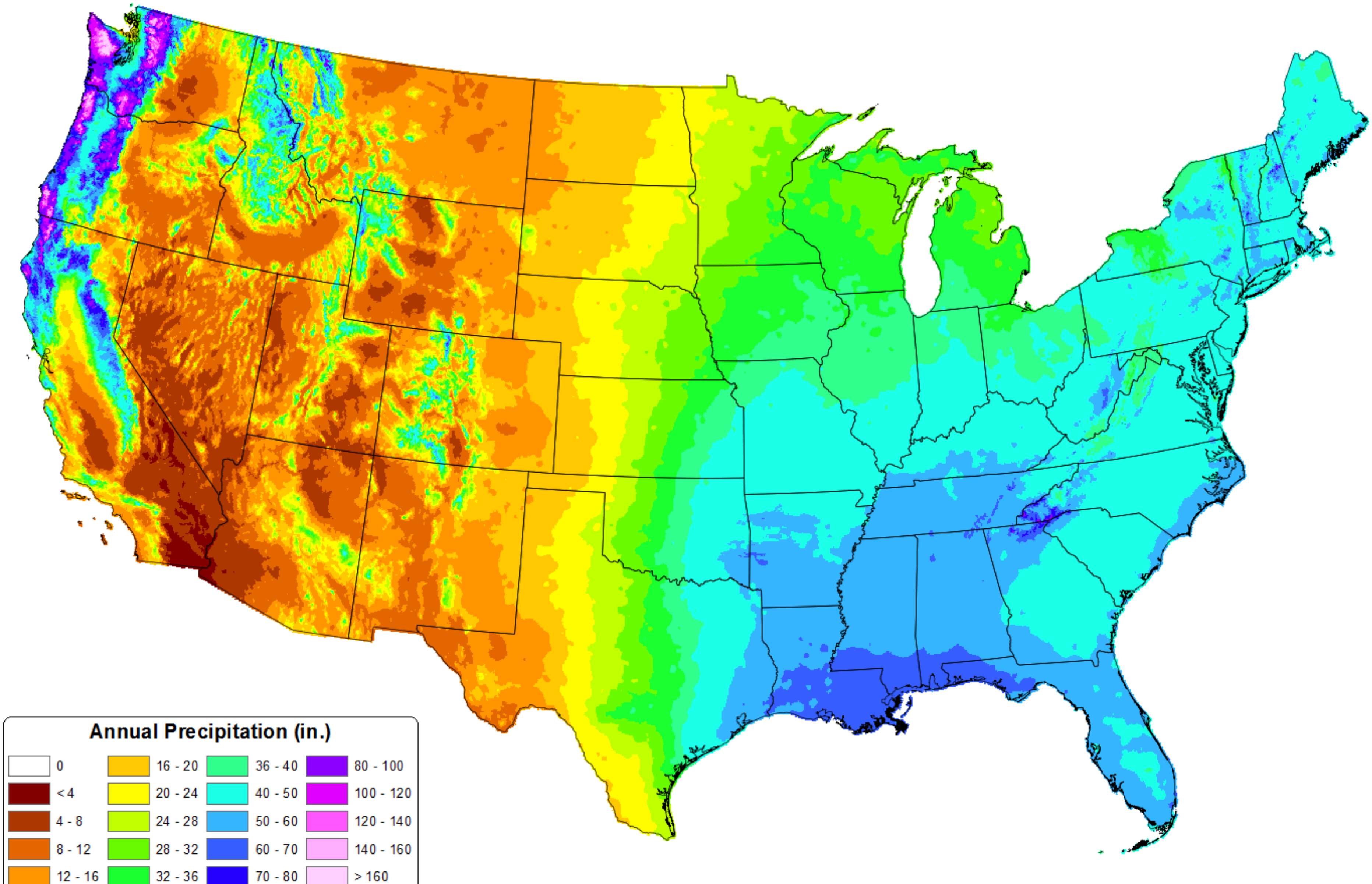
All Energy Production Requires a Fuel Source

Our Fuel Procurement Contract…

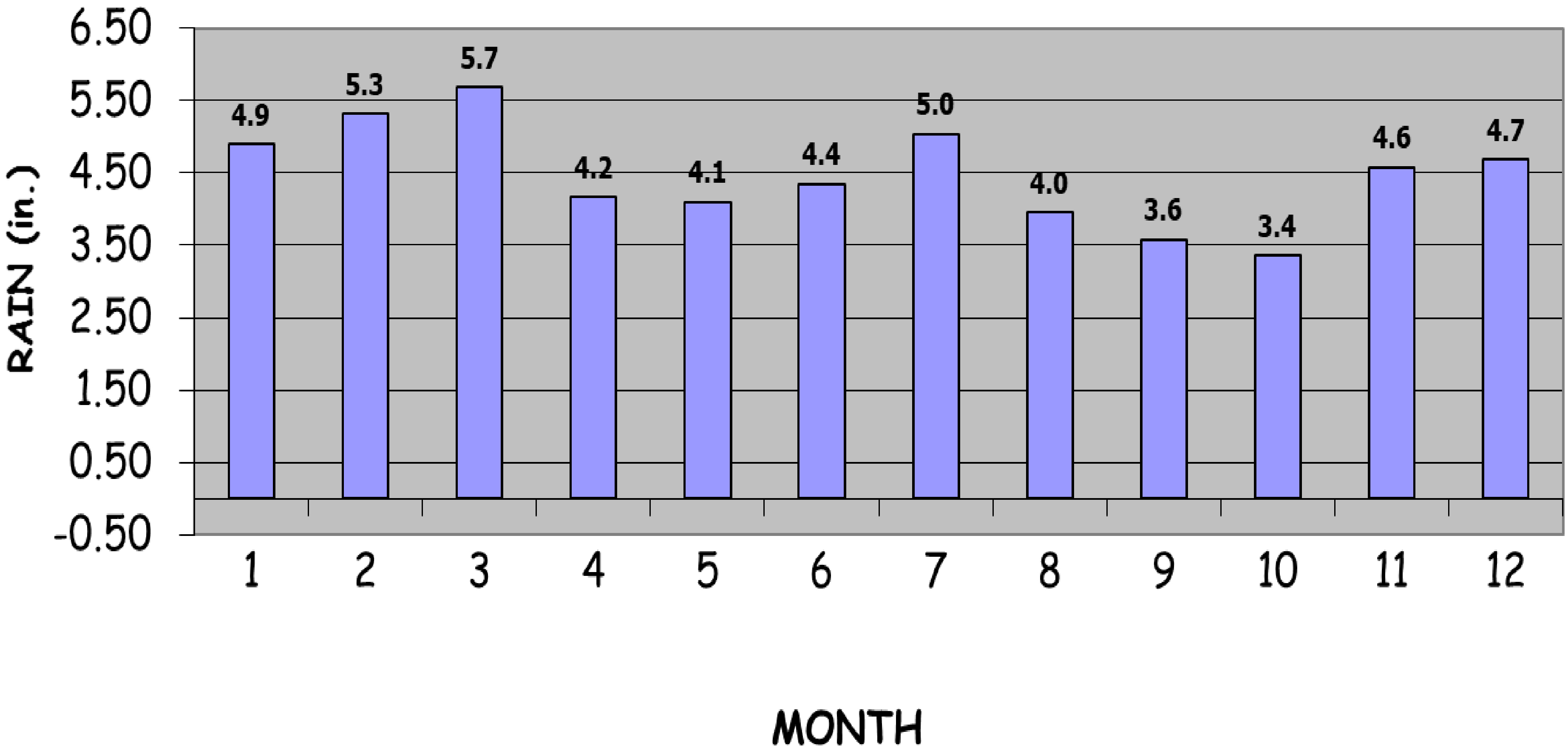


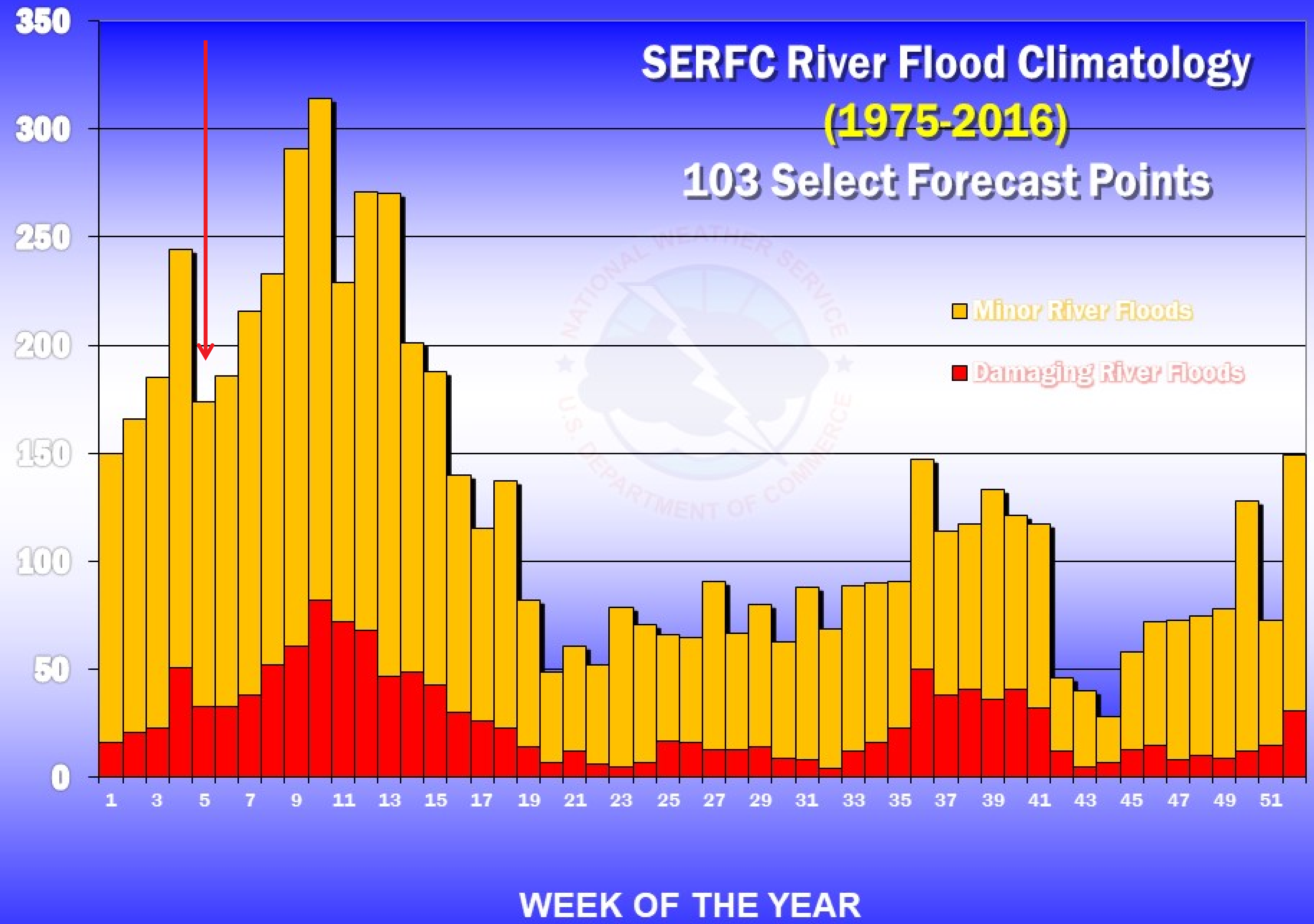
USGS
science for a changing world
The Water Cycle
You may think that every drop of rain that falls from the sky, or each glass of water that you drink, is brand new, but it has always been here and is a part of The Water Cycle.
The heat of the sun provides energy to make the water cycle work.
The sun evaporates water from the oceans into water vapor.
This invisible vapor rises into the atmosphere, where the air is colder.
The water vapor condenses into clouds.
Volcanoes emit steam, which forms clouds.
Air currents move clouds all around the Earth.
Water drops form in clouds, and the drops then fall to Earth as precipitation (rain and snow).
In cold climates, precipitation builds up as snow, ice, and glaciers.
Snow can melt and become runoff, which flows into rivers, the oceans, and into the ground.
Some ice evaporates directly into the air, skipping the melting phase (sublimation).
Rainfall on land flows downhill as runoff, providing water to lakes, rivers, and the oceans.
Some rain soaks into the ground, as infiltration, and if deep enough, recharges groundwater.
Water from lakes and rivers can also seep into the ground.
Water moves underground because of gravity and pressure.
Groundwater close to the land surface is taken up by plants.
Some groundwater seeps into rivers and lakes, and can flow to the surface as springs.
Plants take up groundwater and evapotranspire, or evaporate, it from their leaves.
Some groundwater goes very deep into the ground and stays there for a long time.
Groundwater flows into the oceans, keeping the water cycle going.
SUBLIMATION
ICE AND SNOW
VOLCANIC STEAM
PRECIPITATION
ATMOSPHERE
CONDENSATION
EVAPOTRANSPIRATION
EVAPORATION
SNOWMELT
RUNOFF
RIVERS
FOG AND DEW
ANIMALS
RUNOFF
STREAMFLOW
SEEPAGE
EVAPOTRANSPIRATION
THE OCEANS
SPRING
RUNOFF
LAKES
INFILTRATION
SEEPAGE
PLANT UPTAKE
GROUNDWATER RECHARGE
GROUNDWATER FLOW
GROUNDWATER STORAGE
H_2O
UN WATER
World Water Day 2013
United Nations International Year of Water Cooperation
U.S. Department of the Interior
U.S. Geological Survey
Stefanie Neno, Jim Morgan, Gabriele Zanolli, Food and Agriculture Organization of the United Nations
Howard Perlman, Gerard Gonthier, U.S. Geological Survey
General Information Product 146
http://ga.water.usgs.gov/edu/watercycle-kids.html

30-yr Normal Precipitation: Annual
Period: 1981-2010

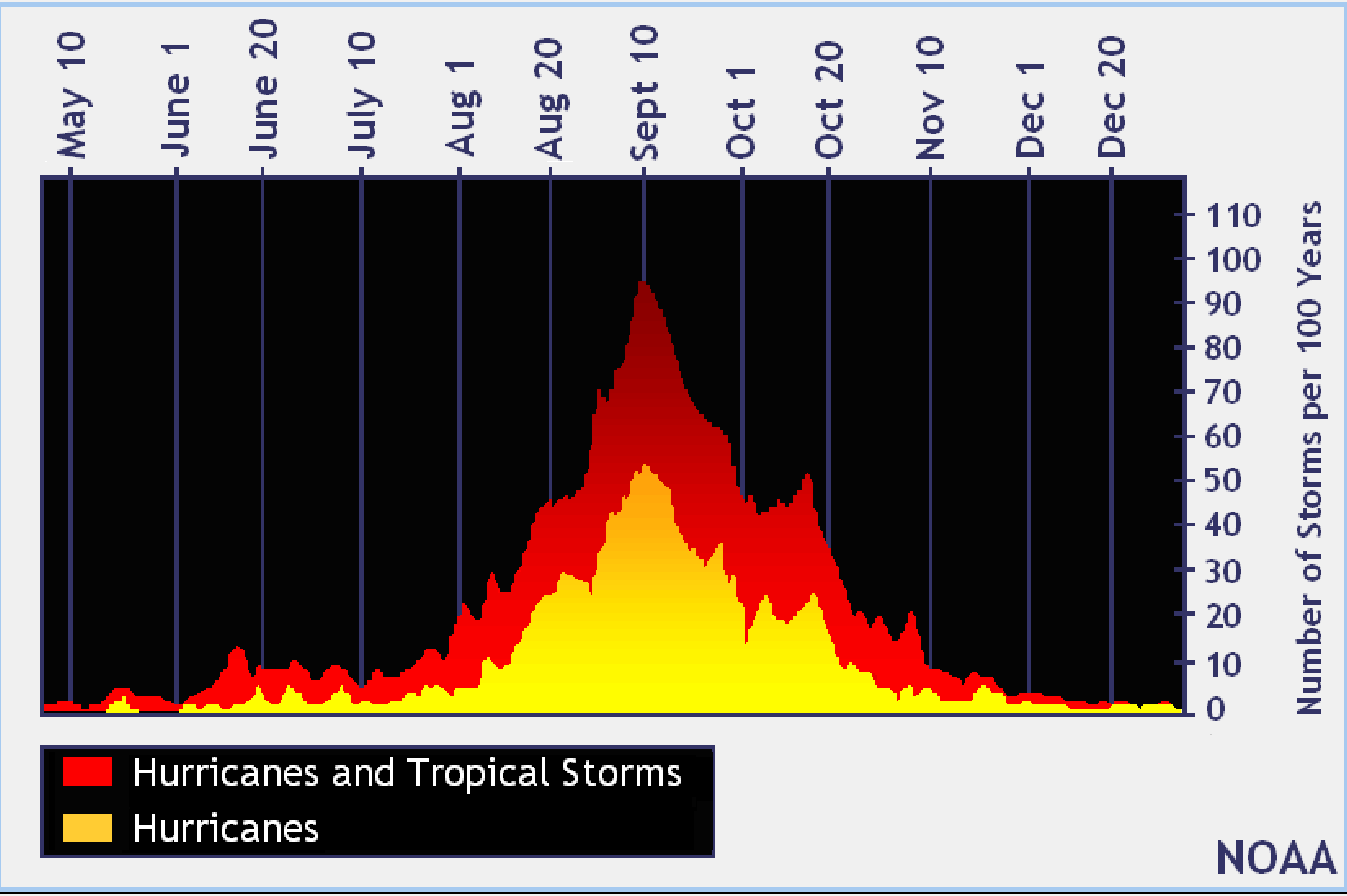


Tallapoosa Basin Average Monthly Rainfall





SERFC River Flood Climatology
(1975-2016)
103 Select Forecast Points
Minor River Floods
Damaging River Floods
350
300
250
200
150
100
50
0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
37
39
41
43
45
47
49
51
WEEK OF THE YEAR


May 10
June 1
June 20
July 10
Aug 1
Aug 20
Sept 10
Oct 1
Oct 20
Nov 10
Dec 1
Dec 20
110
100
90
80
70
60
50
40
30
20
10
0
Number of Storms per 100 Years
Hurricanes and Tropical Storms
Hurricanes
NOAA

Informed Decision Making

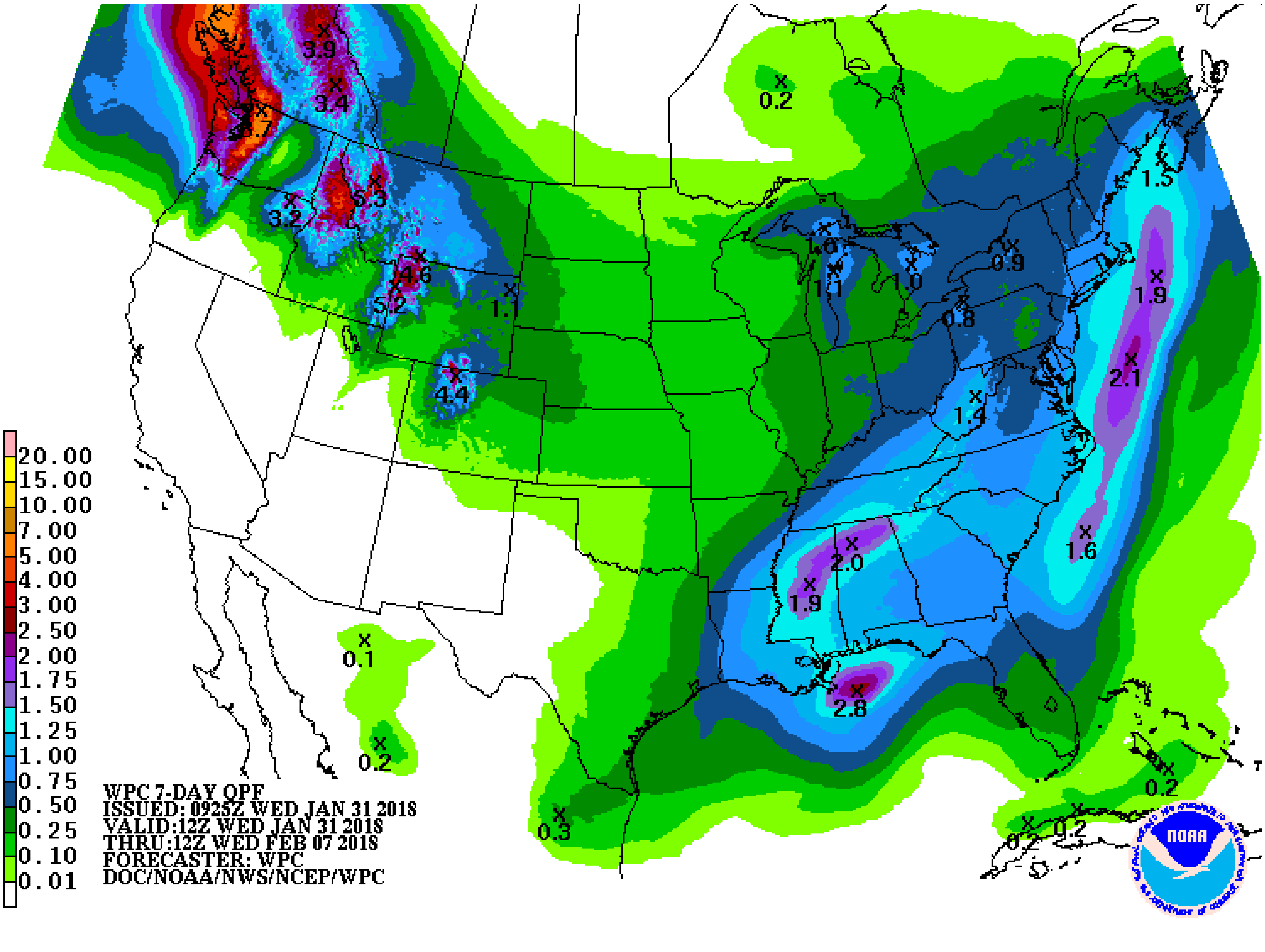
How Do We Know What We Need to Know to Operate?

HARRIS DAM
RELICENSING

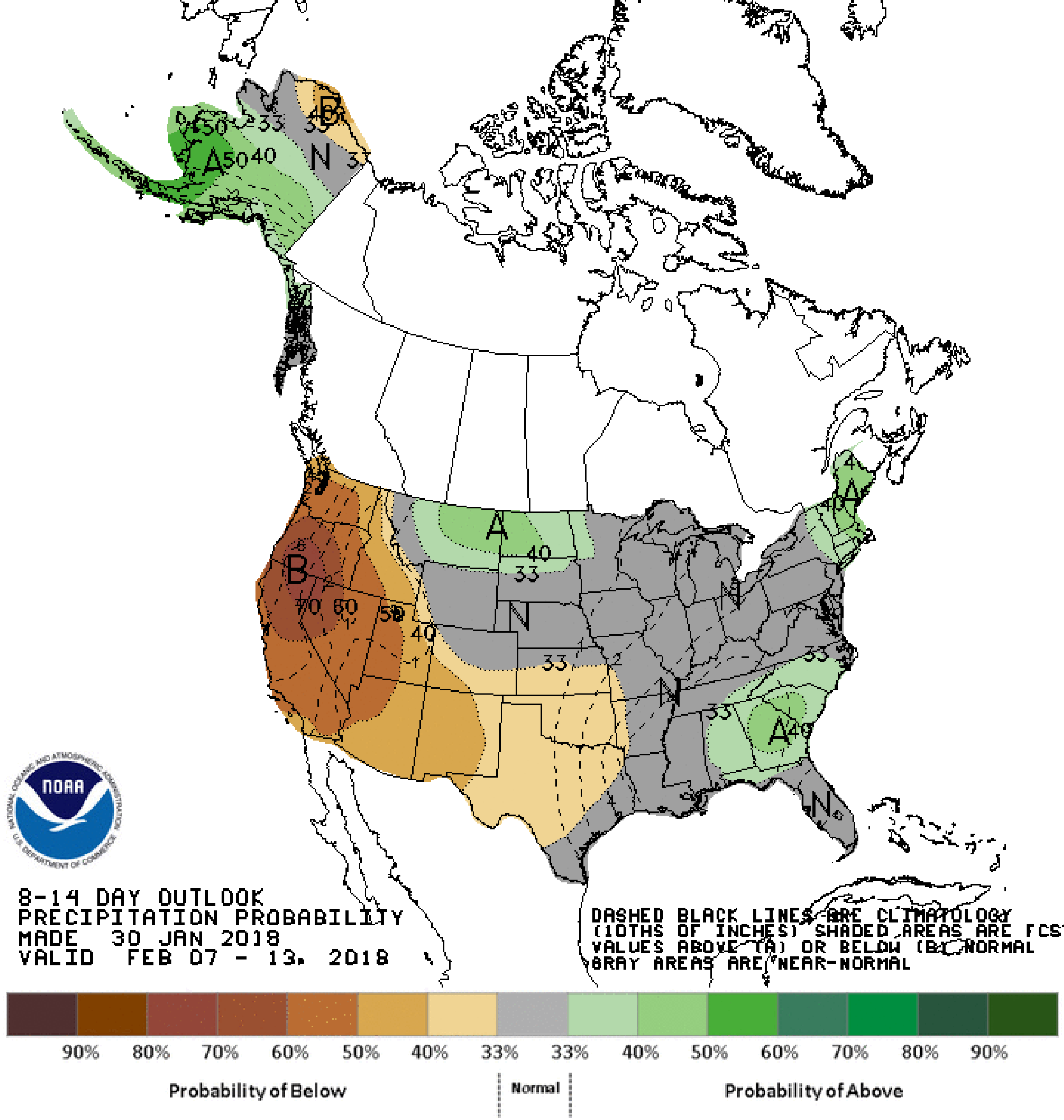
wil·ly-nil·ly

adverb
1. without direction or planning; haphazardly.

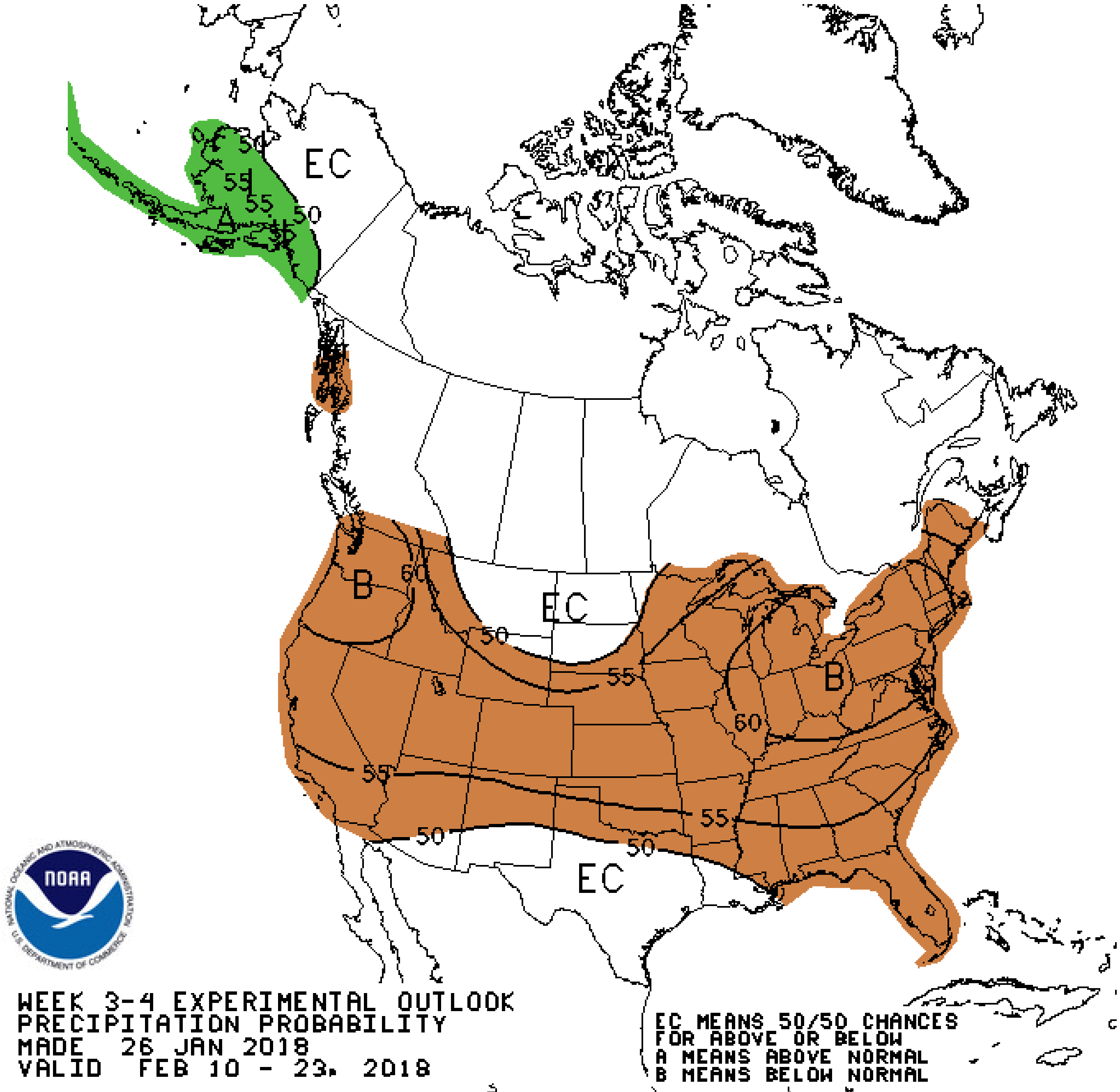
synonyms: haphazardly, at random, randomly, every which way, here and there, all over the place, in no apparent order



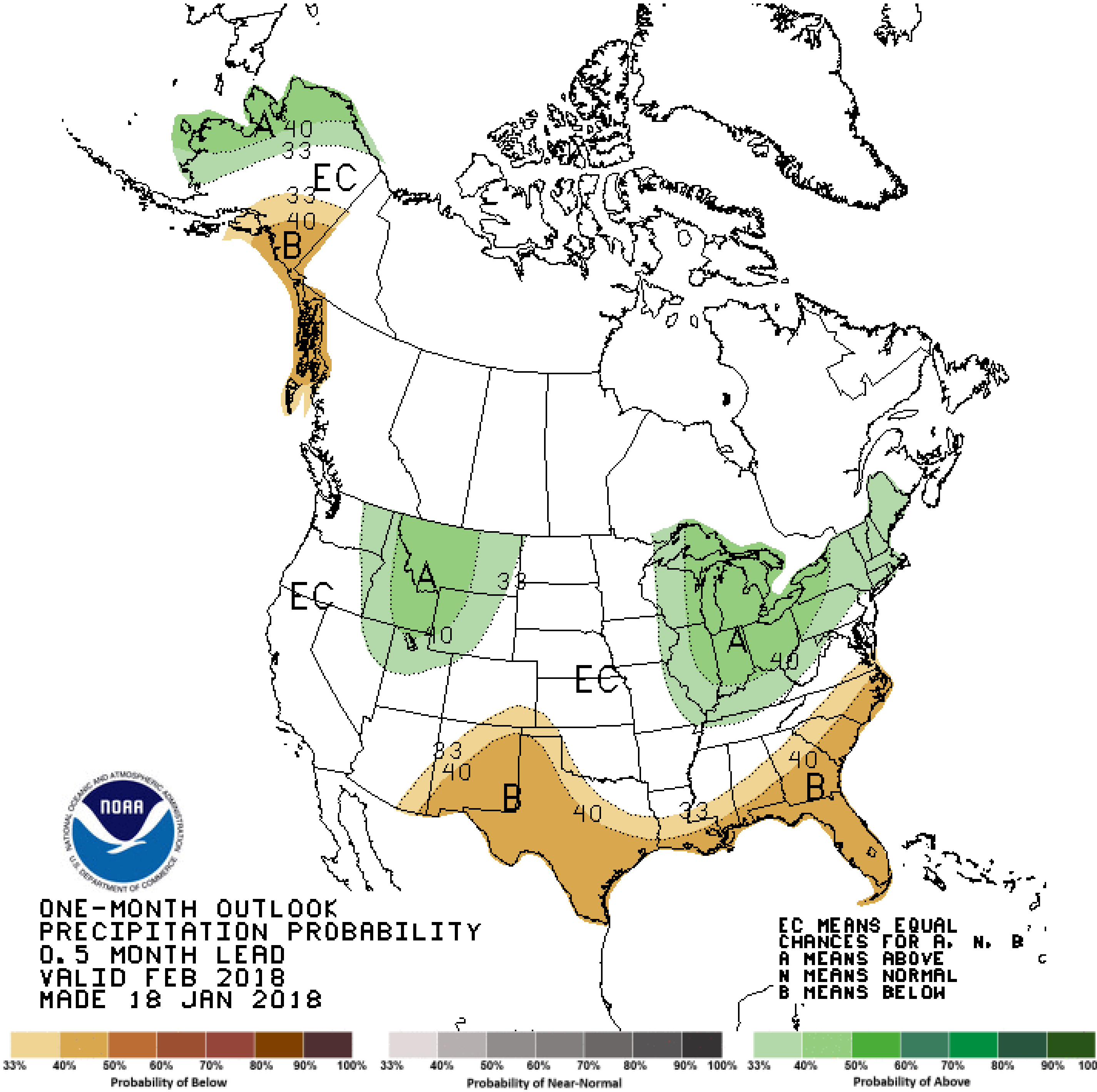
20.00
15.00
10.00
7.00
5.00
4.00
3.00
2.50
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.10
0.01
WPC 7-DAY QPF
ISSUED: 0925Z WED JAN 31 2018
VALID:12Z WED JAN 31 2018
THRU:12Z WED FEB 07 2018
FORECASTER: WPC
DOC/NOAA/NWS/NCEP/WPC
3.9
3.4
5.3
3.2
4.6
5.2
1.1
4.4
0.2
1.5
0.9
1.1
1.0
0.8
1.9
2.1
1.4
1.6
2.0
1.9
2.8
0.1
0.2
0.3
0.2
0.2
0.2
NOAA



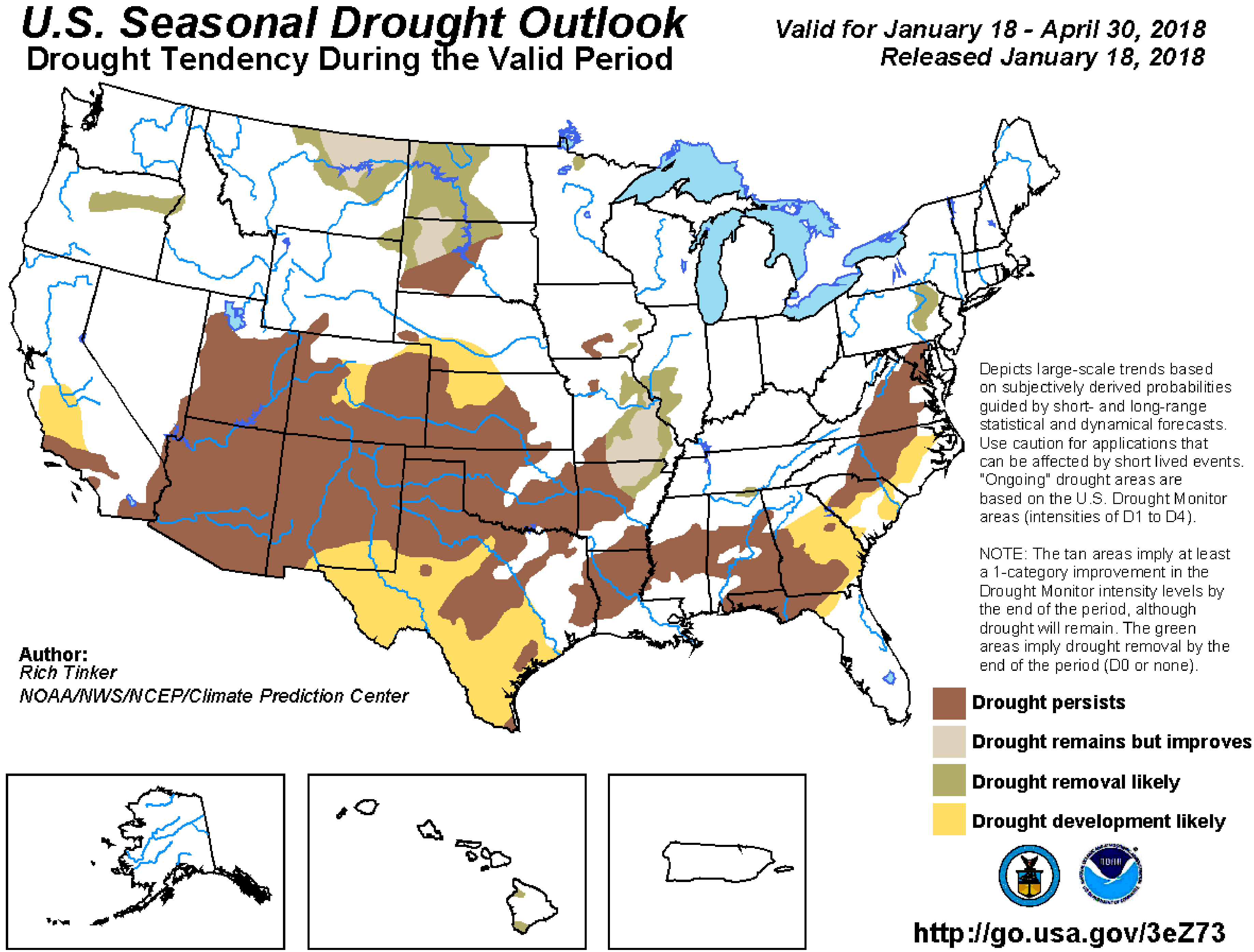
ARRIS DAM
RELICENSING



RRIS DAM
RELICENSING



RRIS DAM
RELICENSING


U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period
Valid for January 18 - April 30, 2018
Released January 18, 2018
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).
NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).
Author:
Rich Tinker
NOAA/NWS/NCEP/Climate Prediction Center
Drought persists
Drought remains but improves
Drought removal likely
Drought development likely
http://go.usa.gov/3eZ73

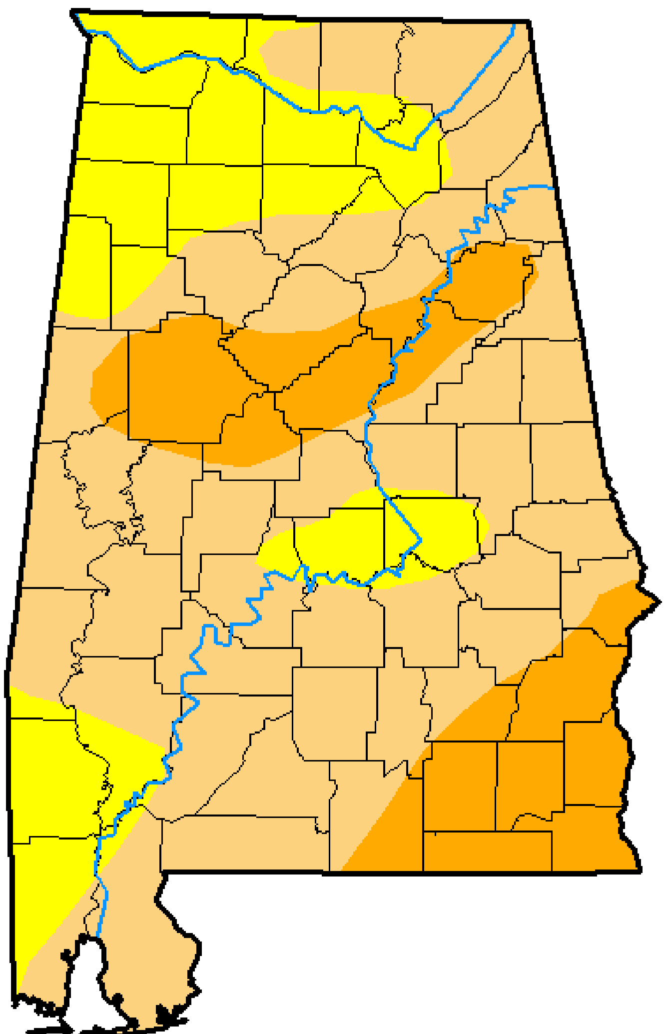
U.S. Drought Monitor

Alabama

January 23, 2018

(Released Thursday, Jan. 25, 2018)

Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

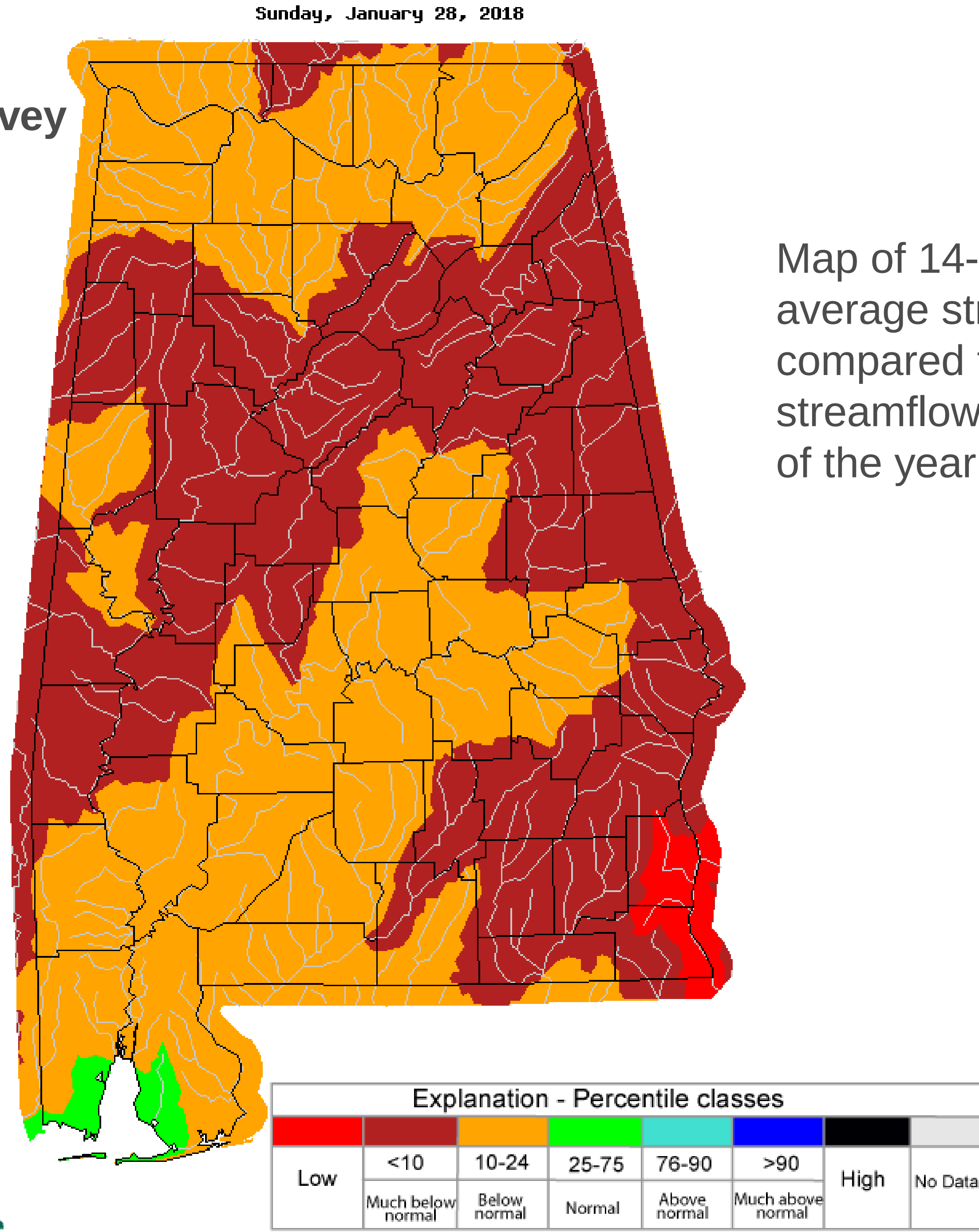
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Richard Heim
NCEI/NOAA

http://droughtmonitor.unl.edu/

United States Geological Survey



Map of 14-day average streamflow compared to historical streamflow for the day of the year

USGS

HARRIS DAM RELICENSING

We are a Data Driven Function

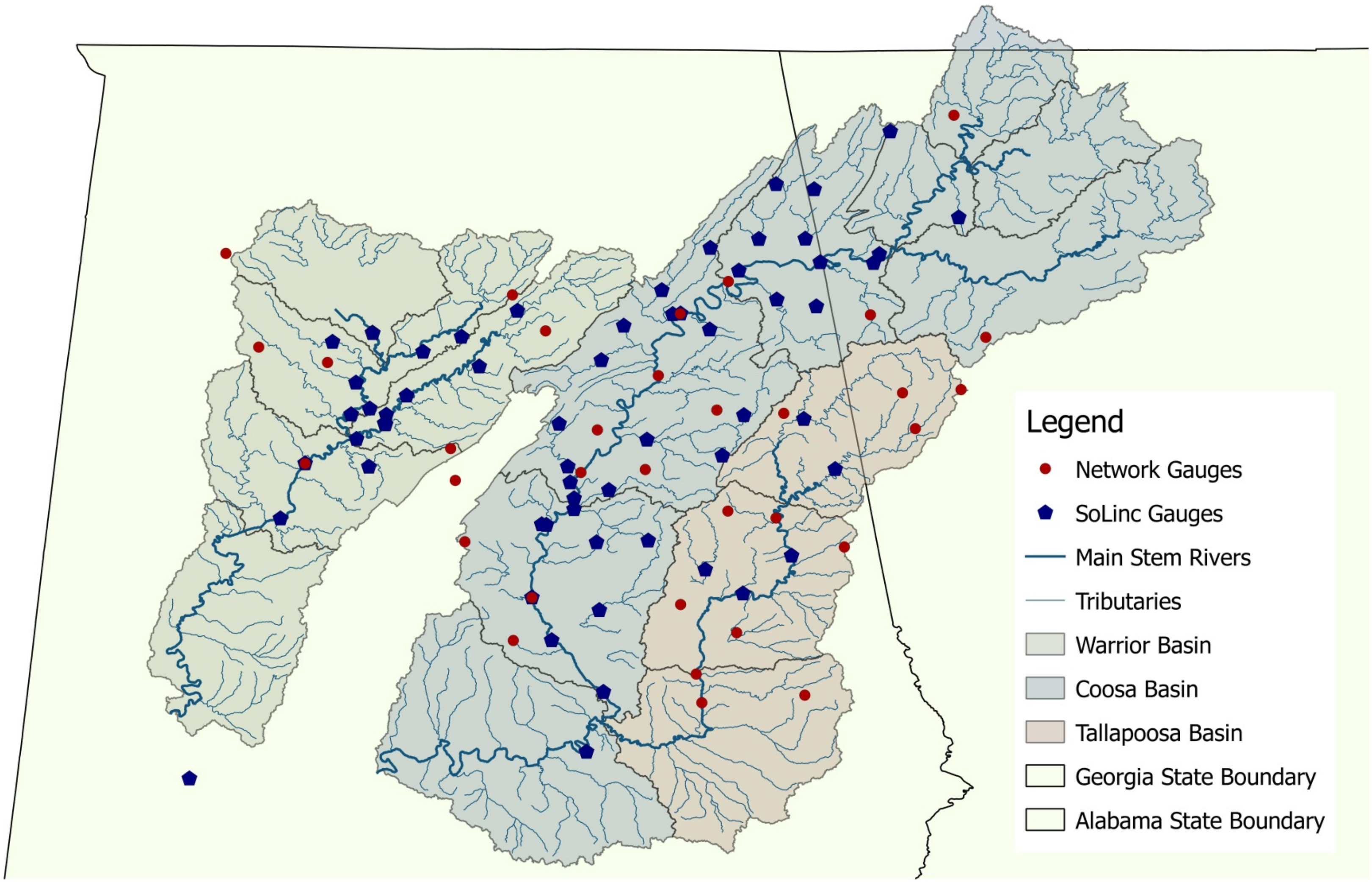
How Do We Know What We Need to Know to Operate?

HARRIS DAM
RELICENSING

Real Time Systems

- HDAS – Hydro Data Acquisition System
- HOMS – Hydro Optimization Management System

HDAS Remote Gage Network



Hydro Optimization Management System HOMS

- Three Systems – Production, Backup and Development
- Twenty Three Servers
- Seven Database Servers and Twenty Databases
- Six Web Sites
- Six Desktop Applications

Gaging Program – Electronic Gages

Two Types of Reservoirs:

- Run of River

- Storage

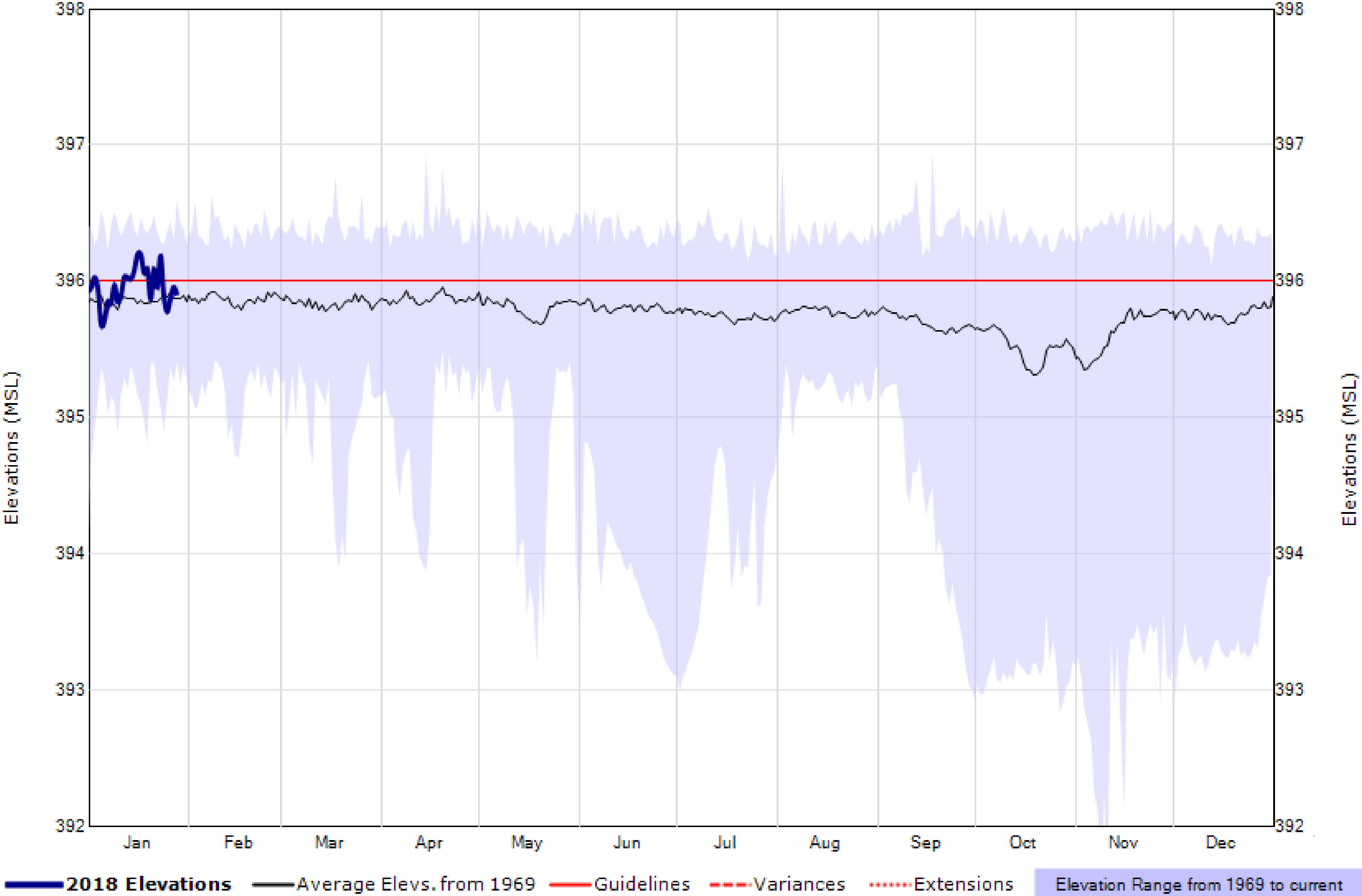
Run of River:

- What flows in, also flows out
  - Inflow = Releases
  - Substantially consistent lake level year round

    Coosa
    - Lay
    - Mitchell
    - Jordan/Bouldin

    Tallapoosa
    - Yates/Thurlow

Alabama Power - Lay



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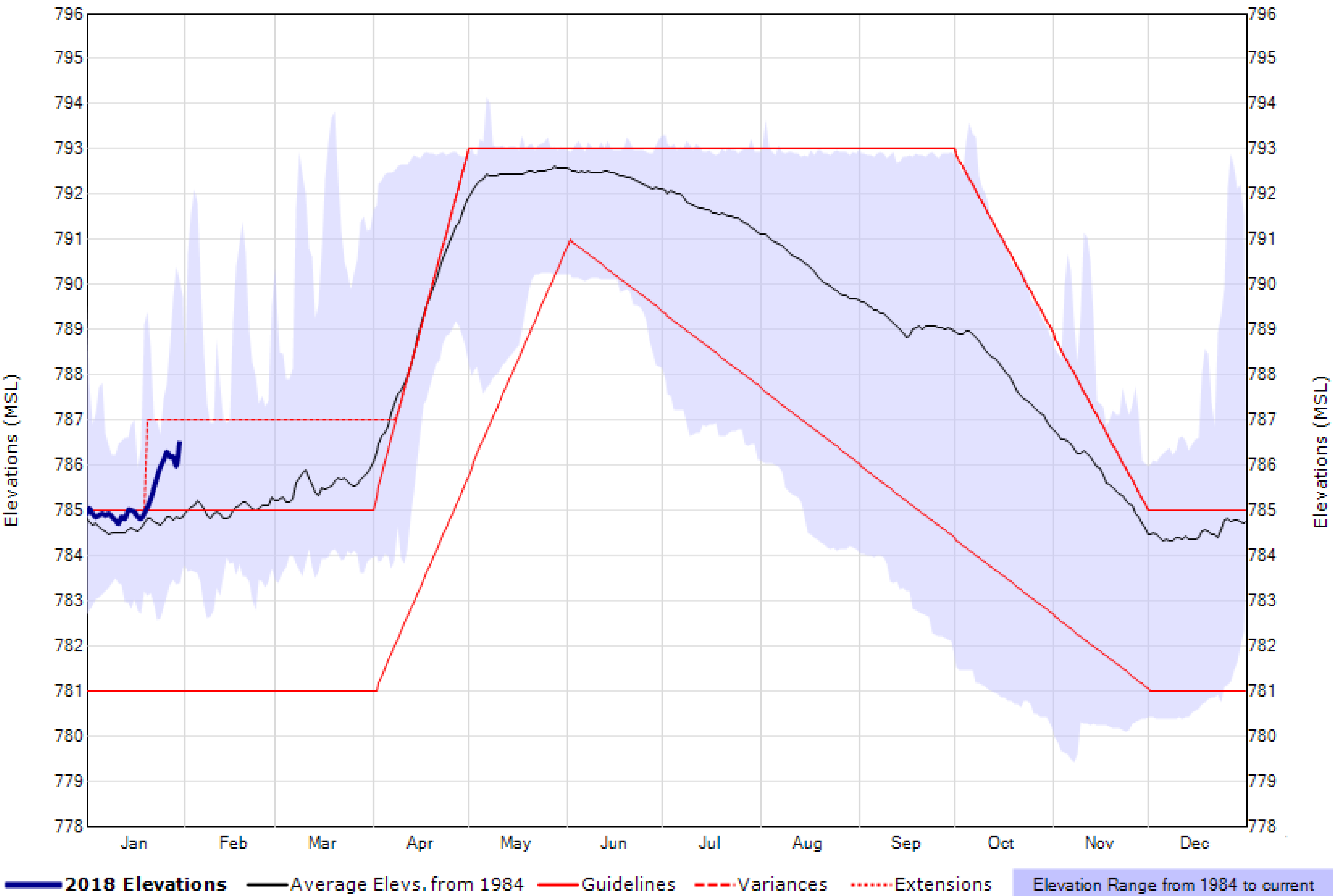
Year 2018

Storage Reservoirs

- What flows in, doesn't necessarily flow out or what doesn't flow in may actually flow out
  - Different Summer and Winter Elevations
    - *Coosa*
      - Weiss
      - H. Neely Henry
      - Logan Martin
    - *Tallapoosa*
      - Harris
      - Martin
    - *Warrior*
      - Smith
- Critical for Flood Control
- Critical for Drought Mitigation

Alabama Power - Harris



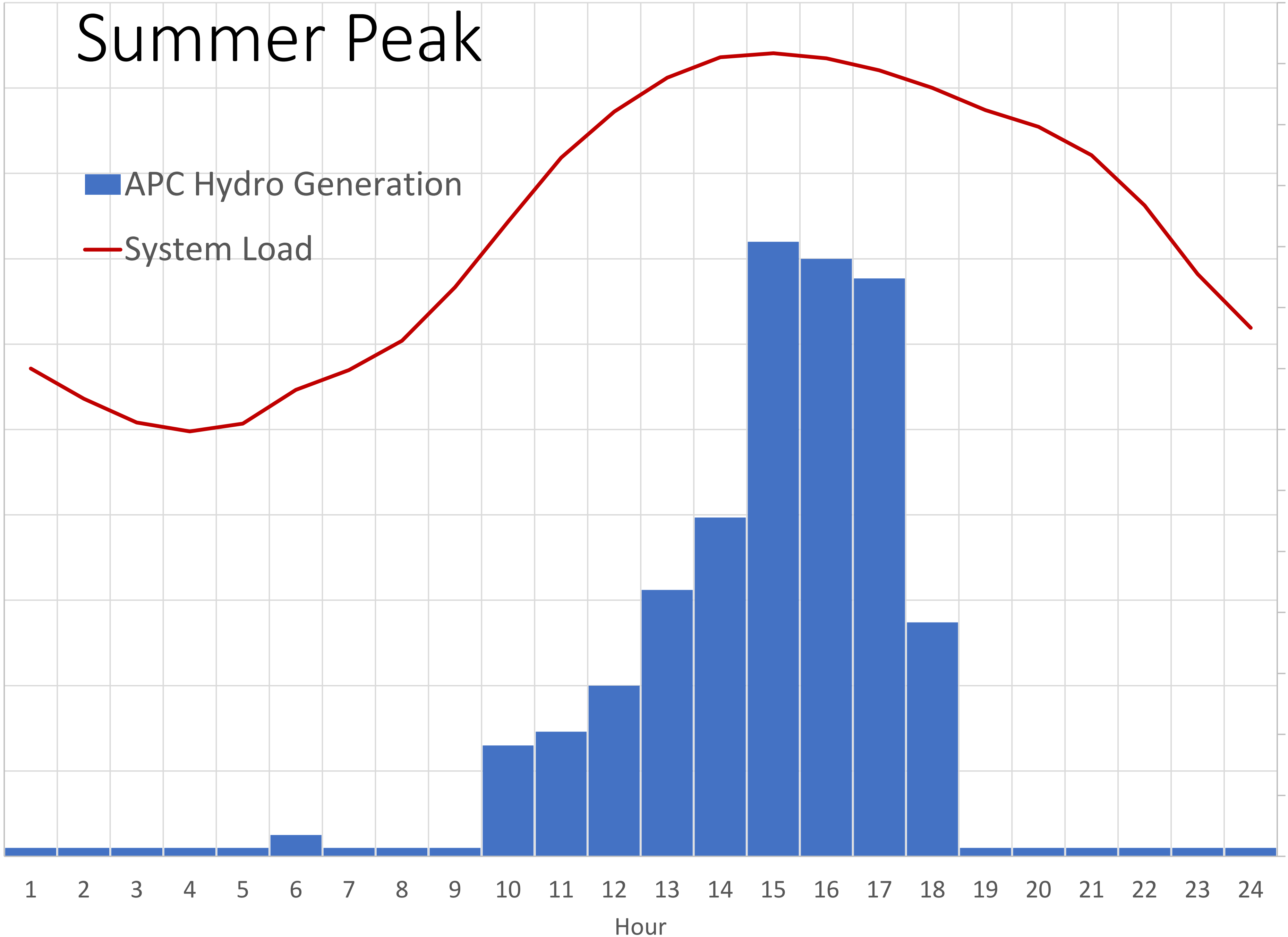
Plotted@1/31/2018 5:22 AM

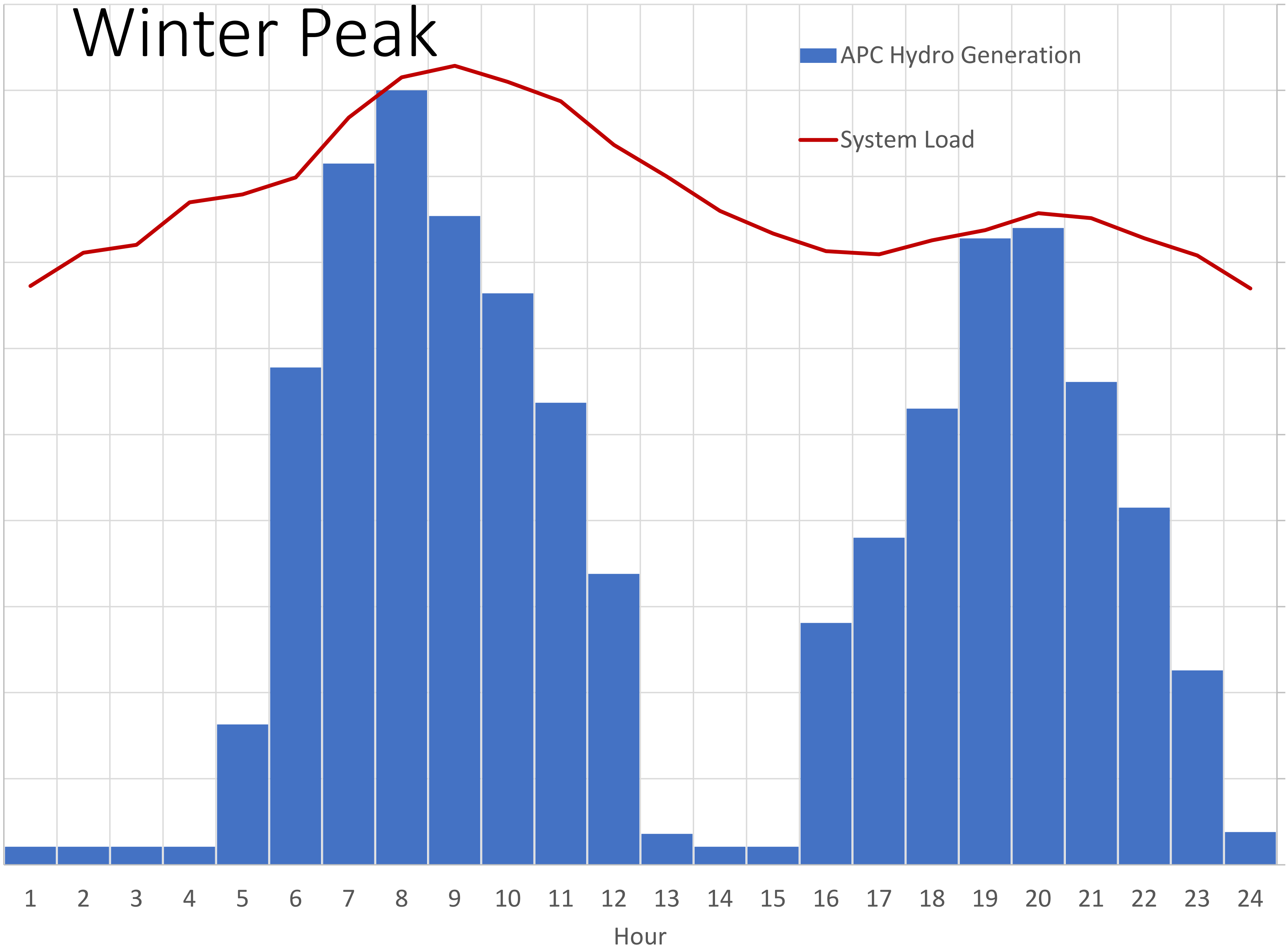
Year 2018

Hot Dogs and Energy Production

Peaking Generation

- Water available for generating electricity is limited
- Hydro is operated to fill in the peak load demand
  - Maximizes economics
- Summer has one peak
  - around 3 pm
- Winter has two peaks
  - Morning around 7 a.m.
  - Afternoon around 7 p.m.


Summer Peak
APC Hydro Generation
System Load
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour



Winter Peak
APC Hydro Generation
System Load
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour

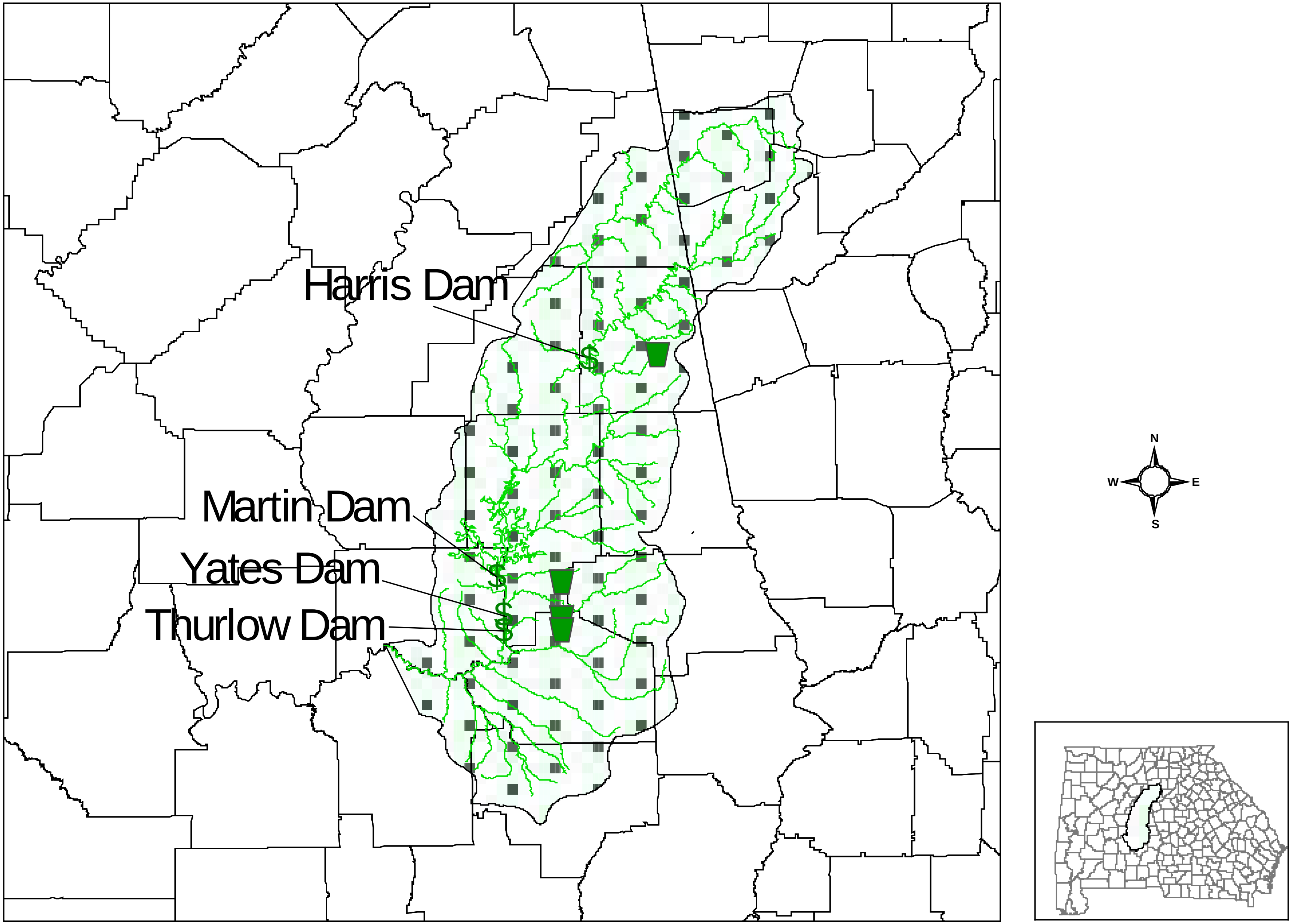
Harris Specific Operations

Routine Operations

Flood Operations

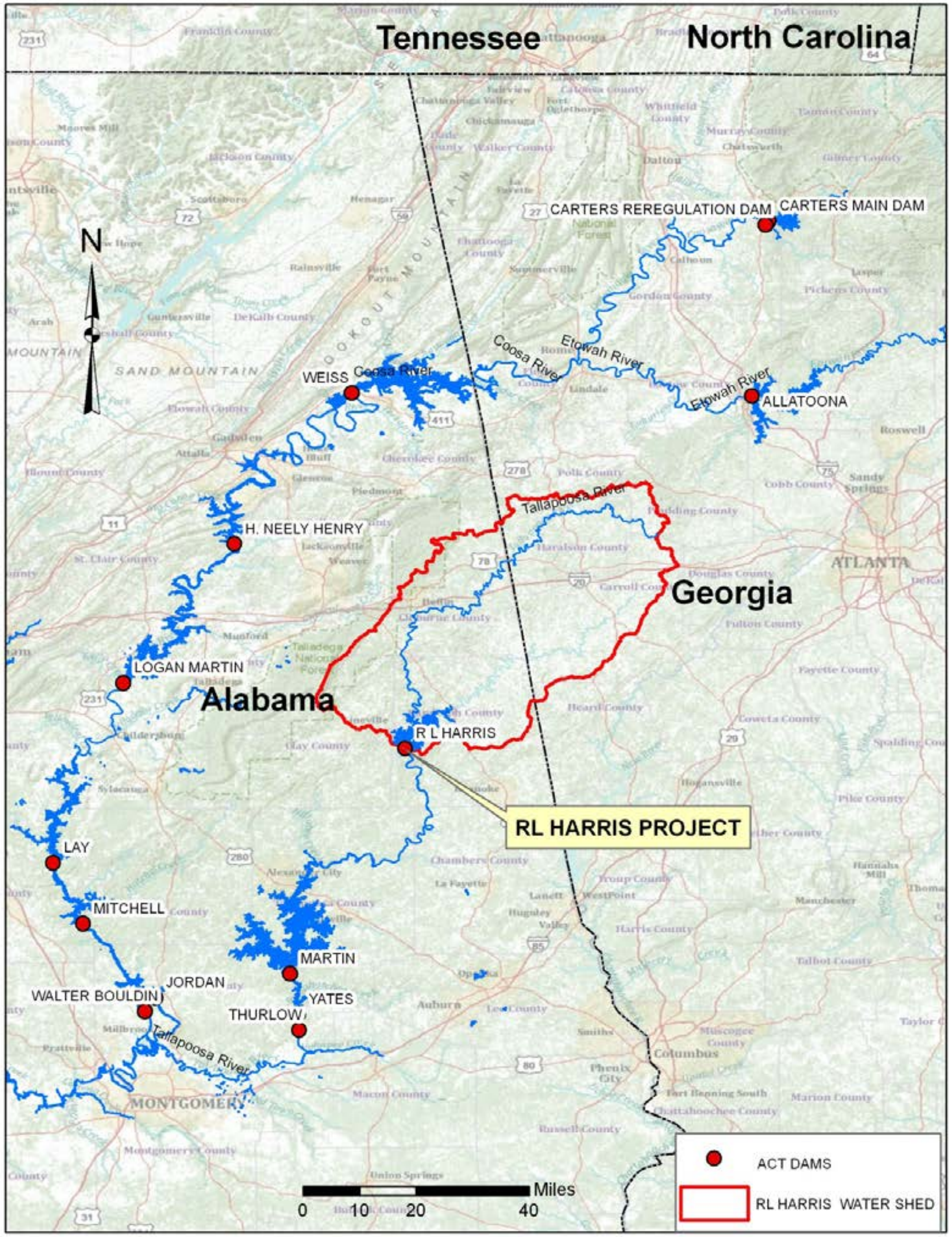
Drought Operations

Tallapoosa River Basin



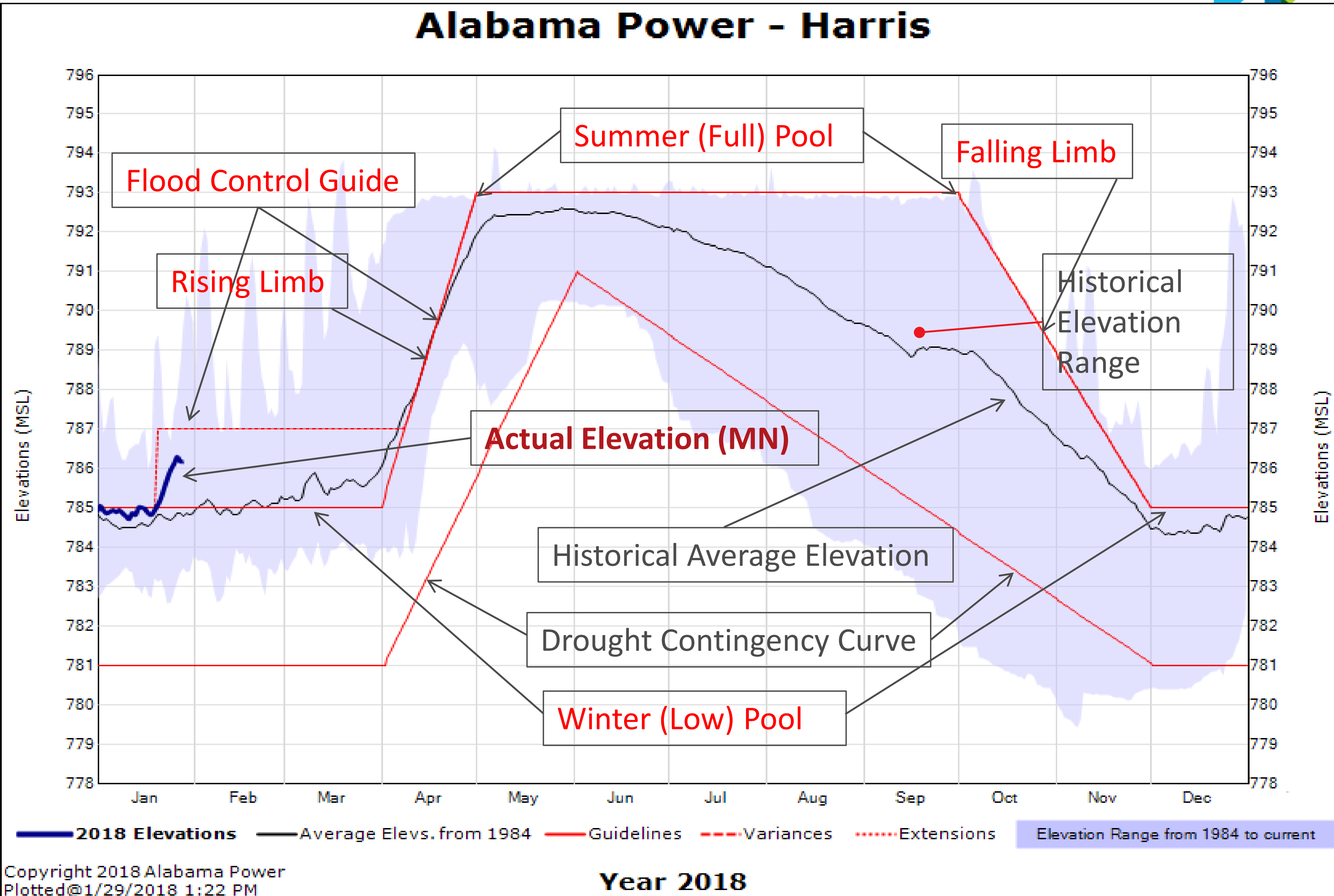
Tallapoosa River Basin

Approx. 1450 square miles of watershed draining into the reservoir

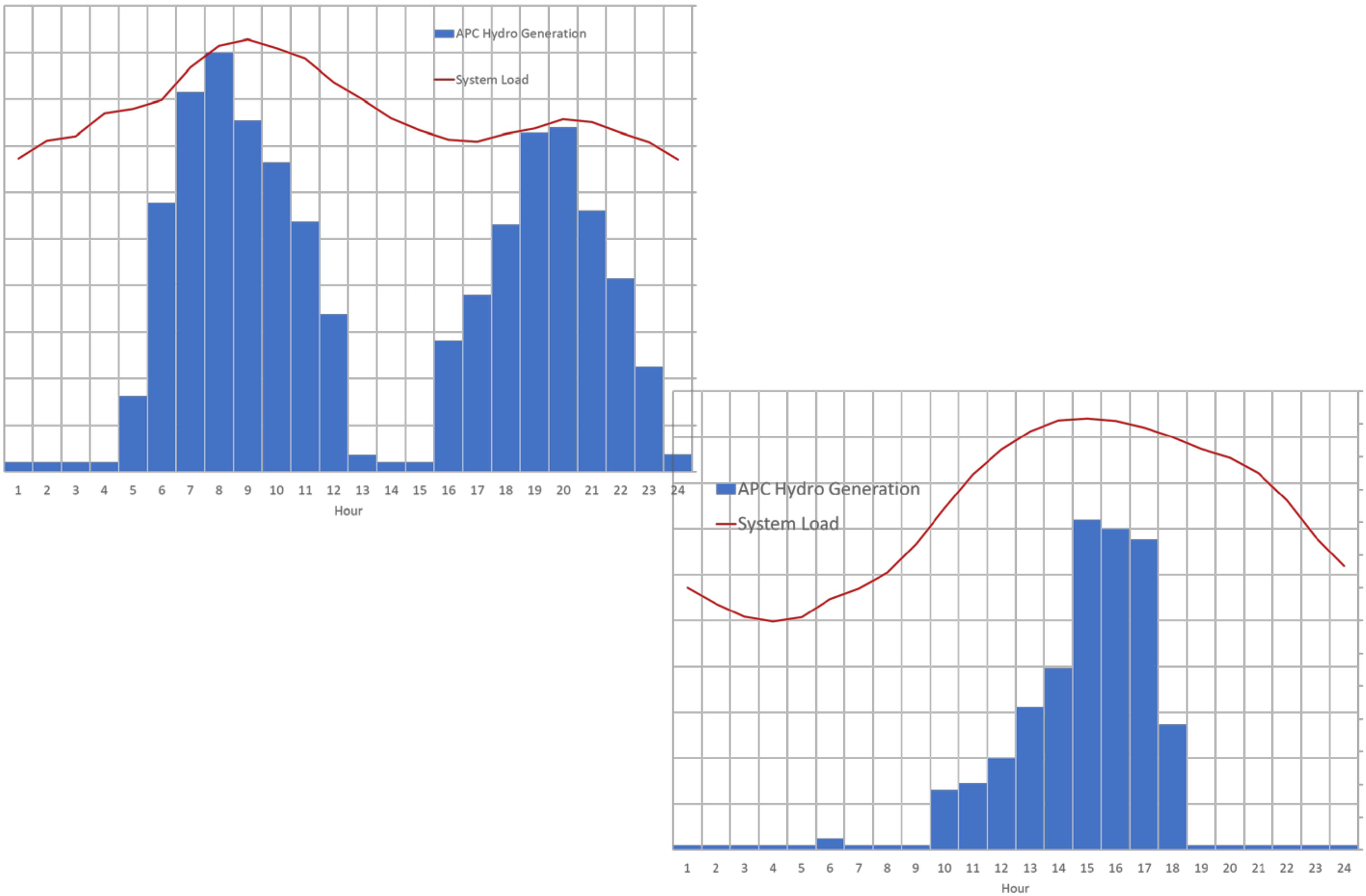


HARRIS DAM RELICENSING

Anatomy of a "Rule Curve Plot"



Designed for Peaking Operations



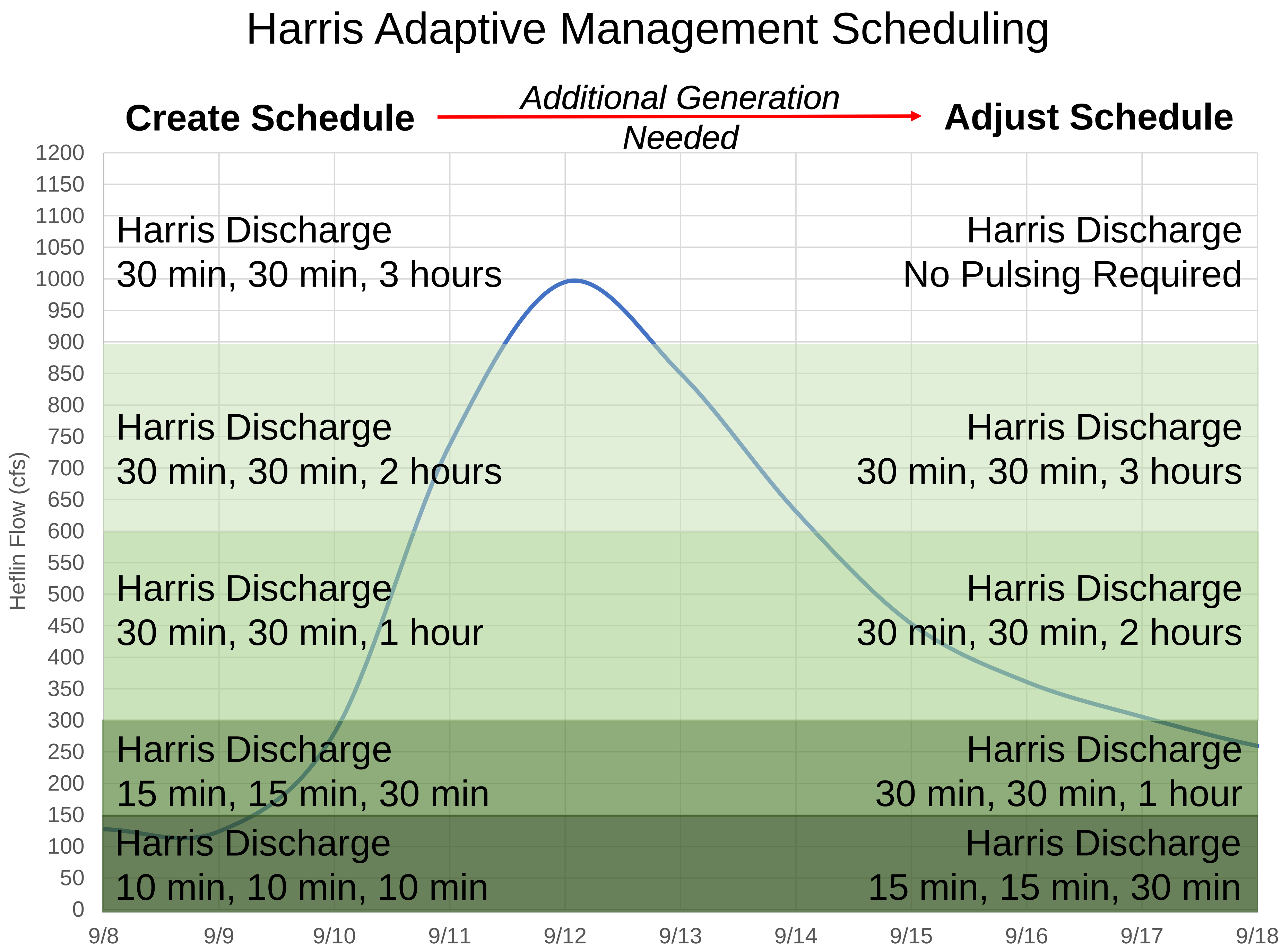
Harris Adaptive Flow – Green Plan - Main Unit Pulses

Create schedule based on prior day's Heflin flow

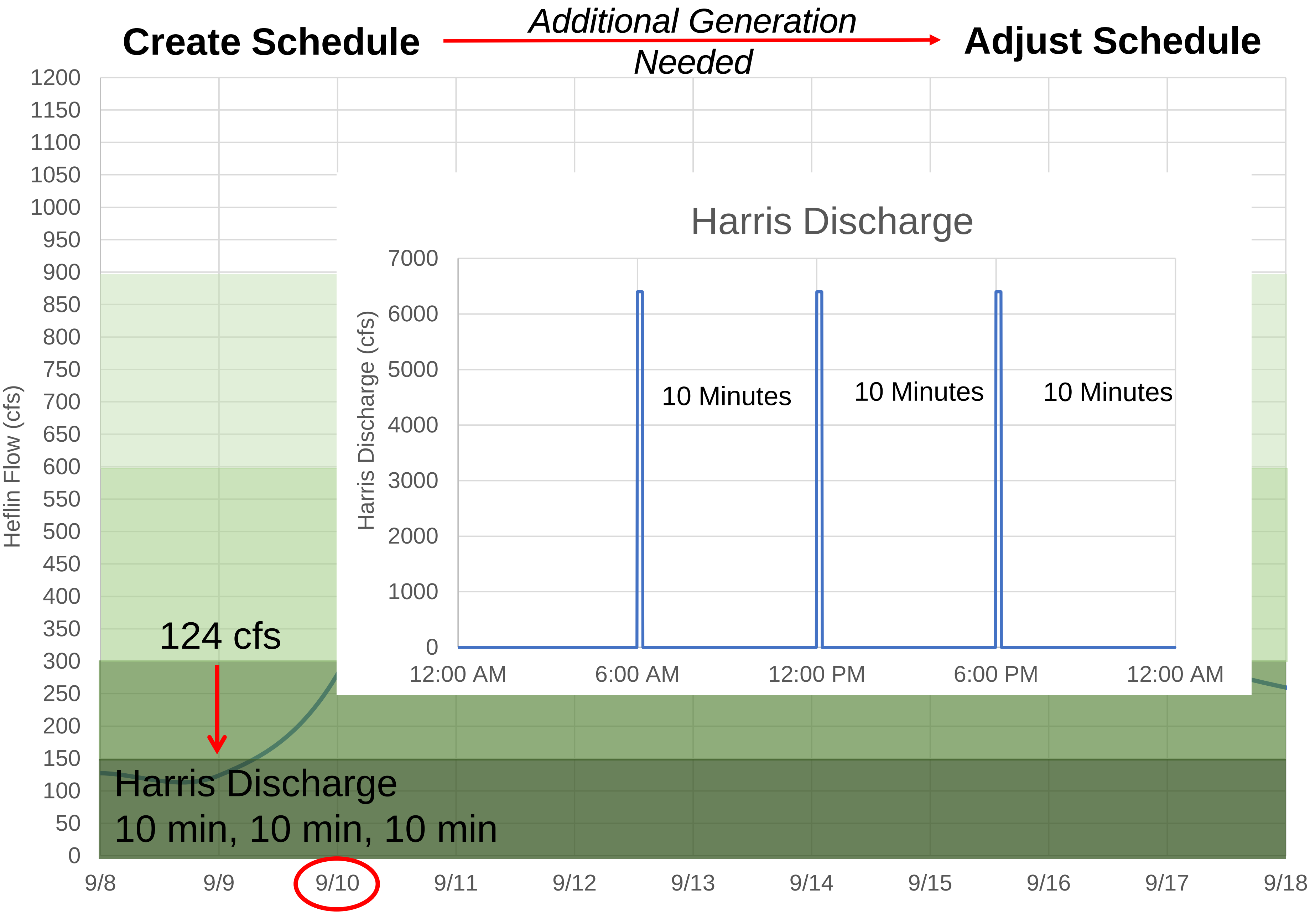
STEP	Prior Day's Heflin Flow (dsf)	Generation At 6 AM	Generation At 12 Noon	Generation As System Needs	Total Machine Time	Harris Total Discharge (dsf)
1A	0 < Heflin Q < 150	10 min	10 min	10 min	30 min	133
2A	150 < Heflin Q < 300	15 min	15 min	30 min	1 hour	267
3A	300 < Heflin Q < 600	30 min	30 min	1 hour	2 hours	533
4A	600 < Heflin Q < 900	30 min	30 min	2 hours	3 hours	800
5A	900 < Heflin Q	30 min	30 min	3 hours	4 hours	1,067

Adjust Schedule if Necessary

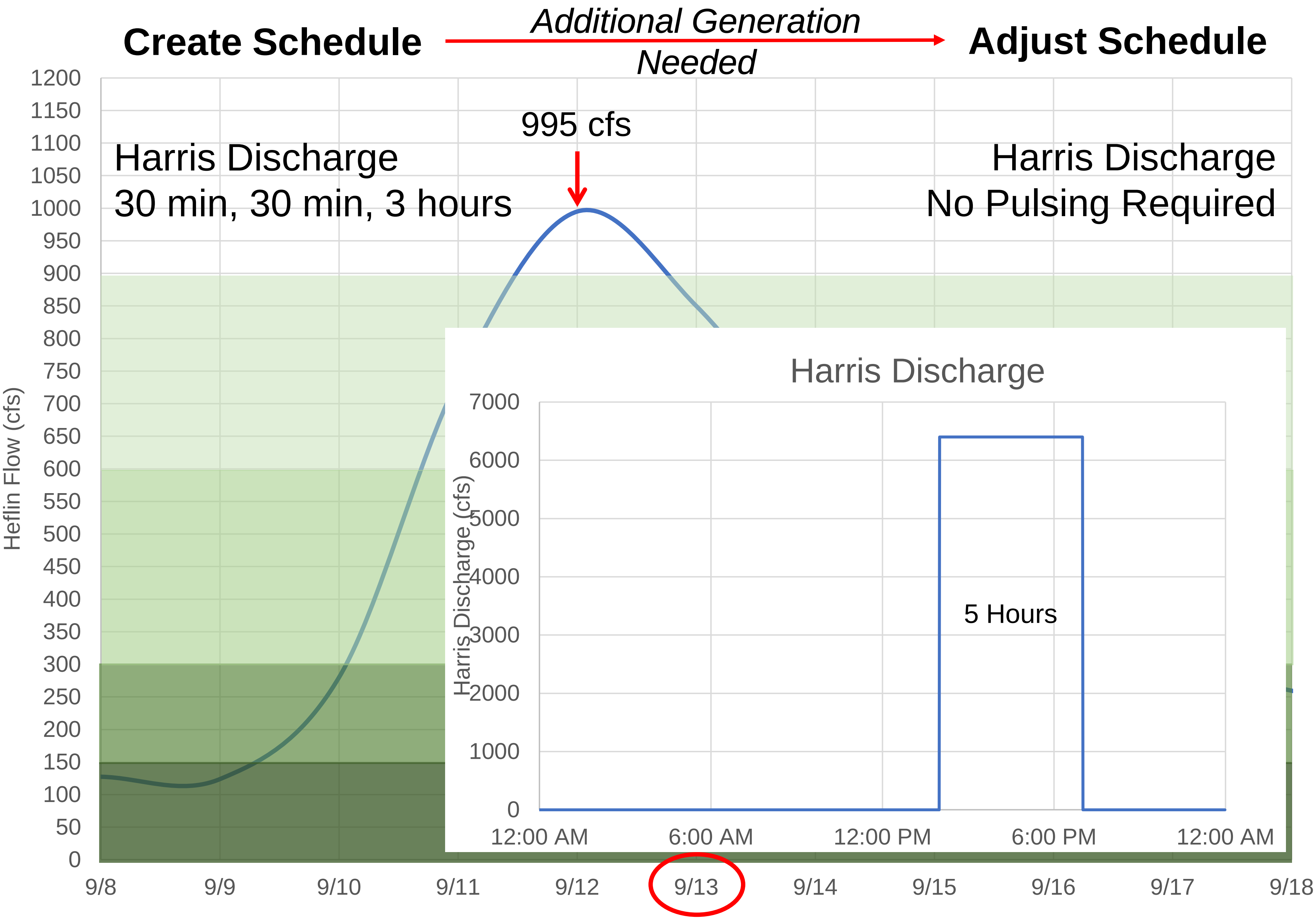
STEP	Total Schedule Generation	Generation At 6 AM	Generation At 12 Noon	Generation As System Needs	Total Machine Time	Harris Total Discharge (dsf)
1B	If generation = 1 machine hr	15 min	15 min	30 min	30 min	267
2B	If generation = 2 machine hr	30 min	30 min	1 hour	1 hour	533
3B	If generation = 3 machine hr	30 min	30 min	2 hours	2 hours	800
4B	If generation = 4 machine hr	30 min	30 min	3 hours	3 hours	1,067
5B	Generation > 4 machine hr	Not Required	Not Required	ALL		


Harris Adaptive Management Scheduling
Create Schedule
Additional Generation Needed
Adjust Schedule
Harris Discharge
30 min, 30 min, 3 hours
Harris Discharge
No Pulsing Required
Harris Discharge
30 min, 30 min, 2 hours
Harris Discharge
30 min, 30 min, 3 hours
Harris Discharge
30 min, 30 min, 1 hour
Harris Discharge
30 min, 30 min, 2 hours
Harris Discharge
15 min, 15 min, 30 min
Harris Discharge
30 min, 30 min, 1 hour
Harris Discharge
10 min, 10 min, 10 min
Harris Discharge
15 min, 15 min, 30 min
Heflin Flow (cfs)
1200
1150
1100
1050
1000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
9/8
9/9
9/10
9/11
9/12
9/13
9/14
9/15
9/16
9/17
9/18

Harris Adaptive Management Scheduling

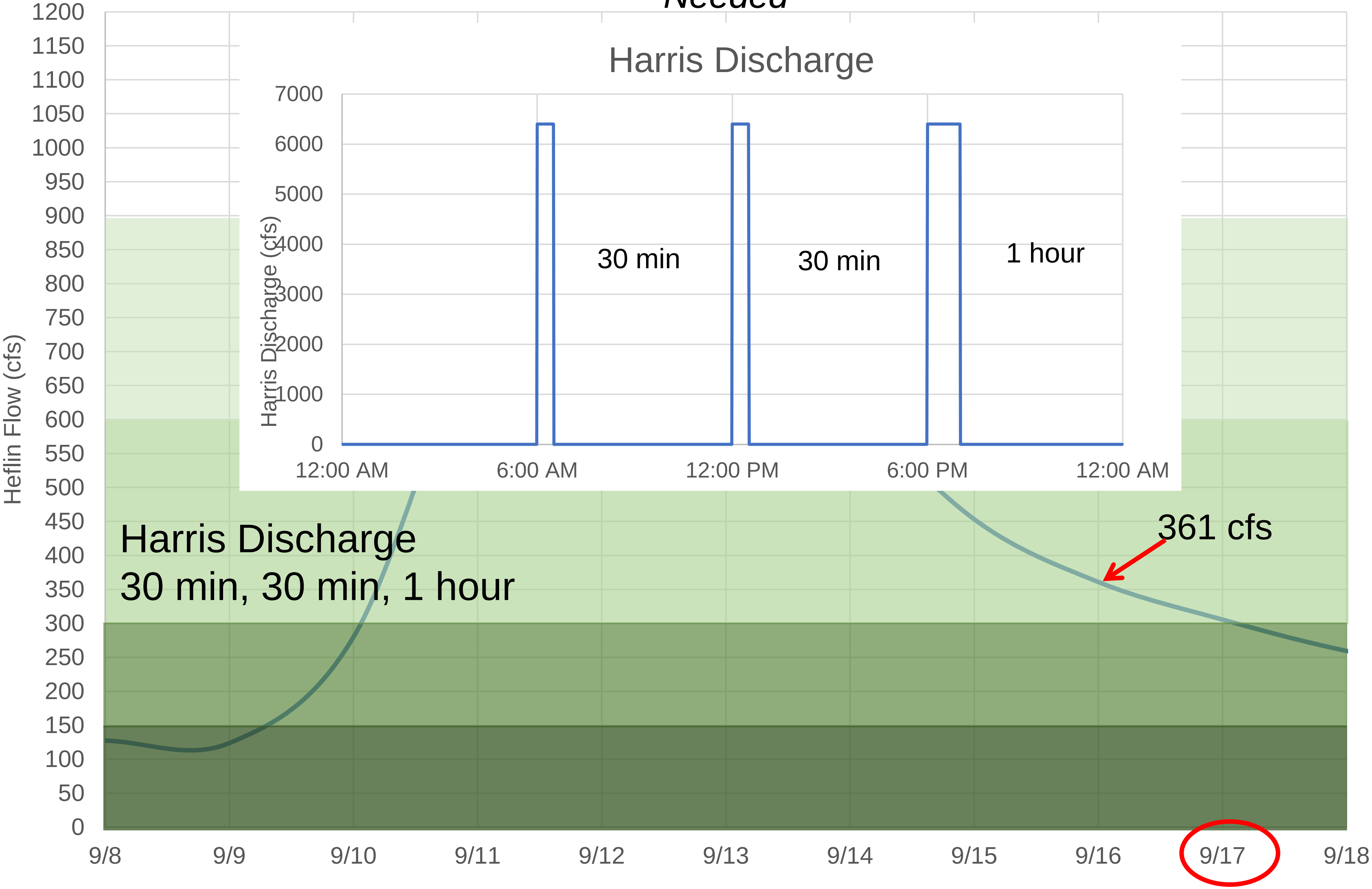


Harris Adaptive Management Scheduling



Harris Adaptive Management Scheduling

Create Schedule → *Additional Generation Needed* → **Adjust Schedule**

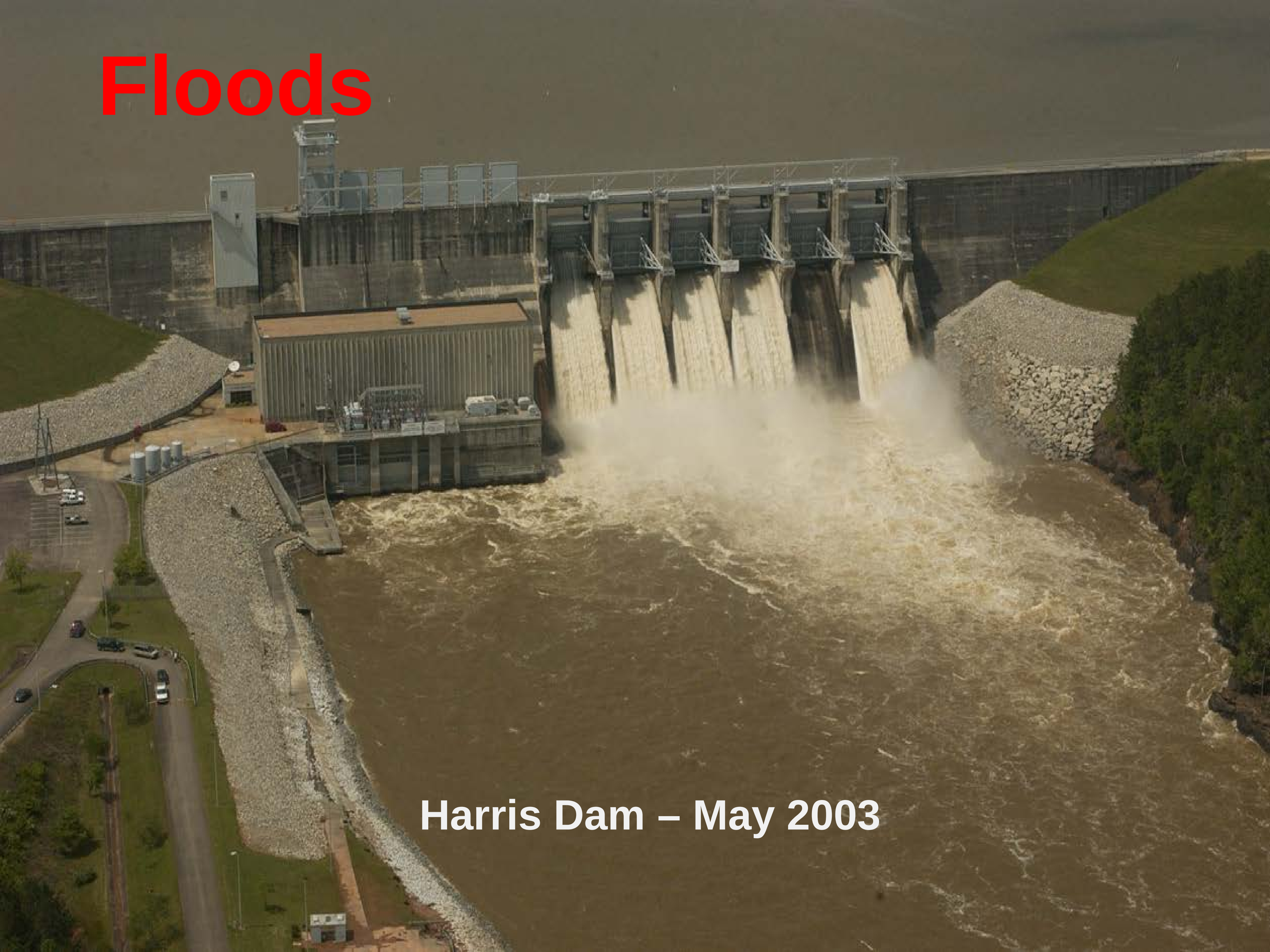


Weather Extremes!

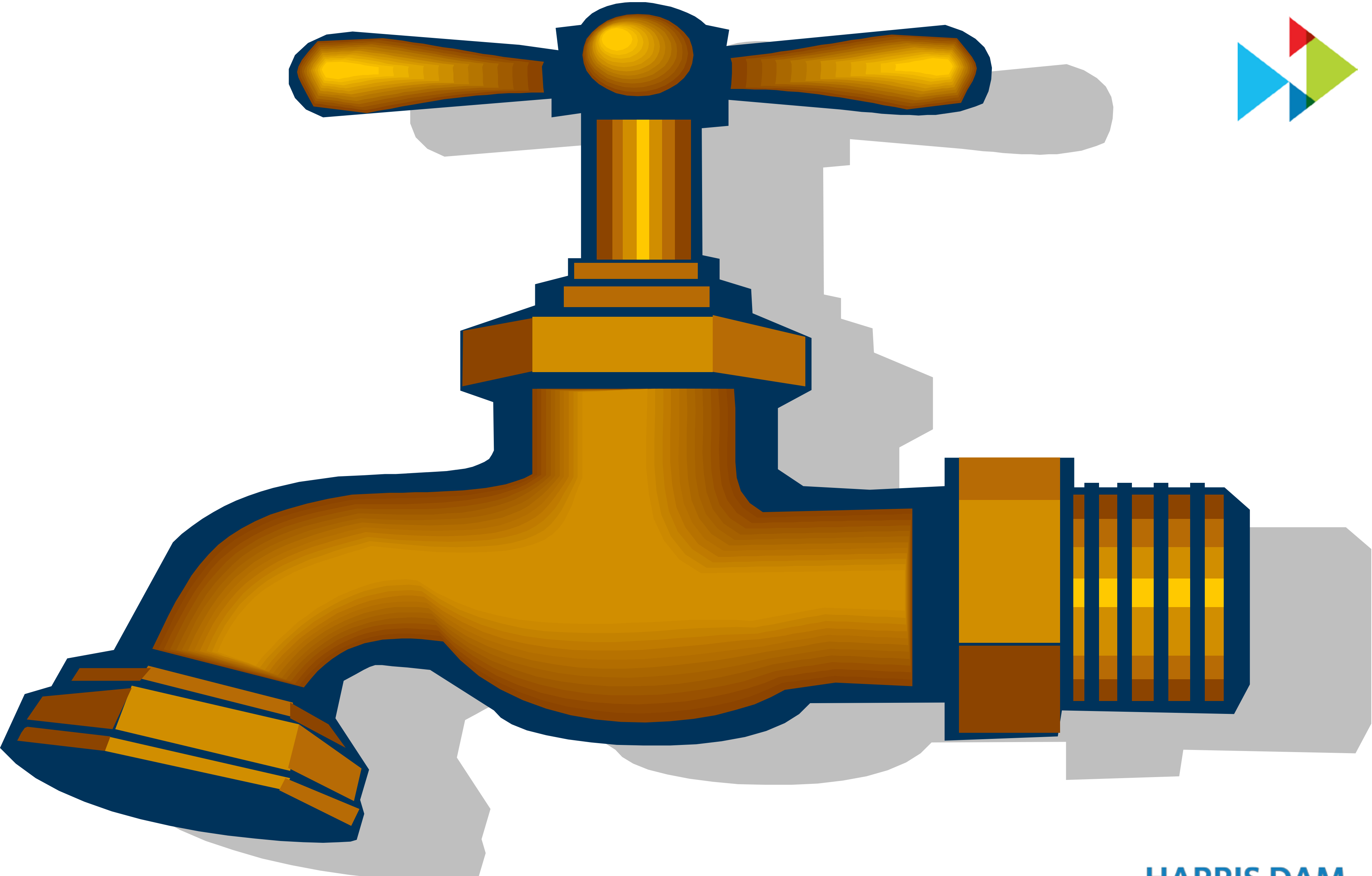
Floods and Drought

HARRIS DAM
RELICENSING

Floods



Harris Dam – May 2003



HARRIS DAM
RELICENSING

Flood Control

- **Flood Control can be defined as minimizing river stages downstream of a dam**
  - Generally, the people and property located downstream benefit from flood control operations
- **Run-of-river reservoirs have no flood control capability**
  - they cannot provide this benefit to the public
- **Most flood control reservoirs have a control point that is used as a focus for the flood control operations:**
  - Harris uses Wadley

HARRIS DAM
RELICENSING

How Are Floods Managed

- **Downstream flood peaks are minimized by discharging less water than is coming into the reservoir**

- **Studies of historic rainfall events result in a reasonable rules and regulations (flood control plan)**

- **Not every flood can be completely controlled**
  - each project has a particular amount of water that it can store
  - after all flood storage has been used, the project becomes run-of-river

License for FERC Project 2628

- Article 13. (c) Operate the reservoir for flood control in accord with the agreement between the Chief of Engineers, Department of the Army, and the Licensee ...

US Army Corps
of Engineers ®
Mobile District

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN WATER CONTROL MANUAL

Final
APPENDIX I

R. L. HARRIS DAM AND LAKE
(ALABAMA POWER COMPANY)

TALLAPOOSA RIVER, ALABAMA

U.S. ARMY CORPS OF ENGINEERS
SOUTH ATLANTIC DIVISION
MOBILE DISTRICT
MOBILE, ALABAMA

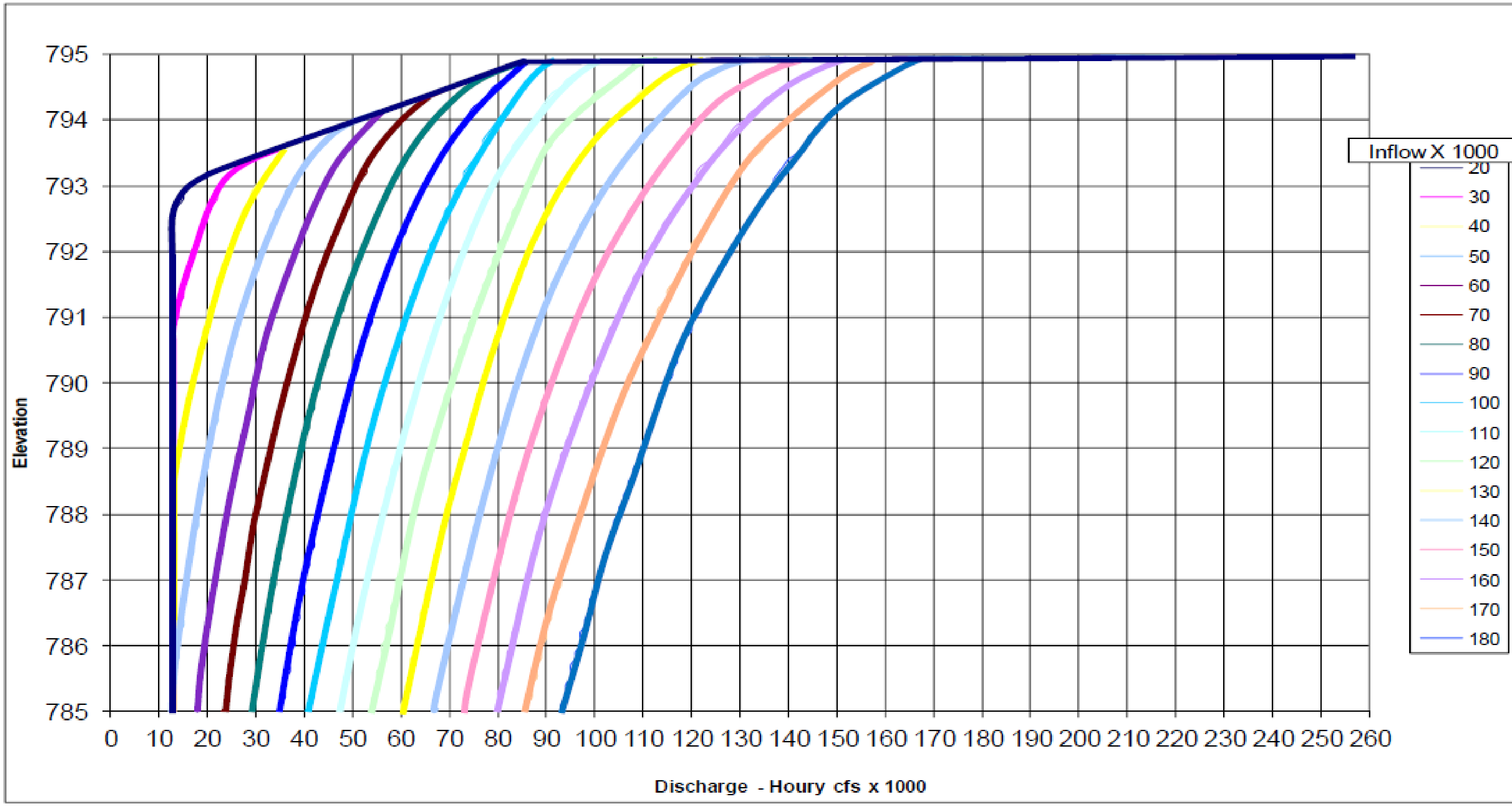
SEPTEMBER 1972
REVISED OCTOBER 1993; JUNE 2004; and MAY 2015

Harris Reservoir Flood Control Procedure

Rule	Condition	Outflow	Operation
1	Below Power Guide Curve (PGC)		Operate powerplant to satisfy system load requirements.
2	At or above PGC and below elevation 790	13,000 cfs or less depending on Wadley stage	Operate to discharge 13,000 cfs or an amount that will not cause the gage at Wadley to exceed 13.0 feet, unless greater discharge amounts are required by the Induced Surcharge Schedule. Discharge rates determined by the Harris real-time water control model may be substituted for those indicated by the Induced Surcharge Curves. If the model produces outflows in excess of those identified by the Induced Surcharge Schedule for six (6) consecutive periods, the operator shall notify the Water Management Section before making any further gate movements.
3	Above PGC and above 790 and rising	16,000 cfs or greater	Discharge 16,000 cfs or greater if required by the Induced Surcharge Curves Releases may be made through the spillway gates or powerhouse or a combination of both. Discharge rates determined by the Harris real-time water control model may be substituted for those indicated by the Induced Surcharge Curves. If the model produces outflows in excess of those identified by the Induced Surcharge Schedule for six (6) consecutive periods, the operator shall notify the Water Management Section before making any further gate movements.
4	Above PGC and falling		When the reservoir begins to fall, maintain current gate settings and power house discharge until the pool recedes to the PGC, then return to normal operation.

Induced Surcharge Curves

CORPS OF ENGINEERS U. S. ARMY



Operating Instructions:

1. Follow regular flood control regulation as shown on Plate 7-3 until releases are required by this schedule.
2. Adjust the outflow hourly based on the average inflow for the preceding three hours and the current reservoir level as indicated by these curves.
3. When the reservoir level begins to fall maintain the current gate openings and power plant discharge in effect at that time until the reservoir recedes to the top of the Power Guide Curve, then follow regular flood regulations.
4. The Spillway Gate will be opened in accordance with the gate opening schedule to produce a discharge as near as practical to those prescribed under this schedule.

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

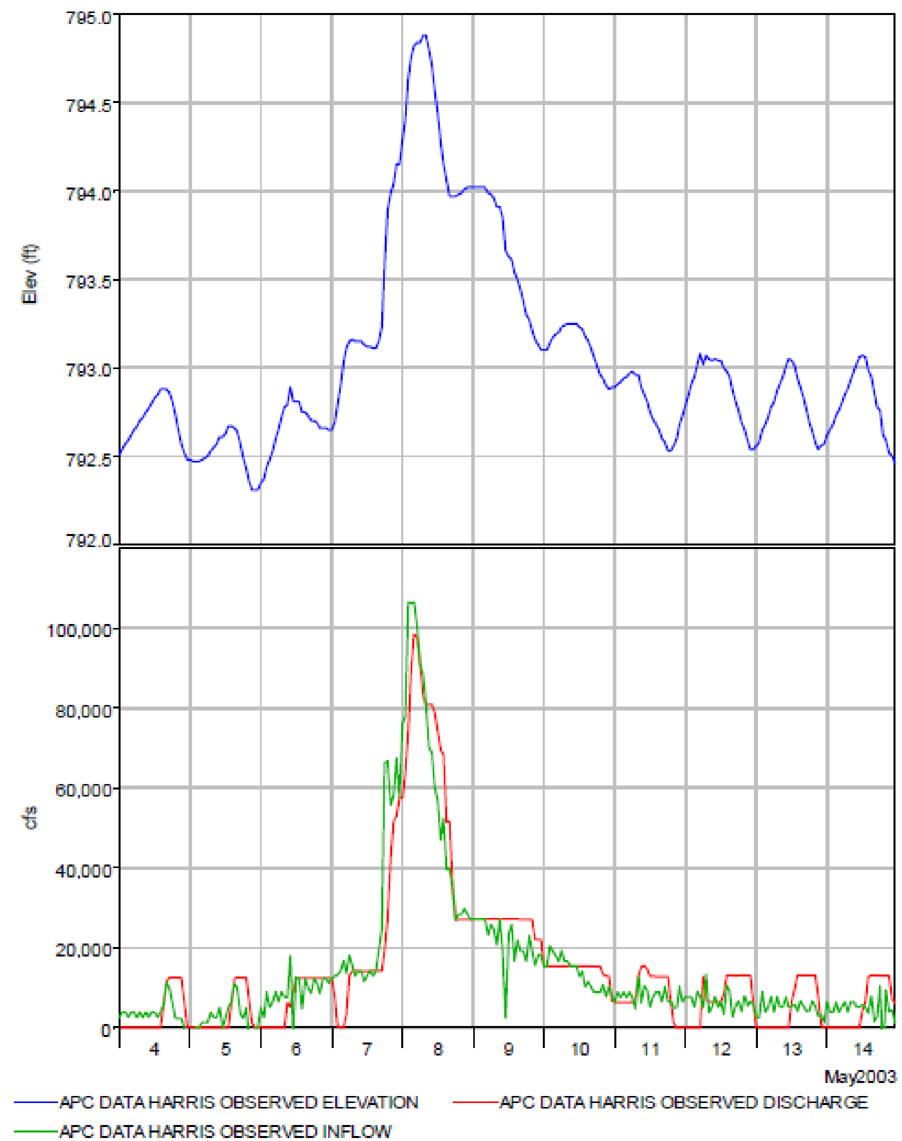
WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

INDUCED SURCHARGE CURVES


HIGH WATER MARK
37.20 FEET (24.30 FEET ABOVE FLOOD STAGE)
MAY 8, 2003
ON THIS DAY, WATER FROM THE TALLAPOOSA RIVER ROSE TO THIS LEVEL AT THIS LOCATION. FOR MORE INFORMATION, CONTACT:
NATIONAL WEATHER SERVICE BIRMINGHAM, AL
www.srh.noaa.gov/bmx
SOUTHEAST RIVER FORECAST CENTER
weather.gov/serfc
USGS ALABAMA WATER SCIENCE CENTER
al.water.usgs.gov
USGS


WADLEY
TOWN LIMIT
TALLAPOOSA
RIVER


WADLEY
TOWN LIMIT
TALLAPOOSA
RIVER



Data from APC hourly values

ALABAMA-COOSA-TALLAPOOSA RIVER BASIN

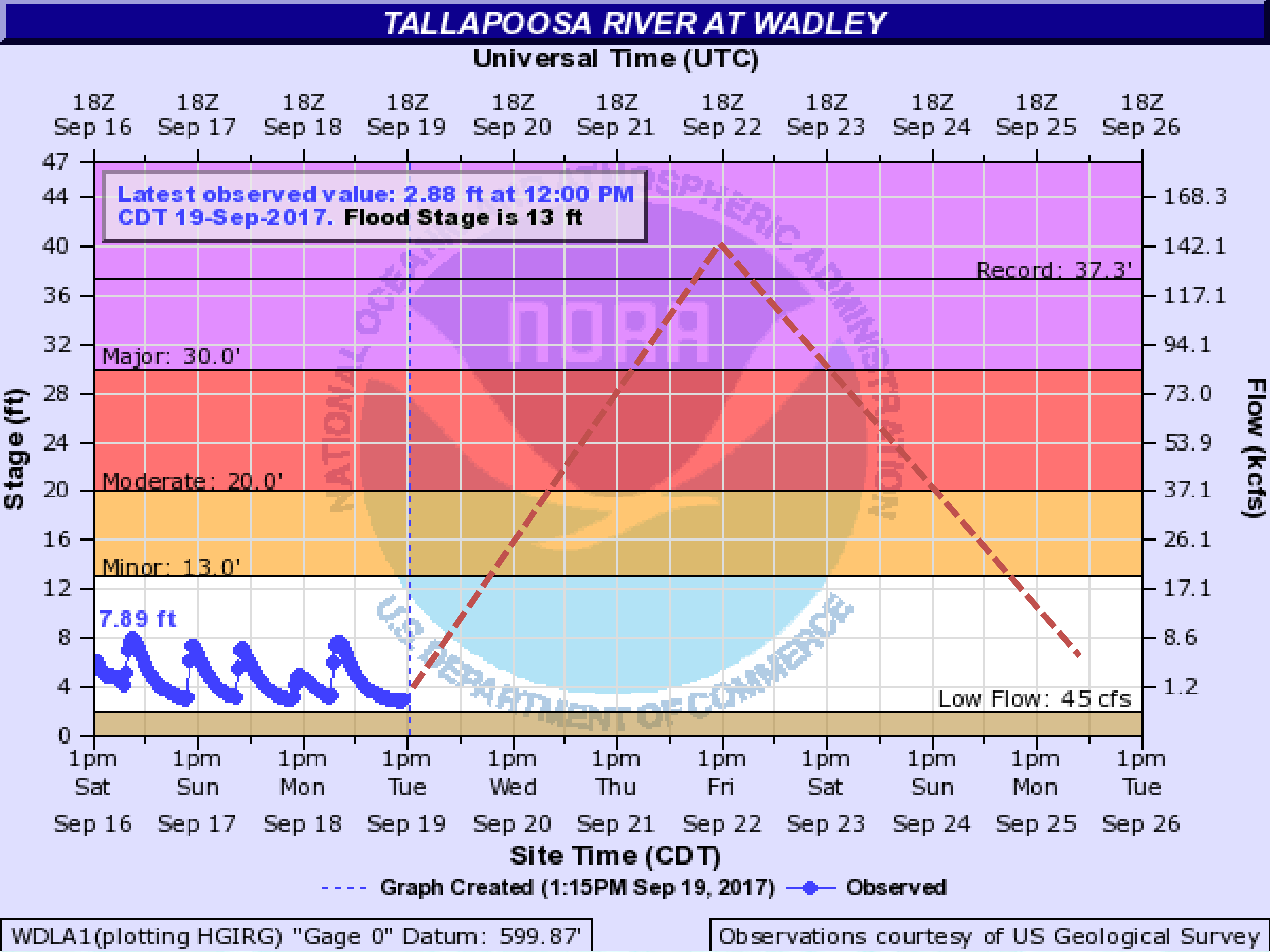
WATER CONTROL MANUAL
R.L. HARRIS DAM AND LAKE

FLOOD OF 2003
INDUCED SURCHARGE REGULATION
HOURLY VALUES

Responsibility for issuing stage forecasts to the public

- The issuing of stage forecasts to the general public is the legal responsibility of the National Weather Service. For the Alabama-Coosa-Tallapoosa and Black Warrior-Tombigbee river basins, forecasts are prepared by the National Weather Service's Southeast River Forecast Center in Peachtree City, Georgia. Flood warnings are issued by Birmingham's National Weather Service office in Calera.

HARRIS DAM RELICENSING


TALLAPOOSA RIVER AT WADLEY
Universal Time (UTC)
18Z Sep 16
18Z Sep 17
18Z Sep 18
18Z Sep 19
18Z Sep 20
18Z Sep 21
18Z Sep 22
18Z Sep 23
18Z Sep 24
18Z Sep 25
18Z Sep 26
Latest observed value: 2.88 ft at 12:00 PM CDT 19-Sep-2017. Flood Stage is 13 ft
Record: 37.3'
Major: 30.0'
Moderate: 20.0'
Minor: 13.0'
7.89 ft
Low Flow: 45 cfs
Stage (ft)
47
44
40
36
32
28
24
20
16
12
8
4
0
Flow (kcfs)
168.3
142.1
117.1
94.1
73.0
53.9
37.1
26.1
17.1
8.6
1.2
1pm Sat Sep 16
1pm Sun Sep 17
1pm Mon Sep 18
1pm Tue Sep 19
1pm Wed Sep 20
1pm Thu Sep 21
1pm Fri Sep 22
1pm Sat Sep 23
1pm Sun Sep 24
1pm Mon Sep 25
1pm Tue Sep 26
Site Time (CDT)
Graph Created (1:15PM Sep 19, 2017)
Observed
WDLA1(plotting HGIRG) "Gage 0" Datum: 599.87'
Observations courtesy of US Geological Survey

Tallapoosa River at Wadley

Flood Impacts

- **35** - THE EAST END OF THE HIGHWAY 22 BRIDGE BEGINS TO FLOOD. WATER REACHES STORE/GAS STATION ON HIGHWAY 22 JUST WEST OF TOWN.
- **32** - PORTIONS OF HIGHWAY 22 SOUTHWEST OF WADLEY ARE FLOODED.
- **30** - SOME FLOODING OF BUSINESSES...INCLUDING PLANTATION PATTERNS...OCCURS IN THE WADLEY AREA.
- **20** - SOME FLOODING OCCURS IN THE WADLEY AREA. BETWEEN 22 AND 25 FEET THE BRIDGE OVER BEAVERDAM CREEK FLOODS.
- **13** - FLOODING OF PASTURELANDS IN THE AREA OCCURS AND CATTLE SHOULD BE MOVED TO HIGHER GROUND.

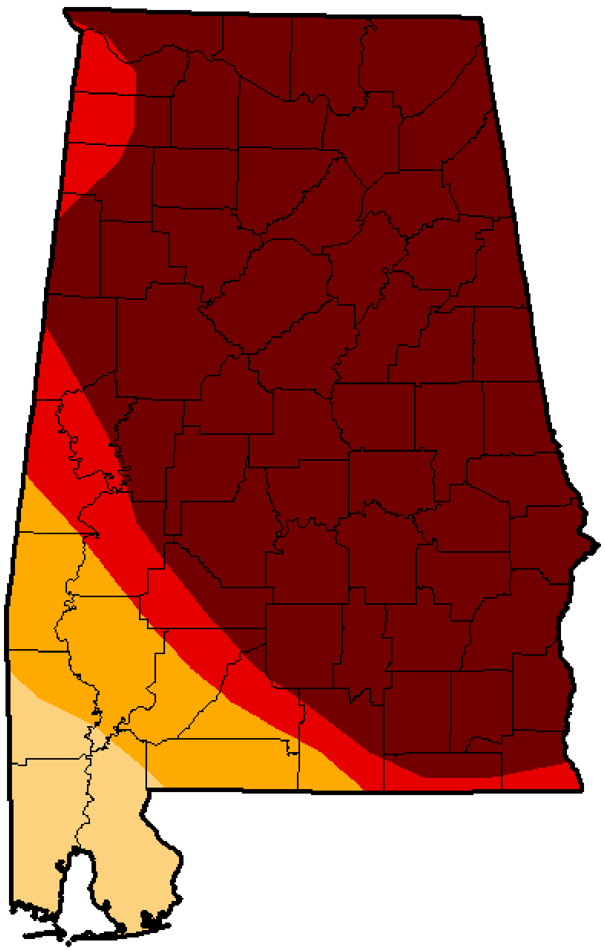
Low Water Impacts

- 45 CFS R.L. Harris dam (15 miles upstream) operated to provide a minimum flow of 45 cfs at Wadley.

Droughts

U.S. Drought Monitor

Alabama



October 16, 2007

(Released Thursday, Oct. 18, 2007)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	99.97	93.23	83.12	73.04
Last Week *10/9/2007*	0.00	100.00	99.97	91.01	78.18	58.82
3 Months Ago *7/17/2007*	0.00	100.00	90.28	71.55	41.56	24.33
Start of Calendar Year *1/2/2007*	51.87	48.13	0.00	0.00	0.00	0.00
Start of Water Year *9/25/2007*	1.40	98.60	90.18	81.92	71.11	48.72
One Year Ago *10/17/2006*	0.00	100.00	57.95	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Mark Svoboda
National Drought Mitigation Center

National Drought Mitigation Center

http://droughtmonitor.unl.edu/

DAM LICENSING

Drought Management

- Droughts are very difficult to see coming
  - you don't know you're in a severe drought until you've been there for some time
- Droughts tend to take months to setup
  - And take months of wet weather to return flow conditions to normal
- APCo's storage reservoirs can, to an extent, support some level of critical downstream flows during drought periods
  - this is done by releasing water from storage
- How does APCo determine how much and when and from where?
  - Alabama-ACT Drought Response Operating Plan (ADROP)
    - a low flow management plan, not a plan to keep the lakes full

Table 3: Drought Intensity Level Response Matrix[1]

<table>
<tr><th></th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>June</th><th>July</th><th>Aug</th><th>Sept</th><th>Oct</th><th>Nov</th><th>Dec</th></tr>
<tr><td rowspan="4">Drought Intensity Level Triggers</td><td colspan="12">Normal Operations</td></tr>
<tr><td colspan="12">DIL 1: Low Basin Inflows or Low Composite Storage or Low State Line Flow</td></tr>
<tr><td colspan="12">DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite Storage or Low State Line Flow)</td></tr>
<tr><td colspan="12">DIL 3: Low Basin Flows + Low Composite Storage + Low State Line Flow</td></tr>
<tr><td rowspan="4">Coosa River Flow[2]</td><td colspan="3">Normal Operations 2000 cfs</td><td colspan="2">4000 (8000)</td><td>4000 - 2000</td><td colspan="6">Normal Operations 2000 cfs</td></tr>
<tr><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="2">Jordan
4000 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="3">Jordan
2000 +/- cfs</td></tr>
<tr><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="2">Jordan
2500 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="3">Jordan
2000 – 1600 +/- cfs</td></tr>
<tr><td colspan="3">Jordan
1600 +/- cfs</td><td colspan="3">Jordan
1600 - 2000 +/- cfs</td><td colspan="3">Jordan
2000 +/- cfs</td><td colspan="2">Jordan
1800 +/- cfs</td><td>Jordan
1600 +/- cfs</td></tr>
<tr><td rowspan="4">Tallapoosa River Flow[3]</td><td colspan="12">Normal Operations 1200 cfs</td></tr>
<tr><td colspan="4">Greater of: ½ Yates Inflow or
2 x Heflin Gage (Thurlow releases > 350 cfs)</td><td colspan="5">½ Yates Inflow</td><td colspan="3">½ Yates Inflow</td></tr>
<tr><td colspan="4">Thurlow 350 cfs</td><td colspan="5">½ Yates Inflow</td><td colspan="3">Thurlow 350 cfs</td></tr>
<tr><td colspan="6">Maintain 400 cfs at Montgomery WTP
(Thurlow release 350 cfs)</td><td colspan="3">Thurlow 350 cfs</td><td colspan="3">Maintain 400 cfs at Montgomery WTP
(Thurlow release 350 cfs)</td></tr>
<tr><td rowspan="4">Alabama River Flow[4]</td><td colspan="12">Normal Operations 4640 cfs</td></tr>
<tr><td colspan="4">4200 cfs (10% Cut) - Montgomery</td><td colspan="5">4640 cfs - Montgomery</td><td colspan="3">Reduce 4640 cfs – 4200 cfs Montgomery</td></tr>
<tr><td colspan="5">3700 cfs (20% Cut) - Montgomery</td><td colspan="4">4200 cfs (10% Cut) - Montgomery</td><td colspan="3">Reduce: 4200 cfs - 3700 cfs Montgomery
(1 Week ramp)</td></tr>
<tr><td colspan="4">2000 cfs Montgomery</td><td colspan="2">3700 cfs Montgomery</td><td colspan="3">4200 cfs (10% Cut) Montgomery</td><td colspan="3">Reduce 4200 cfs - 2000 cfs Montgomery
(1 Month ramp)</td></tr>
<tr><td rowspan="4">Guide Curve Elevation</td><td colspan="12">Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)</td></tr>
<tr><td colspan="12">USACE Variances: As Needed; FERC Variance for Martin</td></tr>
<tr><td colspan="12">USACE Variances: As Needed; FERC Variance for Martin</td></tr>
<tr><td colspan="12">USACE Variances: As Needed; FERC Variance for Martin</td></tr>
</table>

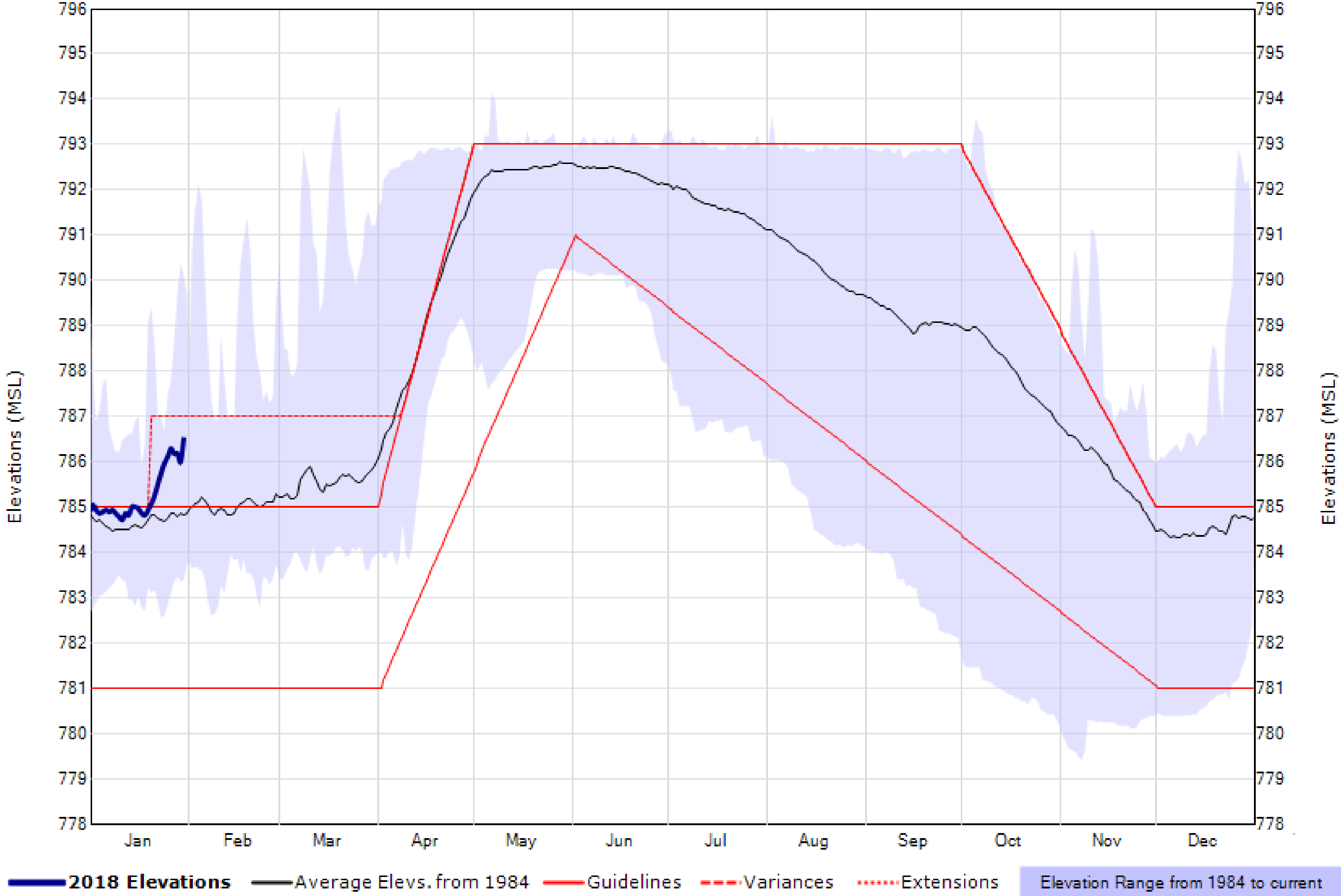
1. Note these are base flows that will be exceeded when possible
2. Jordan flows are based on a continuous +/- 5% of target flow
3. Thurlow flows are based on a continuous +/-5% of target flow; Flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates
4. Alabama River flows are 7-Day Average Flow

EVAPORATION

- Evaporative losses amounted to 1.5 feet of water from Alabama Power lakes in the summer months of 2007

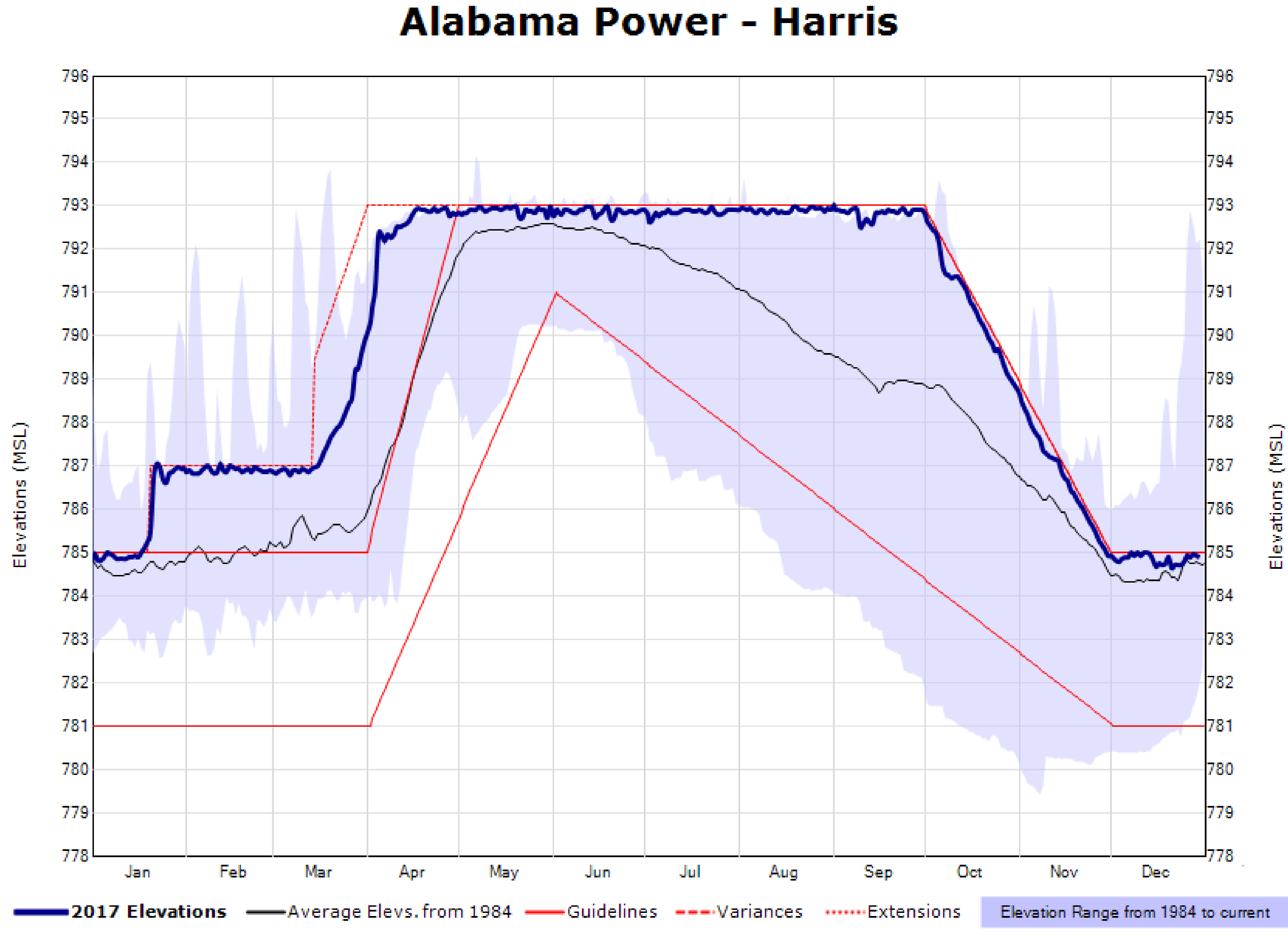
- Enough water to supply Birmingham for one year

Alabama Power - Harris



Plotted@1/31/2018 5:22 AM

Year 2018



Plotted@12/31/2017 9:22 PM

Our Agency Partners in Water Management

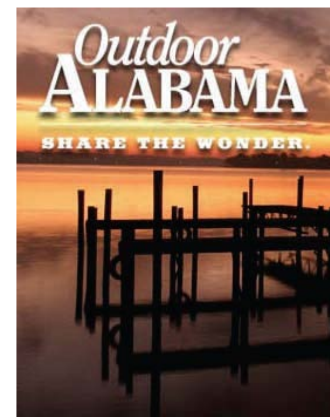
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

ADEM
Alabama Department of Environmental Management

NATIONAL WEATHER SERVICE

USGS
science for a changing world

U.S. FISH & WILDLIFE SERVICE



OWR
The Office of Water Resources
A Division of ADECA

FERC
FEDERAL ENERGY REGULATORY COMMISSION

HARRIS DAM
RELICENSING

Questions?

APPENDIX C

STAKEHOLDER CONSULTATION

1. CONSULTATION SUMMARY FOR HARRIS PROJECT RELICENSING - TABLE

1. CONSULTATION SUMMARY FOR HARRIS PROJECT RELICENSING - TABLE

Consultation Summary for Harris Project Relicensing[1]

Year	Name	Description	Date of Meeting
2017	Issue Identification Workshop	Alabama Power facilitated discussions with stakeholders regarding the potential issues and data needs at the Harris Project.	10/19/2017
2018	Informational Meeting Presentation	Alabama Power presented the overview of Harris Project Operations and Harris AMP, as well as provided the introduction of HATs.	1/31/2018
2018	Study Plan Methodology for Stakeholders	Alabama Power presented an overview of the FERC Study Plan Process, the Study Plans, and the ILP. The meeting concluded with HAT sign-ups.	04/24/2018
2018	FERC Scoping Meeting	Public Meeting conducted by FERC.	08/28/2018 to 08/29/2018
2018	HAT 1-5 Stakeholder Meeting	Alabama Power facilitated HAT 1-5 meetings to present Study Plans to stakeholders and outline the feedback/comment process.	09/20/2018
2018	Selected HAT 6 Stakeholder Meeting	Alabama Power presented Study Plan development, methodology, and geographic scope related to the Cultural Resources and Historic Properties study. *	10/17/2018
2018	HAT 1-6 (Selected HAT 6) Stakeholder Meeting	Alabama Power presented Study Plan updates for HATs 1-6.	12/13/2018
2019	HAT 6 Stakeholder Meeting	Alabama Power discussed the details of Harris Project, including Project operations, lands owned by Alabama Power, and the nature of cultural resources sites in the Project Area.	01/25/2019
2019	Selected HAT 6 Stakeholder Meeting	Alabama Power presented an overview of the Cultural Resources Programmatic Agreement and *Historic Properties Management Plan Study Plan* and facilitated the discussion on identifying sites in the Project Boundary for further investigation. *	03/11/2019
2019	HAT 3 Stakeholder Meeting – Process Update	Alabama Power presented the methodology related to the Aquatic Resources Study and the Downstream Aquatic Habitat Study.	03/20/2019

1 This consultation summary consists of milestone meetings and consultation is on-going; therefore, the full consultation record will be included with the Final License Application.

Year	Name	Description	Date of Meeting
2019	Selected HAT 6 Stakeholder Meeting	Alabama Power provided updates regarding the *Cultural Resources Study Plan*, reviewing the method for the sites selected for further evaluation and developing the area of potential affects (APE). *	05/22/2019
2019	Selected HAT 6 Stakeholder Meeting	Alabama Power worked with stakeholders to finalize the list of sites for further evaluation, to ensure it was provided to the OAR in time for field evaluations. *	07/09/2019
2019	HAT 3 Stakeholder Meeting	Alabama Power provided an update on the *T&E Species Study Plan*.	08/27/2019
2019	HAT 1 Stakeholder Meeting	Alabama Power discussed all models, methods, and model input and output (how the model will be used) for the Operating Curve Change Feasibility Analysis and the Downstream Release Alternatives Studies.	09/11/2019
2019	HAT 2 Stakeholder Meeting	Alabama Power worked with stakeholders to finalize the erosion and sedimentation sites and provided an update on the water quality data collection.	09/11/2019
2019	HAT 4 Stakeholder Meeting	Alabama Power presented the proposed land use changes at the Harris Project.	09/11/2019
2019	Selected HAT 6 Stakeholder Meeting	Alabama Power updated on the relicensing process and reviewed the six HATs and how cultural resource impacts are being evaluated as part of other studies. *	11/06/2019
2019	HAT 3 Stakeholder Meeting	Alabama Power discussed methods for the habitat analysis using the HEC-RAS model.	12/11/2019
2019	HAT 5 Stakeholder Meeting	Alabama Power explained the purpose, study area, goals and objectives, and timeline of the Tallapoosa River Landowner Survey Research Plan.	12/11/2019
2020	HAT 3 Stakeholder Meeting	Alabama Power presented preliminary results of the habitat analysis using the HEC-RAS model.	02/20/2020
2020	Selected HAT 6 Stakeholder Meeting	Alabama Power discussed the Draft Inadvertent Discovery Plan (IDP) and Draft Traditional Cultural Properties (TCP) Identification Plan. *	03/02/2020

Year	Name	Description	Date of Meeting
2020	Initial Study Report Meeting	Alabama Power presented information on the progress of each study including applicable study results, variances requested, and any additional studies or requested study modifications.	04/28/2020
2020	HAT 3 Stakeholder Meeting	Auburn University presented research to date and informed the HAT of remaining work on the Aquatic Resources Study.	06/02/2020
2020	HAT 1 and 5 Stakeholder Meeting	Alabama Power presented the methodology for analyzing the number of usable recreation structures on Lake Harris at the current winter operating curve and the alternatives. Additionally, Alabama Power presented the methodology for analyzing how structures located downstream of Harris Dam might be affected by a change in the winter operating curve during a 100-year flood event.	06/04/2020
2020	HAT 4 Stakeholder Meeting	Alabama Power reviewed the goals and objectives of the Project Lands Evaluation Study and discussed the Shoreline Management Plan and the Wildlife Management Plan outline.	10/19/2020
2020	HAT 5 Stakeholder Meeting	Alabama Power discussed Recreation Evaluation Study Report comments.	10/19/2020
2020	HAT 3 Stakeholder Meeting	Alabama Power presented modeling results on the Downstream Aquatic Habitat Study and discussed Auburn University's progress to date on the Aquatic Resources Study.	11/05/2020
2021	Selected HAT 6 Stakeholder Meeting	Alabama Power and OAR presented a virtual cultural resources overview of Skyline. *	03/04/2021
2021	HAT 3 Stakeholder Meeting	Alabama Power and Auburn University presented results of the Downstream Fish Population Study for the Aquatic Resources Study.	03/31/2021
2021	HAT 1 Stakeholder Meetings	Alabama Power presented results of the Phase 2 Operating Curve Change Feasibility Analysis Study and the Phase 2 Downstream Release Alternatives Study.	04/01/2021
2021	Updated Study Report Meeting	Alabama Power presented study progress including data collected, variances, and remaining activities for all studies.	04/27/2021

Year	Name	Description	Date of Meeting
2021	HAT 1 Stakeholder Meeting	Alabama Power presented results from the Battery Energy Storage System study.	05/03/2021
2021	Selected HAT 6 Stakeholder Meeting	Alabama Power presented Cultural Resources Programmatic Agreement and Historic Properties Management Plan study progress and reviewed remaining items to be completed to develop the Historic Properties Management Plan. *	05/05/2021

*Note that due to the sensitive nature of the subject matter, participants were limited for this meeting. This information is considered Privileged and the distribution was limited.

APPENDIX D

GEOLOGY AND SOILS

1. PHYSIOGRAPHY OF THE SKYLINE PROJECT VICINITY
2. PHYSIOGRAPHIC DISTRICTS OF THE CUMBERLAND PLATEAU - SKYLINE
3. SOIL TYPES LOCATED IN THE SKYLINE VICINITY
4. SOIL TYPES WITHIN THE SKYLINE PROJECT BOUNDARY - TABLE
5. PHYSIOGRAPHY OF THE LAKE HARRIS PROJECT VICINITY
6. PHYSIOGRAPHY AND TOPOGRAPHY – LAKE HARRIS
7. SOIL TYPES LOCATED IN LAKE HARRIS PROJECT VICINITY
8. SOILS WITHIN THE LAKE HARRIS PROJECT BOUNDARY - TABLE

1. PHYSIOGRAPHY OF THE SKYLINE PROJECT VICINITY

Physiography of the Skyline Project Vicinity

Jackson County Mountains District

The Jackson County Mountains district is a submaturely dissected plateau of high relief characterized by mesa-like sandstone remnants above limestone lowland (Sapp and Emplaincourt 1975). Rock formations observed in the Project area include: the Pottsfield formation, Pennington formation, Bangor Limestone, Monteagle Limestone and Tuscumbia Limestone (Raymond et. al.1988 [citation includes information in the following list]):

- **Pottsfield formation** consists primarily of sandstone and shale with some coal and limestone
- **Pennington formation** consists of a lower supratidal dolostone subsequently overlain by fine-grained shallow-marine clastics
- **Bangor Limestone** is a bioclastic and oolitic limestone containing interbeds of mudstone and shale
- **Monteagle Limestone** consists of massive cross-bedded oolitic and bioclastic limestone
- **Tuscumbia Limestone** is a bioclastic or micritic, partially oolitic, limestone with local abundant chert

Structural Features

The Cumberland Plateau (referred to as the Appalachian Plateau) is underlain by Paleozoic sedimentary rocks. The Paleozoic sedimentary rocks are underlain by crystalline basement rock of Precambrian age. The Cumberland Plateau includes northeast-trending anticlines including the Sequatchie, Murphrees Valley, and Wills Valley. The Sequatchie and Wills Valley anticlines are asymmetric to the northwest and include southeast-dipping thrust faults along parts of the northwest limbs. The Murphrees Valley anticline is asymmetric to the southeast and is bounded on the southeast side by the northwest-dipping Straight Mountain fault. Synclinal Sand, Lookout, and Blount mountains separate the anticlines. The Paleozoic sedimentary rocks dip southwestward into the Black Warrior basin beneath the coastal plain overlap (Raymond et al. 1988).

Mineral Resources

Historically, there has been extensive mining within the Cumberland Plateau of Alabama. Two of the largest coalfields lie beneath the province (Raymond et al. 1988). Twenty-one listed abandoned mines previously operated within Jackson County; however, there are no listed mines operating within Jackson County as of 2013 (Whitson 2013). The primary resource mined within the county historically has been coal, commonly found in the Pottsfield formation. There is potential for limestone quarries in Jackson County due to the presence of the Monteagle and Tuscumbia limestones. Historically, the formations quarried in other counties were located within the Cumberland Plateau (Raymond et al. 1988).

References:

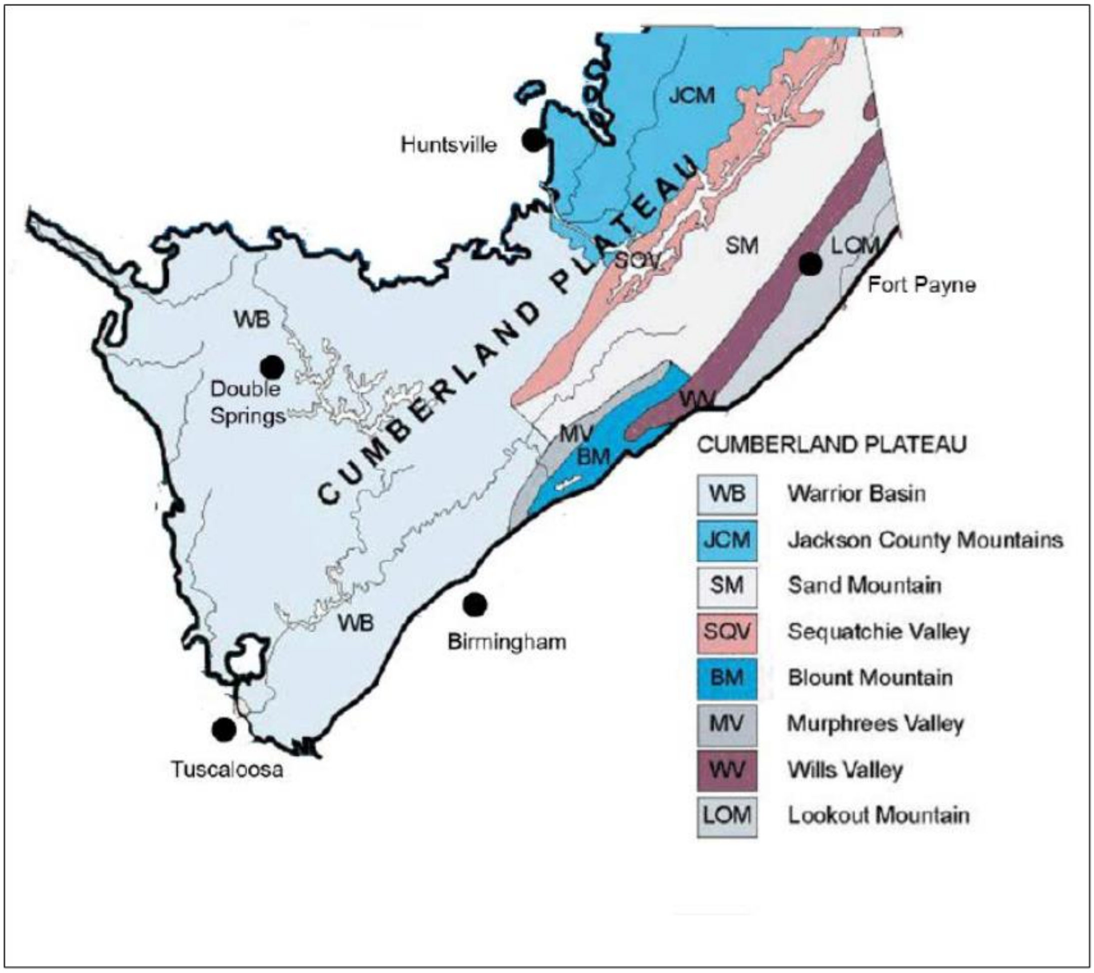
Raymond, D. E., W.E. Osborne, C.W. Copeland, and T.L. Neathery. 1988. Alabama Stratigraphy. Geological Survey of Alabama, Tuscaloosa, AL.

Sapp, D. and J. Emplaincourt. 1975. Physiographic Regions of Alabama. Map 168. Geological Survey of Alabama, Tuscaloosa, AL.

Whitson, C. 2013. Alabama Mine Map Repository. Directory of Underground Mine Maps. Birmingham, AL.

2. PHYSIOGRAPHIC DISTRICTS OF THE CUMBERLAND PLATEAU - SKYLINE

Physiographic Districts of the Cumberland Plateau



Source: Neilson 2013a

Reference:

Neilson, M. 2013a. Encyclopedia of Alabama: Cumberland Plateau Physiographic Section. Available at: http://www.encyclopediaofalabama.org/article/h-1301. Accessed on November 28, 2016.

3. SOIL TYPES LOCATED IN THE SKYLINE VICINITY

Soil Types Located in the Skyline Vicinity

Jackson County Soils

Jackson County soils encompass all of the approximately 15,063 acres at Skyline. Soil units encountered include: Allen, Barbourville-Cotaco, Bruno, Colbert-Talbott, Colbert, Dunning, Egam, Hollywood, Hartsells, Huntington, Hanceville, Hilly stony land, Hermitage, Holston, Jefferson-Allen, Jefferson, Limestone Rockland, Lindside, Muskingum, Melvin, Monongahela, Rolling Stony Land, Rough Stony Land, Swaim, Sequatchie, Stony Alluvium, Talbott, and Wolftever (NRCS 2016b [Note: citation pertains to information in the following list]).

Allen: generally described as a well-drained loam derived from sandstone and shale typically found on ridges or hillslopes. Multiple Allen units identified within the Skyline Project area included:

- eroded and undulating phase fine sandy loam with 2 to 5 percent slopes
- eroded and rolling phase fine sandy loam with 5 to 12 percent slopes
- rolling phase fine sandy loam with 5 to 12 percent slopes
- undulating phase fine sandy loam with 2 to 5 percent slopes

Barbourville-Cotaco: fine sandy loams generally described as moderately well drained with slopes of 0 to 4 percent. Derived from sandstone and shale, Barbourville-Cotaco is typically found on stream terraces.

Bruno: fine sandy loam and loamy fine sand generally described as moderately well drained with slopes of 0 to 2 percent. Derived from sedimentary rock, Bruno is typically found in floodplains.

Colbert-Talbott: stony silty clay loams generally described as well drained with slopes of 2 to 12 percent. Derived from limestone, Colbert-Talbott is typically found on hillslopes.

Colbert: silty clay loam generally described as moderately well drained with slopes of 5 to 12 percent. Derived from limestone, Colbert is typically found on hillslopes.

Dunning: silty clay generally described as poorly drained with slopes of 0 to 2 percent. Derived from sedimentary rock, Dunning is typically found in depressions.

Egam: silt loam generally described as well drained with slopes of 0 to 2 percent. Derived from limestone, sandstone and shale, Egam is typically found in flood plains.

Hollywood: silty clay generally described as moderately well drained with slopes of 0 to 2 percent. Derived from limestone, Hollywood is typically found on terraces.

Hartsells: generally described as a well-drained loam derived from sandstone typically found on ridges or hillslopes. Multiple units of Hartsells, identified within the Skyline Project area, included:

- rolling shallow phase fine sandy loam
- undulating shallow phase fine sandy loam

- eroded Nauvoo fine sandy loam with 6 to 10 percent slopes
- Nauvoo fine sandy loam with 6 to 10 percent slopes
- undulating phase fine sandy loam

Huntington: silt loam generally described as well drained with slopes of 0 to 2 percent. Derived from sedimentary rock, Huntington is typically found in flood plains.

Hanceville: rolling phase and undulating phase fine sandy loams generally described as well drained with slopes of 0 to 10 percent. Derived from sandstone and shale, Hanceville is typically found on ridges.

Hilly Stony: typically well drained and found on hillslopes with slopes of 10 to 20 percent.

Hermitage: cherty silty clay loam generally described as well drained with slopes of 12 to 25 percent. Derived from cherty limestone, Hermitage is typically found on hillslopes.

Holston: loam generally described as well drained with slopes of 2 to 5 percent. Derived from limestone, sandstone and shale, Holston is found on stream terraces or hillslopes.

Jefferson-Allen: generally described as a well-drained loam derived from sandstone and shale and is typically found on hillslopes with slopes ranging from 5 to 35 percent. Multiple units of Jefferson-Allen identified within the Skyline Project area included:

- eroded hilly phase loam
- hilly phase loam
- eroded rolling phase loam
- severely eroded hilly phase loam
- severely eroded steep phase loam

Jefferson: generally described as a well-drained loam derived from sandstone and shale and is typically found on stream terraces with slopes of two to 12 percent. Multiple Jefferson units identified within the Skyline Project area included:

- eroded undulating phase fine sandy loam
- eroded rolling phase fine sandy loam
- rolling phase fine sandy loam
- undulating phase fine sandy loam

Limestone Rockland: typically well drained and found on hillslopes with slopes of 11 to 40 percent.

Lindside: silt loam generally described as somewhat poorly drained with slopes of 0 to 2 percent. Derived from sedimentary rock, Lindside is typically found in flood plains.

Muskingum: fine sandy and stony fine sandy loams generally described as well drained with slopes of 10 to 20 percent. Derived from sandstone, Muskingum is typically found on hillslopes.

Melvin: silt loam generally described as poorly drained with slopes of 0 to 2 percent. Derived from sedimentary rock, Melvin is typically found in flood plains.

Monongahela: loam generally described as moderately well drained with slopes of 2 to 5 percent. It is typically found on stream terraces and is derived from limestone, sandstone, and shale.

Rolling Stony Land: typically well drained and found on hillslopes with slopes of 2 to 12 percent.

Rough Stony Land: typically well drained and found on hillslopes with slopes of 20 to 45 percent.

Swaim: generally described as a moderately well-drained loam derived from limestone typically found on ridges or hillslopes with slopes of two to 12 percent. Multiple Swaim silty clay loam units identified within the Skyline Project area included:

- eroded and non-eroded undulating phase
- eroded and non-eroded rolling phase

Sequatchie: fine sandy loam generally described as well drained with slopes of 0 to 2 percent. Derived from sedimentary rock, Sequatchie is typically found on stream terraces.

Stony Alluvium is typically well drained and found in flood plains with slopes of 0 to 2 percent.

Talbott: silty clay loam generally described as well drained with slopes of 5 to 12 percent. Derived from limestone, Talbott is typically found on hillslopes.

Wolftever: silt loam generally described as moderately well drained with slopes of 2 to 5 percent. Derived from sedimentary rock, Wolftever is typically found on stream terraces (NRCS 2016b).

Note: There may be a discrepancy in the total number of acres reported as Harris Project acres due to map inconsistencies.

Reference:
NRCS 2016 - Natural Resources Conservation Service (NRCS). 2016. Web Soil Survey. Available at: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed November 2, 2016.

4. SOIL TYPES WITHIN THE SKYLINE PROJECT BOUNDARY - TABLE

Table 1 Soils Types within the Skyline Project Boundary

Map Unit Symbol	Map Unit Name	Acres in Project Boundary	Percent of Project Boundary
#1, Jackson County, Alabama (AL071)			
Hfm	Hartsells fine sandy loam, undulating, shallow phase	0.7	0.0%
Hfo	Hartsells (Nauvoo) fine sandy loam, 6 to 10 percent slopes	26.6	0.1%
Lr	Limestone rockland rough	228.6	1.2%
Mfl	Muskingum (Gorgas) fine sandy loam, 10 to 20 percent slopes	0.5	0.0%
Msl	Muskingum (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony	3.8	0.0%
Msz	Muskingum (Gorgas) stony fine sandy loam, 20 to 45 percent slopes, very stony	1.7	0.0%
RsC	Rolling stony land, Colbert soil material	11.9	0.1%
RsM	Rough stony land, Muskingum soil material	88.9	0.5%
Subtotals for #1		**362.8**	**1.9%**
Totals for Project Boundary		**18,694.1**	**100.0%**
#2, Jackson County, Alabama (AL071)			
Lr	Limestone rockland rough	199.4	1.1%
RsM	Rough stony land, Muskingum soil material	2.7	0.0%
Subtotals for #2		**202.1**	**1.1%**
Totals for Project Boundary		**18,694.1**	**100.0%**
#3, Jackson County, Alabama (AL071)			
Hfn	Hartsells (Nauvoo) fine sandy loam, 6 to 10 percent slopes, eroded	0.0	0.0%
Hfo	Hartsells (Nauvoo) fine sandy loam, 6 to 10 percent slopes	91.6	0.5%
Lr	Limestone rockland rough	83.1	0.4%
Mfl	Muskingum (Gorgas) fine sandy loam, 10 to 20 percent slopes	24.5	0.1%
Msl	Muskingum (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony	25.4	0.1%
#4, Jackson County, Alabama (AL071)			
Hfo	Hartsells (Nauvoo) fine sandy loam, 6 to 10 percent slopes	32.1	0.2%
Hfu	Hartsells fine sandy loam, undulating phase	7.8	0.0%
Lr	Limestone rockland rough	26.0	0.1%
Mfl	Muskingum (Gorgas) fine sandy loam, 10 to 20 percent slopes	6.4	0.0%
Msl	Muskingum (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony	6.8	0.0%
RsM	Rough stony land, Muskingum soil material	86.8	0.5%

Map Unit Symbol	Map Unit Name	Acres in Project Boundary	Percent of Project Boundary
Subtotals for #4		**165.9**	**0.9%**
Totals for Project Boundary		**18,694.1**	**100.0%**
#5, Jackson County, Alabama (AL071)			
Lh	Limestone rockland, hilly	47.7	0.3%
Ll	Lindside silt loam	0.6	0.0%
Lr	Limestone rockland rough	230.4	1.2%
Mo	Melvin silty clay loam	0.3	0.0%
Subtotals for #5		**278.9**	**1.5%**
Totals for Project Boundary		**18,694.1**	**100.0%**
#6, Jackson County, Alabama (AL071)			
JAr	Jefferson-Allen loams, severely eroded, hilly phases	5.3	0.0%
Lr	Limestone rockland rough	28.2	0.2%
RsM	Rough stony land, Muskingum soil material	43.1	0.2%
Subtotals for #6		**76.5**	**0.4%**
Totals for Project Boundary		**18,694.1**	**100.0%**
#7, Jackson County, Alabama (AL071)			
Ade	Allen fine sandy loam, eroded, undulating phase	8.0	0.0%
Adn	Allen fine sandy loam, eroded, rolling phase	21.9	0.1%
Ado	Allen fine sandy loam, rolling phase	2.3	0.0%
Adu	Allen fine sandy loam, undulating phase	2.8	0.0%
BC	Barbourville-Cotaco fine sandy loams	1.7	0.0%
Bf	Bruno fine sandy loam	59.2	0.3%
Bu	Bruno loamy fine sand	11.9	0.1%
CTd	Colbert-Talbott stony silty clay loams, severely eroded, rolling phases	5.0	0.0%
Cto	Colbert silty clay loam, rolling phase	11.8	0.1%
Du	Dunning silty clay	5.6	0.0%
Eg	Egam silt loam	34.8	0.2%
Hcv	Hollywood silty clay, level phase	38.4	0.2%
Hfg	Hartsells fine sandy loam, rolling, shallow phase	280.7	1.5%
Hfo	Hartsells (Nauvoo) fine sandy loam, 6 to 10 percent slopes	1,432.4	7.7%
Hfu	Hartsells fine sandy loam, undulating phase	89.4	0.5%
Hl	Huntington silt loam	51.7	0.3%
Hno	Hanceville fine sandy loam, rolling phase	52.5	0.3%
Hnu	Hanceville fine sandy loam, undulating phase	7.4	0.0%
HsM	Hilly stony land	35.4	0.2%
Hth	Hermitage cherty silty clay loam, eroded, hilly phase	2.2	0.0%
Huu	Holston loam, 2 to 5 percent slopes	0.4	0.0%

Map Unit Symbol	Map Unit Name	Acres in Project Boundary	Percent of Project Boundary
JAh	Jefferson-Allen loams, eroded, hilly phases	19.4	0.1%
JAl	Jefferson-Allen loams, hilly phases	77.4	0.4%
JAn	Jefferson-Allen loams, eroded, rolling phases	33.3	0.2%
JAr	Jefferson-Allen loams, severely eroded, hilly phases	210.7	1.1%
JAs	Jefferson-Allen loams, severely eroded, steep phases	33.0	0.2%
Jfe	Jefferson fine sandy loam, eroded, undulating phase	9.7	0.1%
Jfn	Jefferson fine sandy loam, eroded, rolling phase	43.3	0.2%
Jfu	Jefferson fine sandy loam, undulating phase	44.4	0.2%
Lh	Limestone rockland, hilly	140.7	0.8%
Ll	Lindside silt loam	18.7	0.1%
Lr	Limestone rockland rough	6,987.7	37.4%
Mfh	Muskingum (Gorgas) fine sandy loam, 10 to 20 percent slopes, eroded	24.0	0.1%
Mfl	Muskingum (Gorgas) fine sandy loam, 10 to 20 percent slopes	639.7	3.4%
Ml	Melvin silt loam	0.0	0.0%
Mnu	Monongahela loam, undulating phase	4.7	0.0%
Msl	Muskingum (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony	628.4	3.4%
Msz	Muskingum (Gorgas) stony fine sandy loam, 20 to 45 percent slopes, very stony	480.3	2.6%
RlM	Rolling stony land, Muskingum soil material	20.4	0.1%
RsC	Rolling stony land, Colbert soil material	52.7	0.3%
RsM	Rough stony land, Muskingum soil material	5,221.2	27.9%
Sce	Swaim silty clay loam, eroded, undulating phase	0.7	0.0%
Scn	Swaim silty clay loam, eroded, rolling phase	26.3	0.1%
Sco	Swaim silty clay loam, rolling phase	9.4	0.1%
Scu	Swaim silty clay loam, undulating phase	15.6	0.1%
Sfv	Sequatchie fine sandy loam, level phase	5.9	0.0%
StM	Stony alluvium	156.8	0.8%
Tcn	Talbott silty clay loam, eroded, rolling phase	16.5	0.1%
W	Water	0.9	0.0%
Wsu	Wolftever silt loam, undulating phase	3.6	0.0%
Subtotals for #7		**17,140.4**	**91.7%**
Totals for Skyline Project Boundary		**18,694.1**	**100.0%**

Source: NRCS 2016

Note: There may be a discrepancy in the total number of acres reported as Skyline acres due to map inconsistencies.

Reference:

NRCS 2016 - Natural Resources Conservation Service (NRCS). 2016. Web Soil Survey. Available at: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed November 2, 2016.

5. PHYSIOGRAPHY OF THE LAKE HARRIS PROJECT VICINITY

Physiography of the Lake Harris Project Vicinity

The Northern Piedmont

The Northern Piedmont consists of three sections called blocks; the Tallapoosa block, the Coosa block, and the Talladega block. The Project area is within the Tallapoosa and Coosa blocks. The Tallapoosa block contains rocks of the Wedowee Group, the Hackneyville schist, the Cornhouse schist and the Emuckfaw Formation. The Wedowee Group consists of a wide range of sericite phyllites, feldspathic-biotite-quartz gneiss and quartzite. The Hackneyville schist is composed of muscovite and biotite schist, and biotite quartz schist with occasional kyanite. The Cornhouse schist consists of interlayered chlorite-biotitegarnet schist and muscovite-biotite-garnet-quartz-plagioclase schist. Quartzite and layered amphibolites are also present. The Emuckfaw Formation is interlayered metagraywacke and muscovite-garnet-biotite-schist with local occurrences of quartzite and amphibolite (Raymond, et al. 1988).

In addition to the regionally metamorphosed rocks of the Tallapoosa block, granitoid plutons composed of the Elkahatchee quartz diorite gneiss, the Zana granite and Kowaliga gneiss occur in the Tallapoosa block. The Coosa block contains rocks of the Poe Bridge Mountain Group, the Mad Indian Group, the Wedowee Group, the Higgins Ferry Group and the Hatchet Creek Group. The Wedowee Group consists of quartz-graphite-sericite phyllite to fine-grained schist and chlorite-sericite phyllite to fine-grained schist. The Poe Bridge Mountain and Higgins Ferry Groups contain sequences of interlayered coarse-grained graphitic feldspathic mica schist, graphitic and garnetiferous quartzite, garnet mica schist, fine-grained biotite gneiss and quartzite. These groups also are associated with major amphibolite sequences: the Ketchepedrakee Amphibolite with the Poe Bridge Mountain Group and the Mitchell Dam Amphibolite with the Higgins Ferry Group. The Mad Indian and Hatchet Creek Groups consists of feldspathic garnet-quartz-muscovite schist, minor amounts of biotite (garnet) schist and gneiss, micaceous quartzite, migmatitic gneiss and rare amphibolite. They also typically contain abundant pegmatite and small granitoid bodies (Raymond et al. 1988).

Structural Features

The dominant features in the Piedmont are northeast-trending ridges underlain by resistant quartzite and quartz-rich schists. The linear ridges to the northwest and northeast of the dam site are a result of tectonic movement approximately 500 million years ago. Triassic dikes intruded into the area approximately 200 million years ago and show no sign of any movement since that time. The Tallapoosa block contains the Alexander City fault and a series of cataclastic zones. The Alexander City fault divides the Wedowee Group and Emuckfaw Formation (Beg 1987). The Enitachopco fault separates the Coosa block from the Tallapoosa block. The Enitachopco fault also divides the Coosa block into two subregional salient. The Project is located in the northeastern salient containing the Poe Bridge Mountain Group and the Mad Indian Group. The southwest salient contains the Wedowee Group, the Higgins Ferry Group and the Hatchet Creek Group (Raymond et al. 1988).

Mineral Resources in the Project Vicinity

Reportedly, during the late 1830s, gold discovered in Randolph County was found primarily in lode deposits associated with quartz veins. The only known placer deposits were in the Bradley prospect, which is flooded by the backwaters of Lake Harris. The only other gold prospect found within the Project area was the Morris Property prospect, a lode deposit. Many of the gold mines and prospects discovered within Randolph County were discovered southwest of Harris Dam (Beg 1987).

Systematic mica mining in Randolph County started around 1870. Mica is a platy mineral that splits into very thing tough sheets as small as 1/1000 of an inch. Muscovite mica is a very common mineral found in many of the granitic, gneissic, schistose and phyllitic rocks of Randolph County. Commercially, mica is divided into sheet mica and scrap mica. Scrap mica is commonly used as a filler in roofing and siding, shingles, wallboard, drilling mud, rubber, plastic, paints and other synthetic goods. Sheet mica is used as an electrical and heat insulation material. Many of the mica mines and prospects are located in northeastern Randolph County. A number of the prospects fall within Project lands or are covered by Lake Harris (Beg 1987).

Three major varieties of granitic rock occur in Randolph County: the Almond Trondhjemite, the Bluff Springs Granite and the Rock Mills Granite Gneiss. The Almond Trondhjemite and the Bluff Springs Granite are present with the Project area. The Almond Trondhjemite is a light-colored equigranular rock that forms large pavement areas in the Blake Ferry and Almond plutons. The Blake Ferry pluton was quarried for the construction of the R.L. Harris Dam. The Bluff Springs Granite has not been quarried in Randolph County; however, it exhibits similar characteristics and composition to other granitic rocks used for road material and aggregate. The only granite quarry within the Project area was the quarry used during construction of the Harris Dam, which is now flooded by Lake Harris (Beg 1987).

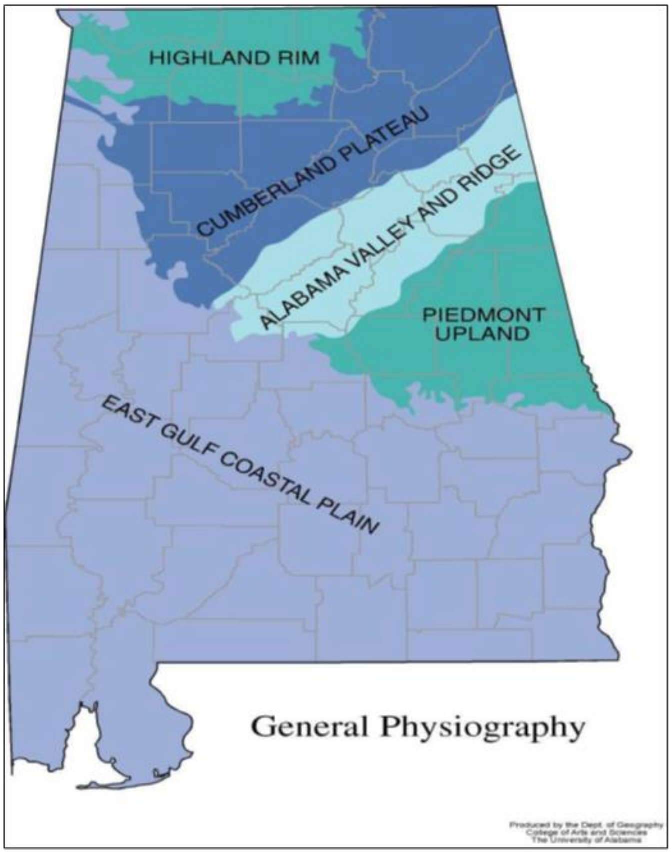
Deposits of mixed sand, clay and gravel occur extensively in the fluvial deposits along the flood plains and low terraces of the major drainage systems within Randolph County. The most extensive deposits occur along the Tallapoosa and Little Tallapoosa rivers. Now many of these larger deposits, found within the Project area, are flooded by Lake Harris; however, deposits are located along the Little Tallapoosa upstream of the area of Project effect. There are six quarries located within the deposits along the Little Tallapoosa (Beg 1987).

References:

Beg, M. 1987. Mineral Resources of Randolph County, Alabama. Geological Survey of Alabama, Special Map 206. Available at: http://cartweb.geography.ua.edu/lizardtech/iserv/calcrgn?cat=North%20America%20and%20United%20States&item=States/Alabama/Counties/randolph/Randolph1987a.

Raymond, D. E., W.E. Osborne, C.W. Copeland, and T.L. Neathery. 1988. Alabama Stratigraphy. Geological Survey of Alabama, Tuscaloosa, AL.

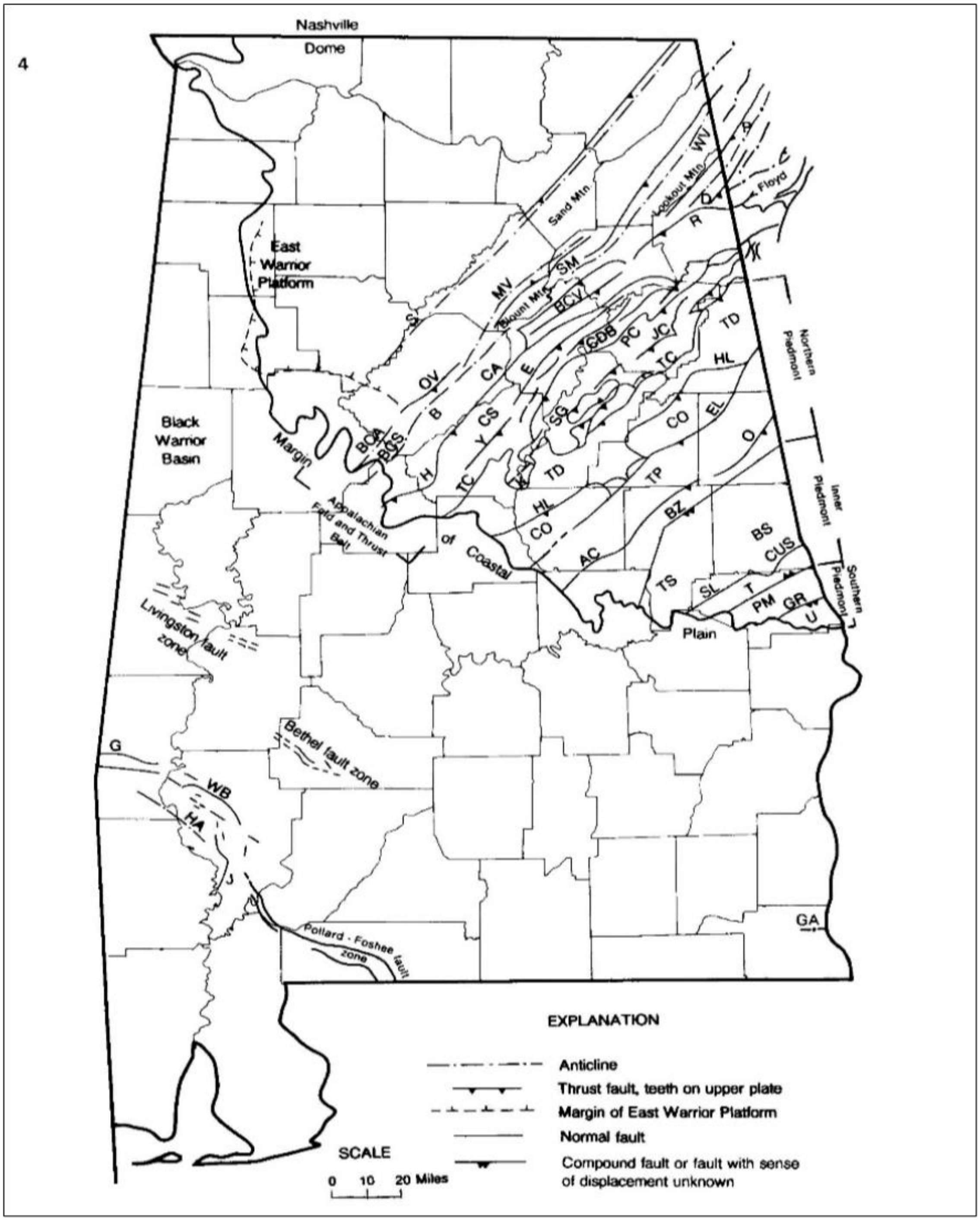
6. PHYSIOGRAPHY AND TOPOGRAPHY – LAKE HARRIS



Physiographic Regions of Alabama

Reference:

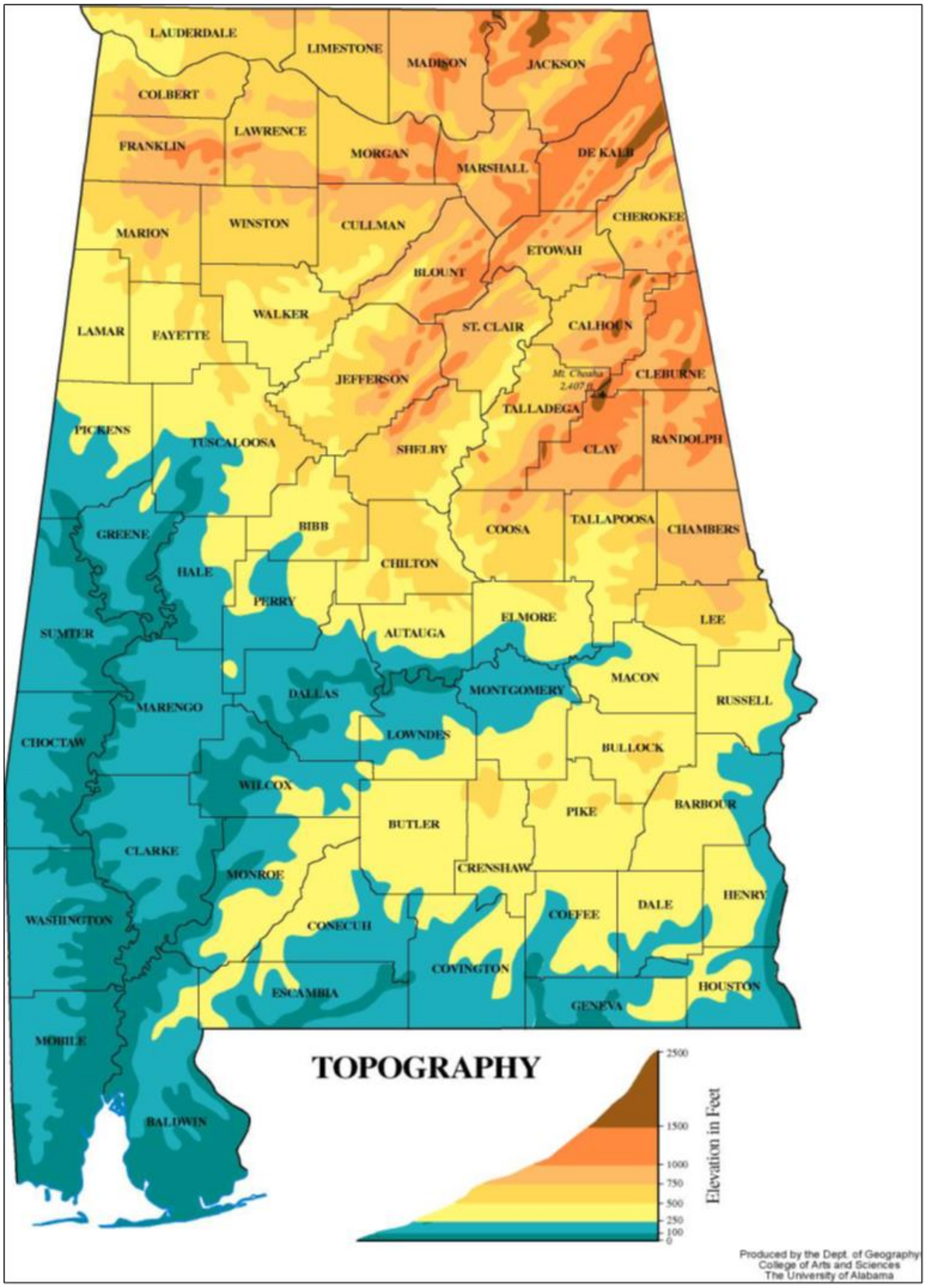
University of Alabama. 2016a. General Physiography. Map. Available at: http://alabamamaps.ua.edu/contemporarymaps/alabama/physical/basemap6.pdf. Accessed November 2, 2016.



Structural Geology of the Piedmont Upland Physiographic Region

Reference:

Raymond, D. E., W.E. Osborne, C.W. Copeland, and T.L. Neathery. 1988. Alabama Stratigraphy. Geological Survey of Alabama, Tuscaloosa, AL.



Topography of Alabama

University of Alabama. 2016b. General Topography. Map. Available at: https://i.pinimg.com/736x/ad/a6/18/ada618d71947f7446d54987bb0d89d41--topographic-map-geography.jpg. Accessed November 2, 2016.

7. SOIL TYPES LOCATED IN LAKE HARRIS PROJECT VICINITY

Soil Types Located in the Lake Harris Vicinity

Clay County Soils

Soils in Clay County encompass approximately 29 acres of the approximate 19,194 acres within the Harris Project boundary. Soils encountered include the Chewacla-Riverview complex, the Grover association, the Madison-Riverview association and the Tatum-Tallapoosa-Riverview association.

- Chewacla is typically found in flood plains and derives from sedimentary rocks. Chewacla is generally described as a somewhat poorly drained silt loam with slopes of 0 to 2 percent.
- Riverview is found in flood plains and derives from sedimentary rocks. Riverview is generally described as a well-drained loam with slopes of zero to two percent and includes three horizons: silt loam, loam and fine sandy loam.
- Grover is typically found on ridges and derives from metamorphic rock. Grover is generally described as a well-drained loam with slopes of 2 to 12 percent and consists of five horizons: sandy loam, clay loam, loam, sandy clay loam and sandy loam.
- Madison is typically found on ridges and derives from schist. Madison is generally described as a well-drained loam with slopes of 3 to 15 percent and includes three horizons: loam, clay and sandy loam.
- Tatum is typically found on hills and derives from schist. Tatum is generally described as a well-drained clayey gravelly loam with slopes of 6 to 20 percent and includes three horizons: gravelly loam, clay and weathered bedrock.
- Tallapoosa is typically found on high hills and derives from slate. Tallapoosa is generally described as a well-drained gravelly loam with slopes of 15 to 45 percent. Tallapoosa includes three horizons: gravelly loam, gravelly loam and weathered bedrock (NRCS 2016).

Cleburne County Soils

Cleburne County soils encompass approximately 30 acres of the approximate 19,194 acres within the Harris Project boundary. Soils encountered include the Hiwassee-Gwinnett association, the Madison-Louisa association, the Riverview-State-Sylacauga complex, the state fine sandy loam and the Waynesboro-Holston complex.

- Hiwassee typically found on hills and derives from igneous rocks, is generally described as a well-drained clayey loam with slopes of 2 to 15 percent. Hiwassee consists of three horizons: clay loam, clay and loam.
- Gwinnett typically found on hills and derives from granite and gneiss, is generally described as sandy clayey loam with slopes of 2 to 15 percent. Gwinnett consists of four horizons: sandy clay loam, clay, sandy clay loam and weathered bedrock.
- Madison typically found on hills and derives from schist is generally described as a loam with slopes of 10 to 35 percent. Madison consists of four horizons: gravelly sandy loam, clay, sandy clay loam and sandy loam.
- Louisa typically found on hills and derives from mica schist is generally described as a gravelly sandy loam with slopes of 10 to 35 percent. Louisa consists of four horizons: gravelly sandy loam, gravelly sandy loam, channery loam and weathered bedrock.
- Riverview typically found in flood plains and derives from sedimentary rocks is generally described as a loam with slopes of 0 to 2 percent. Riverview consists of three horizons: loam, loam, and loamy fine sand.

- Slate typically found in stream terraces and derives from igneous and metamorphic rock is generally described as a loam with slopes of 0 to 2 percent. Slate consists of three horizons: loam, loam and fine sandy loam.
- Sylacauga typically found in stream terraces and derives from sedimentary rock is generally described as a silty clayey loam with slopes of 0 to 2 percent. Sylacauga consists of three horizons: silt loam, clay loam and loam.
- State, a fine sandy loam, typically found in stream terraces and derives from igneous; metamorphic rock is generally described as a loam with slopes of 0 to 2 percent. Slate consists of three loam horizons.
- Waynesboro typically found on hills and derives from sandstone and shale is generally described as a loam with slopes from 2 to 10 percent. Waynesboro consists of three horizons: fine sandy loam, clay loam and clay.
- Holston typically found on terraces, derives from sandstone and shale is generally described as a loam with slopes of 2 to 10 percent. Holston consists of three horizons: loam, loam and clay loam (NRCS 2016).

Randolph County Soils

Randolph County soils encompass approximately 19,135 acres of the 19,194 acres within the Harris Project boundary. Soil units encountered include the Altavista, Appling, Augusta, Buncombe, Chewacla, Congaree, Davidson, Louisa, Louisburg, Madison, Mantachie, Ochlockonee, Wedowee, Wehadkee and Wickham. Other units identified within the Project area include Pits, Rock land, Stony rough land and Terrace escarpment. (NRCS 2016). (Note: citation pertains to information in the following list also.)

Altavista: generally described as a well-drained loam derived from sedimentary rock typically found on stream terraces. Multiple Altavista units identified within the Lake Harris Project area include:

- fine sandy loam with 2 to 6 percent slopes
- gravelly fine sandy loam with 2 to 6 percent slopes
- gravelly fine sandy loam with 6 to 10 percent slopes

Appling: generally described as a well-drained loam derived from igneous and metamorphic rock typically found on hills and hillslopes. Multiple Appling units identified within the Lake Harris Project area include:

- a gravelly sandy loam with 2 to 6 percent slopes
- gravelly sandy loam with 6 to 10 percent slopes
- sandy loam with 2 to 6 percent slopes
- sandy loam with 6 to 10 percent slopes

Augusta: a fine sandy loam, generally described as somewhat poorly drained with slopes of 0 to 2 percent. Augusta typically found on stream terraces is derived from sedimentary rock.

Buncombe: loamy sand is generally described as being excessively drained with slopes of 0 to 5 percent. Buncombe, typically found in levees, is derived from metamorphic rock.

<u>Chewacla</u>: silt loam is generally described as being somewhat poorly drained with slopes of 0 to 2 percent. Chewacla, typically found in flood plains, is derived from loamy alluvium.

<u>Congaree</u>: silt loam is generally described as being moderately well drained with slopes of 0 to 2 percent. Congaree, typically found in flood plains, is derived from sedimentary rock.

<u>Davidson</u>: multiple units were identified within the Lake Harris Project area. Davidson is generally described as well-drained loam derived from metamorphic rocks typically found on hillslopes. These units included:

- gravelly clay loam with 6 to 10 percent slopes
- gravelly clay loam with 10 to 15 percent slopes

<u>Louisa</u>: multiple units were identified within the Lake Harris Project area. Louisa is generally described as a well-drained to somewhat excessively drained loam derived from mica schist, is typically found on hillslopes. These units include:

- gravelly clay loam with 6 to 10 percent slopes
- gravelly sandy loam with 10 to 15 percent slopes
- gravelly sandy loam with 15 to 40 percent slopes
- slaty loam with 10 to 15 percent slopes
- slaty loam with 15 to 40 percent slopes
- stony sandy clay loam with 6 to 10 percent slopes
- stony sandy clay loam with 10 to 15 percent slopes
- stony sandy clay loam with 15 to 40 percent slopes
- stony sandy loam with 10 to 15 percent slopes
- stony sandy loam with 15 to 40 percent slopes

<u>Louisburg</u>: multiple units were identified within the Lake Harris Project area. Louisburg is generally described as a well-drained loam derived from igneous and metamorphic rocks typically found on hillslopes. These units include a stony sandy loam with 6 to 10 percent slopes and a stony sandy loam with 10 to 25 percent slopes.

<u>Madison</u>: multiple units were identified within the Lake Harris Project area. Madison is generally described as a well-drained loam derived from schist typically found on hillslopes. These units include:

- gravelly clay loam with 6 to 10 percent slopes
- gravelly clay loam with 10 to 15 percent slopes
- gravelly clay loam with 15 to 25 percent slopes
- gravelly fine sandy loam with 2 to 6 percent slopes
- gravelly fine sandy loam with 6 to 10 percent slopes
- gravelly fine sandy loam with 10 to 15 percent slopes

<u>Mantachie</u>: a fine sandy loam generally described as somewhat poorly drained with slopes of 0 to 2 percent. Mantachie typically found in flood plains is derived from sedimentary rock.

<u>Ochlockonee</u>: multiple units were identified within the Lake Harris Project area. These units include a fine sandy loam with 0 to 2 percent slopes and a fine sandy loam of local alluvium with 0 to 3 percent slopes. Ochlockonee is generally described as being moderately well drained loam derived from sedimentary rock typically found in flood plains.

Wedowee: gravelly sandy loam generally described as well drained with slopes of 10 to 15 percent. Wedowee, typically found on hillslopes, is derived from igneous rock.

Wehadkee: multiple units were identified within the Lake Harris Project area. Wehadkee generally described as being a poorly drained loam derived from igneous and metamorphic rock is typically found in drainage ways. These units include a fine sandy loam with 0 to 2 percent slopes and the Wehadkee and Mantachie soils with 0 to 2 percent slopes.

Wickham: multiple units were identified within the Lake Harris Project area. Wickham generally described as being a well-drained loam is derived from sedimentary rocks found on stream terraces. These units include:

- fine sandy loam with 2 to 6 percent slopes
- fine sandy loam with 6 to 10 percent slopes
- fine sandy loam with 10 to 15 percent slopes
- gravelly fine sandy loam with 6 to 10 percent slopes
- gravelly fine sandy loam with 10 to 15 percent slopes

Note: There may be a discrepancy in the total number of acres reported as Harris Project acres due to map inconsistencies.

Reference:
NRCS 2016 - Natural Resources Conservation Service (NRCS). 2016. Web Soil Survey. Available at: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed November 2, 2016.

8. SOILS WITHIN THE LAKE HARRIS PROJECT BOUNDARY - TABLE

Table 1 Soils within the Lake Harris Project Boundary

Map Unit Symbol	Map Unit Name	Acres in Project Boundary	Percent of Project Boundary
Clay County, Alabama (AL027)			
Ch	Chewacla-Riverview complex	19.1	0.1%
GVC	Grover association, rolling	4.2	0.0%
MRD	Madison-Riverview association, hilly	0.6	0.0%
TRE	Tatum-Tallapoosa-Riverview association, steep	0.8	0.0%
W	Water	3.8	0.0%
Subtotals for Soil Survey Area		**28.5**	**0.1%**
Totals for Project Boundary		**19,194.0**	**100.0%**
Cleburne County, Alabama (AL029)			
HGH	Hiwassee-Gwinnett association, hilly	1.1	0.0%
MLS	Madison-Louisa association, steep	1.1	0.0%
Rs	Riverview-State-Sylacauga complex	2.7	0.0%
St	State fine sandy loam	6.8	0.0%
W	Water	15.1	0.1%
WhC	Waynesboro-Holston complex, 2 to 10 percent slopes	3.4	0.0%
Subtotals for Soil Survey Area		**30.2**	**0.2%**
Totals for Project Boundary		**19,194.0**	**100.0%**
Randolph County, Alabama (AL111)			
AaB	Altavista fine sandy loam, 2 to 6 percent slopes	3.5	0.0%
AgB	Altavista gravelly fine sandy loam, 2 to 6 percent slopes	5.2	0.0%
AgC2	Altavista gravelly fine sandy loam, 6 to 10 percent slopes, eroded	20.7	0.1%
AlB2	Appling gravelly sandy loam, 2 to 6 percent slopes, eroded	1.1	0.0%
AlC2	Appling gravelly sandy loam, 6 to 10 percent slopes, eroded	2.2	0.0%
ApB2	Appling sandy loam, 2 to 6 percent slopes, eroded	13.9	0.1%
ApC2	Appling sandy loam, 6 to 10 percent slopes	35.8	0.2%
AuA	Augusta fine sandy loam, 0 to 2 percent slopes	1.5	0.0%
Bu	Buncombe loamy sand	47.7	0.2%
Cn	Chewacla silt loam, 0 to 2 percent slopes, occasionally flooded	14.0	0.1%
Co	Congaree silt loam	3.7	0.0%
DaC3	Davidson gravelly clay loam, 6 to 10 percent slopes, severely eroded	8.8	0.0%
DaD3	Davidson gravelly clay loam, 10 to 15 percent slopes, severely eroded	7.1	0.0%
LgC	Louisa gravelly sandy loam, 6 to 10 percent slopes	42.3	0.2%

Map Unit Symbol	Map Unit Name	Acres in Project Boundary	Percent of Project Boundary
LgD	Louisa gravelly sandy loam, 10 to 15 percent slopes	62.2	0.3%
LgE	Louisa gravelly sandy loam, 15 to 40 percent slopes	620.8	3.2%
LoD	Louisa slaty loam, 10 to 15 percent slopes	52.9	0.3%
LoE	Louisa slaty loam, 15 to 40 percent slopes	1,429.5	7.4%
LsC2	Louisa stony sandy clay loam, 6 to 10 percent slopes, eroded	0.8	0.0%
LsD2	Louisa stony sandy clay loam, 10 to 15 percent slopes, eroded	21.8	0.1%
LsE2	Louisa stony sandy clay loam, 15 to 40 percent slopes, eroded	81.8	0.4%
LtD	Louisa stony sandy loam, 10 to 15 percent slopes	64.3	0.3%
LtE	Louisa stony sandy loam, 15 to 40 percent slopes	5,671.7	29.5%
LuC2	Louisburg stony sandy loam, 6 to 10 percent slopes, eroded	6.9	0.0%
LuD2	Louisburg stony sandy loam, 10 to 25 percent slopes, eroded	27.9	0.1%
MaC3	Madison gravelly clay loam, 6 to 10 percent slopes, severely eroded	174.0	0.9%
MaD3	Madison gravelly clay loam, 10 to 15 percent slopes, severely eroded	612.9	3.2%
MaE3	Madison gravelly clay loam, 15 to 25 percent slopes, severely eroded	3.2	0.0%
MdB2	Madison gravelly fine sandy loam, 2 to 6 percent slopes, eroded	11.6	0.1%
MdC2	Madison gravelly fine sandy loam, 6 to 10 percent slopes, eroded	224.4	1.2%
MdD2	Madison gravelly fine sandy loam, 10 to 15 percent slopes, eroded	142.7	0.7%
Mt	Mantachie fine sandy loam	284.1	1.5%
Oc	Ochlockonee fine sandy loam (toccoa)	221.7	1.2%
Ok	Ochlockonee fine sandy loam, local alluvium (toccoa)	22.7	0.1%
Pt	Pits	6.6	0.0%
Ro	Rock land	41.8	0.2%
Sr	Stony rough land	107.9	0.6%
Te	Terrace escarpment	1.2	0.0%
W	Water	8,787.5	45.8%
WgD2	Wedowee gravelly sandy loam, 10 to 15 percent slopes, eroded	1.7	0.0%
Wh	Wehadkee fine sandy loam	6.2	0.0%
Wk	Wehadkee and Mantachie soils	145.1	0.8%

Map Unit Symbol	Map Unit Name	Acres in Project Boundary	Percent of Project Boundary
WmB2	Wickham fine sandy loam, 2 to 6 percent slopes, eroded	6.0	0.0%
WmC2	Wickham fine sandy loam, 6 to 10 percent slopes	14.4	0.1%
WmD2	Wickham fine sandy loam, 10 to 15 percent slopes, eroded	12.2	0.1%
WnC2	Wickham gravelly fine sandy loam, 6 to 10 percent slopes, eroded	41.6	0.2%
WnD2	Wickham gravelly fine sandy loam, 10 to 15 percent slopes, eroded	17.8	0.1%
Subtotals for Soil Survey Area		**19,135.4**	**99.7%**
Totals for Project Boundary		**19,194.0**	**100.0%**

Source: NRCS 2016

Note there may be a discrepancy in the total number of acres reported as Lake Harris Project acres due to map inconsistencies.

Reference:

Natural Resources Conservation Service (NRCS). 2016. Web Soil Survey. Available at:

http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed November 2, 2016.

APPENDIX E

WATER RESOURCES

1. **FINAL 2018 HARRIS BASELINE WATER QUALITY REPORT**
2. **FINAL 2018 HARRIS WATER QUANTITY, WATER USE, AND DISCHARGE REPORT**

1. FINAL 2018 HARRIS BASELINE WATER QUALITY REPORT

BASELINE WATER QUALITY REPORT

R. L. HARRIS HYDROELECTRIC PROJECT

FERC NO. 2628

Prepared for*:*

ALABAMA POWER COMPANY

BIRMINGHAM, ALABAMA

Prepared by:

March 2018

ALABAMA POWER COMPANY
BIRMINGHAM, ALABAMA

R.L. HARRIS HYDROELECTRIC PROJECT
FERC NO. 2628

BASELINE WATER QUALITY REPORT

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BASELINE WATER QUALITY REPORT

1.0 INTRODUCTION

Alabama Power Company (Alabama Power) is initiating the Federal Energy Regulatory Commission (FERC) relicensing of the 135-megawatt (MW) R.L. Harris Hydroelectric Project (Harris Project), FERC Project No. 2628. The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources. These structures, lands, and water are enclosed within the FERC Project Boundary. Under the existing Harris Project license, the FERC Project Boundary encloses two distinct geographic areas, described below.

Harris Reservoir is the 9,870-acre reservoir (Harris Reservoir) created by the R.L. Harris Dam (Harris Dam). Harris Reservoir is located on the Tallapoosa River, near Lineville, Alabama. The lands adjoining the reservoir total approximately 7,392 acres and are included in the FERC Project Boundary. This includes land to 795 feet mean sea level (msl)[1], as well as natural undeveloped areas, hunting lands, prohibited access areas, recreational areas, and all islands.

The Harris Project also contains 15,063 acres of land within the James D. Martin-Skyline Wildlife Management Area (Skyline WMA) located in Jackson County, Alabama. These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigative Plan and Wildlife Management Plan. These lands are leased to, and managed by, the State of Alabama for wildlife management and public hunting and are part of the Skyline WMA (ADCNR 2016b).

For the purposes of this technical report, "Lake Harris" refers to the 9,870-acre reservoir, adjacent 7,392 acres of project land, and the dam, spillway, and powerhouse. "Skyline" refers to the 15,063 acres of Project land within the Skyline WMA in Jackson County. "Harris Project" refers to all the lands, waters, and structures enclosed within the FERC Project Boundary, which includes both Lake Harris and Skyline. "Harris Reservoir" refers to the 9,870-acre reservoir only; Harris Dam refers to the dam, spillway, and powerhouse. The "Project Area" refers to the land and water in the Project Boundary and immediate geographic area adjacent to the Project Boundary (Alabama Power Company 2018).

Lake Harris and Skyline are located within two river basins: the Tallapoosa and Tennessee River Basins, respectively. The only waterbody managed by Alabama Power as part of their FERC license for the Harris Project is the Harris Reservoir.

To support the relicensing process and summarize baseline water quality information for the Pre-Application Document (PAD), Kleinschmidt Associates (Kleinschmidt) prepared this report to

[1] Also includes a scenic easement (to 800 feet msl or 50 horizontal feet from 793 feet msl, whichever is less, but never less than 795 feet msl)

summarize baseline operational data collected from 2005 to 2016. Although the Harris Project has been operating since 1983, Alabama Power, after consultations with interested stakeholders, implemented a pulsing scheme in 2005 (referred to as the "Green Plan"), which created a new operational baseline. Therefore, this report summarizes data from 2005 through 2016.

2.0 PROJECT DESCRIPTION

2.1 LAKE HARRIS

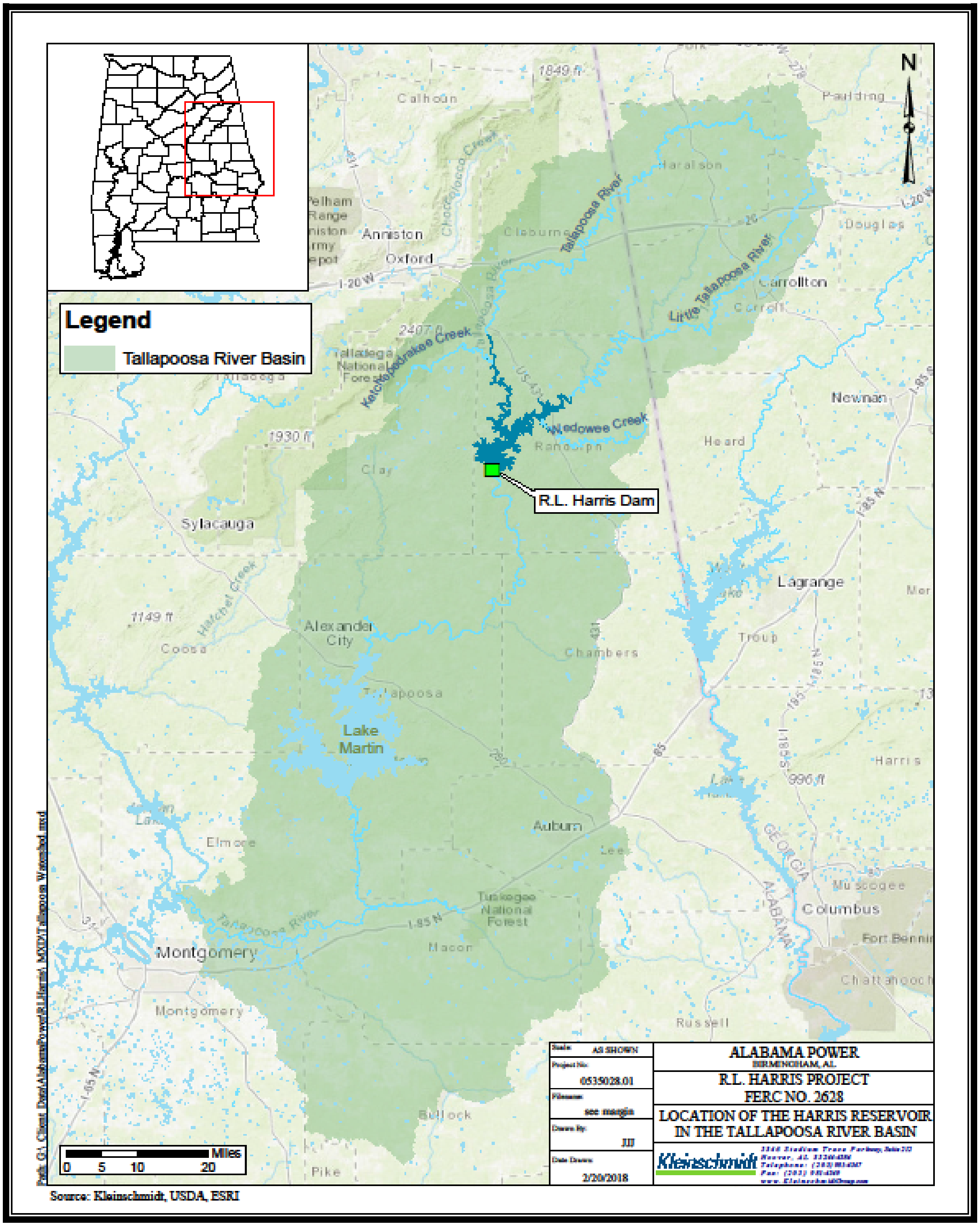
Harris Reservoir is located within the Tallapoosa River Basin (Figure 2-1). The Harris Reservoir extends up the Tallapoosa River approximately 29 miles from Harris Dam with approximately 367 miles of shoreline. The reservoir surface area is approximately 9,870 acres at normal full pool elevation of 793 feet mean sea level (msl) and has a mandatory 8-foot drawdown to 785 feet msl from December to April. The normal tailwater elevation with one unit operating is 664.9 feet msl; with two units operating, it is 667.7 feet msl. The gross storage capacity of Harris Reservoir is approximately 425,721 acre-feet, and the usable storage capacity is approximately 207,317 acre-feet.

The Harris Dam consists of a concrete gravity dam, powerhouse, and spillway totaling 1,142 feet long with a maximum height of 151.5 feet. The spillway has five radial gates for passing floodwaters in excess of turbine capacity and one radial trash gate. Each radial gate measures 40 feet 6 inches high and 40 feet wide.

The Harris powerhouse is a concrete structure and is integral with the intake facilities. It houses two units totaling 135 MW, which are comprised of two vertical generators each rated at 71,740 Kilovolts (kV) and two vertical Francis turbines each rated at 95,000 horsepower (hp). Project intake structures are located at 746 feet msl and are equipped with a skimmer weir that can incrementally raise the effective intake elevation approximately 18 feet to a maximum elevation of approximately 764 feet msl.

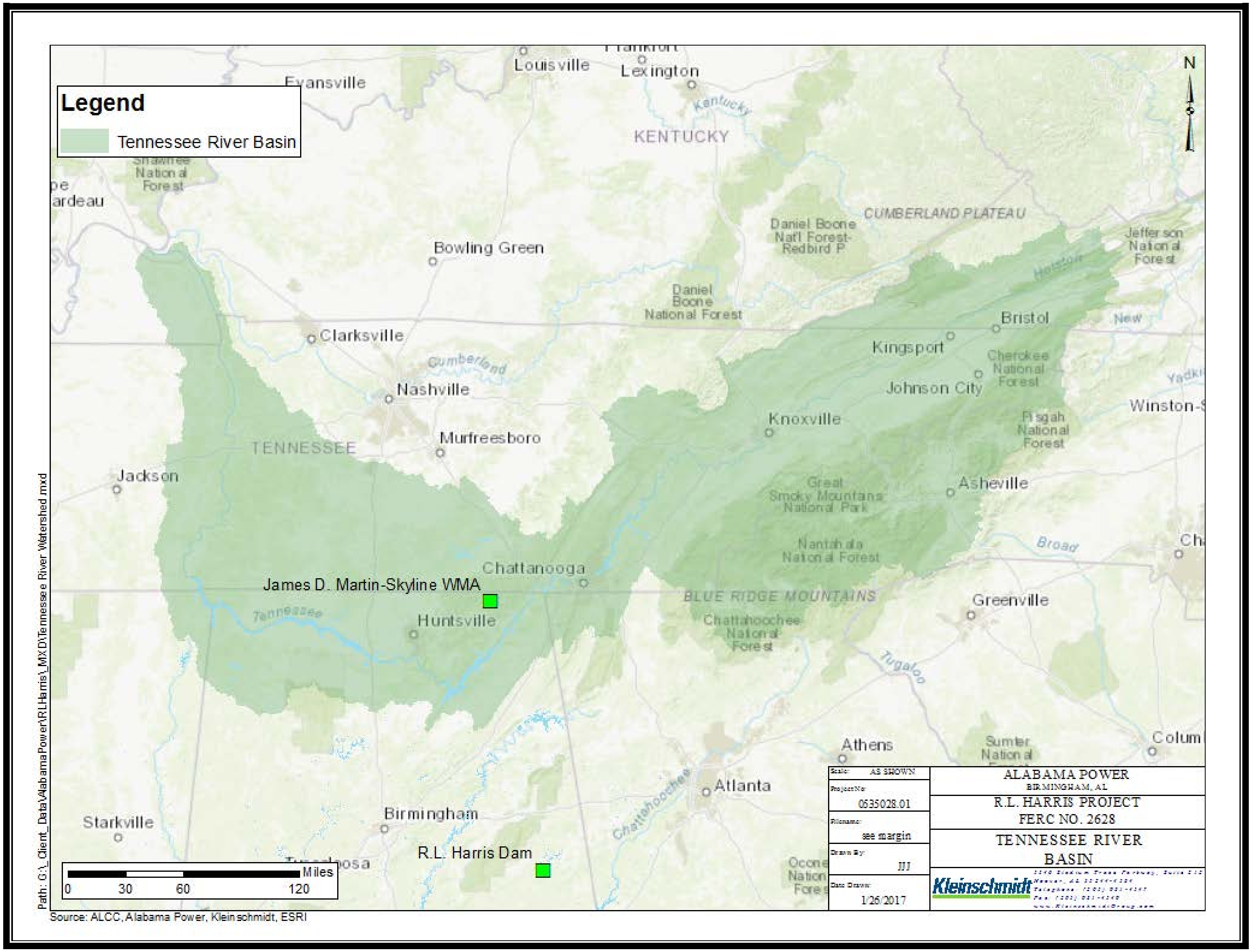
2.2 SKYLINE

The Harris Project contains 15,063 acres of land within the Skyline WMA located within the Tennessee River Basin in Jackson County near Scottsboro, Alabama (Figure 2-2). These Harris Project lands are located approximately 110 miles north of Harris Reservoir. Portions of the drainage areas for Coon Creek and Crow Creek fall within the Skyline boundary.



Source: Kleinschmidt, USDA, ESRI 2018

FIGURE 2-1 TALLAPOOSA RIVER BASIN



Source: ALCC, Alabama Power, Kleinschmidt, ESRI 2017

FIGURE 2-2 TENNESSEE RIVER BASIN

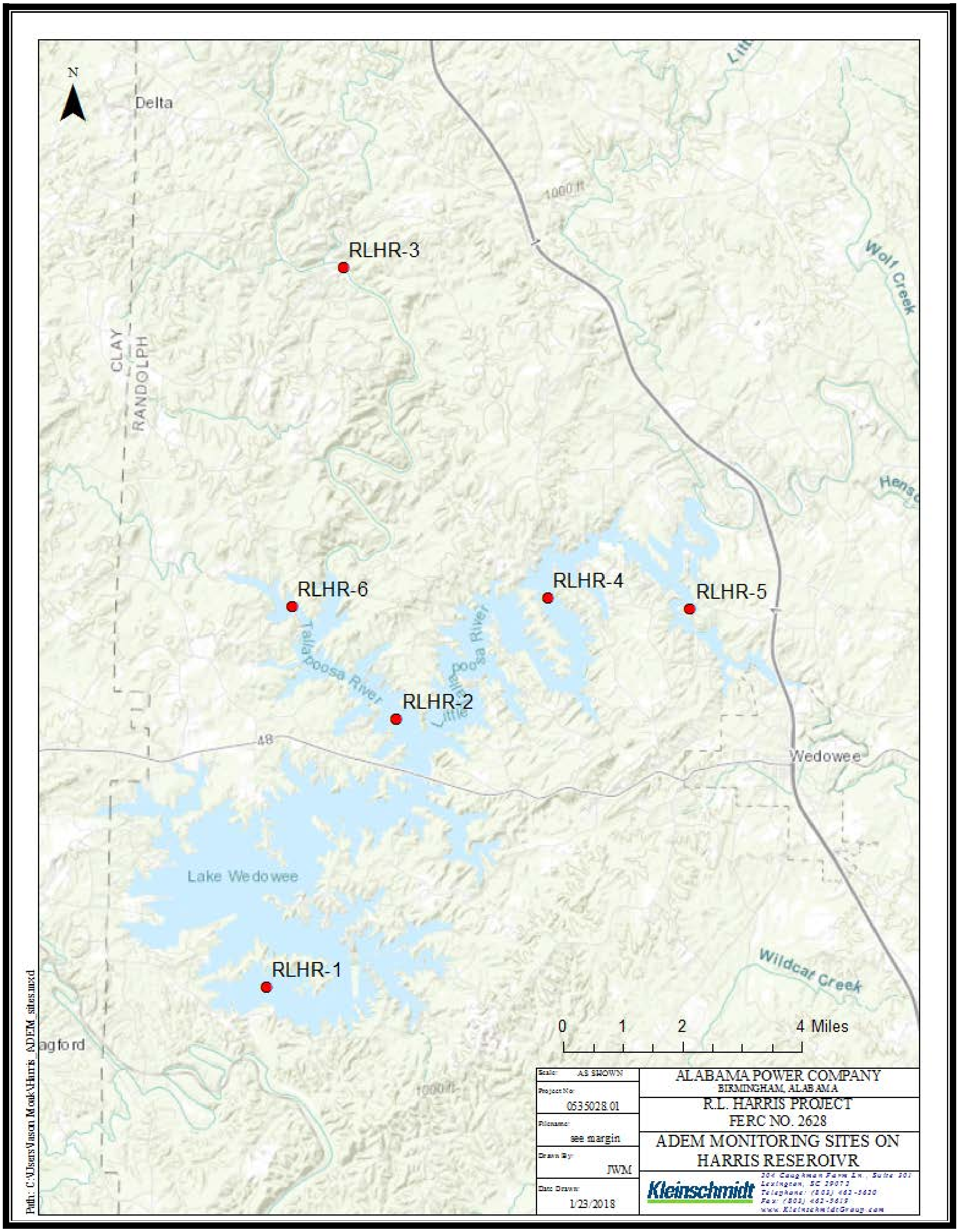
3.0 RESERVOIR WATER QUALITY

The Alabama Department of Environmental Management (ADEM) performed water quality sampling at several Harris Reservoir sites, including the forebay. ADEM's 2013 report for Harris Reservoir includes a presentation of water quality data collected in 2010, with comparisons to previous years extending back to 1997 (ADEM 2013a). In the 2013 report, ADEM noted that concentrations of nutrients (nitrogen and phosphorus), chlorophyll *a*, and total suspended solids (TSS) were generally lower than samples collected in 2005. Long-term monitoring of water quality indicates that Harris Reservoir is currently mesotrophic with an average Trophic State Index (TSI) value of 49 (ADEM 2016). Data collected by ADEM in 2015 indicated a TSI value of 38, which is in the oligotrophic range. A mesotrophic or oligotrophic classification indicates that substantial nutrient loading does not normally occur in Harris Reservoir.

As part of its monitoring program, ADEM collects basic water quality data throughout a vertical profile from the reservoir surface to the bottom at regular depth intervals (approximately 3 feet) (Figure 3-1). Water temperature, dissolved oxygen, pH, and conductivity data from these forebay profiles collected between 2005 and 2015 are presented in Figure 3-2 to Figure 3-5. Generally, during the spring and summer, the Harris Reservoir stratifies into three layers:

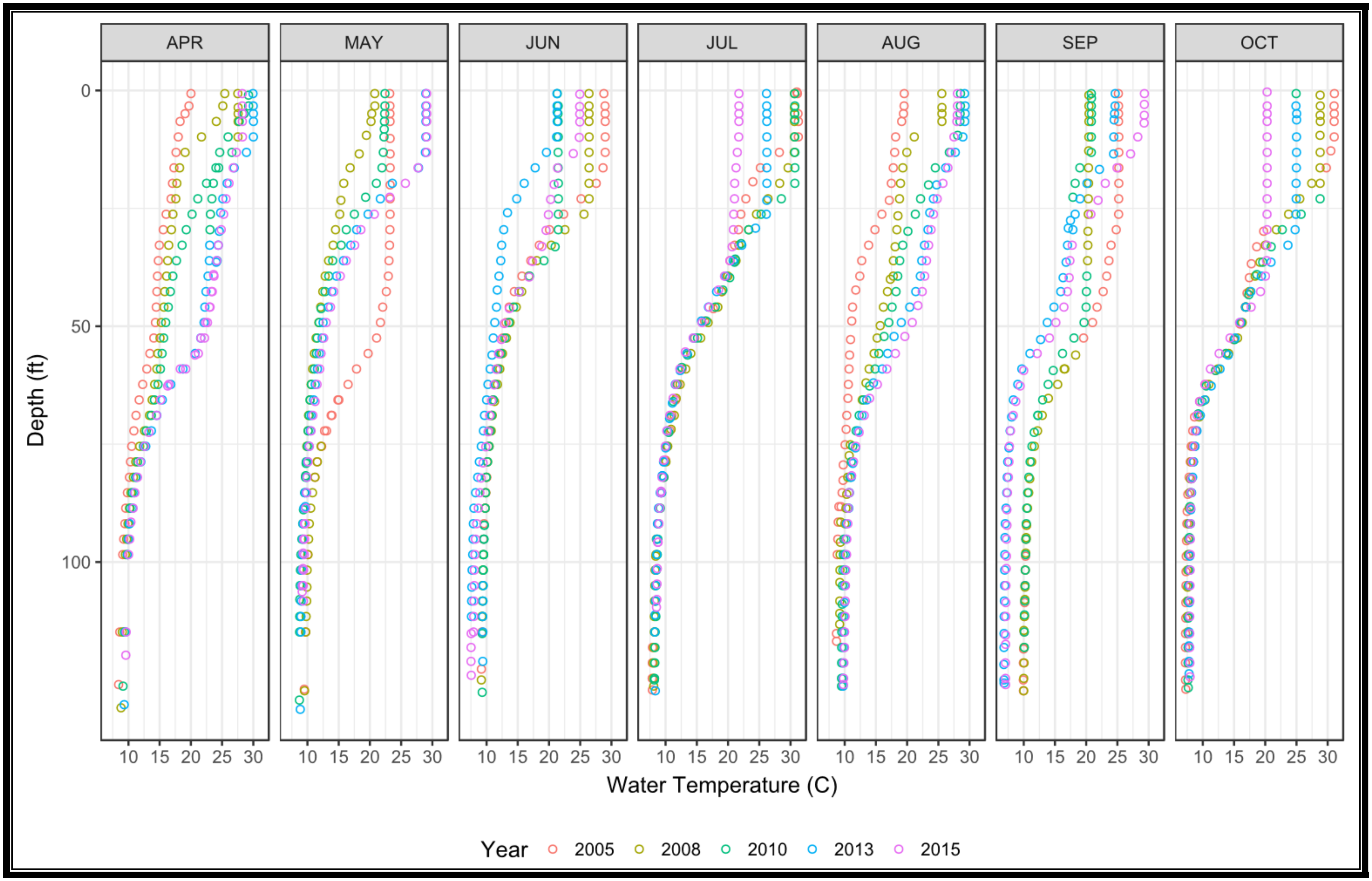
- an epilimnion, which is fairly uniform in temperature and is well oxygenated,
- a hypolimnion, a cold, less oxygenated bottom layer, and
- a metalimnion or thermocline, which is a transition layer between the epilimnion and hypolimnion.

ADEM collected and analyzed monthly surface water samples for numerous parameters at six stations on Harris Reservoir in April through October during their sampling years between 2005 and 2015. These data are summarized in Table 3-1 to Table 3-6. Water clarity, as measured by mean Secchi Disk depth, is typically higher in the lower reaches of the reservoir and lower in the upper reaches, ranging from 8.9 ft at RLHR-1 to 4.3 ft at RLHR-3. Similarly, concentrations of nutrients such as nitrogen and phosphorus, as well as chlorophyll *a* concentrations, were higher at the upper reservoir stations (RLHR-3 and RLHR-5).



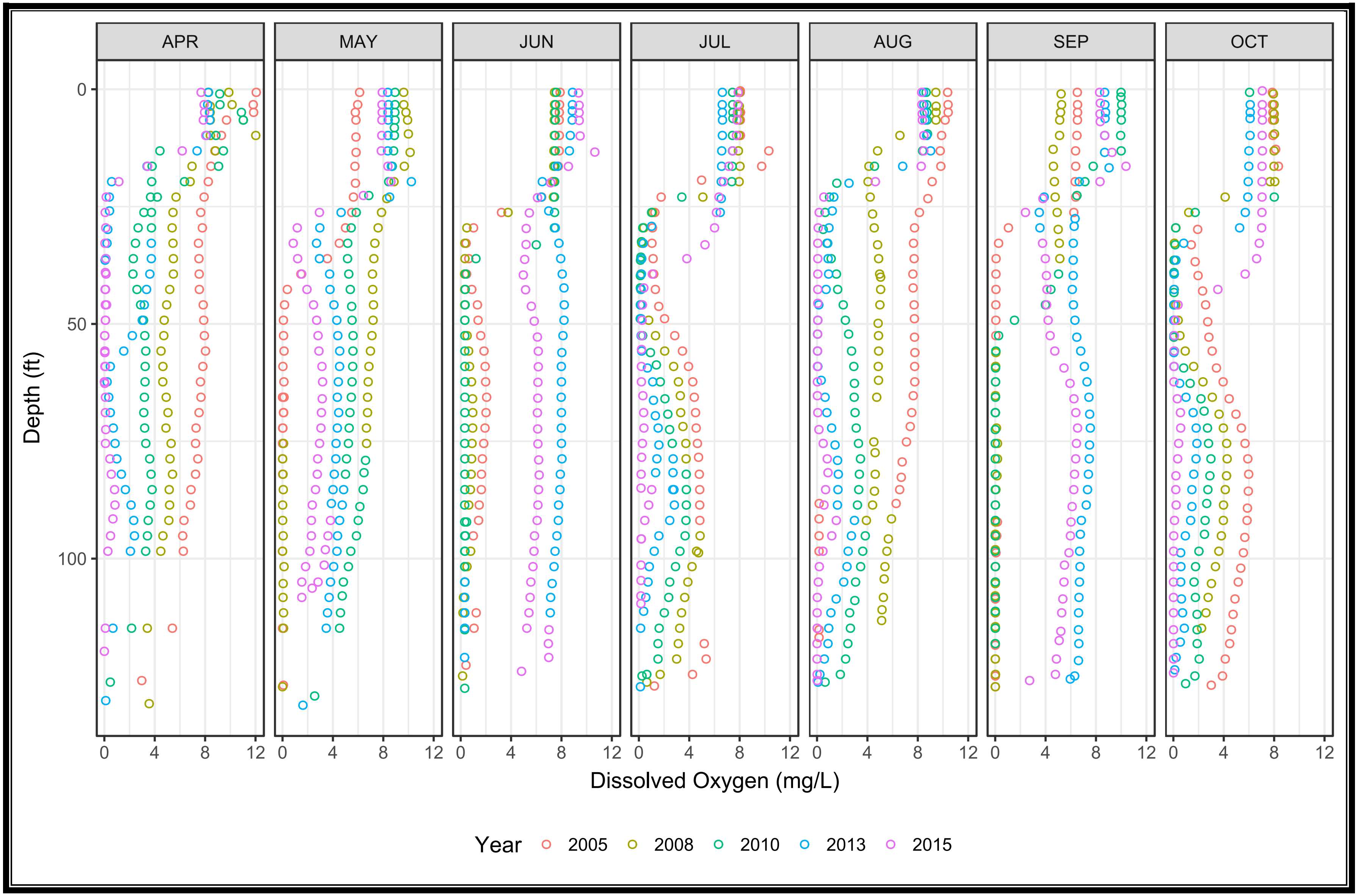
Source: ADEM, Kleinschmidt, ESRI 2018

FIGURE 3-1 ADEM MONITORING SITES ON HARRIS RESERVOIR



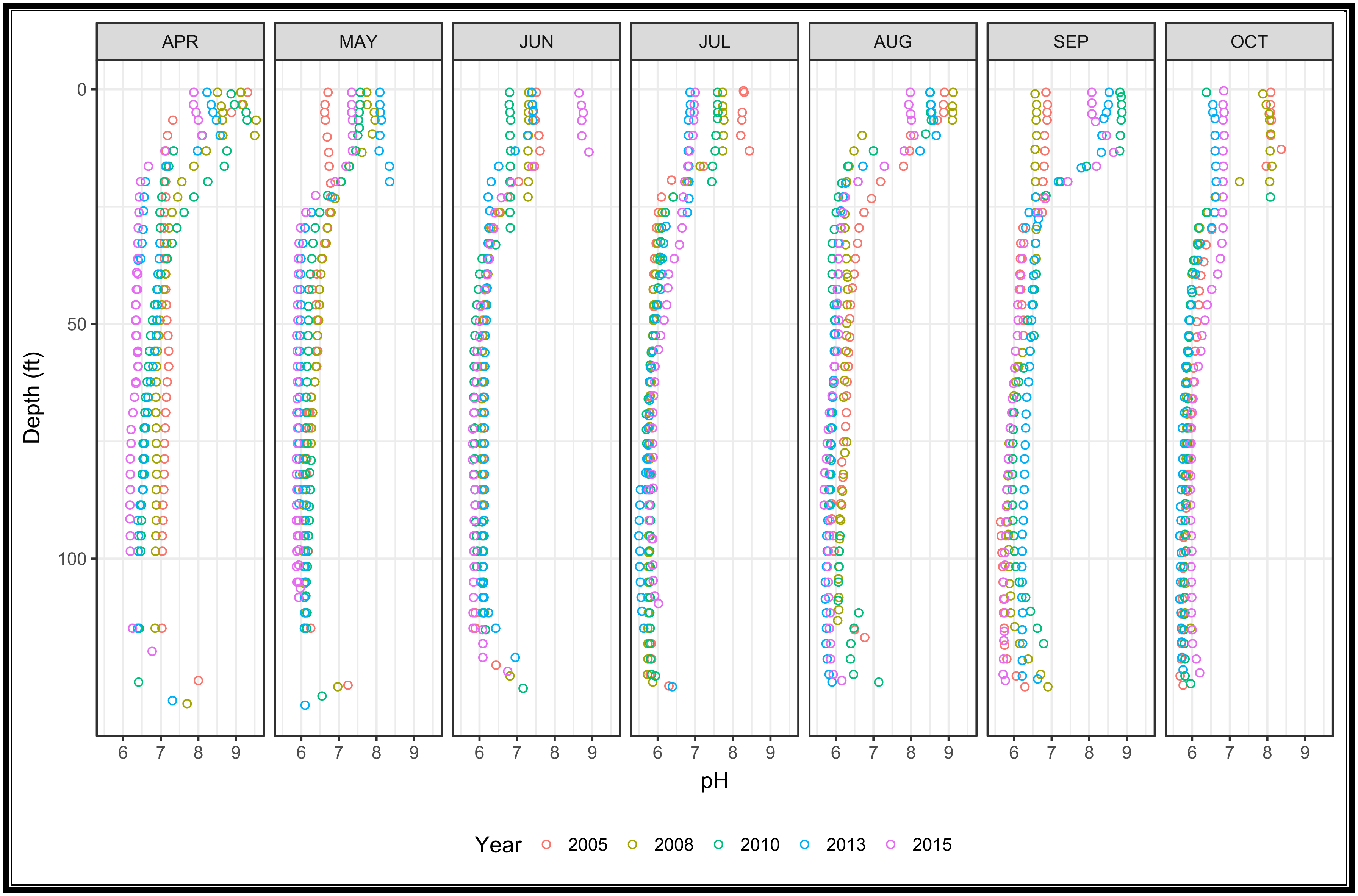
Source: ADEM 2017

FIGURE 3-2 HARRIS RESERVOIR FOREBAY (RLHR-1) WATER TEMPERATURE PROFILES



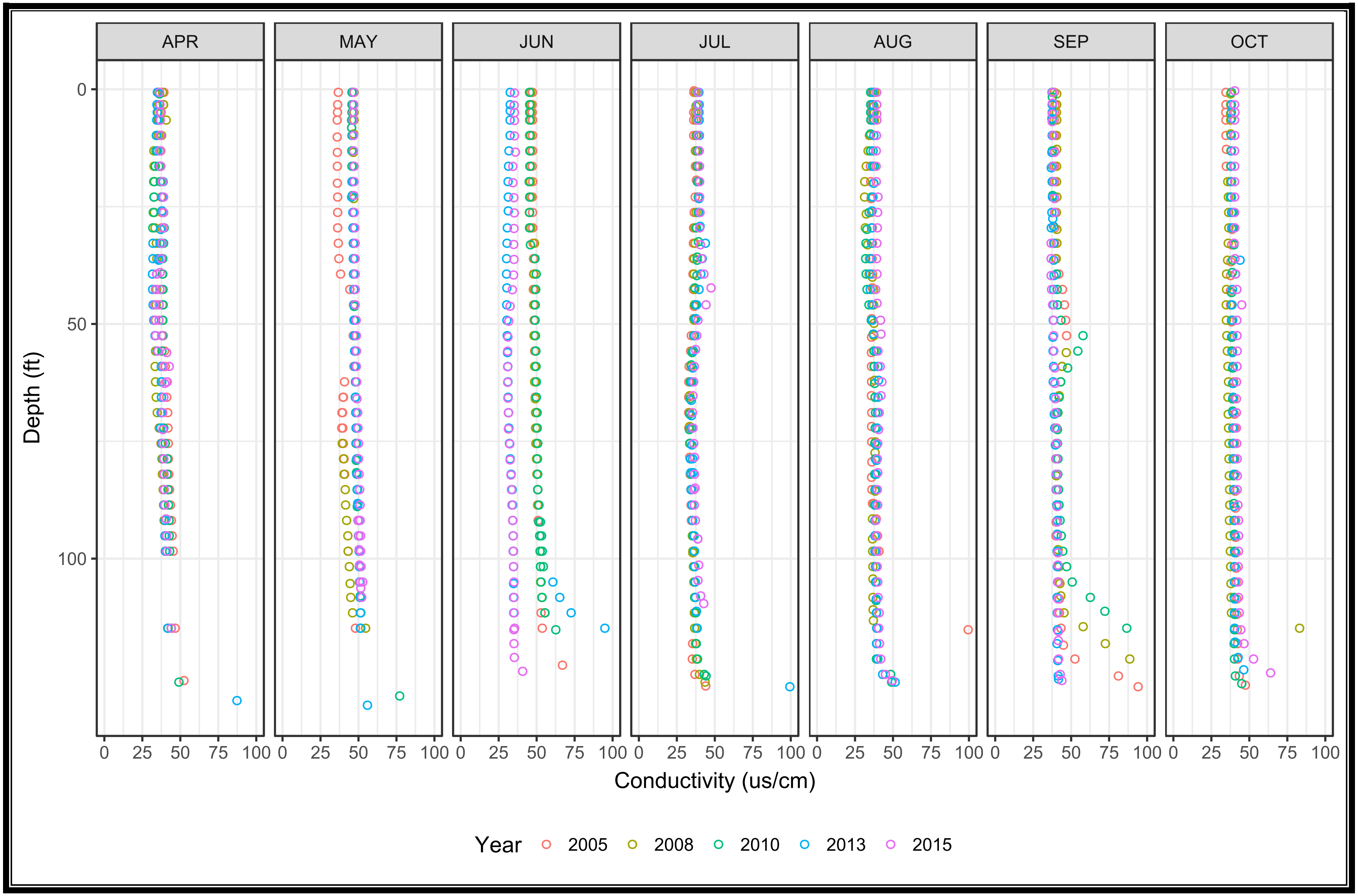
Source: ADEM 2017

FIGURE 3-3 HARRIS RESERVOIR FOREBAY (RLHR-1) DISSOLVED OXYGEN PROFILES



Source: ADEM 2017

FIGURE 3-4 HARRIS RESERVOIR FOREBAY (RLHR-1) pH PROFILES



Source: ADEM 2017

FIGURE 3-5 HARRIS RESERVOIR FOREBAY (RLHR-1) CONDUCTIVITY PROFILES

TABLE 3-1 SUMMARY OF ADEM SAMPLE RESULTS FOR RLHR-1 SITE (2005-2015)

Parameter	n	Mean	SD	Min	Max	Units
Algal growth potential	2	2.6	0.4	2.32	2.91	MSC
Alkalinity, total	37	11.8	3.1	6.1	24.1	mg/L
Ammonia-nitrogen	37	0.012	0.045	0.000	0.201	mg/L
5-day BOD	30	0.1	0.4	0.0	2.1	mg/L
Calcium	12	2.46	0.31	1.95	2.86	mg/L
Chloride	30	2.4	0.3	1.8	3.6	mg/L
Chlorophyll *a*	37	6.4	5.3	0.0	20.8	mg/m3
Depth, bottom	30	37.4	2.0	32.4	40	m
Depth, Secchi disk depth	37	2.7	0.7	1.2	4.2	m
Escherichia coli	7	3.7	4.6	1	11	MPN/100mL
Fecal Coliform	3	1.0	0.0	1	1	cfu/100 mL
Hardness, Ca, Mg	21	10.6	1.8	7.26	13.6	mg/L
Nitrate + Nitrite	37	0.024	0.037	0.000	0.169	mg/L
Kjeldahl nitrogen	37	0.244	0.189	0.000	0.625	mg/L
Light attenuation, depth at 99%	37	6.8	1.9	3.6	12.8	m
Magnesium	12	1.16	0.13	0.90	1.34	mg/L
Orthophosphate	37	0.005	0.004	0.000	0.012	mg/L
Phosphorus	37	0.014	0.008	0.000	0.027	mg/L
Total dissolved solids	37	26.6	15.8	0.0	66.0	mg/L
Total suspended solids	37	2.6	3.2	0.0	11.0	mg/L
Turbidity	37	2.2	0.9	0.4	4.9	NTU

Source: ADEM 2017; Data from 2005, 2007, 2008, 2010, 2013, and 2015

Key:

BOD	Biochemical Oxygen Demand
Ca	Calcium
cfu	Colony Forming Unit
m	Meter
m3	Cubic Meter
mg	Milligram
Mg	Magnesium
mg/L	Milligram per liter
MPN	Most Probable Number
MSC	Maximum Standing Crop
n	Number of Samples
NTU	Nephelometric Turbidity Unit
SD	Standard Deviation

TABLE 3-2 SUMMARY OF ADEM SAMPLE RESULTS FOR RLHR-2 SITE (2005-2015)

Parameter	n	Mean	SD	Min	Max	Units
Algal growth potential	2	2.6	0.5	2.26	2.9	MSC
Alkalinity, total	39	13.2	3.6	9.49	29.6	mg/L
Ammonia-nitrogen	39	0.015	0.049	0.000	0.236	mg/L
5-day BOD	32	0.0	0.0	0.0	0.0	mg/L
Calcium	13	2.57	0.30	2.18	2.97	mg/L
Chloride	32	2.5	0.4	1.9	3.3	mg/L
Chlorophyll *a*	39	7.6	5.5	0.0	24.6	mg/m3
Depth, bottom	32	26.9	1.3	23.5	28.3	m
Depth, Secchi disk depth	39	2.0	0.5	0.9	3.2	m
Escherichia coli	7	1.1	0.4	1	2	MPN/100 mL
Fecal Coliform	3	1.0	0.0	1	1	cfu/100 mL
Hardness, Ca, Mg	22	11.5	1.8	7.74	14.6	mg/L
Nitrate + Nitrite	39	0.027	0.054	0.000	0.311	mg/L
Kjeldahl nitrogen	39	0.298	0.221	0.000	0.761	mg/L
Light attenuation, depth at 99%	39	5.4	1.0	3.1	7.6	m
Magnesium	13	1.22	0.14	1.04	1.43	mg/L
Orthophosphate	39	0.006	0.004	0.000	0.015	mg/L
Phosphorus	39	0.018	0.009	0.000	0.051	mg/L
Total dissolved solids	39	32.2	17.6	0.0	73.0	mg/L
Total suspended solids	39	2.6	2.9	0.0	15.0	mg/L
Turbidity	41	3.0	1.3	0.1	6.5	NTU

Source: ADEM 2017; Data from 2005, 2007, 2008, 2010, 2013, and 2015

Key:

BOD Biochemical Oxygen Demand
Ca Calcium
cfu Colony Forming Unit
m Meter
m3 Cubic Meter
mg Milligram
Mg Magnesium
mg/L Milligram per liter
MPN Most Probable Number
MSC Maximum Standing Crop
n Number of Samples
NTU Nephelometric Turbidity Unit
SD Standard Deviation

TABLE 3-3 SUMMARY OF ADEM SAMPLE RESULTS FOR RLHR-3 SITE (2005-2015)

Parameter	n	Mean	SD	Min	Max	Units
Algal growth potential	2	6.4	1.6	5.26	7.46	MSC
Alkalinity, total	31	14.7	4.4	11.1	29.3	mg/L
Ammonia-nitrogen	31	0.019	0.051	0.000	0.177	mg/L
5-day BOD	24	0.0	0.0	0.0	0.0	mg/L
Calcium	12	2.76	0.30	2.35	3.24	mg/L
Chloride	24	2.0	0.2	1.5	2.5	mg/L
Chlorophyll *a*	31	12.5	9.1	0.0	39.2	mg/m3
Depth, bottom	24	8.1	1.1	4	9.3	m
Depth, Secchi disk depth	31	1.3	0.4	0.6	2.2	m
Escherichia coli	9	29.4	53.0	1	160.7	MPN/100 mL
Fecal Coliform	2	6.5	6.4	2	11	cfu/100 mL
Hardness, Ca, Mg	16	12.2	1.2	10.4	14.1	mg/L
Nitrate + Nitrite	31	0.055	0.064	0.000	0.203	mg/L
Kjeldahl nitrogen	31	0.381	0.241	0.000	0.902	mg/L
Light attenuation, depth at 99%	31	3.3	0.8	1.6	6.1	m
Magnesium	12	1.32	0.17	1.10	1.55	mg/L
Orthophosphate	31	0.006	0.005	0.000	0.024	mg/L
Phosphorus	31	0.028	0.016	0.000	0.079	mg/L
Total dissolved solids	31	35.0	18.2	0.0	66.0	mg/L
Total suspended solids	31	5.5	3.9	0.0	18.0	mg/L
Turbidity	34	7.6	5.4	0.2	26.2	NTU

Source: ADEM 2017; Data from 2005, 2007, 2008, 2010, 2013, and 2015

Key:

BOD	Biochemical Oxygen Demand
Ca	Calcium
cfu	Colony Forming Unit
m	Meter
m3	Cubic Meter
mg	Milligram
Mg	Magnesium
mg/L	Milligram per liter
MPN	Most Probable Number
MSC	Maximum Standing Crop
n	Number of Samples
NTU	Nephelometric Turbidity Unit
SD	Standard Deviation

TABLE 3-4 SUMMARY OF ADEM SAMPLE RESULTS FOR RLHR-4 SITE (2005-2015)

Parameter	n	Mean	SD	Min	Max	Units
Algal growth potential	2	4.9	0.8	4.27	5.46	MSC
Alkalinity, total	33	13.0	3.0	8.9	26.9	mg/L
Ammonia-nitrogen	33	0.014	0.031	0.000	0.142	mg/L
5-day BOD	26	0.6	1.6	0.0	7.1	mg/L
Calcium	12	2.57	0.24	2.24	2.99	mg/L
Chloride	26	3.5	0.5	2.7	4.8	mg/L
Chlorophyll *a*	32	10.4	6.3	0.0	22.4	mg/m3
Depth, bottom	25	18.4	1.5	13.9	19.6	m
Depth, Secchi disk depth	32	1.8	0.5	1.0	2.9	m
Escherichia coli	7	5.0	6.9	1	18.9	MPN/100 mL
Fecal Coliform	2	1.0	0.0	1	1	cfu/100 mL
Hardness, Ca, Mg	17	11.7	1.0	10.4	13.6	mg/L
Nitrate + Nitrite	33	0.066	0.076	0.000	0.317	mg/L
Kjeldahl nitrogen	33	0.366	0.192	0.000	0.702	mg/L
Light attenuation, depth at 99%	32	4.8	1.1	2.5	6.9	m
Magnesium	12	1.27	0.13	1.10	1.51	mg/L
Orthophosphate	33	0.005	0.004	0.000	0.014	mg/L
Phosphorus	33	0.023	0.015	0.000	0.074	mg/L
Total dissolved solids	33	37.7	39.7	0.0	208.0	mg/L
Total suspended solids	33	4.7	5.9	0.0	34.0	mg/L
Turbidity	31	4.0	1.6	2.4	8.7	NTU

Source: ADEM 2017; Data from 2005, 2007, 2008, 2010, 2013, and 2015

Key:

BOD	Biochemical Oxygen Demand
Ca	Calcium
cfu	Colony Forming Unit
m	Meter
m3	Cubic Meter
mg	Milligram
Mg	Magnesium
mg/L	Milligram per liter
MPN	Most Probable Number
MSC	Maximum Standing Crop
n	Number of Samples
NTU	Nephelometric Turbidity Unit
SD	Standard Deviation

TABLE 3-5 SUMMARY OF ADEM SAMPLE RESULTS FOR RLHR-5 SITE (2005-2015)

Parameter	n	Mean	SD	Min	Max	Units
Algal growth potential	1	6.2	NA	6.21	6.21	MSC
Alkalinity, total	22	12.9	4.2	7.6	24.1	mg/L
Ammonia-nitrogen	22	0.016	0.032	0.000	0.113	mg/L
5-day BOD	14	0.2	0.8	0.0	2.9	mg/L
Calcium	10	2.32	0.40	1.63	2.84	mg/L
Chloride	14	3.4	0.5	2.5	4.2	mg/L
Chlorophyll *a*	22	11.2	6.0	0.0	20.5	mg/m3
Depth, bottom	15	11.3	1.6	8.1	13.5	m
Depth, Secchi disk depth	22	1.7	0.4	1.1	2.5	m
Escherichia coli	6	8.6	12.1	1	28.5	MPN/100 mL
Fecal Coliform	1	20.0	NA	20	20	cfu/100 mL
Hardness, Ca, Mg	14	10.8	1.6	7.98	13.3	mg/L
Nitrate + Nitrite	22	0.060	0.074	0.000	0.251	mg/L
Kjeldahl nitrogen	22	0.400	0.194	0.000	0.772	mg/L
Light attenuation, depth at 99%	22	4.7	1.0	2.8	6.6	m
Magnesium	10	1.20	0.20	0.94	1.50	mg/L
Orthophosphate	22	0.004	0.004	0.000	0.013	mg/L
Phosphorus	22	0.026	0.018	0.000	0.073	mg/L
Total dissolved solids	22	32.7	17.7	0.0	77.0	mg/L
Total suspended solids	22	4.7	4.5	0.0	16.0	mg/L
Turbidity	22	4.1	1.6	0.3	8.5	NTU

Source: ADEM 2017; Data from 2005, 2007, 2008, 2010, 2013, and 2015

Key:

BOD	Biochemical Oxygen Demand
Ca	Calcium
cfu	Colony Forming Unit
m	Meter
m3	Cubic Meter
mg	Milligram
Mg	Magnesium
mg/L	Milligram per liter
MPN	Most Probable Number
MSC	Maximum Standing Crop
n	Number of Samples
NTU	Nephelometric Turbidity Unit
SD	Standard Deviation

TABLE 3-6 SUMMARY OF ADEM SAMPLE RESULTS FOR RLHR-6 SITE (2005-2015)

Parameter	n	Mean	SD	Min	Max	Units
Algal growth potential	1	3.5	NA	3.47	3.47	MSC
Alkalinity, total	23	12.7	4.0	8.1	28.2	mg/L
Ammonia-nitrogen	23	0.023	0.059	0.000	0.241	mg/L
5-day BOD	16	0.3	1.2	0.0	4.7	mg/L
Calcium	8	2.49	0.37	1.99	2.96	mg/L
Chloride	16	2.2	0.3	1.6	2.6	mg/L
Chlorophyll *a*	23	7.9	7.1	0.0	30.3	mg/m3
Depth, bottom	17	12.8	1.0	10.7	14.6	m
Depth, Secchi disk depth	23	1.9	0.4	0.9	2.7	m
Escherichia coli	6	3.2	5.0	1	13.4	MPN/100 mL
Fecal Coliform	1	23.0	NA	23	23	cfu/100 mL
Hardness, Ca, Mg	13	10.8	1.5	8.7	13.4	mg/L
Nitrate + Nitrite	23	0.036	0.041	0.000	0.160	mg/L
Kjeldahl nitrogen	23	0.324	0.198	0.000	0.611	mg/L
Light attenuation, depth at 99%	23	4.9	1.1	3.2	7.3	m
Magnesium	8	1.20	0.18	0.91	1.45	mg/L
Orthophosphate	23	0.005	0.004	0.000	0.012	mg/L
Phosphorus	23	0.018	0.017	0.000	0.082	mg/L
Total dissolved solids	23	286.3	1213.4	0.0	5852.0	mg/L
Total suspended solids	23	3.3	3.9	0.0	14.0	mg/L
Turbidity	23	4.3	1.9	0.2	9.4	NTU

Source: ADEM 2017; Data from 2005, 2007, 2008, 2010, 2013, and 2015

Key:

BOD	Biochemical Oxygen Demand
Ca	Calcium
cfu	Colony Forming Unit
m	Meter
m3	Cubic Meter
mg	Milligram
Mg	Magnesium
mg/L	Milligram per liter
MPN	Most Probable Number
MSC	Maximum Standing Crop
n	Number of Samples
NTU	Nephelometric Turbidity Unit
SD	Standard Deviation

4.0 DOWNSTREAM WATER QUALITY

ADEM performed monitoring in the Tallapoosa River at three sites downstream of Harris Reservoir from 2005 through 2016 (Figure 4-1). The site immediately downstream of Harris Dam (MARE-12) was sampled monthly in 2015 from April to October (Table 4-1). Dissolved oxygen levels at this station were lowest in October but remained above 5.0 milligrams per liter (mg/L).

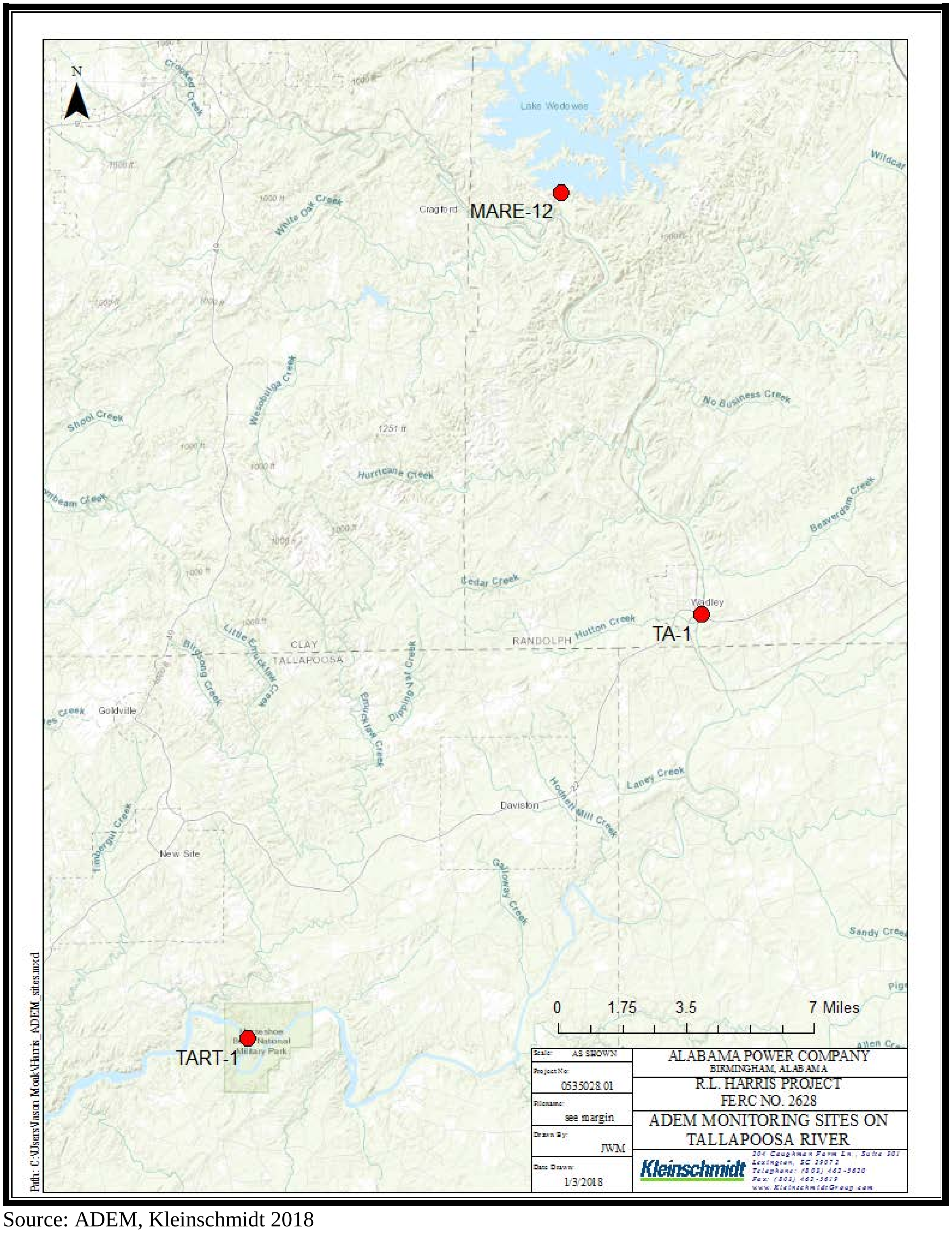
From May to October 2016, in anticipation of relicensing, Alabama Power conducted a study to help identify an appropriate location for installing a monitor to record dissolved oxygen and temperature data during generation to support an application for a Section 401 Water Quality Certificate from ADEM. The hydroelectric generation period for each hydroelectric unit is defined as the time from turbine start until turbine shut down. Dissolved oxygen concentrations and water temperatures measured after the initial reading following the beginning of the generation period and through turbine shut down were included in this analysis. Results from four different monitoring locations found that dissolved oxygen concentrations ranged from 5.39 mg/L to 11.01 mg/L. The average temperature recorded during this study ranged from 21.65 to 22.02 degrees Celsius.

Using the results of this study, the vicinity of Station 3 was selected as the most advantageous monitoring location. Water depth, access to the location, mixing upstream, and the vicinity of the station location were all taken into consideration. Station 3 is located directly downstream of the Unit 1 and Unit 2 turbine discharge area at a sufficient distance to allow for adequate mixing when both units are operating. Also, the location appears to be deep enough to ensure the sensors remain under water at all times.

Table 4-2 presents a summary of discrete chemistry samples collected by ADEM at the Wadley site (TA-1) located approximately 14 miles downstream of Harris Dam. Results of in-stream measurements indicated the highest water temperatures occurred during July and August (Figure 4-2). Lowest dissolved oxygen levels were typically experienced in the late summer and early fall, though no measurements less than 6.0 mg/L were recorded (Figure 4-3). Measurements of pH were typically circumneutral (Figure 4-4), and conductivity was generally between 40 to 50 microsiemens per centimeter (us/cm) (Figure 4-5).

In addition to water quality sampling, ADEM performs macroinvertable bioassessments to address water quality and total maximum daily loads (TMDLs). Macroinvertebrates can be used as bioindicators of water quality and a water body can be listed as impaired based on the results of the macroinvertebrate bioassessment. ADEM performed a macroinvertebrate bioassessment in July 2010 at this site. Results of that study rated the site as “fair/poor” (ADEM 2010).

Table 4-3 presents a summary of results for discrete chemistry samples collected by ADEM at the Horseshoe Bend site (TART-1) located approximately 44 miles downstream of Harris Dam. Results of in-stream measurements indicated the highest water temperatures occurred during July and August (Figure 4-6). Lowest dissolved oxygen levels were typically experienced in the late summer and early fall, though no measurements less than 6.0 mg/L were recorded (Figure 4-7). Measurements of pH were typically circumneutral (Figure 4-8), and conductivity was generally between 35 to 50 us/cm (Figure 4-9).



Source: ADEM, Kleinschmidt 2018

FIGURE 4-1 ADEM MONITORING SITES ON TALLAPOOSA RIVER

TABLE 4-1 ADEM WATER QUALITY DATA FROM HARRIS DAM TAILRACE (MARE-12)

Date	Water Temperature (°C)	DO (mg/L)	pH	Specific conductance (μs/cm)
4/29/2015	16.92	7.58	6.62	38
5/28/2015	18.76	5.74	6.43	38
6/16/2015	21.35	7.39	6.98	38
7/28/2015	24.23	7.92	6.31	36
8/27/2015	25.56	7.90	6.34	39
9/30/2015	22.26	6.40	6.33	39
10/29/2015	18.89	5.24	6.45	41

Source: ADEM 2017

Key: DO dissolved oxygen
C Centigrade
mg/L milligrams per liter
μs/cm microsiemens per centimeter

TABLE 4-2 SUMMARY OF ADEM SAMPLE RESULTS FOR TALLAPOOSA RIVER AT WADLEY (TA-1)

Parameter	n	Mean	Min	Max	Units
Alkalinity, total	46	11.2	7.3	14.4	mg/L
Ammonia-nitrogen	45	0.010	0.000	0.236	mg/L
BOD, 5-day	45	0.35	0.00	4.40	mg/L
Calcium	3	2.25	2.04	2.56	mg/L
Chloride	45	2.71	1.64	5.00	mg/L
Chlorophyll *a*	46	1.39	0.00	5.34	ug/L
Escherichia coli	16	208.6	0.0	2419.6	MPN/100 mL
Fecal Coliform	17	95.1	2.0	640.0	CFU/100 mL
Hardness, Ca, Mg	22	10.4	7.4	14.0	mg/L
Nitrate + Nitrite	46	0.136	0.000	0.365	mg/L
Kjeldahl nitrogen	46	0.221	0.000	1.090	mg/L
Magnesium	3	1.12	1.03	1.18	mg/L
Orthophosphate	45	0.006	0.000	0.014	mg/L
Phosphorus	45	0.021	0.000	0.153	mg/L
Total dissolved solids	46	39.5	0.0	98.0	mg/L
Total suspended solids	46	6.2	0.0	103.0	mg/L
Turbidity	54	8.5	0.1	193.0	NTU

Source: ADEM 2017; Data from samples in 2005-2014

Key:
BOD Biochemical Oxygen Demand
cfu Colony Forming Unit
μg/L Microgram per liter
mg/L Milligram per liter
n Number of Samples
NTU Nephelometric Turbidity Unit

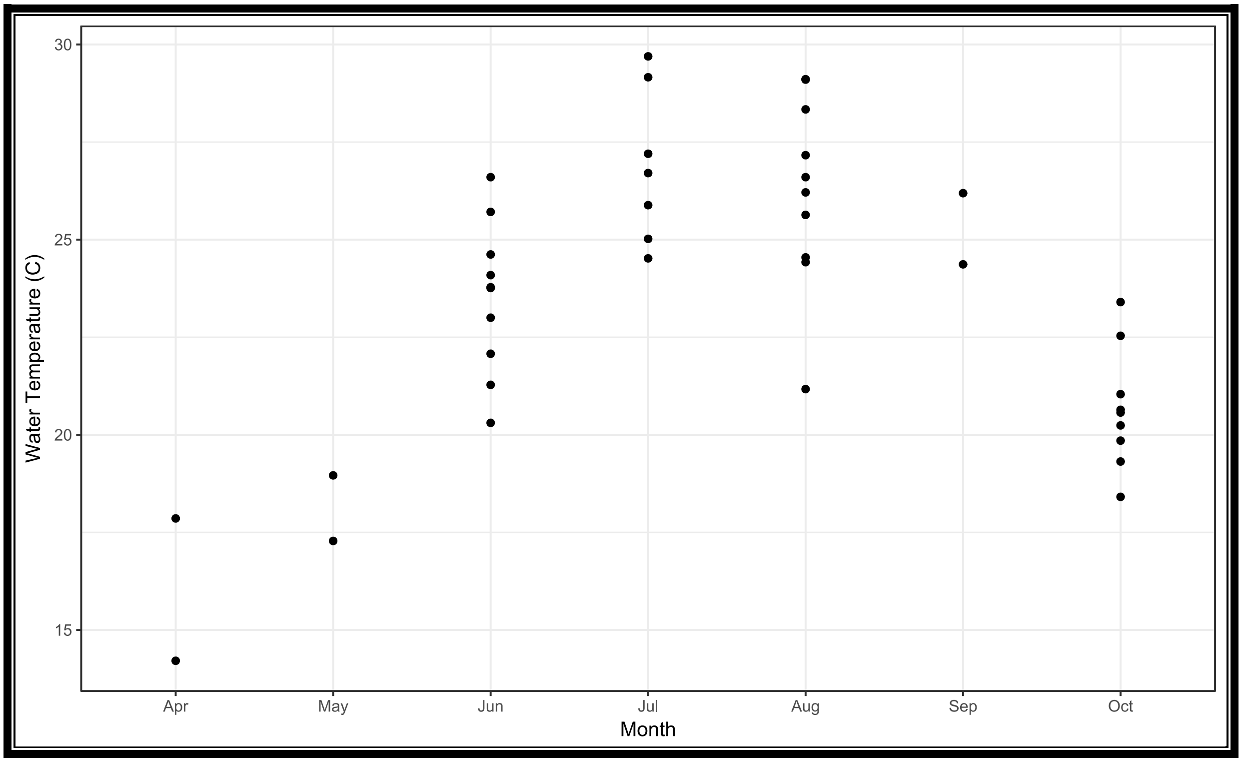


FIGURE 4-2 ADEM WATER TEMPERATURE DATA (2005-2015) FROM TALLAPOOSA RIVER AT WADLEY (TA-1)

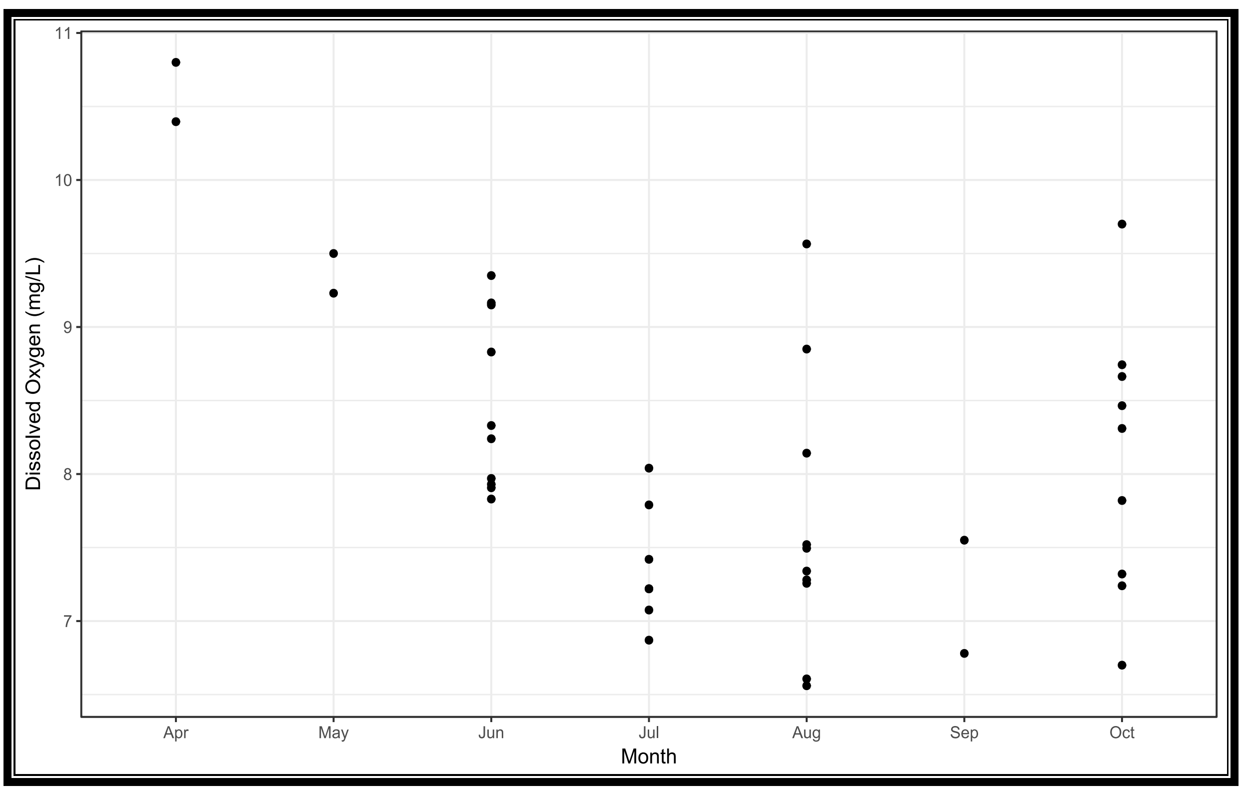


FIGURE 4-3 ADEM DISSOLVED OXYGEN DATA (2005-2015) FROM TALLAPOOSA RIVER AT WADLEY (TA-1)

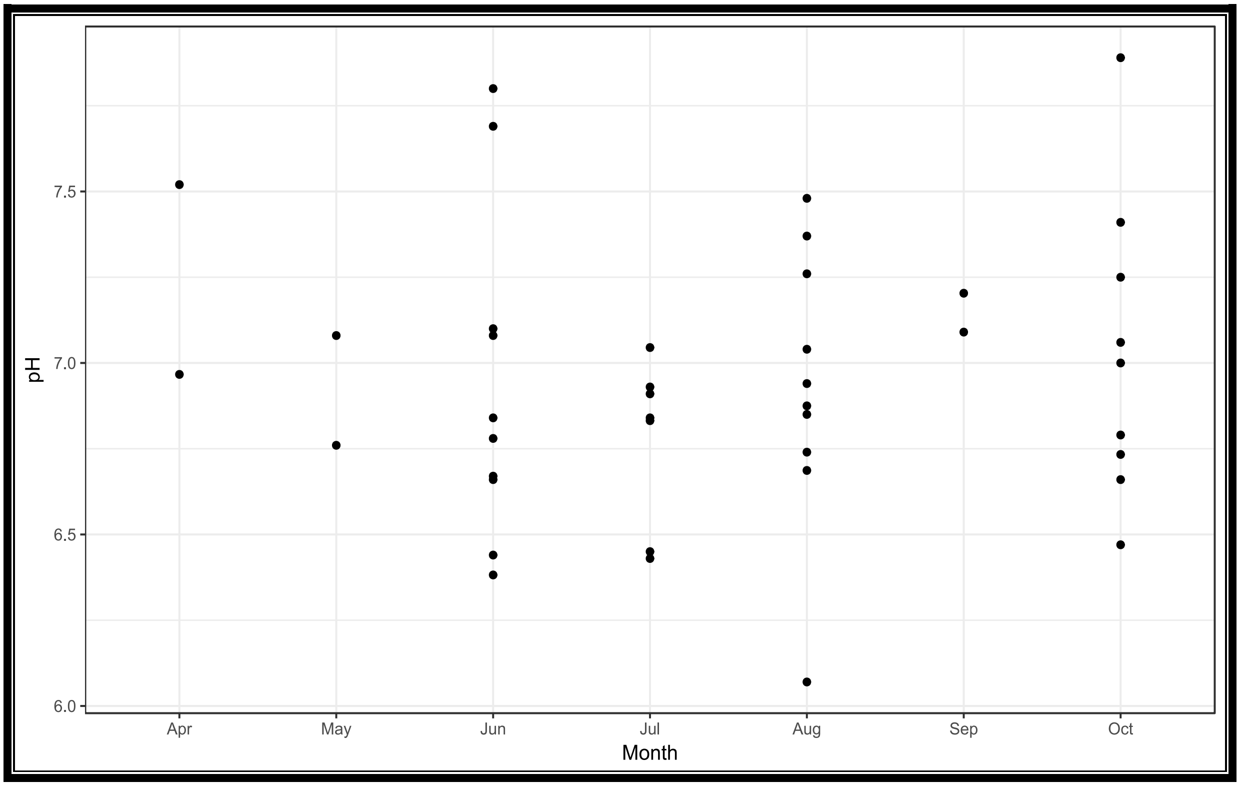


FIGURE 4-4 ADEM PH DATA (2005-2015) FROM TALLAPOOSA RIVER AT WADLEY (TA-1)

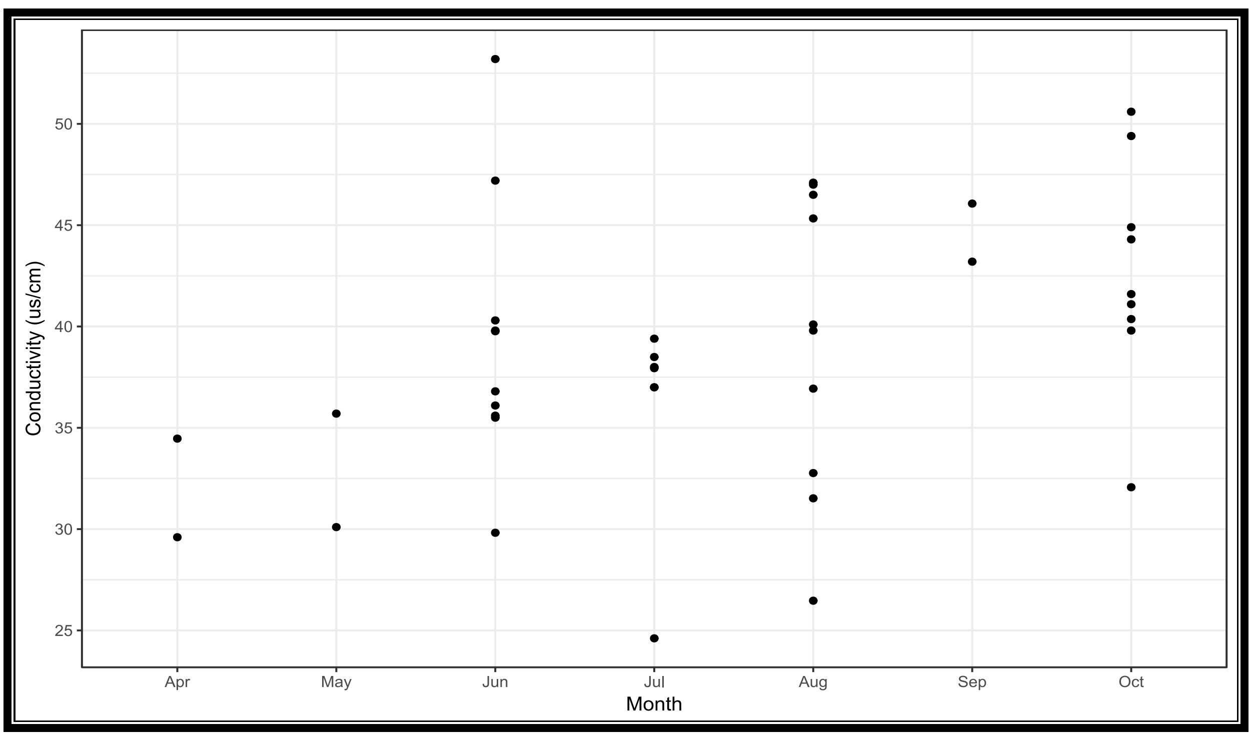


FIGURE 4-5 ADEM CONDUCTIVITY DATA (2005-2015) FROM TALLAPOOSA RIVER AT WADLEY (TA-1)

TABLE 4-3 SUMMARY OF ADEM SAMPLE RESULTS FOR TALLAPOOSA RIVER AT HORSESHOE BEND (TART-1)

Parameter	n	Mean	Min	Max	Units
Algal growth potential	1	1.56	1.56	1.56	MSC
Alkalinity, total	50	12.8	8.6	20.8	mg/L
Ammonia-nitrogen	50	0.009	0.000	0.113	mg/L
BOD, 5-day	50	0	0	0	mg/L
Calcium	3	2.45	2.25	2.66	mg/L
Chloride	50	2.53	1.90	3.48	mg/L
Chlorophyll *a*	50	1.55	0.00	12.50	µg/L
Escherichia coli	31	167.9	6.3	2419.6	MPN/100 mL
Hardness, Ca, Mg	3	11.7	10.9	12.8	mg/L
Nitrate + Nitrite	50	0.143	0.000	0.333	mg/L
Kjeldahl nitrogen	50	0.259	0.000	0.625	mg/L
Magnesium	3	1.36	1.29	1.49	mg/L
Orthophosphate	50	0.005	0.000	0.019	mg/L
Phosphorus	50	0.017	0.009	0.037	mg/L
Sulfate	28	2.02	1.57	2.83	mg/L
Total dissolved solids	50	33.8	0.0	98.0	mg/L
Total suspended solids	50	5.6	0.0	55.0	mg/L
Turbidity	59	8.3	0.3	34.2	NTU

Source: ADEM 2017; Data from 2010, 2011, 2015, & 2016

Key:

BOD	Biochemical Oxygen Demand
cfu	Colony Forming Unit
µg/L	Microgram per liter
mg/L	Milligram per liter
n	Number of Samples
NTU	Nephelometric Turbidity Unit

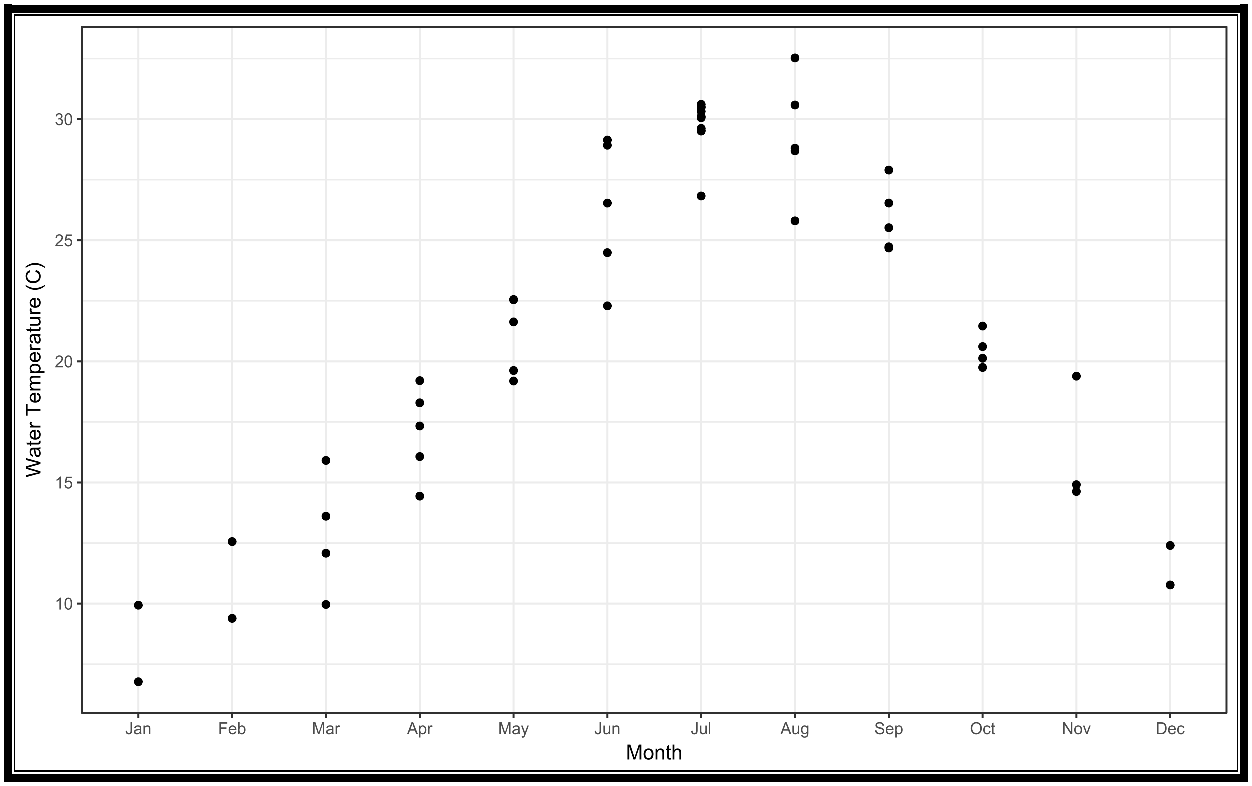


FIGURE 4-6 ADEM WATER TEMPERATURE DATA (2005-2015) FROM TALLAPOOSA RIVER AT HORSESHOE BEND (TART-1)

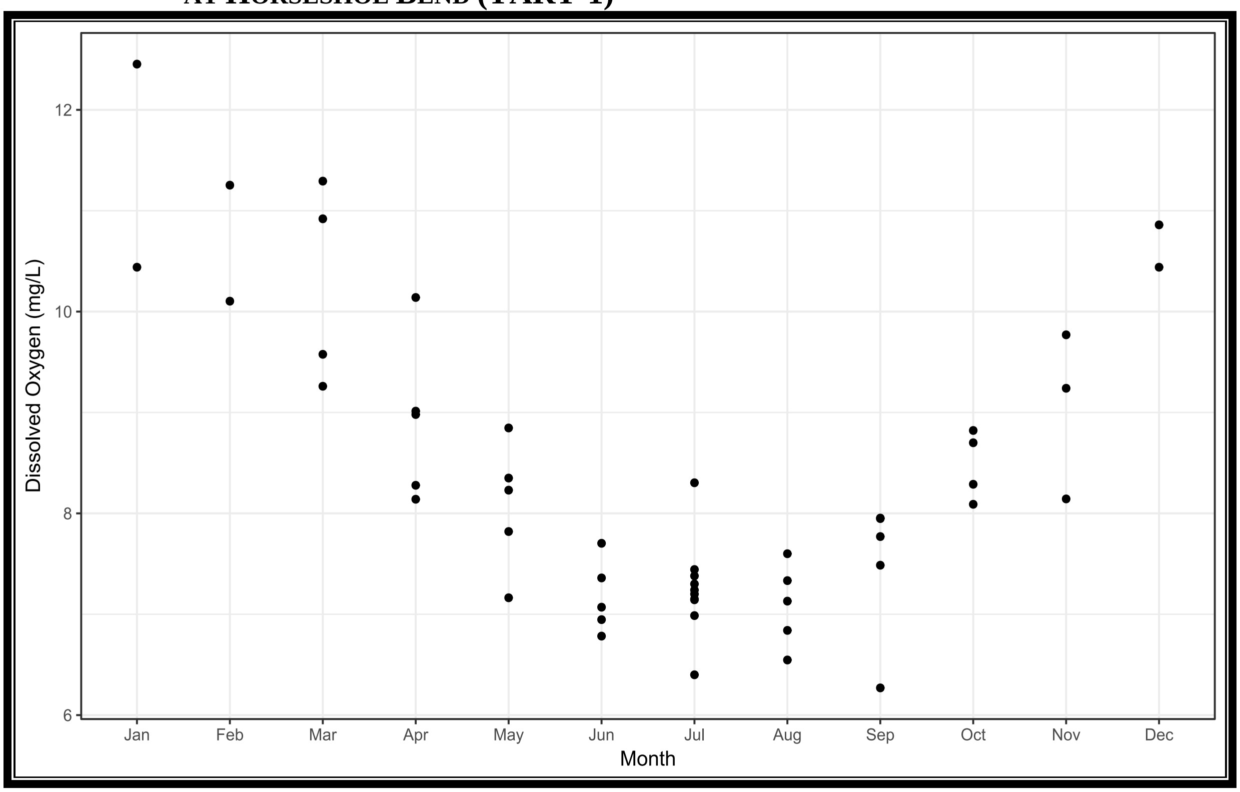


FIGURE 4-7 ADEM DISSOLVED OXYGEN DATA (2005-2015) FROM TALLAPOOSA RIVER AT HORSESHOE BEND (TART-1)

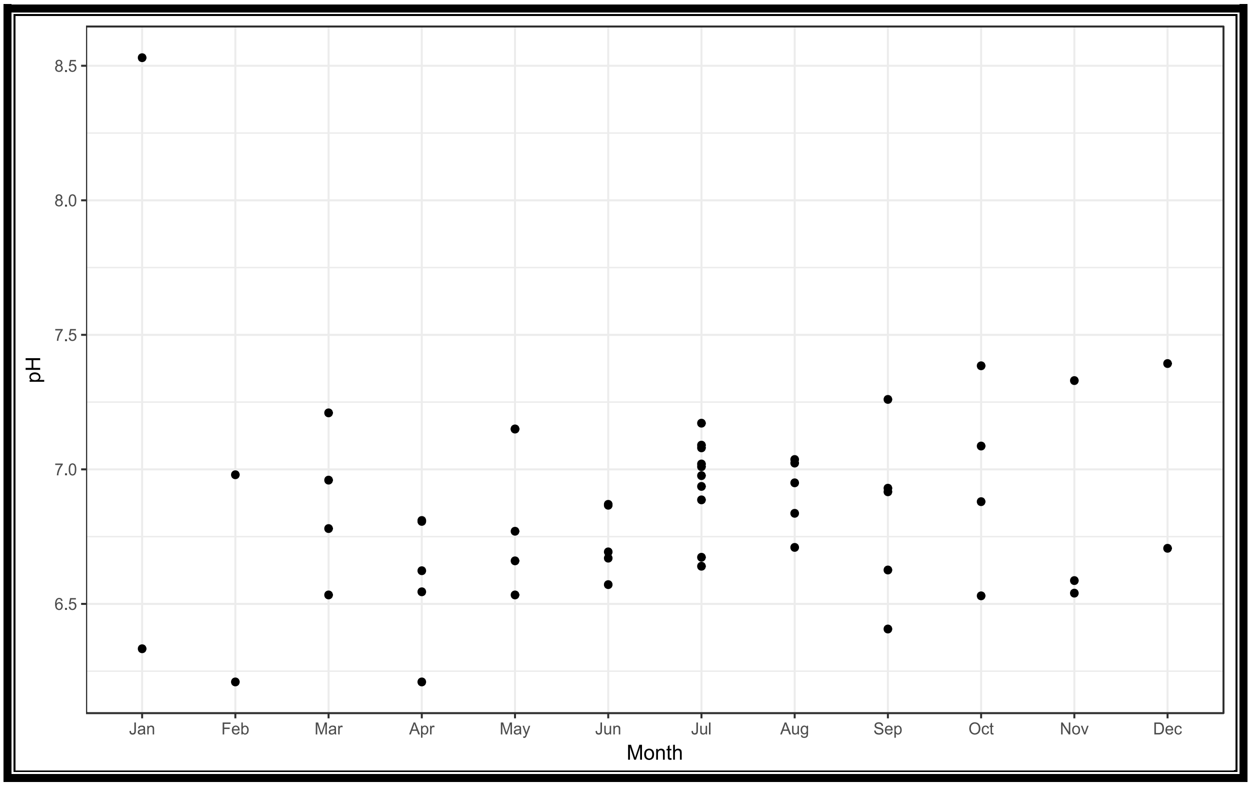


FIGURE 4-8 ADEM PH DATA (2005-2015) FROM TALLAPOOSA RIVER AT HORSESHOE BEND (TART-1)

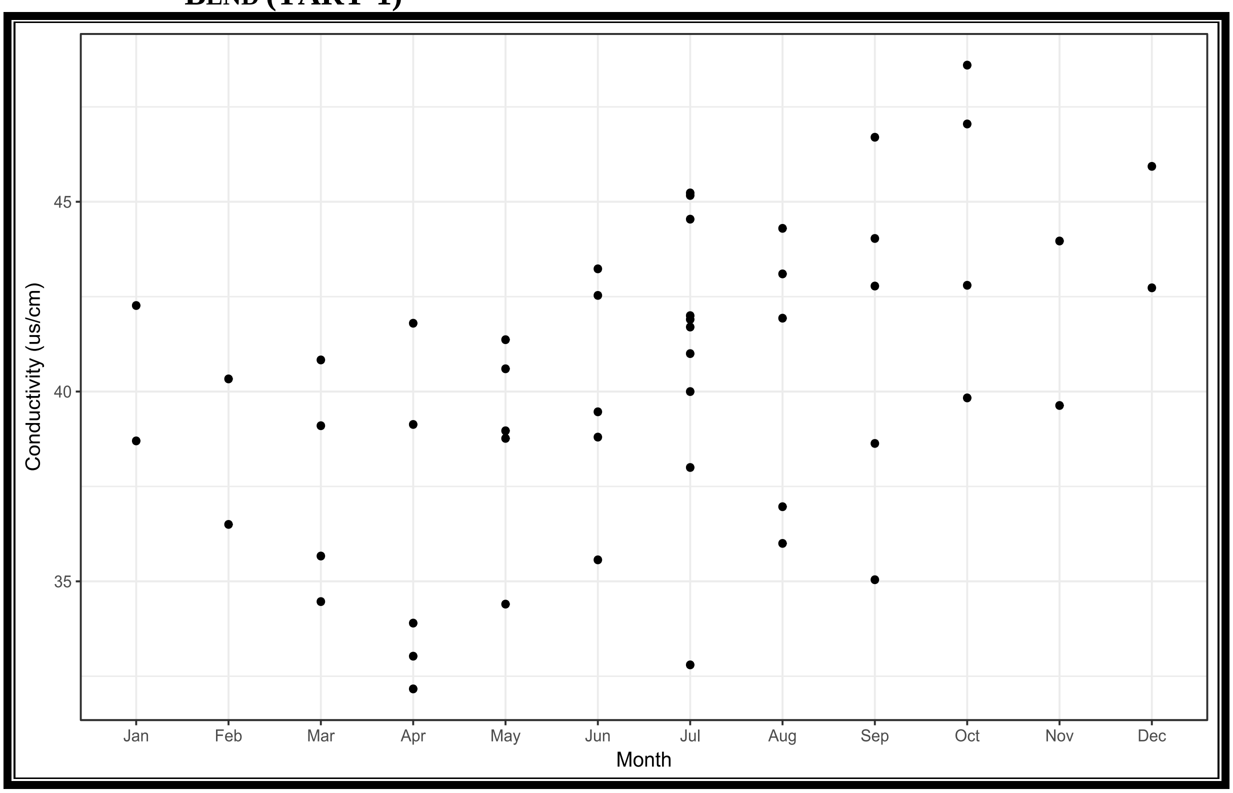
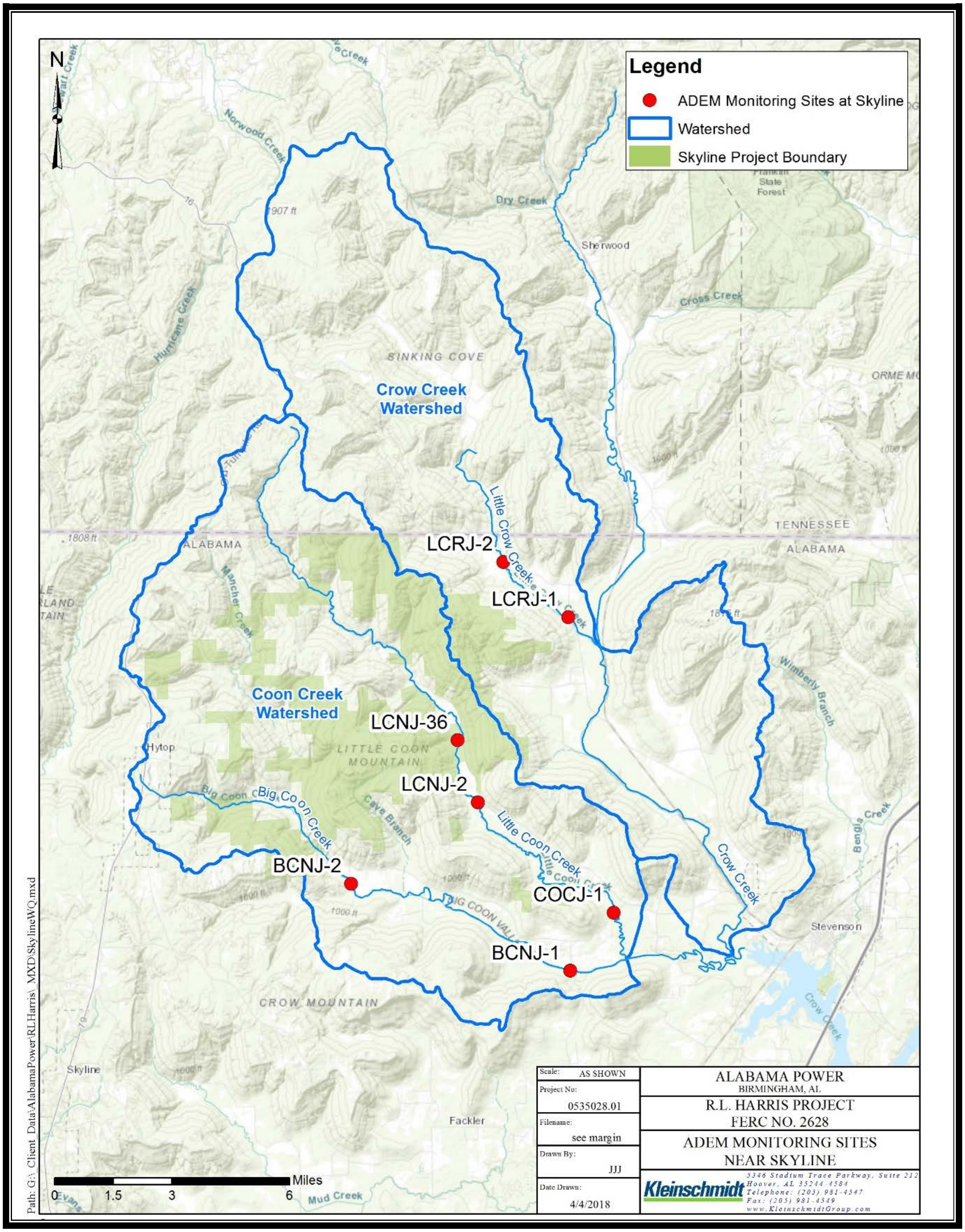


FIGURE 4-9 ADEM CONDUCTIVITY DATA (2005-2015) FROM TALLAPOOSA RIVER AT HORSESHOE BEND (TART-1)

5.0 SKYLINE WATER QUALITY

ADEM performed periodic sampling at six stream sites with watersheds that drain into the Harris Project boundary at Skyline (Figure 5-1). A summary of results from common parameters that were tested at each site is presented in Table 5-1.

In addition to water quality sampling, ADEM performed a macroinvertebrate bioassessment at the lower Big Coon Creek site (BCNJ-1) in May 2013 and the lower Little Coon Creek site (COCJ-1) in June 2013. Macroinvertebrates can be used as bioindicators of water quality and a water body can be listed as impaired based on the results of the macroinvertebrate bioassessment. Assessment results indicated that the macroinvertebrate communities at both sites were in “fair” condition.



Source: Alabama Power, Kleinschmidt 2018

FIGURE 5-1 ADEM MONITORING SITES NEAR SKYLINE

TABLE 5-1 SUMMARY OF ADEM SAMPLING RESULT BY PARAMETER AVERAGE FOR WATER QUALITY STATIONS AT SKYLINE

	Big Coon Creek		Little Coon Creek		Little Crow Creek		
Parameter	**BCNJ-1**	**BCNJ-2**	**COCJ-1**	**LCNJ-36**	**LCRJ-2**	**LCRJ-1**	**Units**
Alkalinity, total	112	126	136	124	75*	101*	mg/L
Ammonia-nitrogen	0.014	-	0.042	-	-	-	mg/L
Calcium	38.06	45.20*	46.04	-	-	-	mg/L
Chloride	3.05	1.97	2.36	1.10	3.53*	3.72*	mg/L
Dissolved oxygen (DO)	8.55	9.66	7.29	9.66	9.40	9.00	mg/L
Escherichia coli	150.3	53.5	205.8	-	-	-	MPN/100 mL
Fecal Coliform	109.2	33.0*	163.3	-	45.0*	72.0*	CFU/100 mL
Hardness, Ca, Mg	111	138	140	-	112*	112*	mg/L
Nitrate + Nitrite	0.758	0.144	0.380	0.079	0.368*	0.517*	mg/L
Kjeldahl nitrogen	0.249	0.241	0.359	0.187	-	-	mg/L
Magnesium	4.74	6.39	6.72	-	-	-	mg/L
pH	7.70	7.86	7.62	7.87	7.99	7.67	
Phosphorus	0.011	0.015	0.018	0.009	0.018*	0.017*	mg/L
Specific conductance	221.3	257.4	271.4	224.2	251.2	210.8	us/cm
Temperature, water	16.91	16.71	17.89	16.87	17.00	18.00	C
Total dissolved solids	146.5	202.0	166.6	143.0	118.0*	101.0*	mg/L
Total suspended solids	4.4	2.5	5.0	10.8	5.0*	4.0*	mg/L
Turbidity	6.7	3.0	9.2	3.1	3.7	4.4	NTU

Source: ADEM 2018
* Single sample result
Key:

- BOD Biochemical Oxygen Demand
- cfu Colony Forming Unit
- µg/L Microgram per liter
- mg/L Milligram per liter
- n Number of Samples
- NTU Nephelometric Turbidity Unit

6.0 REFERENCES

Alabama Department of Conservation and Natural Resources (ADCNR). 2016b. Wildlife Management Areas. Available at: http://www.outdooralabama.com/wildlife-management-areas. Accessed November 2016.

Alabama Department of Environmental Management (ADEM). 2010. 2010 Monitoring Summary, Tallapoosa River at Alabama Highway 77 in Randolph County. Available: http://adem.alabama.gov/programs/water/wqsurvey/table/2010/2010TallapoosaRiver.pdf. Accessed December 8, 2017.

Alabama Department of Environmental Management (ADEM). 2013a. 2010 R.L. Harris Reservoir Report. Rivers and Reservoirs Monitoring Program. ADEM, Montgomery, Alabama. 29pp.

Alabama Department of Environmental Management (ADEM). 2013b. 2013 Monitoring Summary, Little Coon Creek at Jackson County Road 53. Available: http://adem.alabama.gov/programs/water/wqsurvey/table/2013/2013LittleCoonCk.pdf. Accessed December 8, 2017.

Alabama Department of Environmental Management (ADEM). 2013C. 2013 Monitoring Summary, Big Coon Creek at Jackson County Road 55. Available: http://adem.alabama.gov/programs/water/wqsurvey/table/2013/2013BigCoonCk.pdf. Accessed December 8, 2017.

Alabama Department of Environmental Management (ADEM). 2016. 2016 Integrated Water Quality Monitoring and Assessment Report. ADEM, Montgomery, Alabama.

Alabama Department of Environmental Management (ADEM). 2017. Water Quality Data. Available: https://www.waterqualitydata.us/portal/. Accessed December 8, 2017.

Alabama Power Company. 2018. Pre-Application Document for the Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

TTL, Inc. (TTL). 2017. Dissolved Oxygen Study – R.L. Harris Dam Tailrace. TTL, Inc. Montgomery, Alabama.

APPENDIX A

2010 AND 2013 ADEM MONITORING SUMMARIES

Alabama Department of Environmental Management

Special Study

Rivers and Streams Monitoring Program

2010 Monitoring Summary

Fair-Poor

TM

Tallapoosa River at Alabama Highway 77 in Randolph County (33.11801/-85.56015)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) selected the Tallapoosa River at TA-1 for nutrient criteria development in the Tallapoosa River Basin in 2010. Data collected will be used to develop and implement nutrient criteria in streams in the Tallapoosa River Basin, as well as statewide.

The Tallapoosa River at TA-1 is also one of a network of 94 ambient sites monitored annually to identify long-term trends in water quality and to provide data for the development of Total Maximum Daily Loads (TMDLs) and water quality criteria.

Figure 1. Tallapoosa River at TA-1, July 20, 2010.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tallapoosa R
Drainage Area (mi²)		1674
Ecoregion[a]		45A
% Landuse[b]		
Open water		2%
Wetland	Woody	2%
	Emergent herbaceous	<1%
Forest	Deciduous	37%
	Evergreen	22%
	Mixed	<1%
Shrub/scrub		7%
Grassland/herbaceous		6%
Pasture/hay		17%
Cultivated crops		<1%
Development	Open space	5%
	Low intensity	2%
	Moderate intensity	<1%
	High intensity	<1%
Barren		<1%
Population/km²[c]		29
# NPDES Permits[d]	**TOTAL**	536
Construction		463
Industrial General		35
Industrial Individual		8
Mining		10
Municipal		5
Small Mining		3
Underground Injection Control		12

a.Southern Inner Piedmont

b.2011 National Land Cover Dataset

c.2010 US Census

d.#NPDES outfalls downloaded from ADEM's NPDES Management System database, April 1, 2016.

Table 2. Physical characteristics of Tallapoosa River at TA-1, July 13, 2010.

Physical Characteristics		
Width (ft)		240
Canopy cover		Open
Depth (ft)		
	Riffle	0.2
	Run	2.7
	Pool	3.2
% of Reach		
	Riffle	7
	Run	37
	Pool	56
% Substrate		
	Bedrock	10
	Boulder	7
	Cobble	33
	Gravel	27
	Sand	23

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Tallapoosa River at TA-1 is a *Fish & Wildlife (F&W)* waterbody located in southwestern Randolph County in Wadley, AL. According to the 2011 National Land Cover Dataset, land use within the watershed is primarily forest (59%) with some pasture land. As of April 1, 2016, there were 536 outfalls active in the area.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. The Tallapoosa River at TA-1 is a riffle-run stream located in the Southern Inner Piedmont ecoregion (Figure 1). Bottom substrate consists primarily of cobble, gravel, and sand. Overall habitat quality was rated as *sub-optimal* for supporting a diverse aquatic macroinvertebrate community.

Table 3. Results of the habitat assessment conducted in Tallapoosa River at TA-1, July 13, 2010.

Habitat Assessment	% Maximum Score	Rating
Instream Habitat Quality	79	Sub-optimal (55-79)
Sediment Deposition	75	Sub-Optimal (55-79)
Bank and Vegetative Stability	66	Marginal (60-<74)
Riparian Zone Measurements	50	Marginal (31-<60)
Habitat Assessment Score	**140**	
% Maximum Score	**70**	**Sub-optimal (57-82)**

BIOASSESSMENT RESULTS

The benthic macroinvertebrate community was sampled using ADEM's Nonwadeable Multi-habitat Bioassessment methodology (NWM-I). Measures of taxonomic richness, community composition, and community tolerance are used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in north Alabama streams and rivers. Each site is placed in one of six levels, ranging from 1, or *natural* to 6, or *highly altered.* The macroinvertebrate survey conducted at TA-1 rated the site as a *4-*, or *Fair/Poor.* Relative abundance and numbers of pollution-sensitive taxa are lower than expected for this macroinvertebrate community (Table 4).

Table 4. Results of the macroinvertebrate bioassessment conducted in Tallapoosa River at TA-1, July 13, 2010.

Macroinvertebrate Assessment	Results
Taxa richness and diversity measures	
Total # Taxa	38
# EPT taxa	11
Shannon Diversity	3.59
# Highly-sensitive and Specialized Taxa	1
Taxonomic composition measures	
% EPT minus Baetidae and Hydropsychidae	9
% Non-insect taxa	16
Tolerance measures	
# Sensitive EPT	4
% Sensitive taxa	21
% Tolerant taxa	26
WMB-I Assessment Score	**4-**
WMB-I Assessment Rating	**Fair/Poor**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected April through December of 2010 to help identify any stressors to the biological community. All parameters met *F&W* use classification criteria throughout the sampling season. However, water temperature, ammonia-nitrogen, and nitrate-nitrite nitrogen were higher than expected based on reference reach data collected in the Southern Inner Piedmont ecoregion. Turbidity was >50 NTU above ecoregional guidelines during the October sampling date. High flows at the time of collection were likely the cause of the increased turbidity.

SUMMARY

While the habitat assessment conducted in the Tallapoosa River at TA-1 indicated the reach to be *sub-optimal* for supporting a diverse biological community, bioassessment results indicated the macroinvertebrate community in the reach to be in *fair/poor* condition. Results of water chemistry analyses showed that water temperature, ammonia-nitrogen, and nitrate-nitrite nitrogen were higher than expected for ecoregion 45a. Monitoring should continue to ensure that conditions in the stream reach continue to meet current standards.

Table 5. Summary of water quality data collected April-December, 2010. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Parameter	N	Min	Max	Med	Avg	SD
Physical						
Temperature (°C)	10	12.6	29.2	25.0[M]	22.8	6.0
Turbidity (NTU)	9	1.1	193.0[T]	4.8	29.8	62.2
[J] Total Dissolved Solids (mg/L)	8	16.0	58.0	37.0	37.5	14.8
Total Suspended Solids (mg/L)	8	< 1.0	103.0	3.5	18.9	35.4
Specific Conductance (μmhos)	10	29.6	43.2	39.7	37.7	4.6
Hardness (mg/L)	1				10.1	
Alkalinity (mg/L)	8	7.3	14.4	10.7	10.8	2.8
Monthly Stream Flow (cfs)	10	142.0	8350.0	300.5	1784.4	2740.6
Stream Flow during Sample Collection (cfs)	10	142.0	8350.0	300.5	1784.4	2740.6
Chemical						
Dissolved Oxygen (mg/L)	10	6.6	10.8	7.6	7.9	1.3
pH (su)	10	6.5	7.5	7.0	7.0	0.3
Ammonia Nitrogen (mg/L)	8	< 0.021	0.074	0.010[M]	0.018	0.022
Nitrate+Nitrite Nitrogen (mg/L)	8	0.112	0.365	0.171[M]	0.193	0.082
Total Kjeldahl Nitrogen (mg/L)	8	< 0.080	0.650	0.211	0.247	0.198
Total Nitrogen (mg/L)	8	< 0.152	1.015	0.419	0.440	0.266
[J] Dissolved Reactive Phosphorus (mg/L)	8	0.003	0.014	0.008	0.008	0.003
[J] Total Phosphorus (mg/L)	8	0.009	0.153	0.017	0.037	0.049
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.1	0.4
Chlorides (mg/L)	8	1.6	3.0	2.4	2.3	0.5
Total Metals						
Aluminum (mg/L)	1				< 0.033	
Iron (mg/L)	1				0.268	
Manganese (mg/L)	1				< 0.001	
Dissolved Metals						
Aluminum (mg/L)	1				< 0.033	
Antimony (μg/L)	1				< 1.9	
Arsenic (μg/L)	1				< 2.1	
Cadmium (μg/L)	1				< 14.000	
Chromium (μg/L)	1				< 13.000	
Copper (mg/L)	1				< 0.013	
Iron (mg/L)	1				< 0.026	
Lead (μg/L)	1				< 1.7	
Manganese (mg/L)	1				< 0.001	
Mercury (μg/L)	1				< 0.080	
Nickel (mg/L)	1				< 0.019	
Selenium (μg/L)	1				< 1.7	
Silver (μg/L)	1				< 2.000	
Thallium (μg/L)	1				< 0.6	
Zinc (mg/L)	1				< 0.030	
Biological						
Chlorophyll a (ug/L)	8	0.27	5.34	2.22	2.39	1.79
[J] E. coli (col/100mL)	3	16	2420	29	821	1384

J=estimate; M=value >90% of all verified ecoregional reference reach data collected in the ecoregion 45a; N= # of samples; T=value exceeds 50 NTU above the 90th percentile of all verified ecoregional reference reach data collected in ecoregion 45a.

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ADEM

Alabama Department of Environmental Management

Ecological Reference Reach

Rivers and Streams Monitoring Program

2013 Monitoring Summary

Big Coon Creek at Jackson County Road 55 (34.85659/-85.92684)

BACKGROUND

The Alabama Department of Environmental Management (ADEM) monitored Big Coon Creek as part of the 2013 Assessment of the Tennessee River Basin (TN). The objectives of the TN Basin Assessments were to assess the biological integrity of each monitoring site and to estimate overall water quality within the TN basin.

Figure 1. Big Coon Creek at BCNJ-1, May 16, 2013.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		42
Ecoregion[a]		68b
% Landuse		
Open water		<1
Wetland	Woody	<1
Forest	Deciduous	80
	Evergreen	1
	Mixed	4
Shrub/scrub		3
Grassland/herbaceous		1
Pasture/hay		7
Cultivated crops		2
Development	Open space	1
	Low intensity	<1
Barren		<1
Population/km[2b]		3

a.Sequatchie Valley

b.2000 US Census

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Big Coon Creek is a *Fish & Wildlife (F&W)* stream that drains north-central Jackson County. It runs roughly southeast along Jackson County road 53 towards its confluence with Little Coon Creek and later Crow Creek. Based on the 2011 National Land Cover Dataset, land use within the watershed is primarily forest (85%) with some pasture/hay. As of September 1, 2012, ADEM has issued no NPDES permits in the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Big Coon Creek at BCNJ-1 is a low-gradient, glide-pool stream. The predominant instream substrate was sand (Figure 1). The overall habitat assessment resulted in a *marginal* rating due to poor bank and vegetative stability. Banks were very steep and root bank habitat was virtually nonexistent.

Table 2. Physical characteristics of Big Coon Creek at BCNJ-1, May 16, 2013.

Physical Characteristics		
Width (ft)		50
Canopy Cover		Estimate 50/50
Depth (ft)		
	Run	2.0
	Pool	4.0
% of Reach		
	Run	90
	Pool	10
% Substrate		
	Clay	5
	Cobble	1
	Gravel	14
	Sand	60
	Silt	15
	Organic Matter	5

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Table 4 summarizes results of taxonomic richness, community composition, and community tolerance metrics. Each metric is scored on a 100 point scale. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community in Big Coon Creek at BCNJ-1 to be in *fair* condition.

Table 3. Results of the habitat assessment conducted in Big Coon Creek at BCNJ-1, May 16, 2013.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	40	Poor (<41)
Sediment Deposition	59	Marginal (41-58)
Sinuosity	33	Poor (<45)
Bank and Vegetative Stability	25	Poor (<35)
Riparian Buffer	71	Sub-optimal (70-89)
Habitat Assessment Score	**106**	
% Maximum Score	**48**	**Marginal (41-58)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Big Coon Creek at BCNJ-1, May 16, 2013.

Macroinvertebrate Assessment		
	Results	**Scores**
Taxa richness measures		**(0-100)**
# EPT taxa	9	22
Taxonomic composition measures		
% Non-insect taxa	13	46
% Dominant Taxon	17	86
% EPC taxa	23	42
Functional feeding group measures		
% Predators	5	16
Tolerance measures		
% Taxa as Tolerant	35	41
WMB-I Assessment Score	**---**	**42**
WMB-I Assessment Rating		**Fair (39-58)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected April, June, August and October 2013 to help identify any stressors to the biological communities. In situ parameters were also measured during the macroinvertebrate assessment on May 16. The *F&W* human health criterion for Arsenic was exceeded on April 10, 2013. ADEM criteria for arsenic are expressed as dissolved trivalent arsenic (arsenite – As III). Presently studies are being conducted in order to provide a better understanding of the prevalence and areal distribution of dissolved trivalent arsenic to total arsenic in the State of Alabama. Upon conclusion of the studies Big Coon Creek will be reassessed for arsenic violations. Values for Total Dissolved Solids, Specific Conductance, Hardness, and Alkalinity were greater than expected for ecoregion 68. No organics samples were collected.

SUMMARY

Bioassessment results indicated the macroinvertebrate community to be in *fair* condition. Overall habitat conditions were *marginal*. Total dissolved solids, specific conductance, hardness and alkalinity condcentrations were greater than expected for ecoregion 68. Monitoring of Big Coon Creek at BCNJ-1 should continue to ensure that water quality and biological conditions remain stable.

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Table 5. Summary of water quality data collected between April, June, August, October 2013. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

	Parameter	N		Min		Max	Med	Avg	SD	Q
	Physical									
	Temperature (°C)	5		12.9		19.2	18.2	16.6	2.9	
	Turbidity (NTU)	5		3.3		6.0	3.9	4.3	1.1	
	Total Dissolved Solids (mg/L)	4		112.0		141.0	129.0 M	127.8	12.6	
	Total Suspended Solids (mg/L)	4	<	1.0		8.0	0.8	2.5	3.7	
	Specific Conductance (μmhos)	5		187.5		274.7	237.0 G	225.5	37.1	
	Hardness (mg/L)	4		97.9		135.0	118.0 G	117.2	15.5	
J	Alkalinity (mg/L)	4		97.3	<	136.0	116.5 M	116.6	15.8	
	Stream Flow (cfs)	5		6.2		80.0	23.9	36.3	31.5	
	Chemical									
	Dissolved Oxygen (mg/L)	5		7.2		9.7	8.3	8.4	1.0	
	pH (su)	5		7.5		7.7	7.6	7.6	0.1	
J	Ammonia Nitrogen (mg/L)	4	<	0.013	<	0.018	0.011	0.012	0.003	
	Nitrate+Nitrite Nitrogen (mg/L)	4		0.144		0.365	0.296	0.275	0.094	
	Total Kjeldahl Nitrogen (mg/L)	4	<	0.041		0.391	0.178	0.192	0.153	
	Total Nitrogen (mg/L)	4	<	0.164		0.756	0.474	0.467	0.243	
J	Dissolved Reactive Phosphorus (mg/L)	4	<	0.004	<	0.006	0.005	0.004	0.002	
J	Total Phosphorus (mg/L)	4	<	0.007		0.014	0.011	0.011	0.003	
	CBOD-5 (mg/L)	4	<	2.0	<	2.0	1.0	1.0	0.0	
	Chlorides (mg/L)	4		1.1		1.3	1.3	1.2	0.1	
	Total Metals									
J	Aluminum (mg/L)	4	<	0.076	<	0.199	0.068	0.094	0.076	
J	Iron (mg/L)	4	<	0.148		0.317	0.266	0.250	0.075	
J	Manganese (mg/L)	4	<	0.020		0.054	0.034	0.035	0.014	
	Dissolved Metals									
	Aluminum (mg/L)	4	<	0.076	<	0.076	0.038	0.038	0.000	
	Antimony (μg/L)	4	<	0.1	<	2.6	0.0	0.4	0.6	
J	Arsenic (μg/L)	4	<	0.2	<	1.7 H	0.3	0.6	0.7	1
	Cadmium (μg/L)	4	<	0.046	<	0.170	0.085	0.070	0.031	
J	Chromium (μg/L)	4	<	0.918	<	32.000	1.210	4.834	7.446	
J	Copper (mg/L)	4	<	0.0003	<	0.005	0.0003	0.002	0.003	
J	Iron (mg/L)	4		0.033	<	0.109	0.062	0.066	0.033	
	Lead (μg/L)	4	<	0.1	<	1.1	0.0	0.2	0.2	
J	Manganese (mg/L)	4	<	0.018	<	0.041	0.029	0.029	0.009	
	Mercury (μg/L)	1						< 0.057		
J	Nickel (mg/L)	4	<	0.0002	<	0.016	0.001	0.002	0.004	
	Selenium (μg/L)	4	<	0.2	<	1.4	0.1	0.3	0.3	
	Silver (μg/L)	4	<	0.215	<	2.120	1.060	0.822	0.476	
	Thallium (μg/L)	4	<	0.1	<	1.1	0.0	0.2	0.2	
J	Zinc (mg/L)	4	<	0.002	<	0.017	0.003	0.004	0.003	
	Biological									
	Chlorophyll a (ug/L)	4	<	0.10	<	0.10	0.05	0.05	0.00	
	E. coli (col/100mL)	4		66		291	117	148	101	

G=value greater than median concentration of all verified reference data collected in ecoregion 68; H=*F&W* human health criterion exceeded; J=estimate; M=value greater than the 90th percentile of all verified reference data collected in ecoregion 68; N=# of samples; Q=#samples where criteria exceedences are uncertain.

2013 Monitoring Summary

Little Coon Creek at Jackson County Road 53 (34.87425/-85.91075)

BACKGROUND

Little Coon Creek, from its confluence with Coon Creek to the Alabama / Tennessee State Line was placed on Alabama's Clean Water Act (CWA) §303(d) list of impaired waters in 2012. It was listed for siltation (habitat alteration) from non-irrigated crop production and pasture grazing. The Environmental Protection Agency (EPA) requires states to develop Total Maximum Daily Loads (TMDL) for listed water bodies to reduce contaminant concentrations. A Draft TMDL for Little Coon Creek is scheduled for completion in 2015. This report summarizes the results of biological and water quality monitoring activities the Alabama Department of Environmental Management (ADEM) has conducted to support the TMDL process.

Figure 1. Little Coon Creek at COCJ-1, April 30, 2013.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. Little Coon Creek is a *Fish & Wildlife (F&W)* stream in north-central Jackson County. It runs roughly southeast through the Skyline Wildlife Management Area and then along Jackson County Road 54. It combines with Big Coon Creek to form Crow Creek. Based on the 2006 National Land Cover Dataset, land use within the watershed is primarily forest (86%) with some shrub/scrub. As of May 13, 2013, ADEM has issued one NPDES permits in the watershed.

REACH CHARACTERISTICS

General observations (Table 2) and a habitat assessment (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Little Coon Creek at COCJ-1 is a low-gradient, glide-pool stream. Predominant instream substrates were sand, silt and hard pan clay (Figure 1). The overall habitat assessment resulted in a *marginal* rating.

Table 1. Summary of watershed characteristics.

Watershed Characteristics		
Basin		Tennessee River
Drainage Area (mi^2)		29
Ecoregion[a]		68b
% Landuse		
Open Water		<1
Wetland	Woody	<1
Forest	Deciduous	81
	Evergreen	1
	Mixed	4
Shrub/scrub		4
Grassland/herbaceous		1
Pasture/hay		6
Cultivated crops		1
Development	Open space	1
	Low Intensity	<1
Population/km^2[b]		11
# NPDES Permits[c]	**TOTAL**	1
401 Water Quality Certification		1

a.Sequatchie Valley
b.2000 US Census
c.#NPDES permits downloaded from ADEM's NPDES Management System database, May 13, 2013.

Table 2. Physical characteristics of Little Coon Creek at COCJ-1, June 5, 2013.

Physical Characteristics		
Width (ft)		25
Canopy Cover		Mostly Shaded
Depth (ft)		
	Run	2.0
	Pool	3.0
% of Reach		
	Run	80
	Pool	20
% Substrate		
	Boulder	2
	Clay	10
	Cobble	1
	Gravel	5
	Hard Pan Clay	15
	Sand	45
	Silt	15
	Organic Matter	7

BIOASSESSMENT RESULTS

Benthic macroinvertebrate communities were sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Table 4 summarizes results of taxonomic richness, community composition, and community tolerance metrics. Each metric is scored on a 100 point scale. The final score is the average of all individual metric scores. Metric results indicated the macroinvertebrate community in Little Coon Creek at COCJ-1 to be in *fair* condition.

TM Graphics provided by Florida Dept. of Environmental Protection (FDEP); used with permission

Table 3. Results of the habitat assessment conducted in Little Coon Creek at COCJ-1, June 5, 2013.

Habitat Assessment	%Maximum Score	Rating
Instream Habitat Quality	61	Sub-optimal (59-70)
Sediment Deposition	71	Optimal (>70)
Sinuosity	40	Poor (<45)
Bank and Vegetative Stability	36	Marginal (35-59)
Riparian Buffer	63	Marginal (50-69)
Habitat Assessment Score	**128**	
% Maximum Score	**58**	**Marginal (41-58)**

Table 4. Results of the macroinvertebrate bioassessment conducted in Little Coon Creek at COCJ-1, June 5, 2013.

Macroinvertebrate Assessment		
	Results	**Scores (0-100)**
Taxa richness and diversity measures		
# EPT taxa	13	39
Taxonomic composition measures		
% Non-insect taxa	15	38
% Dominant Taxon	12	100
% EPC taxa	18	32
Functional feeding group measures		
% Predators	11	42
Tolerance measures		
% Taxa as Tolerant	39	27
WMB-I Assessment Score	**---**	**46**
WMB-I Assessment Rating		**Fair (39-58)**

WATER CHEMISTRY

Results of water chemistry analyses are presented in Table 5. In situ measurements and water samples were collected March through October 2013 to help identify any stressors to the biological communities. In situ parameters were also measured during the macroinvertebrate assessment on June 5. The *F&W* dissolved oxygen criterion was exceeded one time in October. Total dissolved solids, alkalinity and specific conductance values were greater than expected, as compared to all reference data collected in ecoregion 68. No metals, bacteriological or organics samples were collected.

SUMMARY

Little Coon Creek at COCJ-1 is a slow to medium velocity glide-pool stream. It is located downstream of LCNJ-36 and is located in the Sequatchie Valley sub-ecoregion. Overall habitat quality was rated *marginal*. Sediment loads are high during rain events and streambanks are being eroded, potentially impacting macroinvertebrate populations.

Bioassessment results indicated the macroinvertebrate communities to be in *fair* condition. Monitoring should continue to ensure that water quality and biological conditions meet current standards.

Table 5. Summary of water quality data collected between March and October 2013. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

	Parameter	N		Min		Max	Med	Avg	SD	E
	Physical									
	Temperature (°C)	9		12.2		22.3	19.0	18.0	3.2	
	Turbidity (NTU)	9		3.8		12.5	8.3	7.9	2.5	
J	Total Dissolved Solids (mg/L)	8		80.0		192.0	148.5 [M]	145.6	34.1	
J	Total Suspended Solids (mg/L)	8	<	1.0		13.0	3.0	4.4	4.2	
	Specific Conductance (μmhos)	9		200.5		340.4	279.4 [G]	265.7	44.3	
	Alkalinity (mg/L)	8		104.0		167.0	133.0 [M]	131.1	21.0	
	Stream Flow (cfs)	6		3.4		55.6	11.7	19.0	19.5	
	Chemical									
	Dissolved Oxygen (mg/L)	9		4.6 [C]		10.3	7.4	7.4	2.2	1
	pH (su)	9		7.4		7.9	7.6	7.6	0.1	
	Ammonia Nitrogen (mg/L)	8	<	0.008		0.070	0.009	0.019	0.022	
	Nitrate+Nitrite Nitrogen (mg/L)	8		0.083		0.313	0.140	0.158	0.080	
J	Total Kjeldahl Nitrogen (mg/L)	8	<	0.041		0.383	0.159	0.173	0.142	
J	Total Nitrogen (mg/L)	8	<	0.114		0.669	0.330	0.330	0.203	
J	Dissolved Reactive Phosphorus (mg/L)	8	<	0.004		0.014	0.008	0.008	0.003	
J	Total Phosphorus (mg/L)	8	<	0.009		0.029	0.018	0.018	0.007	
	CBOD-5 (mg/L)	8	<	2.0	<	2.0	1.0	1.0	0.0	
	Chlorides (mg/L)	8		1.0		1.7	1.3	1.3	0.3	

C= *F&W* criterion exceeded; E=#samples that exceeded criterion; G=value greater than median concentration of all verified reference data collected in ecoregion 68; ; J=estimate; M=value greater than the 90th percentile of all verified reference data collected in ecoregion 68; N=# of samples.

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2. FINAL 2018 HARRIS WATER QUANTITY, WATER USE, AND DISCHARGE REPORT

WATER QUANTITY, WATER USE, AND DISCHARGE REPORT

R.L. HARRIS HYDROELECTRIC PROJECT

FERC NO. 2628

Prepared for:

ALABAMA POWER COMPANY

BIRMINGHAM, ALABAMA

Prepared by:

Kleinschmidt

March 2018

ALABAMA POWER COMPANY
BIRMINGHAM, ALABAMA

R. L. HARRIS HYDROELECTRIC PROJECT
FERC NO. 2628

WATER QUANTITY, WATER USE, AND DISCHARGE REPORT

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WATER QUANTITY, WATER USE, AND DISCHARGES REPORT

1.0 INTRODUCTION

Alabama Power Company (Alabama Power) is initiating the Federal Energy Regulatory Commission (FERC) relicensing of the 135-megawatt (MW) R.L. Harris Hydroelectric Project (Harris Project), FERC Project No. 2628. The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources. These structures, lands, and water are enclosed within the FERC Project Boundary. Under the existing Harris Project license, the FERC Project Boundary encloses two distinct geographic areas, described below.

Harris Reservoir is the 9,870-acre reservoir (Harris Reservoir) created by the R.L. Harris Dam (Harris Dam). Harris Reservoir is located on the Tallapoosa River, near Lineville, Alabama. The lands adjoining the reservoir total approximately 7,392 acres and are included in the FERC Project Boundary. This includes land to 795 feet mean sea level (msl)[1], as well as natural undeveloped areas, hunting lands, prohibited access areas, recreational areas, and all islands.

The Harris Project also contains 15,063 acres of land within the James D. Martin-Skyline Wildlife Management Area (Skyline WMA) located in Jackson County, Alabama. These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigative Plan and Wildlife Management Plan. These lands are leased to, and managed by, the State of Alabama for wildlife management and public hunting and are part of the Skyline WMA (ADCNR 2016b).

For the purposes of this technical report, "Lake Harris" refers to the 9,870-acre reservoir, adjacent 7,392 acres of project land, and the dam, spillway, and powerhouse. "Skyline" refers to the 15,063 acres of Project land within the Skyline WMA in Jackson County. "Harris Project" refers to all the lands, waters, and structures enclosed within the FERC Project Boundary, which includes both Lake Harris and Skyline. "Harris Reservoir" refers to the 9,870-acre reservoir only; Harris Dam refers to the dam, spillway, and powerhouse. The "Project Area" refers to the land and water in the Project Boundary and immediate geographic area adjacent to the Project Boundary (Alabama Power Company 2018).

Lake Harris and Skyline are located within two river basins: the Tallapoosa and Tennessee River Basins, respectively. The only waterbody managed by Alabama Power as part of their FERC license for the Harris Project is the Harris Reservoir.

[1] Also includes a scenic easement (to 800 feet msl or 50 horizontal feet from 793 feet msl, whichever is less, but never less than 795 feet msl)

The Harris Project is the most upstream of the three Alabama Power hydroelectric projects on the Tallapoosa River (the other two projects are Martin, Yates/Thurlow). The Tallapoosa projects are operated to generate hydroelectric power and other project purposes.

The Harris Project is located within the Alabama-Coosa-Tallapoosa (ACT) River Basin. The ACT basin originates just north of the Tennessee-Georgia border, extends into central north Georgia, crosses the Georgia-Alabama state line into north Alabama, and continues across central and south Alabama before terminating in Mobile Bay (USACE 2010). The basin covers 32 counties in Alabama, 18 counties in Georgia, and two counties in Tennessee. The basin drains 22,800 square miles, extending approximately 320 miles. The U.S. Army Corps of Engineers (USACE) owns and maintains five projects in the basin and Alabama Power Company owns and maintains eleven developments (Figure 1-1).

To support the relicensing process and provide baseline information for the Pre-Application Document (PAD), Kleinschmidt Associates (Kleinschmidt) prepared this report to summarize water quantity, withdrawals and use at the Harris Project.

Alabama Power is using FERC’s Integrated Licensing Process (ILP) to relicense the Harris Project, which includes a multi-year cooperative effort with interested stakeholders to address operational, recreational, and ecological concerns associated with hydroelectric project operations. Alabama Power is consulting with a wide variety of stakeholders, including state and federal resource agencies, non-governmental organizations, and interested citizens, to gather their input on important relicensing issues.

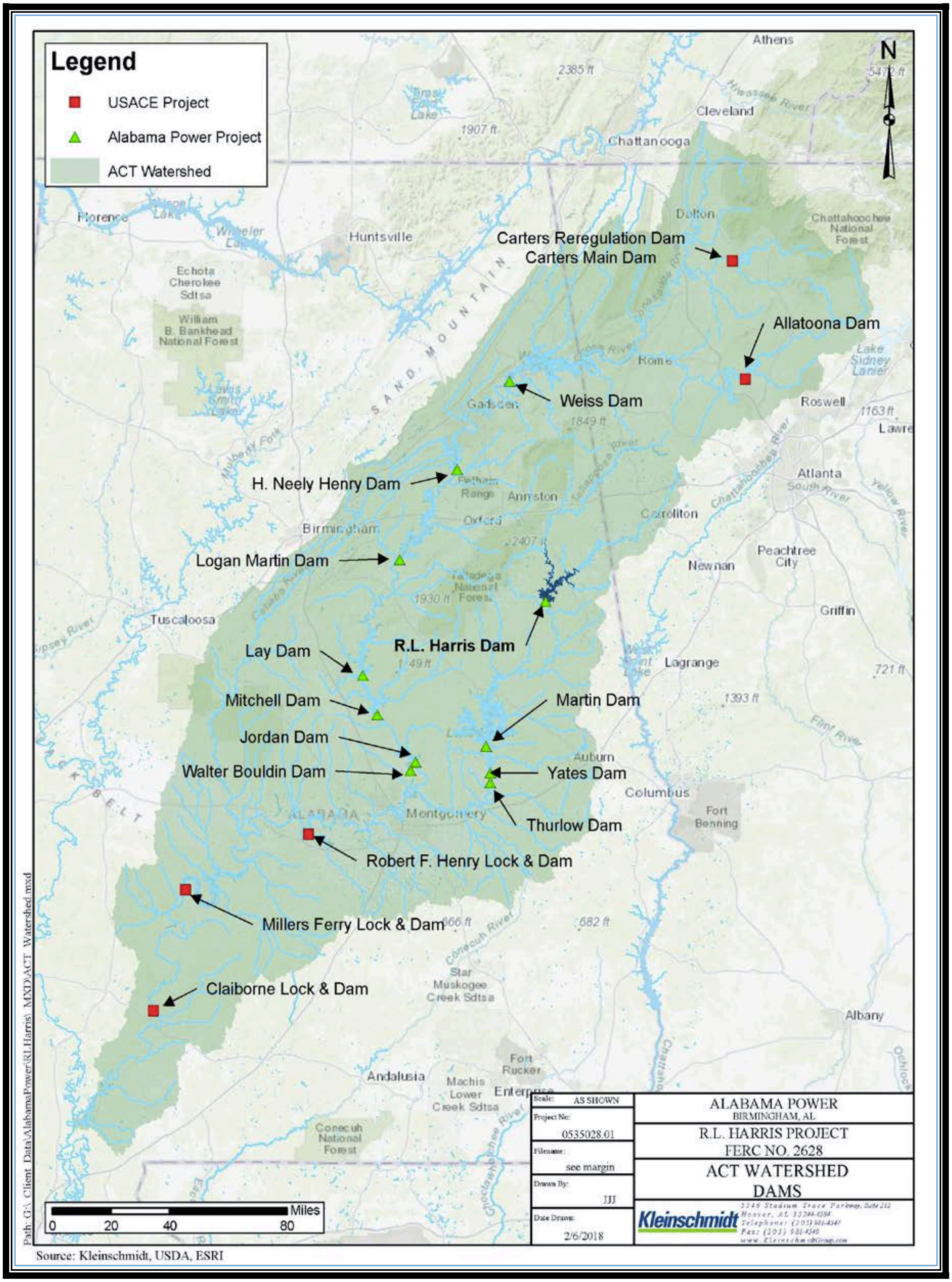


FIGURE 1-1: ACT WATERSHED DAMS

The Harris Project is operated in accordance with its FERC license. In addition, the USACE has issued a Water Control Manual (WCM), last updated in 2014, for the Harris Project. The WCM primarily describes the flood risk management water control plan for Harris Dam, and includes descriptions of the plans for navigation support and drought contingency operations. Furthermore, Alabama Power collaborates with the state of Alabama's Office of Water Resources (OWR) to plan for and mitigate the effects of droughts. Alabama Power also complies with the National Pollutant Discharge Elimination System (NPDES) permitting program administered by the Alabama Department of Environmental Management (ADEM).

Alabama Power's reservoirs provide the majority of storage within the ACT river basin and to a large degree releases from Alabama Power's dams control the flow to the Alabama River from the Coosa and Tallapoosa Rivers. During periods of low flow, many entities often rely on Alabama Power's reservoirs to supply their water needs. Alabama Power has established a water withdrawal policy with respect to these non-project uses of its federally-licensed project lands and waters. This report describes project operations, ecological and navigational flow requirements in the Tallapoosa River, drought plans, the water withdrawal policy, currently known water withdrawals, and NPDES permitted sites near Lake Harris. There are no NPDES permits within Skyline.

2.0 HARRIS PROJECT OPERATION

The Harris Project is a peaking hydroelectric facility and generally operates Monday through Friday to meet peak power demands. Under normal conditions[2], Alabama Power operates the Harris Project by running the turbines to maintain reservoir levels according to the Harris Operating Curve (Figure 2-1). The hydropower generated is available for use during daily peak-load periods.

In the interest of protecting and developing downstream aquatic habitat, Article 13 of the existing FERC license for the Harris Project requires Alabama Power to provide a minimum flow of 45 cubic feet per second (cfs) as measured at the United States Geological Survey (USGS) Gage No. 02414500 Tallapoosa River at Wadley, Alabama (FERC 1973). Furthermore, Alabama Power operates its four reservoirs on the Tallapoosa River to meet the year-round minimum flow requirement below Thurlow Dam (Alabama Power 2013) and to support flows to the Alabama River at the levels specified by the USACE's ACT River Basin Water Control Manual (2014).

Harris Reservoir is maintained at or below the elevations specified by the Harris Operating Curve, except when storing floodwater. From May 1 through October 1, Harris Reservoir is maintained at or below elevation 793 feet mean sea level (msl), depending on inflow conditions, which corresponds to a storage of 425,721 acre-feet. Between October 1 and December 1, the operating curve elevation drops to elevation 785 feet msl. (an additional storage of 78,505 acre-feet). The pool level remains at or below elevation 785 feet msl until April 1. From April 1 to May 1, the operating curve elevation rises to the full pool elevation of 793 feet msl. During the summer, Harris Reservoir provides 207,318 acre-feet of storage between elevations 768 feet

[2] Normal operations include pulsing operations as part of the Green Plan, as explained in Section 5.0.

and 793 feet msl; during winter operation, the reservoir provides 128,813 acre-feet between elevations 768 feet and 785 feet msl.

During high flow conditions, USACE-approved flood control procedures (discussed in Section 3.0 below) are implemented. Furthermore, during low flow conditions, the drought contingency curve (red line in Figure 2-1) is intended to be used as one of several factors in evaluating drought reservoir operations consistent with approved drought plans (discussed in Section 4.0 below). The Harris Project is managed in accordance with the Alabama Drought Response Operating Plan (ADROP), which provides a range of potential responses based on the severity of the drought and the time of year.

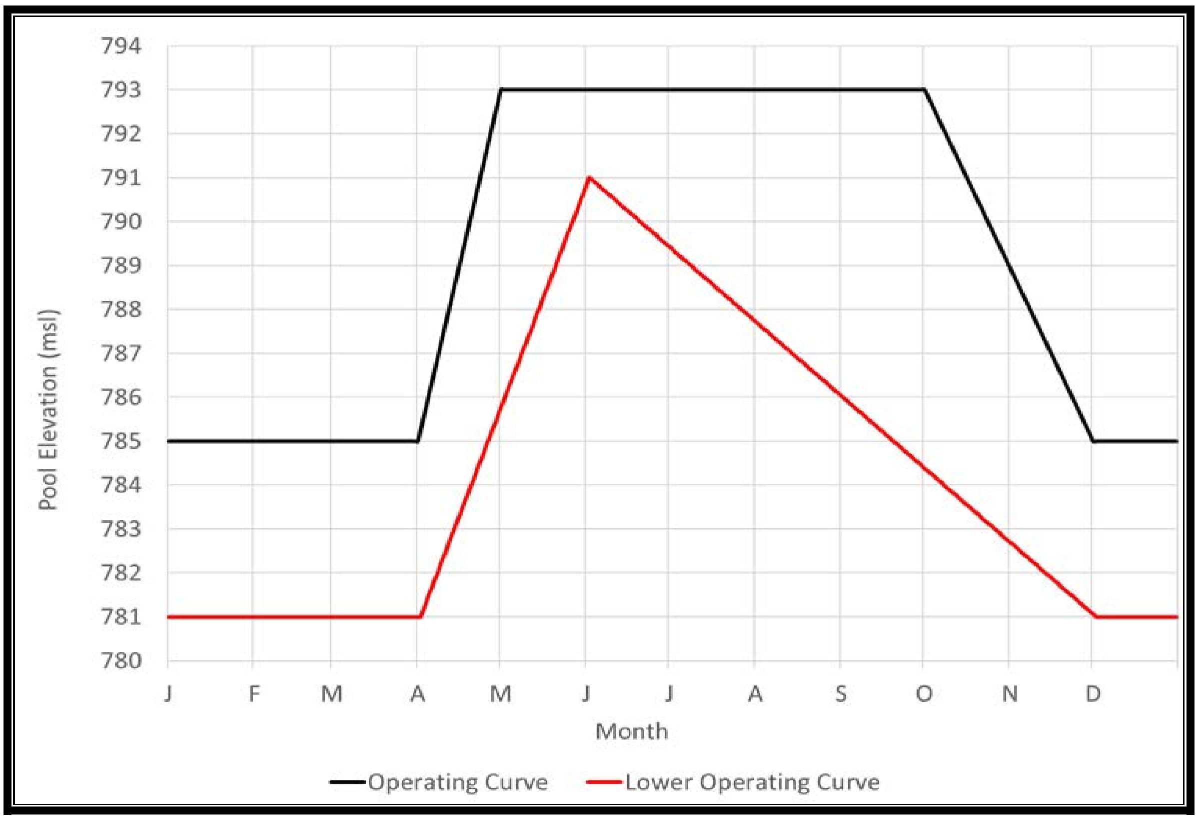


FIGURE 2-1 HARRIS OPERATING CURVE

3.0 WATER CONTROL MANUAL

3.1 OVERVIEW

The USACE's Master Water Control Manual (Master WCM) provides a general reference for day-to-day, real-time water management decision making for the six federal projects operated by USACE and the 11 non-federal developments operated by Alabama Power in the ACT basin. Projects in the ACT basin are operated in a coordinated manner to manage the often-competing uses, meet all authorized uses, ensure that enough water is available to at least minimally satisfy project purposes during droughts, and to maintain a balanced use of storage (USACE 2013). The Master WCM contains nine appendices that describe specific regulations for individual projects in the ACT basin. Alabama Power operates Lake Harris in accordance with the operating plan in Appendix I of the Master WCM issued October 2014. This Harris WCM describes flood management regulations, navigational support plans, and drought contingency operations (USACE 2014).

3.2 FLOOD CONTROL

The objective of flood control at Harris Dam is to store excess water during high flow events in order to maintain water levels below flood stage downstream and to not cause stages higher than would occur naturally. The WCM provides procedures to be used by Alabama Power to carry out the operation of the Harris Project during floods.

The Harris Project will operate to pass the inflow up to approximately 13,000 cfs by releasing water through the powerhouse to maintain the reservoir near the operating curve (USACE 2014). If the reservoir rises above the operating curve (or is predicted to in the near future) but is below elevation 790 feet msl, the Harris Project will operate to discharge 13,000 cfs or an amount that will not cause the USGS stream gage at Wadley, Alabama (gage No. 02414500), to exceed 13.0 feet, unless greater discharge amounts are required by the induced surcharge curves. When the reservoir rises above elevation 790 feet msl, the powerhouse discharge will be increased to the larger of approximately 16,000 cfs or the amount indicated by the induced surcharge curves. Once the reservoir level begins to fall, all spillway gate openings and the powerhouse discharge will be maintained at those settings until the Harris Reservoir level returns to the operating guide curve. If a second flood enters the reservoir prior to the complete evacuation of the stored flood waters, the release will be as directed by the induced surcharge curve operation plan outlined in the WCM (USACE 2014).

The spillway gates at Harris Dam are generally operated in accordance with the gate opening schedule described in the WCM (USACE 2014). The schedule specifies the gate step and gate position based on the induced surcharge curve.

3.3 NAVIGATION

Alabama Power operates the Harris Project, along with other hydroelectric projects on the Coosa and Tallapoosa Rivers, to support a predictable minimum navigable channel (i.e., a minimum water depth) in the Alabama River.

As outlined in the USACE Master WCM for the ACT River Basin, Alabama Power's Coosa River and Tallapoosa River projects are operated to provide a minimum 7-day average flow of 4,640 cfs (32,480 day-second-feet (dsf)/7 day) to the Alabama River at Montgomery. This flow is subject to being increased for navigation or decreased due to drought, generally described as follows:

> The ACT Master WCM includes a template for Alabama River navigation support, subject to development of a "navigational MOU," or navigation memorandum of understanding,

between Alabama Power and the USACE. This template provides for the use of specified amounts of storage from Alabama Power's reservoirs to support navigation during the June-December period, under certain conditions, including adequate basin inflow. Also, navigation is not supported during drought operations, as defined by the ACT Basin Drought Contingency Plan (discussed in Section 4.0 below).

4.0 DROUGHT OPERATIONS

Droughts vary in duration, magnitude, degree of severity, and geographical extent, and, as a result, are difficult to predict and manage. Significant impacts to hydroelectric projects may occur despite Alabama Power's efforts to conserve water during periods of low rainfall. Effects of drought on hydroelectric operations can be classified into three broad categories: ecological impacts (e.g., changes to water quality and minimum flows), reduced electric generating capacity, and reduced recreational opportunities.

4.1 ALABAMA DROUGHT RESPONSE OPERATING PLAN

The ADROP describes the management of Alabama Power reservoirs within the ACT basin during drought conditions. It was developed by Alabama Power, stakeholders, and state and federal agencies in response to the 2007 drought, which is the drought of record for the ACT basin (Alabama Power 2013). ADROP defines three drought triggers: (1) low basin inflow; (2) low composite conservation storage; and (3) low state line flow. If any one of these triggers is met, navigation support is suspended, and the 4,640 cfs Alabama River flow at Montgomery may be reduced consistent with the plan, depending on the severity of the drought conditions. Under the plan, the "drought triggers" are used to define three incremental Drought Intensity Level (DIL) responses. The DIL responses describe a range of operations for the hydroelectric projects within the ACT basin as a function of the DIL and month. Alabama Power, OWR, and other relevant state and federal agencies monitor specific precipitation and stream flow indicators within the ACT basin. The precipitation indicator is based on the average of normal monthly rainfall at the following airport rain gages: Rome, Anniston, Shelby County, and Montgomery. The stream flow indicator is based on specific percentile ranges of stream flow from eleven USGS gages in the Coosa River basin and seven gages in the Tallapoosa River basin (Alabama Power 2013). Alabama Power evaluates the DIL using the ADROP Decision Tool that was developed by Alabama Power and the USACE Mobile District to implement portions of the WCM in real time operations. ADROP has been incorporated into the WCM and ACT Basin Drought Contingency Plan. A full description of ADROP and associated operational responses for its projects on the Coosa and Tallapoosa Rivers during periods of drought is included in Appendix A.

4.2 STATE DROUGHT PLAN

The State of Alabama Drought Management Plan (Drought Management Plan) was finalized in 2013 (ADECA 2013). The plan gives the Alabama Water Resources Commission, OWR, and the Alabama Drought Assessment and Planning Team responsibility for drought planning, management, mitigation, and response activities. The Drought Management Plan presents the processes and procedures for issuing an Alabama Drought Declaration, which is intended to aid water managers, state agencies, and other stakeholders in making water use and management decisions (ADECA 2013). The Drought Management Plan creates a defined statewide structure to collect, coordinate, and communicate information; identify the areas impacted and associated risks; identify ways to prepare for droughts; develop impact assessments; and prepare response and mitigation recommendations.

The Drought Management Plan consists of four drought declaration levels: drought advisory, drought watch, drought warning, and drought emergency (ADECA 2013). The declaration of a level is based on several drought triggers, including the Lawn and Garden Index, Crop Moisture Index, Palmer Drought Severity Index, Keetch-Bryam Drought Index, USDA-NASS Topsoil Moisture, USGS stream flows, and 180-day rainfall totals (ADECA 2013). In addition to these indices, groundwater levels, public water supply systems, and reservoir levels are considered in decisions to issue a drought declaration.

The Drought Management Plan also identifies five categories of drought impact sectors that should be included in planning, mitigation, and response decisions and activities. The five impact sectors are: domestic, agricultural, environmental, industrial, and recreational.

5.0 HARRIS GREEN PLAN

During the 1990s, Alabama Power began working with stakeholders, including the Alabama Department of Conservation and Natural Resources, U.S. Fish and Wildlife Service, and Alabama Cooperative Fish and Wildlife Research Unit, to develop a plan for specific daily and hourly releases to improve downstream fisheries conditions. The final Harris "Green Plan" was a result of years of discussions, study, and various iterations of the plan. In 2005, Alabama Power began implementing the Harris Green Plan flows, and the Alabama Cooperative Fish and Wildlife Research Unit began monitoring ecological conditions (e.g., water temperature, fisheries, vegetation) downstream of the dam. The Harris Green Plan flows and monitoring have continued since 2005. The Harris Green Plan outlines specific daily and hourly release schedules based on the number of machine hours planned for a specific day. The upstream USGS gage No. 02412000 Tallapoosa River near Heflin, Alabama, is used to set a daily target release from Harris Dam. Alabama Power uses pulse operations from Harris Dam when four or less machine hours occur per day. The daily volume releases are suspended during flood operations. In addition to the specific daily and hourly release schedules, specific drought release criteria are also outlined. The complete criteria for the Green Plan are included in Appendix B.

6.0 WATER WITHDRAWALS

6.1 WATER USE

The Tallapoosa River is managed for several beneficial water uses to meet the demands of upstream and downstream users. Harris Reservoir is a multi-purpose storage reservoir with the federally authorized uses of hydroelectric power generation, flood risk management, and navigation. Additional uses of Harris Reservoir include recreation, water supply, water quality enhancement, and fish and wildlife habitat. Additionally, Harris Reservoir provides approximately eight percent of the storage capacity of the ACT basin (USACE 2013).

6.2 HISTORY OF ALABAMA POWER'S WATER WITHDRAWAL POLICY

Over the last several decades, a growing number of new demands have been placed on the state of Alabama's water resources. These additional demands have been for such uses as residential water supply due to population growth, industrial growth, agriculture, recreational use, and environmental stewardship. Large storage reservoirs can provide a reliable water supply, and many water withdrawers have sought approval from Alabama Power to use its hydropower reservoirs as a source of water.

Article 14 of the existing FERC license for the Harris Project states that upon the application by any person, association, corporation, federal agency, state, or municipality, Alabama Power will permit reasonable use of its reservoir in the interest of the comprehensive development of the waterway (FERC 1973). Consistent with FERC licensing authority and to address the growing water use demands, Alabama Power developed a water withdrawal policy and permitting process in 1989 to manage water withdrawals. The policy also includes a compensation plan designed to offset the costs to Alabama Power's ratepayers for the impacts associated with withdrawals from its reservoirs.

6.3 ALABAMA POWER WATER WITHDRAWAL POLICY

Alabama Power's water withdrawal policy was developed to manage withdrawals from its hydropower project reservoirs, including Harris Reservoir, as well as to encourage responsible management and resource planning by water withdrawers. Any party interested in withdrawing 0.1 MGD water or greater from Harris Reservoir may do so only after applying for and receiving a water withdrawal permit[3]. Under the Standard Land Use article in its FERC licenses, Alabama Power has the authority to permit water withdrawals up to 1 MGD without prior FERC authorization, but Alabama Power must obtain FERC's approval before authorizing withdrawals greater than 1 MGD.

In addition to obtaining a water withdrawal permit from Alabama Power, a Declaration of Beneficial Use must be submitted to OWR by each public water system that regularly serves (individually or in combination with other such systems) more than 10,000 households or by any person who diverts, withdraws, or consumes more than 100,000 gallons per day or more from waters of the state (ADECA 2017). After OWR reviews the information in the application and verifies it as complete, OWR will issue a Certificate of Beneficial Use to the withdrawer.

In 2001, OWR requested that Alabama Power implement measures to provide conservation of water resources. In response, Alabama Power implemented a process requiring applicants to demonstrate that they have consulted with the OWR prior to granting permission to withdraw from its reservoirs.

[3] Residential withdrawals are typically addressed under Non-Transferable Lakeshore Use Permits.

6.4 ALABAMA POWER WATER WITHDRAWAL PERMITTING PROCESS

The first formal step in obtaining a water withdrawal permit is for the interested party to submit a request to Alabama Power through the "Non-Residential Permit Application Process (Appendix C). Before this application is formally submitted, the applicant typically schedules a meeting with an Alabama Power representative to discuss the specifics of the proposed water withdrawal, potential impacts to project resources resulting from the withdrawal, compensation for the water withdrawal impacts, and any other pertinent information that will need to be included in the permit application.

Alabama Power's review of the Non-Residential Permit form is divided into three phases. In the first phase, Alabama Power staff reviews the information provided in Section 1 of the application or, if necessary, requests more information from the applicant. After this review, if Alabama Power determines that the application is acceptable, the applicant submits the information required in Phase 2. Alabama Power then reviews this information to determine whether to seek approval from FERC (Phase 3). In addition to the proposed withdrawal amount, the decision to seek FERC approval is based on whether the proposed use will enhance or have no effect on the project's environmental, recreational, or aesthetic values, including the resources identified as sensitive.

Upon Alabama Power's acceptance of the proposed water withdrawal application, the prospective withdrawer and Alabama Power enter into a Water Withdrawal Agreement. This agreement covers details specific to the water withdrawal, including terms and conditions. A standard Water Withdrawal Agreement includes a number of clauses and statements which establish that the Agreement: is not a "water sales" agreement; does not convey any property rights (including riparian rights); is based on other joint use agreements approved by the FERC; may be tailored to address unique withdrawal issues; and will be included in any FERC approval application.

An important part of the permitting process includes requiring the prospective withdrawer to consult with various state and federal resource agencies (identified in Phase 2 of the Non-Residential Permit Application Form in Appendix C). In some instances, the consultation phase may be conducted concurrently with the Water Withdrawal Agreement negotiations.

In addition to the Water Withdrawal Agreement, the withdrawer must also obtain property rights (i.e., an easement) from Alabama Power to use project lands in which Alabama Power owns.

6.5 FERC APPROVAL PROCESS

For any proposed water withdrawal request exceeding 1 MGD, Alabama Power petitions FERC for approval using the applicant information provided to Alabama Power and a properly executed Water Withdrawal Agreement. FERC evaluates the proposed plans, prepares an environmental report of the proposed water withdrawal, and reviews comments submitted by resource agencies and other stakeholders. Once FERC makes a final decision regarding the proposed water withdrawal and a FERC order is issued, Alabama Power either formally authorizes the withdrawer to begin construction and operation or notifies the applicant that the proposed water withdrawal was not approved. Depending on various factors, including staff resources, information requests, interventions, and contested issues, FERC approval can take as little as six months up to several years.

6.6 COMPENSATION FOR WATER WITHDRAWALS

In 1989, Alabama Power adopted a water withdrawal compensation policy for the purpose of ensuring that the withdrawer makes Alabama Power's electric customers whole for the impacts caused by the withdrawal of project waters. The current compensation policy was developed using a pricing method similar to that employed by the USACE and has been accepted by FERC. Furthermore, Alabama Power's water withdrawal compensation method is consistent with OWR's long-term water withdrawal management goals. The compensation method is intended to help offset impacts to hydroelectric energy production at Alabama Power's hydro projects. There are three primary components to the compensation method: (1) Replacement Energy Charge, (2) Storage Value Charge, and (3) Storage Reservation Charge.

6.6.1 REPLACEMENT ENERGY CHARGE

The removal of water from a point upstream of a hydroelectric dam causes a direct loss of energy to all downstream dams, because the water that has been removed will not pass through the turbines. Alabama Power uses an energy budget model to calculate the amount of lost generation based on the magnitude of the withdrawal. The replacement energy cost is based on the highest cost resources operated each day to replace lost hydroelectric generation caused by the water withdrawal. Alabama Power encourages water withdrawers to return as much water as possible by offering a credit against energy charges for any identifiable and verifiable amounts of water returned to the reservoir.

6.6.2 STORAGE VALUE CHARGE

The storage value charge is based on the costs associated with impounding the required volume of water. The storage value of a reservoir is the capability to store an amount of water, making it available for use during periods of low flow in a river. A reservoir's storage capacity is critical to ensuring a reliable and dependable supply of water to meet the needs for which the reservoir was constructed. Without the reservoir, there is no storage value, and without the storage value in the reservoir, there can be no assurance that water will be available for use during low river flow conditions.

6.6.3 STORAGE RESERVATION CHARGE

The storage reservation charge is 10 percent of the storage cost for water not withdrawn but allotted for future withdrawal. The storage reservation charge is a means by which the withdrawer can plan for future growth and ensure that resources are reserved for anticipated future demands. For example, if a water withdrawer has been approved for a 25 MGD withdrawal but only expects to withdraw 10 MGD during a given year, the withdrawer will pay the storage value charge associated with the 10 MGD and 10 percent of the storage value charge for the remaining 15 MGD. The storage reservation charge does not apply to withdrawers with a fixed withdrawal without any future growth.

6.7 CURRENT WATER WITHDRAWALS

Table 6-2 contains a list and Figure 6-1 depicts the locations of the currently known water withdrawals and discharges on or near Harris Reservoir[4]. The list does not include single homeowner withdrawals but rather those of a larger commercial or municipal nature that require a Certificate of Beneficial Use from OWR.

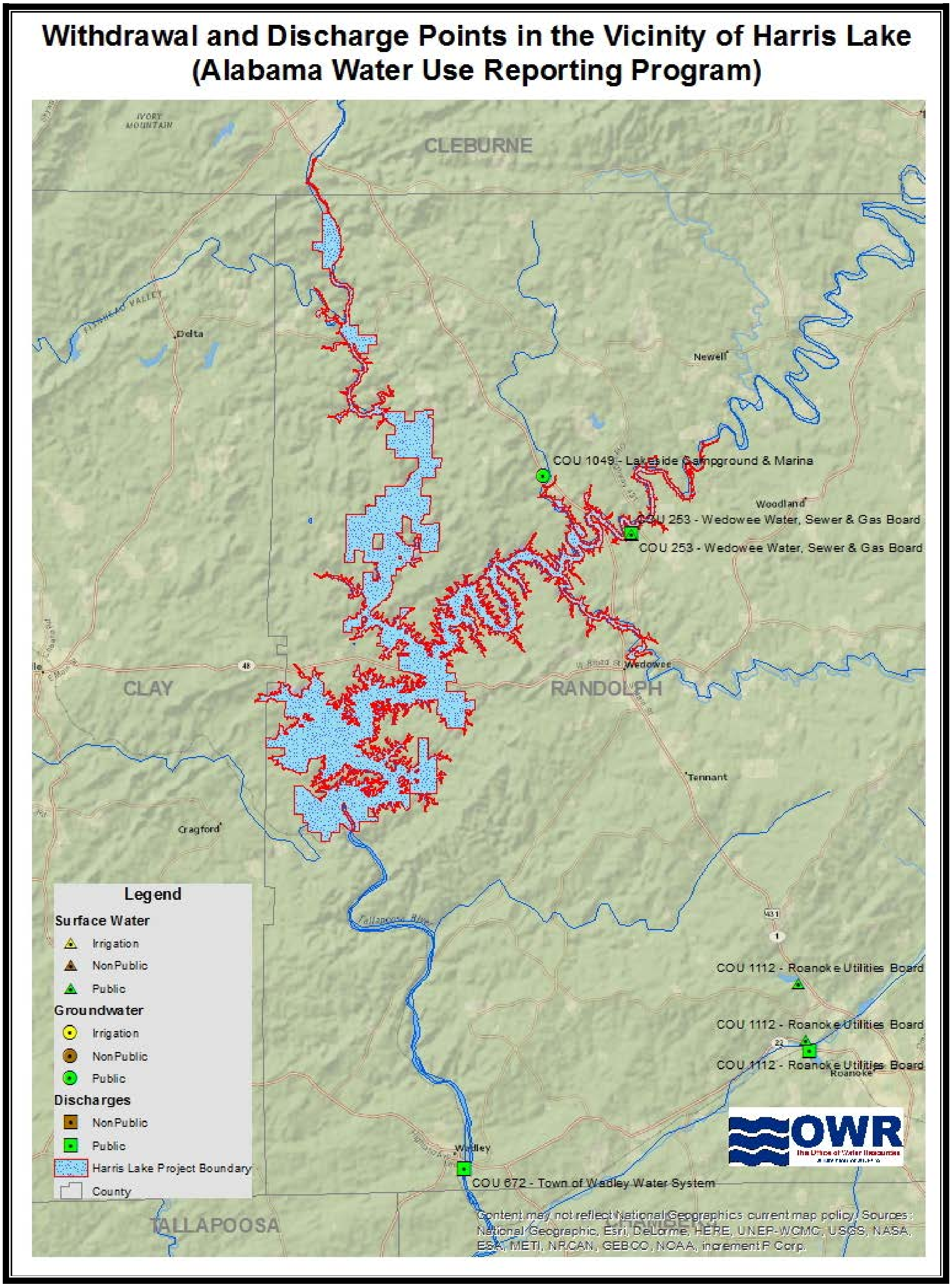
Alabama Power has approved one easement allowing a water withdrawal within the Harris Project Boundary. On April 1, 1988, under the delegated authority provisions of Article 61 of the Harris Project License, Alabama Power granted an easement to the Town of Wedowee-Utility Board, allowing for construction, operation, and maintenance of a new floating water intake system and related facilities. The easement limits the intake to a maximum withdrawal of 0.5 MGD. This withdrawal is used to meet the water supply needs for Northeast Randolph County Service District via the John Swann Water Treatment Plant.

TABLE 6-1 WATER WITHDRAWAL AND DISCHARGES REGISTERED UNDER THE ALABAMA WATER USE REPORTING PROGRAM

Name	Owner	Groundwater/ Surface Water/ Discharge Name	Average Daily (MGD)	Maximum Daily (MGD)
Cohobadiah Creek	Lakeside Campground & Marina	Well No. 1	0.003	0.02
Upper Little Tallapoosa River	Wedowee Water, Sewer & Gas Board	John G. Swann Water Treatment Plant - No. 1	0.411	0.75
Highpine Creek	Roanoke Utilities Board	Roanoke Filter Plant No. 1 - Crystal Lake	0.822	1.96
Highpine Creek	Roanoke Utilities Board	Roanoke Filter Plant No. 2 - Jones Creek Lake	0.000	1.96
Upper Little Tallapoosa River	Wedowee Water, Sewer & Gas Board	Lagoon	0.045	0.15
Hurricane Creek	Town of Wadley Water System	Wadley Lagoon AL0062847	0.123	0.15
Highpine Creek	Roanoke Utilities Board	Roanoke HCR	0.395	3.50

Source: ADECA 2017

[4] There are no current water withdrawals or discharge permits in the Skyline Project Boundary.



Source: ADECA 2017

FIGURE 6-1 WITHDRAWAL AND DISCHARGE POINTS IN THE VICINITY OF HARRIS LAKE

6.8 FUTURE WATER WITHDRAWALS

Demand for water in the Southeastern United States has significantly increased in the past several decades and is expected to continue in the next decade. Several entities responsible for water management in Alabama are pursuing short and long-term solutions to growing concerns regarding water supply and demand. In response to this growing water demand, several processes are in place to resolve long-term water concerns. The outcome of these efforts and negotiations are unknown but are certain to impact water management not only in Alabama but throughout the entire Southeastern United States.

With very little industrial and agricultural use in the Lake Harris area, most of the demand for water results from municipal use. The populations of Randolph and Clay counties are projected to decrease by 2.7 percent and 12.8 percent, respectively, between 2015 and 2040; the population of Cleburne county is projected to increase 3.3 percent (CBER 2017).

7.0 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

The NPDES permit program was created in 1972 by the Clean Water Act to regulate point sources that discharge pollutants to waters of the United States (EPA 2017a). The Environmental Protection Agency (EPA) has authorized state governments to manage the permitting and enforcement activities of the NPDES program. NPDES permits specify numeric limits on the levels of pollutants that can be discharged and contain monitoring and reporting requirements.

EPA has authorized the Alabama Department of Environmental Management (ADEM) to manage the NPDES program in Alabama. Prior to discharging any pollutants into surface waters, an entity must obtain a NPDES permit from ADEM. The permits are issued for a five-year term and may be renewed or administratively extended. The application process requires that the public be notified and allowed to comment. The application requires information such as the purpose of the application, previous permit numbers, business activity, and waste storage and disposal.

The continued operation of the Harris Project requires a NPDES permit (General NPDES Permit Number ALG360017) for the nine existing discharge points at the powerhouse: three for cooling water discharges; two for discharges from sumps and drains; one for plant and unit oil/water separators; one for uncontaminated stormwater; one for uncontaminated stormwater from bulk petroleum secondary containment areas; and one for wastewater resulting from maintenance and repair activities. The permit was reissued effective March 1, 2017 for a period of five years (ADEM 2016).

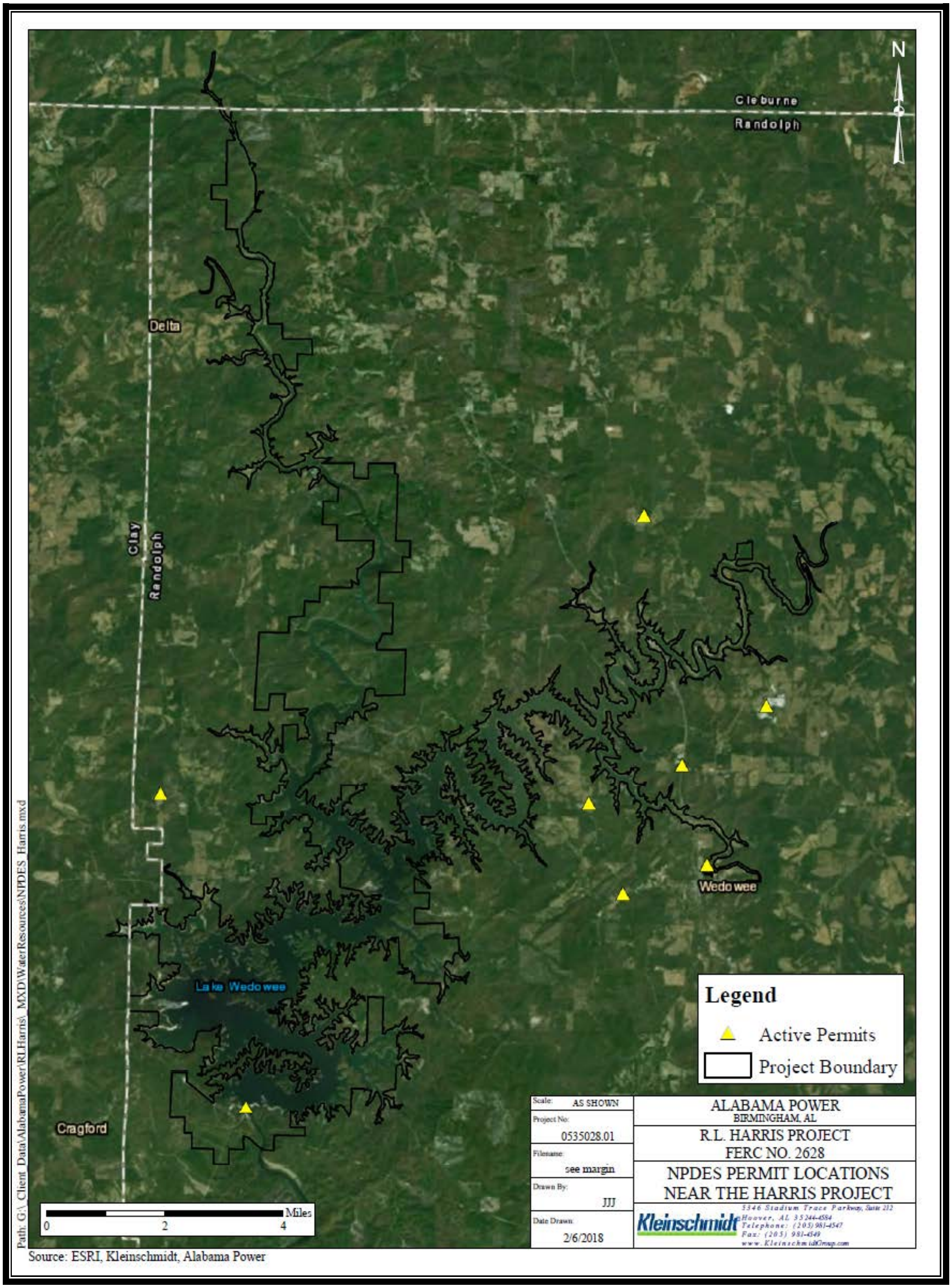
A list of active NPDES permits near the Harris Project is shown in Table 7-1, and the locations of the facilities are shown in Figure 7-1 (EPA 2017b).[5]

[5] There are no NPDES permitted facilities near or within the Skyline WMA.

TABLE 7-1 LIST OF ACTIVE NPDES PERMITS NEAR THE HARRIS PROJECT

Permit Number	Facility Name	City, County	Permit Expiration	Permit Type
ALG360017	Harris Hydroelectric Project	Lineville, Randolph Co.	1/31/2021	General NPDES Permit
ALG110360	Randolph County Concrete, Inc	Wedowee, Randolph Co.	8/31/2022	Minor: General Permit Covered Facility
ALA001178	Kevin Yates Farm	Wedowee, Randolph Co.	2/20/2018	Minor: Individual State Issued Permit (non-NPDES)
ALA000832	Eric Payne Farm	Wedowee, Randolph Co.	10/24/2018	Minor: Individual State Issued Permit (non-NPDES)
ALA000903	Big Mac Farm	Lineville, Clay Co	11/19/2018	Minor: Individual State Issued Permit (non-NPDES)
ALG020182	Wedowee Asphalt Plant*	Wedowee, Randolph Co.	9/30/2022	Minor: General Permit Covered Facility
AL0075191	Wedowee Quarry*	Wedowee, Randolph Co.	10/31/2017	Minor: NPDES Individual Permit
AL0024171	Wedowee Lagoon	Wedowee, Randolph Co.	9/30/2020	Minor: NPDES Individual Permit
ALG890033	Wortham Pit	Newell, Randolph Co.	1/31/2018	Minor: General Permit Covered Facility

Source: EPA 2017b
*At the same location in Figure 7-1.



Source: ESRI, Kleinschmidt, Alabama Power 2018

FIGURE 7-1 NPDES PERMIT LOCATIONS NEAR THE HARRIS PROJECT

8.0 REFERENCES

Alabama Department of Conservation and Natural Resources (ADCNR). 2016b. Wildlife Management Areas. Available at: http://www.outdooralabama.com/wildlife-management-areas. Accessed November 2016.

Alabama Department of Economic and Community Affairs (ADECA). 2013. Alabama Drought Management Plan. ADECA Office of Water Resource. May 22, 2013. http://www.adeca.alabama.gov/Divisions/owr/Documents/ALDroughtPlan.pdf Accessed December 4, 2017.

Alabama Department of Economic and Community Affairs (ADECA). 2015. Harper, M. J., and B. G. Turner. Office of Water Resources. 2010. Estimated use of water in Alabama in 2010. http://adeca.alabama.gov/Divisions/owr/Documents/AL2010Report.pd// Accessed December 5, 2017

Alabama Department of Economic and Community Affairs (ADECA). 2017. Office of Water Resources. Alabama Water Use Reporting Program. http://adeca.alabama.gov/Divisions/owr/watermanagement/Pages/WaterManagement.aspx

Alabama Department of Economic and Community Affairs (ADECA). 2017. Water Management. http://www.adeca.alabama.gov/Divisions/owr/watermanagement/Pages/WaterManagement.aspx. Accessed December 5, 2017.

Alabama Department of Environmental Management (ADEM). 2016. National Pollution Discharge System General Permit Number ALG360017. Alabama Department of Environmental Management, Montgomery, AL.

Alabama Power Company. 2013. Alabama-ACT Drought Response Operations Plan (ADROP) Version 3.3.3. 07-12-2013. Alabama Power Company, Birmingham, AL.

Alabama Power Company. 2018. Pre-Application Document for the Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Center for Business and Economic Research (CBER). 2017. Population Estimates and Projections. University of Alabama. https://cber.cba.ua.edu/edata/est_prj.html Accessed December 5, 2017.

Dieter, C.A., Linsey, K.S., Caldwell, R.R., Harris, M.A., Ivahnenko, T.I., Lovelace, J.K., Maupin, M.A., and Barber, N.L. 2017. Estimated use of water in the United States county-level data for 2015: U.S. Geological Survey data release. https://doi.org/10.5066/F7TB15V5. Accessed December 5, 2017.

Environmental Protection Agency (EPA). 2017a. NPDES Permit Basics. https://www.epa.gov/npdes. Accessed December 5, 2017.

Environmental Protection Agency (EPA). 2017b. EPA Facility Registry Service (FRS): Facility Interests Dataset. https://catalog.data.gov/dataset/epa-facility-registry-service-frs-facility-interests-dataset-download. Accessed December 6, 2017.

Federal Energy Regulatory Commission (FERC). 1973. Order Issuing New License (Major). Federal Energy Regulatory Commission, Washington, D.C. Harris Hydroelectric Project. FERC No. 2628.

United States Army Corps of Engineers (USACE). 2010. Review Plan Alabama-Coosa-Tallapoosa River Basin, Water Control Manual Update and Environmental Impact Statement. USACE South Atlantic Division. Mobile District. 2011.

United States Army Corps of Engineers (USACE). 2011. Drought Contingency Plan for Alabama-Coosa-Tallapoosa River Basin. USACE South Atlantic Division. Mobile District. June 2011.

United States Army Corps of Engineers (USACE). 2013. Master Water Control Manual Alabama-Coosa-Tallapoosa River Basin, Alabama, Georgia. USACE South Atlantic Division. Mobile District. March 2013.

United States Army Corps of Engineers (USACE). 2014. Alabama-Coosa-Tallapoosa River Basin Water Control Manual Appendix I R. L. Harris Dam and Lake (Alabama Power Company) Tallapoosa River, Alabama. December 2014.

APPENDIX A

ALABAMA-ACT DROUGHT RESPONSE OPERATIONS PLAN
NOVEMBER 2016 REVISION

Alabama-ACT Drought Response Operations Plan (ADROP)

Overview

Alabama Power Company (APC) operates eleven hydropower dams in the Alabama-Coosa-Tallapoosa (ACT) River Basin. On the Tallapoosa River, Alabama Power operates the Harris, Martin, Yates and Thurlow hydroelectric dams and their reservoirs. On the Coosa River APC operates the Weiss, Neely Henry, Logan Martin, Lay, Mitchell, Jordan, and Bouldin hydroelectric dams and their reservoirs. The Coosa and Tallapoosa Rivers converge to form the Alabama River at Montgomery, Alabama. Alabama Power operates no reservoirs on the Alabama River, but its upstream operations can impact Alabama River flows and elevations. In addition to requirements contained in Alabama Power's Federal Energy Regulatory Commission ("FERC") licenses for its dams, Alabama Power provides flows to the Alabama River consistent with the U.S. Army Corps of Engineers (USACE) Water Control Manual (WCM) for the ACT river basin.

The Alabama-ACT Drought Response Operations Plan (ADROP) provides a plan for managing APC's reservoirs within the ACT Basin during drought conditions. APC and the Alabama Office of Water Resources (OWR), along with state and federal resource agencies[1], will monitor defined rain and stream flow indicators within the ACT basin. When drought indicators reach specified levels, drought intensity level responses are triggered, resulting in pre-determined incremental reductions or increases of flow from APC's reservoirs.

ADROP provides for three incremental drought intensity level (DIL) and corresponding DIL responses based on the severity of drought conditions. These incremental DIL responses are not rigid but provide a bracketed range of operations allowing for flexibility and smoother transitions in and out of a drought and from level to level. ADROP's drought response triggers are primarily based on past operating experiences and lessons learned during 2007, the current drought of record for the basin. ADROP is a dynamic plan; it may evolve or be expanded in the future as requirements within the basin may shift. Moving forward, any substantive revisions made to ADROP will be made in consultation with OWR and the resource agencies. Any provisions that will affect APC's federal hydropower license requirements will be filed with the FERC for prior approval.

The following provides a snapshot of operations for normal water years, an explanation of ADROP's drought indicators, triggers for each of the three incremental drought response levels, and a summary of operations at each drought response level.

[1] Resource Agencies to be included are US Fish and Wildlife Service (USFWS), Alabama Department of Conservation and Natural Resources (ADCNR), Alabama Department of Environmental Management (ADEM) and US Army Corps of Engineers (USACE).

Normal Conditions

During a normal water year, APC releases a weekly target of 32,480 cubic feet per second-days (a measure of volume) out of Bouldin, Jordan and Thurlow dams into the Alabama River. This release equates to a 7 day average flow target of 4,640 cubic feet per second (cfs).

In accordance with FERC requirements to protect threatened and endangered species downstream of Jordan Dam on the Coosa River, APC provides a minimum continuous flow of 2,000 cfs from July through March. From April 1st through May 31st, in order to provide for recreation and attraction flows for fish spawning, APC releases a continuous base flow of 4,000 cfs for 18 hours per day and an 8,000 cfs pulse flow for the rest of the day. During the month of June, the base and pulse flows are reduced incrementally to a continuous base flow of 2,000 cfs. From April 1st to October 31st, and on weekends and special holidays, additional recreational flows are released from Jordan Dam as scheduled in APC's FERC license guidelines. APC provides a year-round minimum continuous flow release from Thurlow Dam on the Tallapoosa River.

Drought Indicators

Drought indicators are used to describe the onset, magnitude, duration, severity and extent of a drought. Because there is a well-established rain and stream gauging network in the ACT basin, ADROP relies on precipitation and stream flow indicators. Observations of precipitation and stream flow will be used to indicate when the ACT is entering into (or recovering from) a drought. ADROP's precipitation indicator is based on the average of normal monthly rainfall at the following airport rain gages: Rome, Anniston, Shelby County and Montgomery. ADROP's stream flow indicator is based on the U.S. Geological Survey ("USGS") real-time gauging system[2]. USGS gages to be monitored are as follows[3]:

On the Coosa River

- 02397000: Mayo's Bar – Coosa River
- 02397530 State Line, AL/GA – Coosa River
- 02398300: Gaylesville – Chattooga River
- 02399200: Blue Pond – Little River
- 02401390: Ashville - Big Canoe Creek
- 02401000: Crudup – Big Wills Creek
- 02404400: Jackson Shoals – Choccolocco Creek
- 02405500: Vincent - Kelly Creek
- 02407514: Westover – Yellowleaf Creek
- 02406500: Alpine – Talladega Creek
- 02408540: Rockford – Hatchet Creek

On the Tallapoosa River

- 02412000: Heflin – Tallapoosa River
- 02413300: Newell – Little Tallapoosa River
- 02415000: Hackneyville – Hillabee Creek

[2] Real-time data for each of these gages is available on the USGS's National Water Information System website at http://waterdata.usgs.gov/al/nwis/rt.

[3] Gages used as indicators may be added or removed in the future needs.

- 02418230: Loachapoka – Sougahatchee Creek
- 02418760: Chewacla – Chewacla Creek
- 02419000: Tuskegee – Uphapee Creek
- 02419890: Montgomery Water Works, Tallapoosa River

On the Cahaba, Alabama and Tensaw Rivers

- 02425000: Marion Junction – Cahaba River
- 02428400: Claiborne L&D – Alabama River
- 02471019: Mount Vernon – Tensaw River

Precipitation and stream flow indicators are outlined by month in Table 1. The top line shows the combined normal average precipitation at the ACT rainfall gages listed above. The second line shows ranges of flow percentiles that will be used to indicate when the ACT is entering a drought. The third line shows ranges of flow percentiles used to determine when the ACT is emerging from a drought.

ADROP Implementation and Notification

APC continually records and monitors the drought indicators within ADROP for its reservoirs located in the ACT basin for potential and ongoing drought operations. On the first and third Tuesday of each month, APC evaluates the DIL utilizing the ADROP Decision Tool. DIL are further explained below and can also be found in Table 2. The ADROP Decision tool was developed between APC and the Mobile USACE District to implement portions of the WCM into real time operations. The output from the decision tool shows the sum of the DILs that are true along with the corresponding Alabama River flow target. The results from the ADROP Decision Tool and the supporting data are sent to the Mobile USACE District.

As conditions begin to decline, OWR will schedule and facilitate meetings of the Alabama Drought Monitoring & Impact Group (MIG) a subcommittee of the Alabama Drought Assessment and Planning Team (ADAPT). The role of the MIG is to analyze data that reflects past and current drought efforts and to assist with decisions concerning drought declarations levels for the State of Alabama. The MIG is comprised of federal, state, and local agencies and other water resources professionals. During these meetings, APC will discuss current project operations, the results of the ADROP Decision Tool, and future changes to operations. In addition to these scheduled meetings, when a DIL is triggered, APC will provide OWR, USFWS, ADCNR and ADEM with a report containing the latest weather forecast, hydrologic conditions, operations for Coosa and Tallapoosa River projects, and an update of the most recent ADROP Decision Tool. Additionally, APC provides industrial users on the Alabama River the results of the ADROP Decision Tool. These notification paths will continue until the ADROP Decision Tool shows that the basin has returned to normal operations. When normal operations have returned for APC reservoirs, a final communication will be sent to OWR and the resource agencies that drought coordination has ended. APC will continue to participate and provide information to MIG meetings until the OWR declares the State of Alabama has emerged from drought conditions and the MIG meetings will end. At this time, APC and OWR will continue to monitor drought indicators for future drought development.

Explanation of Drought Intensity Level (DIL) Triggers

DIL 1 Trigger: Low Basin Inflows ***or*** *Low Composite Storage* ***or*** *Low State Line Flow*

The trigger for the DIL 1 response is one of the following criteria is met:

- Inflow into the basin is less than the total needed to meet the 7 day average flow target of 4,640 cubic feet per second ("cfs") and to fill APC's reservoirs (see Table 4)
- A basin-wide composite storage equal to or less than drought contingency elevation/volumes (see Figure 1)
- A flow at or below the 7Q10 flows for Rome, Georgia as measured at the Alabama/Georgia state line gage (see Table 5)

DIL 2 Trigger: DIL 1 criteria **+** *(Low Basin Inflows* ***or*** *Low Composite Storage* ***or*** *Low State Line Flow)*

The trigger for the DIL 2 response is two of the criteria in DIL1 are met.

DIL 3 Trigger: Low Basin Inflows **+** *(Low Composite Storage* **+** *Low State Line Flow)*

The trigger for DIL 3 is the combination of DIL 1 criteria and **both** of the following:

- A basin-wide composite storage equal to or less than drought contingency elevation/volumes (see Figure 1)
- A flow at or below the 7Q10 flows for Rome, Georgia as measured at the Alabama/Georgia state line gage (see Table 5)

Explanation of Drought Intensity Level (DIL) Responses

The following explains how flows will change throughout the year at the different drought intensity levels. Table 3 is a matrix of the operational response to drought intensity levels.

Drought Intensity Level 1 Response

- **Coosa River Operations:** From July 1st through March 31st, 2,000 cfs will be released from Jordan Dam. From April 1st through June 15th, 4,000 cfs will be released from Jordan Dam as base flows. From June 15th to July 1st, releases from Jordan Dam will be ramped down to the 2,000 cfs minimum flow. Any inflow into the Coosa River basin in excess of these Jordan Dam minimum releases may be used to refill upstream reservoirs or discharged through Jordan Dam or Bouldin Dam above the corresponding targeted Alabama River release. [4]
- **Tallapoosa River Operations:** From May 1st through December 31st, half of all inflows into Yates Dam will be released from Thurlow Dam. From January 1st through April 30th, the greater of either half the inflows into Yates Dam or two times inflows as

[4] In all drought intensity levels, fish attraction pulses and recreational releases are suspended; however, flows above those needed to fill and meet the base minimum flow may be used for pulsing, recreational or flushing releases.

measured at the Heflin, Alabama gage will be released. During this time, Thurlow Dam releases will be greater than 350 cfs. Any inflow into the Tallapoosa River basin in excess of these Thurlow Dam minimum releases may be used to refill upstream reservoirs or discharged through Thurlow Dam above the corresponding targeted Alabama River release.

- **Alabama River Flows:** A 10% reduction in APC's release into the Alabama River will be in effect from October 1st through April 30th. From May 1st through September 30th, the full targeted release will be maintained.
- **Rule Curve Variances:** APC will seek variances from the USACE and FERC as needed to improve the likelihood of filling APC's reservoirs to full summer pool elevations.

Drought Intensity Level 2 Response

- **Coosa River Operations:** From October 1st through March 31st, flows in a range between 1,600 and 2,000 cfs will be released from Jordan Dam. From April 1st through June 15th, 2,500 cfs will be released from Jordan Dam as base flows. From June 15th to July 1st, releases from Jordan Dam will be ramped down to the 2,000 cfs minimum flow. From July 1st to September 30th, flows will be 2000 cfs. Any inflow into the Coosa River basin in excess of these Jordan Dam minimum releases may be used to refill upstream reservoirs or discharged through Jordan Dam or Bouldin Dam above the corresponding Alabama River release target.
- **Tallapoosa River Operations:** Releases from Thurlow Dam will be 350 cfs from October 1st through April 30th. From May 1st through September 30th, half of the inflows into Yates Dam will be released. Any inflow into the Tallapoosa River basin in excess of these Thurlow Dam minimum releases may be used to refill upstream reservoirs or discharged through Thurlow Dam above the corresponding targeted Alabama River release.
- **Alabama River Flows:** A 20% reduction in APC's targeted release into the Alabama River will be in effect from October 1st through May 31st. From June 1st through September 30th, a 10% reduction in the targeted release will be in effect.
- **Rule Curve Variances:** APC will seek variances from the USACE and FERC as needed to improve the likelihood of filling APC's reservoirs to full summer pool elevations.

Drought Intensity Level 3 Response

- **Coosa River Operations:** From October 1st through November 30th, 1,800 cfs will be released from Jordan Dam. From December 1st through March 31st, 1,600 cfs will be released from Jordan Dam. From April 1st through June 30th, releases from Jordan Dam will be made in a range between 1,600 and 2,000 cfs. From July 1st through September 30th, 2,000 cfs will be released from Jordan Dam. Any inflow into the Coosa River basin in excess of these Jordan Dam minimum releases may be used to refill upstream reservoirs or discharged through Jordan Dam or Bouldin Dam above the corresponding targeted Alabama River release.
- **Tallapoosa River Operations:** From October 1st through June 30th, a flow of 400 cfs will be maintained at the Montgomery Water Treatment Plant. During this time, releases from Thurlow Dam may occasionally be less than 350 cfs. From July 1st through September 30th, 350 cfs will be released from Thurlow Dam. Any inflow into

the Tallapoosa River basin in excess of these Thurlow Dam minimum releases may be used to refill upstream reservoirs or discharged through Thurlow Dam above the corresponding targeted Alabama River release.

- **Alabama River Flows:** From October 1st through April 30th, APC's targeted release will be reduced to an average 2,000 cfs into the Alabama River. During May and June, a 20% reduction in the targeted release will be in effect. From July 1st through September 30th, a 10% reduction in the targeted release will be in effect.
- **Rule Curve Variances:** APC will seek variances from the USACE and FERC as needed to improve the likelihood of filling APC's reservoirs to full summer pool elevations.

Table 1: Indicators

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rain*	**<5.3**	**<5.1**	**<6.1**	**<4.6**	**<4.0**	**<3.9**	**<4.7**	**<3.5**	**<3.6**	**<2.7**	**<4.3**	**<4.7**
Flow**	**10^{th} – 25^{th}**	**10^{th} – 25^{th}**	**10^{th} – 25^{th}**	**10^{th} – 25^{th}**	**10^{th} – 25^{th}**	**<10th**	**<10th**	**<10th**	**<10th**	**10^{th} – 25^{th}**	**10^{th} – 25^{th}**	**10^{th} – 25^{th}**
	50^{th} –75^{th}	**50^{th} –75^{th}**	**50^{th} –75^{th}**	**50^{th} –75^{th}**	**50^{th} –75^{th}**	**25^{th} –50^{th}**	**25^{th} –50^{th}**	**25^{th} –50^{th}**	**25^{th} –50^{th}**	**50^{th} –75^{th}**	**50^{th} –75^{th}**	**50^{th} –75^{th}**

*Average normal rainfall of 4 meteorological stations within ACT Basin
**Lower range of percentiles indicates basin is moving into drought; Upper range of percentiles indicates basin is coming out of drought

Table 2: Drought Intensity Levels Triggers

DIL 1 Trigger	Low Basin Inflows **or** Low Composite Storage **or** Low State Line Flow
DIL 2 Trigger	DIL 1 criteria **+** (Low Basin Inflows or Low Composite Storage **or** Low State Line Flow)
DIL 3 Trigger	Low Basin Inflows + Low Composite Storage + Low State Line Flow

Table 3: Drought Intensity Level Response Matrix[1]

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Drought Intensity Level Triggers	Normal Operations											
	DIL 1: Low Basin Inflows **or** Low Composite Storage **or** Low State Line Flow											
	DIL 2: DIL 1 criteria **+** (Low Basin Inflows **or** Low Composite Storage **or** Low State Line Flow)											
	DIL 3: Low Basin Flows **+** Low Composite Storage **+** Low State Line Flow											
Coosa River Flow[2]	Normal Operations 2000 cfs			4000 (8000)		4000 - 2000	Normal Operations 2000 cfs					
	Jordan 2000 +/- cfs			Jordan 4000 +/- cfs		6/15 Linear Ramp down	Jordan 2000 +/- cfs			Jordan 2000 +/- cfs		
	Jordan 2000 +/- cfs			Jordan 2500 +/- cfs		6/15 Linear Ramp down	Jordan 2000 +/- cfs			Jordan 2000 – 1600 +/- cfs		
	Jordan 1600 +/- cfs			Jordan 1600 - 2000 +/- cfs			Jordan 2000 +/- cfs			Jordan 1800 +/- cfs		Jordan 1600 +/- cfs
Tallapoosa River Flow[3]	Normal Operations 1200 cfs											
	Greater of: ½ Yates Inflow **or** 2 x Heflin Gage (Thurlow releases > 350 cfs)				½ Yates Inflow					½ Yates Inflow		
	Thurlow 350 cfs				½ Yates Inflow					Thurlow 350 cfs		
	Maintain 400 cfs at Montgomery WTP (Thurlow release 350 cfs)						Thurlow 350 cfs			Maintain 400 cfs at Montgomery WTP (Thurlow release 350 cfs)		
Alabama River Flow[4]	Normal Operations 4640 cfs											
	4200 cfs (10% Cut) - Montgomery				4640 cfs - Montgomery					Reduce 4640 cfs – 4200 cfs Montgomery		
	3700 cfs (20% Cut) - Montgomery					4200 cfs (10% Cut) - Montgomery				Reduce: 4200 cfs - 3700 cfs Montgomery (1 Week ramp)		
	2000 cfs Montgomery				3700 cfs Montgomery		4200 cfs (10% Cut) Montgomery			Reduce 4200 cfs - 2000 cfs Montgomery (1 Month ramp)		
Guide Curve Elevation	Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)											
	USACE Variances: As Needed; FERC Variance for Martin											
	USACE Variances: As Needed; FERC Variance for Martin											
	USACE Variances: As Needed; FERC Variance for Martin											

1. **Note these are base flows that will be exceeded when possible**
2. **Jordan flows are based on a continuous +/- 5% of target flow**
3. **Thurlow flows are based on a continuous +/-5% of target flow; Flows are reset on noon each Tuesday based on the prior day's daily average at Heflin or Yates**
4. **Alabama River flows are 7-Day Average Flow**

Table 4: Low Basin Inflows Guide

Month	Coosa Filling Volume	Tallapoosa Filling Volume	Total Filling Volume	Montgomery Flow Target	*Total Basin Inflow Needed
January	628	0	628	4640	5268
February	626	120	747	4640	5387
March	603	2900	3503	4640	8143
April	1683	2585	4269	4640	8909
May	248	0	248	4640	4888
June	0	0	0	4640	4640
July	0	0	0	4640	4640
August	0	0	0	4640	4640
September	-612	-1304	-1916	4640	2724
October	-1371	-2132	-3503	4640	1137
November	-920	-2186	-3106	4640	1534
December	-821	0	-821	4640	3819

- Total Basin Inflow needed is sum of Total Filling Volume + 4640 cfs Release.
- All numbers are in cfs-days.
- Numbers are connected to reservoir rule curves; assumption that all are at top of rule curve elevation.
- When new rule curves are put into effect, numbers will need to be modified.

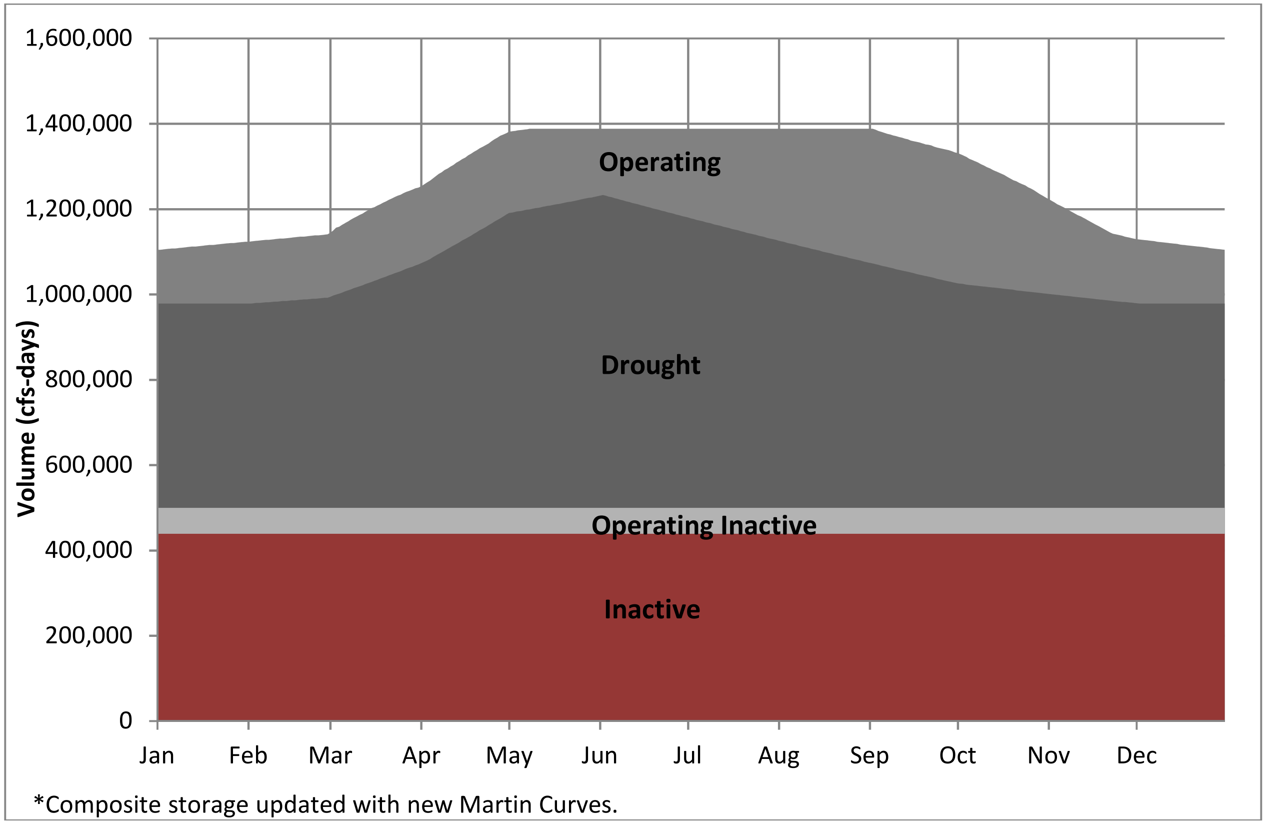
Table 5: Low State Line Flow

A Low State Line Flow occurs, when the Mayo's Bar gage measures a flow below the monthly historical 7Q10 flow. 7Q10 is defined as the lowest flow over a 7 day period that would occur once in 10 years.

Month	Mayo's Bar (cfs-days)
January	2544
February	2982
March	3258
April	2911
May	2497
June	2153
July	1693
August	1601
September	1406
October	1325
November	1608
December	2043

USACE Computation 1949 - 2006

Figure 1: Low Composite Storage



Low Composite Storage occurs when APC composite storage is less than or equal to the storage available within the drought contingency curves for APC's reservoirs. Composite storage is the sum of the amounts of storage available at the current elevation for each reservoir down to the drought contingency curve at each APC plant.

APPENDIX B

GREEN PLAN OPERATIONS

R L HARRIS RELEASE CRITERIA – *Effective March 1, 2005*

1. Daily Release Schedule
    a. The required Daily Volume Release will be at least 75% of the prior day's flow at the USGS Heflin Gauge.
    b. In the event that the Heflin Gauge is not in service, the required Daily Volume Release will be at least one-fourth of the previous day's inflow into R L Harris Reservoir.
    c. The Daily Volume Release will not to be below 100 DSF.
    d. Operations to ensure that flows at Wadley remain above the 45 cfs minimum mark shall continue.
    e. The required Daily Volume Release will be suspended if R L Harris is engaged in flood control operations.
    f. The required Daily Volume Release will be suspended if it jeopardizes the ability to fill R L Harris.
2. Hourly Release Schedule
    a. If less than two machine hours are scheduled for a given day, then the generation will be scheduled as follows:
        i. One-fourth of the generation will be scheduled at 6 AM.
        ii. One-fourth of the generation will be scheduled at 12 Noon.
        iii. One-half of the generation will be scheduled for the peak load.
        iv. If the peak load is during the morning, one-fourth of the generation will be scheduled at 6 PM.
    b. If two to four machine hours are scheduled for a given day, then generation will be scheduled as follows:
        i. Thirty minutes of generation will be scheduled at 6 AM.
        ii. Thirty minutes of generation will be scheduled at 12 Noon.
        iii. The remaining generation will be scheduled for the peak load.
        iv. If the peak load is during the morning, thirty minutes of the generation will be scheduled at 6 PM.
3. Two Unit Operation
    a. On the average, there will be more than 30 minutes between the start times between the two units.
    b. Two units may come online with less than 30 minute difference in their start times if there is a system emergency need.
4. Spawning Windows

    Spring and Fall spawning windows will scheduled as conditions permit. The operational criteria during spawning windows will supersede the above criteria.

R L HARRIS RELEASE CRITERIA – *Effective March 1, 2005*

1. Daily Release Schedule

    a. The required Daily Volume Release will be at least 75% of the prior day's flow at the USGS Heflin Gauge.

    b. In the event that the Heflin Gauge is not in service, the required Daily Volume Release will be at least one-fourth of the previous day's inflow into R L Harris Reservoir.

    c. The Daily Volume Release will not to be below 100 DSF.

    d. Operations to ensure that flows at Wadley remain above the 45 cfs minimum mark shall continue.

    e. The required Daily Volume Release will be suspended if R L Harris is engaged in flood control operations.

    f. The required Daily Volume Release will be suspended if it jeopardizes the ability to fill R L Harris.

DROUGHT 2007-2008 R L HARRIS RELEASE CRITERIA

a. If the flows at Wadley are at or above 100 cfs, there will be one pulse per day, which will result in a Daily Volume Release of approximately 50 DSF.

b. The flows at Wadley will not be lower than the flows at Heflin.

R L HARRIS MINIMUM FLOW PROCEDURE

STEP 1: CREATE SCHEDULE BASED ON PRIOR DAY'S HEFLIN FLOW

Prior Day's Heflin Flow (DSF)	Generation At 6 AM	Generation At 12 Noon	Generation As System Needs	Total Machine Time	R L Harris Total Disch (DSF)
0 < HEFLIN Q < 150	10 MIN	10 MIN	10 MIN	30 MIN	133
150 < HEFLIN Q < 300	15 MIN	15 MIN	30 MIN	1 HR	267
300 < HEFLIN Q < 600	30 MIN	30 MIN	1 HR	2 HRS	533
600 < HEFLIN Q < 900	30 MIN	30 MIN	2 HRS	3 HRS	800
900 < HEFLIN Q	30 MIN	30 MIN	3 HRS	4 HRS	1,067

STEP 2: ADD ADDITIONAL PEAK GENERATION AS NEEDED

STEP 3: ADJUST SCHEDULE IF NECESSARY

TOTAL SCH GENERATION	Generation At 6 AM	Generation At 12 Noon	Generation As System Needs	Total Machine Time	R L Harris Total Disch (DSF)
IF GENERATION = 1 MACH HR	15 MIN	15 MIN	30 MIN	1 HR	267
IF GENERATION = 2 MACH HRS	30 MIN	30 MIN	1 HR	2 HRS	533
IF GENERATION = 3 MACH HRS	30 MIN	30 MIN	2 HRS	3 HRS	800
IF GENERATION = 4 MACH HRS	30 MIN	30 MIN	3 HRS	4 HRS	1,067
IF GENERATION = 5+ MACH HRS			ALL		

NOTES

1. SCHEDULING OF GENERATION DOES NOT PRECLUDE THE ADDITION OF GENERATION AT ANY TIME.

2. ALL START TIMES ARE APPROXIMATE.

3. WHEN PULSING, IF THE SYSTEM DOES NOT DICTATE GENERATION DURING THE PM, A PULSE WILL BE SCHEDULED AT 6 PM.

4. R L HARRIS MIN FLOW PROCEDURE WILL BE SUSPENDED DURING ANY OF THE FOLLOWING CONDITIONS:
   A) TALLAPOOSA RIVER HAS BEEN PLACED UNDER FLOOD CONTROL OPERATIONS.
   B) FISH SPAWNING OPERATIONS HAVE BEEN SCHEDULED.
   C) APC HAS DECLARED THAT CONDITIONS EXIST THAT THREATEN THE SPRING FILLING OF R L HARRIS RESERVOIR.

APPENDIX C

NON-RESIDENTIAL PERMIT APPLICATION PROCESS

General Guidelines for Non-Residential Use of Project Lands and Waters

The following general guidelines are for non-APC structures and facilities intended to serve non-residential operations, generate revenue, etc., on Alabama Power Company's project lands and waters, including, but not limited to public marinas, restaurants, apartments and other rental properties, overnight campgrounds, bed and breakfasts, etc. These guidelines apply to new and existing developments where proposed additions, modifications, repairs, etc., require a new permit. They do not attempt to address every specific situation that may exist on a reservoir, but are provided as general guidelines to assist landowners in their decision to build.

These guidelines represent the maximum allowances Alabama Power will consider. Alabama Power may reduce or deny proposed development within the project boundary to comply with the Federal Energy Regulatory Commission (FERC) license requirements, purposes and operations.

ALABAMA POWER COMPANY RESERVES THE RIGHT TO MAKE EXCEPTIONS AND MODIFICATIONS TO THESE GUIDELINES AT ANY TIME AND AT ITS SOLE DISCRETION.

These general guidelines are implemented by Alabama Power Company to allow it to provide for orderly and reasonable shoreline management of its reservoirs, recognizing that peculiarities in shorelines and property lines exist on the reservoirs and may require flexibility on the part of Alabama Power and/or landowners.

PERMIT PROCESS

Per Alabama Power's FERC licenses, agency consultation and FERC authorization are required before Alabama Power can permit certain non-residential facilities located in project lands and waters. **Absolutely no construction, earthmoving, or other work may be started on, within or partially within the project boundary prior to Alabama Power issuing a permit.**

Alabama Power will evaluate permit applications under the following guidelines:

GENERAL SITE CONDITIONS

1. Required shoreline - 100 feet, minimum

2. Side lot line setback - 25 feet, minimum

STRUCTURE DIMENSIONS

1. Total Footprint Area – 1000 square feet, maximum, per 100 feet of shoreline

The Total Footprint Area includes the deck surface area of all structures (docks, piers, boat slip fingers, swim platforms, etc.) plus the water surface area occupied by vessels. Alabama Power may permit additional square footage for General Public Marinas, if also approved through the FERC process.

2. Boat slip wet dimensions (open water area only) – Will be evaluated during the non-residential permit application process. Dimension maximums must be consistent with those necessary to moor boats meeting current state law.

3. Length of structure into lake – lesser of 150 feet or 1/4 the distance across local water. General Public Marinas may exceed this length if approved by APC through the FERC process.

4. Spacing between multiple docks on the same property – 50 feet, minimum

5. Requests for additional deck area for swim platforms or other activities will be reviewed for approval on a case-by-case basis, subject to the total footprint area limit.

OTHER

1. Boat lifts and canopies may be allowed in marinas but are not allowed in other non-residential developments.

2. Causeways are not allowed.

3. Docks, boat slips, piers, etc., may be floating or fixed.

4. Floatation shall be encased or closed cell (extruded) expanded polystyrene of good quality and manufactured for marine use which will not become waterlogged or sink when punctured. No structures may be constructed with un-encapsulated white beaded foam.

ATTORNEYS' FEES

By accepting a Nontransferable Lakeshore Use Permit ("Permit") and agreeing to the terms of the Permit, you agree and acknowledge that the Company has a right to request, and you have an obligation to pay any and all attorneys' fees, expenses, and/or costs incurred by the Company relating to the enforcement of the rules, regulations, provisions, terms and/or conditions of the Permit, including, without limitation, any and all attorneys' fees, expenses, and costs incurred by the Company relating to remedying any action, construction or activity that is not in compliance with the terms of the Permit, whether caused by you, your family members, guests, agents, employees and/or contractors.

Permittee Statement: I have received, read, understand and agree to abide by these General Guidelines for Non-Residential Use of Project Lands and Waters.

Signed: ____ Date: ___________________
Permittee

General Guidelines for Multiple Single-Family Type Dwelling Use of Project Lands and Waters

The following general guidelines are for community piers, landings, boat docks or similar structures and facilities intended to serve non-commercial multiple single-family type dwellings on Alabama Power Company's project lands and waters, including but not limited to condominiums, subdivisions, campgrounds that offer yearly leases, etc. These guidelines apply to new and existing developments where proposed additions, modifications, repairs, etc., require a new permit. They do not attempt to address every specific situation that may exist on a reservoir, but are provided as general guidelines to assist landowners in their decision to build.

These guidelines represent the maximum allowances Alabama Power will consider. Alabama Power may reduce or deny proposed development within the project boundary to comply with Federal Energy Regulatory Commission (FERC) license requirements, purposes and operations.

ALABAMA POWER COMPANY RESERVES THE RIGHT TO MAKE EXCEPTIONS AND MODIFICATIONS TO THESE GUIDELINES AT ANY TIME AND AT ITS SOLE DISCRETION.

These general guidelines are implemented by Alabama Power Company to allow it to provide for orderly and reasonable shoreline management of its reservoirs, recognizing that peculiarities in shorelines and property lines exist on the reservoirs and may require flexibility on the part of Alabama Power and/or landowners.

PERMIT PROCESS

Per Alabama Power's FERC licenses, Alabama Power, without consultation or review by others, may permit facilities that can accommodate up to a total of 10 watercraft on one property.

Agency consultation and FERC authorization are required before Alabama Power can permit certain facilities that can accommodate more than a total of ten watercraft, at one property. **Absolutely no construction, earthmoving, or other work may be started on, within or partially within the project boundary prior to Alabama Power issuing a permit.**

Alabama Power will evaluate permit applications under the following guidelines:

GENERAL SITE CONDITIONS

1. Required shoreline - 100 feet, minimum

2. Side lot line setback - 25 feet, minimum

STRUCTURE DIMENSIONS

1. Total Footprint Area – 1000 square feet, maximum, per 100 feet of shoreline

The Total Footprint Area includes the deck surface area of all structures (docks, piers, boat slip fingers, swim platforms, etc.) plus the water surface area occupied by vessels.

2. Boat slip wet dimensions (open water area only) – Will be evaluated during the application process. Dimension maximums must be consistent with those necessary to moor boats meeting current state law.

3. Length of structure into lake – lesser of 150 feet or 1/4 the distance across local water

4. Spacing between multiple docks on the same property – 50 feet, minimum

5. Requests for additional deck area for swim platforms or other activities will be reviewed for approval on a case-by-case basis, subject to the total footprint area limit.

6. Causeways are not allowed.

OTHER

1. Boat lifts, roofs and canopies are not allowed.

2. Docks, boat slips, piers, etc., may be floating or fixed.

3. Floatation shall be encased or closed cell (extruded) expanded polystyrene of good quality and manufactured for marine use which will not become waterlogged or sink when punctured. No structures may be constructed with un-encapsulated white beaded foam.

ATTORNEYS' FEES

By accepting a Nontransferable Lakeshore Use Permit ("Permit") and agreeing to the terms of the Permit, you agree and acknowledge that the Company has a right to request, and you have an obligation to pay any and all attorneys' fees, expenses, and/or costs incurred by the Company relating to the enforcement of the rules, regulations, provisions, terms and/or conditions of the Permit, including, without limitation, any and all attorneys' fees, expenses, and costs incurred by the Company relating to remedying any action, construction or activity that is not in compliance with the terms of the Permit, whether caused by you, your family members, guests, agents, employees and/or contractors.

Permittee Statement: I have received, read, understand and agree to abide by these General Guidelines for Multiple Single-Family Type Dwelling use of Project Lands and Waters.

Signed: ____ **Date:** ___________________
Permittee

APPENDIX F

FISH AND AQUATIC RESOURCES

1. 2018 DESKTOP FISH ENTRAINMENT AND TURBINE MORTALITY REPORT

1. 2018 DESKTOP FISH ENTRAINMENT AND TURBINE MORTALITY REPORT

DESKTOP FISH ENTRAINMENT AND TURBINE MORTALITY REPORT

R.L. HARRIS HYDROELECTRIC PROJECT

FERC NO. 2628

Prepared for:

ALABAMA POWER COMPANY

BIRMINGHAM, ALABAMA

Prepared by:

Kleinschmidt

March 2018

ALABAMA POWER COMPANY
BIRMINGHAM, ALABAMA

R. L. HARRIS HYDROELECTRIC PROJECT
FERC NO. 2628

DESKTOP FISH ENTRAINMENT AND TURBINE MORTALITY REPORT

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DESKTOP FISH ENTRAINMENT AND TURBINE MORTALITY STUDY REPORT

1.0 INTRODUCTION

Alabama Power Company (Alabama Power) is initiating the Federal Energy Regulatory Commission (FERC) relicensing of the 135-megawatt (MW) R.L. Harris Hydroelectric Project (Harris Project), FERC Project No. 2628. The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources. These structures, lands, and water are enclosed within the FERC Project Boundary. Under the existing Harris Project license, the FERC Project Boundary encloses two distinct geographic areas, described below.

Harris Reservoir is the 9,870-acre reservoir (Harris Reservoir) created by the R.L. Harris Dam (Harris Dam). Harris Reservoir is located on the Tallapoosa River, near Lineville, Alabama. The lands adjoining the reservoir total approximately 7,392 acres and are included in the FERC Project Boundary. This includes land to 795 feet mean sea level (msl)[1], as well as natural undeveloped areas, hunting lands, prohibited access areas, recreational areas, and all islands.

The Harris Project also contains 15,063 acres of land within the James D. Martin-Skyline Wildlife Management Area (Skyline WMA) located in Jackson County, Alabama. These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigative Plan and Wildlife Management Plan. These lands are leased to, and managed by, the State of Alabama for wildlife management and public hunting and are part of the Skyline WMA (ADCNR 2016b).

For the purposes of this technical report, “Lake Harris” refers to the 9,870-acre reservoir, adjacent 7,392 acres of project land, and the dam, spillway, and powerhouse. “Skyline” refers to the 15,063 acres of Project land within the Skyline WMA in Jackson County. “Harris Project” refers to all the lands, waters, and structures enclosed within the FERC Project Boundary, which includes both Lake Harris and Skyline. “Harris Reservoir” refers to the 9,870-acre reservoir only; Harris Dam refers to the dam, spillway, and powerhouse. The “Project Area” refers to the land and water in the Project Boundary and immediate geographic area adjacent to the Project Boundary (Alabama Power Company 2018).

Lake Harris and Skyline are located within two river basins: the Tallapoosa and Tennessee River Basins, respectively. The only waterbody managed by Alabama Power as part of their FERC license for the Harris Project is the Harris Reservoir.

[1] Also includes a scenic easement (800-feet msl or 50-horizontal-feet from 793-feet msl, whichever is less, but never less than 795-feet msl)

To support the relicensing process and provide baseline information for the Pre-Application Document (PAD), Kleinschmidt Associates (Kleinschmidt) conducted a desktop analysis and prepared this report to address fish entrainment and turbine mortality for the Harris Project.

During operation, most hydropower plants generate electricity by converting the potential energy of water from a reservoir above a dam into mechanical energy as the water spins the blades of a turbine connected to a generator. The amount of electricity generated depends on the head, which is the difference in height between the water in the reservoir above the dam and the elevation of the river below the dam. As hydropower dams operate, some of the fish present in the reservoir are entrained or passed through the turbine. In most cases, these fish are passed into the river below unharmed; however, some may be injured or killed due to strikes from turbine blades or rapid pressure changes.

Numerous field studies during the 1980s and early 1990s documented fish entrainment and turbine mortality trends at hydropower plants throughout the United States. These data were subsequently compiled into a comprehensive database of fish entrainment information by the Electric Power Research Institute (EPRI 1992). Since the mid-1990s, the transfer of fish entrainment rate information from project to project utilizing the EPRI database has been widely accepted by state and federal resource agencies (including FERC, the United States Fish and Wildlife Service, and the National Marine Fisheries Service) as a means of providing desktop estimates of fish entrainment. In a similar fashion, the estimated turbine-induced mortality rates (based on mortality studies for similar type turbines) are applied to the fish entrainment estimates to determine potential fish mortality and project-related impacts to the local fisheries resources (FERC 1995). A few of the agency-accepted examples of these desktop assessments include the:

- *Coosa and Warrior Hydroelectric Projects Desktop Fish Entrainment and Turbine Mortality Analysis* (Kleinschmidt Associates 2003)
- *Claytor Hydroelectric Project Fish Entrainment and Impingement Desktop Assessment* (Normandeau Associates, Inc. 2009)
- *Saluda Hydro Project Desktop Fish Entrainment and Turbine Mortality Report* (Kleinschmidt Associates 2007)

In preparing this report, Alabama Power used the same desktop assessment methodologies that resource agencies have agreed to in previous studies at other hydroelectric projects in the southeast.

2.0 PROJECT DESCRIPTION

Harris Reservoir is located within the Tallapoosa River Basin. The Harris Reservoir extends up the Tallapoosa River approximately 29 miles from the Harris Dam with approximately 367 miles of shoreline. The reservoir surface area is approximately 9,870 acres at normal full pool elevation of 793 feet mean sea level (msl), and has a mandatory 8-foot drawdown to 785 feet msl from December to April. The normal tailwater elevation with one-unit operating is 664.93 feet msl; with two units operating, it is 667.71 feet msl. The gross storage capacity of Harris Reservoir is approximately 425,721 acre-feet and the usable storage capacity is approximately 207,317 acre-feet.

The Harris Dam consists of a concrete gravity dam, powerhouse, and spillway totaling 1,142 feet long with a maximum height of 151.5 feet. The dam has five radial gates for passing floodwaters in excess of turbine capacity and one radial trash gate. Each radial gate measures 40 feet 6 inches high and 40 feet wide.

The Harris powerhouse is a concrete structure and is integral with the intake facilities. It houses two flow units totaling 135 MW. There are two vertical generators each rated at 71,740 Kilovolts (kV) and two vertical Francis turbines each rated at 95,000 horsepower (hp) under a net head of 121 feet and a maximum hydraulic capacity of 8,000 cubic feet per second (cfs). Harris Project intake structures are located at 746 feet msl and are equipped with a skimmer weir that can incrementally raise the effective intake elevation approximately 18 feet to a maximum of approximately 764 feet msl.

3.0 METHODOLOGY

The following sections detail the steps taken to calculate the potential annual estimated fish entrainment and potential turbine-induced mortality for the Harris Project.

3.1 ENTRAINMENT

Fish entrainment for the Harris Project was assessed through a desktop study to provide an order-of-magnitude estimate of potential fish entrainment using existing literature and site-specific information. The primary steps in this analysis are listed below:

- Obtain literature with fish entrainment information that would contribute to a site-specific entrainment database.
- Define the subset of studies that form the entrainment database to be applied to the Harris Project.
- Use the entrainment database to develop potential fish entrainment rates as a function of fish/unit flow volume, species composition, and size classes.
- Estimate the average monthly turbine flows for the Harris Project.
- Estimate the number, species composition, and size of fish potentially entrained through the Harris Project.

3.1.1 DEFINE THE ENTRAINMENT DATABASE

Over 60 site-specific desktop analyses that provide order-of-magnitude estimates of annual resident fish entrainment at hydroelectric sites in the United States have been reported by FERC (1995) (Appendix A). These studies were primarily derived from the 1992 EPRI report entitled *Fish Entrainment and Turbine Mortality Review and Guidelines*. The EPRI Report includes descriptive information gathered from each entrainment study, included below:

1. Project name and FERC project number
2. Location: state and river
3. Project size: discharge capacity and power production
4. Physical project characteristics (e.g., trash rack spacing, intake velocity)
5. Project operation (e.g., peaking, run-of-river)

6. Biological factors: fish species composition
7. Impoundment characteristics: general water quality, impoundment size, and flow regime

Kleinschmidt assembled this information into a screening matrix of data that could potentially be used for this study. Many entrainment reports are available on a national level, but not all studies are applicable to the Harris Project given the differences in project features, fish assemblages, and other parameters. Specific studies were selected from the screening matrix that were most applicable to the Harris Project. Criteria used in selecting specific studies were as follows:

1. Similar geographical location, with preference given to projects located in the same eco-region
2. Similar station hydraulic capacity
3. Similar station operation
4. Biological similarities: fish species, assemblage, and water quality
5. Availability of entrainment data – netting or hydro-acoustics

3.1.2 FISH ENTRAINMENT RATES

Monthly fish entrainment rates for the Harris Project were based on monthly entrainment estimates available from the entrainment database studies. Typically, these rates were reported in fish per hour of sampling. To standardize the data from the database projects and apply them to the Harris Project, the fish per hour rates were converted to an entrainment density of fish per million cubic feet (mcf) of water that was passed through the turbine. The conversion was based on turbine size (hydraulic capacity in cfs, adjusted to cubic feet per hour) in the original study and the hours of sampling (fish per hour). Entrainment rates are presented in mcf for ease in comparison.

The total number of fish entrained by month for the Harris Project was calculated by multiplying the monthly fish entrainment rate (fish per mcf of water) by the monthly volume of water estimated to pass through the turbines of the Harris Project (mcf of water per month). The total number of fish entrained by season was the sum of the total number of fish entrained per month for each season.

3.1.3 SPECIES COMPOSITION AND LENGTH FREQUENCY ANALYSIS

Species composition data for Harris Reservoir, based on existing fisheries surveys, was compared to species composition of potential source studies to identify entrainment data that most closely matched the local fish community. Due to geographic differences among the species present, the species composition data were grouped by family to produce a percentage for each fish family by season. The Centrarchid family was divided into Bass and Sunfish genera because of differences in body morphology type. The total number of entrained fish for each season was multiplied by family percent composition and then converted to a percentage to calculate the total number of fish entrained within each family group by season.

Length frequency data from the selected entrainment study was used to estimate the size of fish potentially entrained at the Harris Project. The size composition data for each entrained family group is represented as a percentage from the selected entrainment study for each season to produce length frequency distributions of observed entrainment. These data were grouped by small (1-149 millimeters [mm]) and large (150-900 mm) size classes, family group, and season to produce length frequency distributions of observed entrainment. The data were then summed across family groups to produce length distribution by season. Length frequency data are summarized in Appendix B. Each seasonal family group entrainment estimate was multiplied by the corresponding length frequency distribution percentage to calculate the estimated number of entrained fish for each length group (small or large).

3.2 TURBINE MORTALITY

Turbine characteristics of the Harris Project were compared to those of source studies to identify appropriate turbine mortality rates. Since the Harris Project is equipped with two vertical Francis units, studies from the turbine mortality database were separated based on whether they were performed at sites with Francis or Kaplan-type turbines. The sites were then sorted based on the following characteristics: head, runner diameter, and runner speed. Information on each turbine mortality study is provided in Appendix C. The study information contained in Appendix C includes (where available): species tested, size class/range tested, number of fish tested (test and control), and survival results. The study information is sorted by species tested. Study sites were initially accepted based on turbine design, availability of sufficient turbine descriptions, and species/family types relevant to the Harris Project. Other screening criteria included operating head and availability of 48-hour post testing survival data.

3.3 CALCULATION OF TURBINE MORTALITY ESTIMATE

For purposes of this report, fish mortality is defined as turbine interaction with a fish that results in death of the fish. Mortality rates selected for the Harris Project were sorted by family groups consistent with those used to estimate entrainment rates. Once sorted, the mortality rate from each family group tested was averaged among source studies to estimate turbine mortality for each family group. Turbine mortality was estimated by multiplying the mortality rate of each family group by the seasonal entrainment estimates for that same family group.

4.0 RESULTS AND DISCUSSION

4.1 FISH ENTRAINMENT RATE

Table 3-1 depicts the projects initially considered as study sources for the Harris Project. Although two projects are located north of Alabama, the similarities of the projects' infrastructures justified their initial selection.

TABLE 3-1: SUMMARY OF STUDY PROJECTS CONSIDERED FOR THE HARRIS PROJECT ENTRAINMENT STUDY

PROJECT NAME	STATE	RIVER	TURBINE CAPACITY (cfs)	MODE OF OPERATION	FISHERY TYPE	ENTRAINMENT SAMPLING (Full or Partial Netting)
Harris	**AL**	**Tallapoosa**	**16,000**	**Peaking**	**Warm**	**N/A**
Richard B. Russell	GA/SC	Savannah	60,000	Peaking	Warm	Full
Hawks Nest	OH/KY	New	11,866	Peaking	Warm	Partial
Hardy	MI	Muskegon	37,500	Pulsed	Cool	Partial

Upon further screening, studies were excluded if: (1) peaking was not the primary form of operation, (2) the site lacked similar species composition, or (3) the site lacked full draft-tube netting data; this is generally considered to be a more reliable method to obtain accurate estimates (EPRI 1992). Using these criteria, the Richard B. Russell (RBR) Project was selected as the most appropriate project to use for the Harris Project study (Table 3-2). The RBR Project is a large mainstem storage project located on the Savannah River in Georgia. The lake stratifies annually, has a standard southeastern fisheries species composition (family groups), is operated on a daily peaking basis similar to the Harris Project, and has extensive entrainment information available.

TABLE 3-2: COMPARISON OF STUDY PROJECT CHOSEN COMPARED TO HARRIS PROJECT

PROJECT NAME	STATE	RIVER	TURBINE CAPACITY (cfs)	MODE OF OPERATION	FISHERY TYPE	ENTRAINMENT SAMPLING (Full or Partial Netting)
Harris	**AL**	**Tallapoosa**	**16,000**	**Peaking**	**Warm**	**N/A**
Richard B. Russell	GA/SC	Savannah	60,000	Peaking	Warm	Full

Average monthly entrainment density for the RBR Project ranged from 0.3 fish per mcf (June) to 33.6 fish per mcf (February) (Table 3-3).

TABLE 3-3: MEAN MONTHLY FISH ENTRAINMENT RATES FROM THE RICHARD B. RUSSELL PROJECT USED FOR THE HARRIS PROJECT ENTRAINMENT ANALYSIS

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6.8	33.6	1.0	1.2	0.5	0.3	0.5	1.3	0.6	0.4	2.6	1.1

Note: Figures are measurements of fish per million cubic feet

4.2 Estimated Total Number of Fish Entrained by Month and Season

Using the average data from the RBR Project entrainment study, the estimated total number of fish entrained annually at the Harris Project is 294,427 fish, with approximately 90 percent of all entrainment occurring in the winter season (Table 3-4). The peak month of entrainment is estimated to be February with 211,878 total fish entrained; this is associated with high Clupeid entrainment at the RBR Project during cold weather. The lowest total entrainment is expected to occur in June with 730 total fish entrained.

Table 3-4: Estimated Number of Fish Entrained at the Harris Project Based on Projected Maximum Project Generation

	Month	Seasonal Entrainment Rate (fish/mcf*)	Total Monthly Project Flows (mcf*)	Total Estimated Fish Entrained by Month	Total Estimated Number of Fish Entrained by Season
Winter	December	1.1	6,361	6,998	
	January	6.8	6,614	44,972	263,848
	February	33.6	6,306	211,878	
Spring	March	1.0	7,747	7,747	
	April	1.2	4,764	5,717	15,573
	May	0.5	4,218	2,109	
Summer	June	0.3	2,433	730	
	July	0.5	2,159	1,080	3,714
	August	1.3	1,465	1,904	
Fall	September	0.6	1,463	863	
	October	0.4	2,600	1,092	11,292
	November	2.6	3,619	9,337	
				Total	**294,427**

*mcf = million cubic feet

4.3 Estimated Total Number of Fish Entrained and Length Frequency for Each Family Group

When comparing family groups between Harris and RBR, a difference in family composition was observed. Gar species, walleye, and yellow perch are not known to occur in the Harris Reservoir; therefore, the percent entrainment for Percids and Lepisosteids (which was very low) was divided proportionally among the other family/genus groups.

Seasonal percent composition information for each family group used in species composition calculations is presented in Table 3-5. The estimated seasonal total number of fish for each family group in the Harris Project is presented in Table 3-6. This calculation applied the seasonal entrainment estimates (Table 3-5) to the seasonal family composition data (Table 3-6) to produce a seasonal total for each family group. For the Harris Project, Clupeids were the most entrained family in all seasons.

The estimated numbers of entrained fish in each length frequency group (small or large) for each family group are presented in Table 3-7. The total number of small and large fish estimated to be entrained annually at the Harris Project was 241,911 and 52,516 fish, respectively. Most Clupeids, Cyprinids, Ictalurids and Sunfish estimated to be entrained were small and most Catostomids and Bass were large.

TABLE 3-5: SEASONAL PERCENT COMPOSITION OF EACH FAMILY OF ENTRAINED FISH AT THE HARRIS PROJECT

Family/Genus Group	Winter	Spring	Summer	Fall
Catostomidae	0.01	0.06	0.03	0.00
Sunfish	0.18	9.50	12.59	1.40
Bass	0.00	0.33	0.06	0.05
Clupeidae	96.17	87.65	83.70	79.04
Cyprinidae	0.11	0.99	0.59	0.60
Ictaluridae	3.53	1.47	3.03	18.91
Total	**100**	**100**	**100**	**100**

TABLE 3-6: ESTIMATED SEASONAL NUMBER OF ENTRAINED FISH BY FAMILY/GENUS GROUP AT THE HARRIS PROJECT

Family/Genus Group	Winter	Spring	Summer	Fall	Total
Catostomidae	18	9	1	0	28
Sunfish	461	1,479	468	158	2566
Bass	5	51	2	5	63
Clupeidae	253,752	13,649	3,108	8,926	279,435
Cyprinidae	287	154	22	68	531
Ictaluridae	9,324	231	113	2,136	11,804
Total	**263,847**	**15,573**	**3,714**	**11,293**	**294,427**

TABLE 3-7: ESTIMATED SEASONAL NUMBER OF FISH ENTRAINED, BY FAMILY/GENUS GROUP FOR LENGTH FREQUENCY AT THE HARRIS PROJECT

Family/Genus Group	Size[1]	Winter	Spring	Summer	Fall	Total
Catostomidae	Small	3	0	0	0	3
Catostomidae	Large	15	9	1	0	25
Sunfish	Small	316	1,346	422	92	2176
Sunfish	Large	145	133	46	66	390
Bass	Small	0	11	1	0	12
Bass	Large	5	40	1	5	51
Clupeidae	Small	214,178	10,930	2,152	5,161	232,421
Clupeidae	Large	39,574	2,719	956	3,765	47,014
Cyprinidae	Small	250	140	15	51	456
Cyprinidae	Large	37	14	7	17	75
Ictaluridae	Small	5,162	82	57	1,542	6,843
Ictaluridae	Large	4,162	149	56	594	4,961
Total		**263,847**	**15,573**	**3,714**	**11,293**	**294,427**

Note: [1]Presented in two length groups:
small 0-150 mm length
large 151-900 mm length

4.4 TURBINE CHARACTERISTICS AND FISH MORTALITY

The most frequently cited significant mortality factors relating to the hydraulic passage environment for Francis and Kaplan runners are runner speed, peripheral runner velocity, and cavitation (Semple 1979; Ruggles and Palmeter 1989; Cada 1990; EPRI 1992). For a given turbine size, the faster the runner rotates, the opening through which the fish must pass is clear less often. Thus, revolutions per minute (rpm) indicate the frequency and duration of the opening between the turbine and the unit housing through which the fish pass. Project head directly affects turbine mortality by dictating Francis turbine design and operating characteristics, such as peripheral runner velocity and cavitation, which in turn are believed to directly affect fish survival. Literature suggests that for large fish, size of wicket gates, number of blades, and guide vane clearances may be the most important mortality factors, along with operating efficiency (EPRI 1992). While larger fish stand the greatest chance of experiencing mortality due to collision with turbine hardware such as blades (Cada 1990), smaller fish are less likely to strike gates and stay vanes but are more prone to runner injury and hydraulically-related mortality, such as cavitation (Eicher 1987).

The Harris Project contains two vertical Francis turbines inside the powerhouse. Each unit has a head of 121 feet[2] and rotation speed of approximately 106 rpm. The runner diameter for each unit is 209 inches. Many studies summarized in the EPRI (1997) database utilize Francis type turbines and were potential source studies for estimating fish mortality for the Harris Project

[2] Net operating head at full pool was used not for calculations but for a screening tool to find similar sites.

(Table 3-8[3]). Of these, five were identified for use in the mortality estimates based on similar turbine parameters (head, runner speed, runner diameter, peripheral runner velocity).

Operating head for source studies applied to the Harris Project ranged from 28 feet to 153 feet (Table 3-9). Turbine sizes ranged in diameter from 51 inches to 135 inches, and runner speeds ranged from 75 rpm to 300 rpm for source studies. The operating head of the Harris Project is relatively low compared to the selected mortality source studies; turbine speeds were intermediate relative to the source studies. These source studies provide reasonable estimates of turbine mortality for this study based on two reasons:

1. The studies selected were based on turbine and biological criteria representative of the Harris Project from prior studies of similar fish and turbines which have been reviewed and accepted by FERC.
2. Multiple test results are available as input for the most dominant entrainment family groups (i.e., Sunfish, Bass, and Clupeids). These tests indicate relatively consistent trends.

[3] Blank cells in Table 3-8 are due to unreported information at the respective project.

TABLE 3-8: TURBINE CHARACTERISTICS OF FRANCIS TYPE TURBINES TESTED FOR ENTRAINMENT MORTALITY

SITE NAME	Unit #	TURBINE	Head		Power	Flow		Speed	Diameter		Runner	Wicket
	Tested	TYPE	(ft)	(m)	(MW)	(cfs)	(cms)	(rpm)	(in)	(cm)	Blades	Gates
Peshtigo	4	Francis (vert)	13	4.0	0.36	460	13.0	100	80	203		
Potato Rapids	2	Francis (vert)	17	5.2	0.44	440	12.5	135	80	203		
Potato Rapids	1	Francis (vert)	17	5.2	0.5	500	14.2	123	84	213		
Minetto	3/4	Francis (vert)	17.3	5.3	1.6	1500	42.5	72	139	353	16	28
Stevens Creek	3	Francis (vert)	28	8.5	2.35	1000	28.3	75	135	343	14	20
White Rapids	1	Francis (vert)	29	8.8	3.27	1540	43.6	100	134	340	14	20
Vernon	4	Francis (vert)	34	10.4	2.5	1280	36.2	133.3	62	158	14	16
Vernon	10	Francis (vert)	34	10.4	4.2	1834	51.9	74	156	396	15	20
Rogers	2	Francis (vert)	39.2	11.9	1.7	727	41.2	150	60	152	15	
Sandstone Rapids	1	Francis (vert)	42	12.8	1.9	650	18.4	150	87	220		
Alcona	2	Francis (vert)	43	13.1	4	1600	45.3	90	100	254	16	18
Prickett	1	Francis (vert)	54	16.5	1.1	326	9.2	257	53	136		
Holtwood	3	Francis (vert, double-runner)	61.5	18.7	14.95	3500	99.1	102.8	112	284	17	20
Holtwood	10	Francis (vert)	62	18.9	14.9			94.7			16	
E. J. West	2	Francis (vert)	63	19.2	12.8	2450	69.4	112.5	131	332	15	28
Caldron Falls	1	Francis (vert)	80	24.4	3.2	650	18.4	226	72	182		
Hardy	2	Francis (vert)	100	30.5	10	1500	42.5	163.6	84	213	16	
Hoist	3	Francis (vert)	142	43.3	1.8			360				
Schaghticoke	4	Francis (vert)	153	46.6	4.7	410	11.6	300	51	128	17	28
Bond Falls	1	Francis (vert)	210	64.0	6	450	12.7	300				
Colton	1	Francis (vert)	258	78.6	11.2	450	12.7	360	59	150	19	28

Source: EPRI 1997

Key:

ft	feet
m	meters
MW	megawatts
cfs	cubic feet per second
cms	cubic meters per second
rpm	revolution per minute

TABLE 3-9: TURBINE CHARACTERISTICS OF FRANCIS TYPE UNITS COMPARED TO THE HARRIS PROJECT

Site Name	Turbine Type	Head (ft)	Head (m)	Power (MW)	Flow (cfs)	Flow (cms)	Speed (rpm)	Diameter (in)	Diameter (cm)	Runner Blades	Wicket Gates
Harris Project	**Francis (vert)**	**121**	**36.9**	**67.5**	**8,000**	**226.5**	**105.9**	**209**	**531**	**13**	**20**
E. J. West[2]	Francis (vert)	63	19.2	12.8	2450	69.4	112.5	131	332	15	28
Vernon[2]	Francis (vert)	34	10.4	2.5	1280	36.2	133.3	62	158	14	16
Stevens Creek[3]	Francis (vert)	28	8.5	2.35	1000	28.3	75	135	343	14	20
White Rapids[2,3]	Francis (vert)	29	8.8	3.27	1540	43.6	100	134	340	14	20
Schaghticoke[1]	Francis (vert)	153	46.6	4.7	410	11.6	300	51	128	17	28

Key:

Similar Head [1]
Similar Speed [2]
Similar Runner Diameter [3]
ft feet
m meters
MW megawatts
cfs cubic feet per second
cms cubic meters per second
rpm revolution per minute

4.5 TURBINE MORTALITY CALCULATIONS

All test data and mortality percentages for each species are presented in Table 3-10. Table 3-11 depicts the average mortality rate for each family and size class for the Harris Project. Small Sunfish had a higher mortality rate than the other family groups, and the large Cyprinids had the lowest mortality rate.

Although literature was not available to estimate turbine mortality for one family (*Ictaluridae*), these fish are a very small component of estimated fish entrainment composition. Consistent with other studies, the Catostomid family group was used as a surrogate for the Ictalurid group due to similar physical characteristics, such as skeletal structure and body shape (FERC 1995). Length frequency turbine mortality estimates are presented in Table 3-12.

TABLE 3-10 SUMMARY OF MORTALITY DATA USED TO CALCULATE MORTALITY RATES FOR THE HARRIS PROJECT

SITE NAME	SPECIES TESTED	LENGTH (mm)	MORTALITY (%)	TEST DURATION	FAMILY/GENUS GROUP REPRESENTED
E.J. West	Largemouth Bass	250	1.4	Latent (48 hrs)	Bass
E.J. West	Largemouth Bass	250	70.0	Latent (48 hrs)	Bass
Schaghticoke	Largemouth Bass	250	8.8	Latent (48 hrs)	Bass
Schaghticoke	Largemouth Bass	250	47.1	Latent (48 hrs)	Bass
Schaghticoke	Largemouth Bass	250	39.2	Latent (48 hrs)	Bass
E.J. West	White Sucker	175	31.1	Latent (48 hrs)	Catostomidae, Ictaluridae
E.J. West	White Sucker	250	12.3	Latent (48 hrs)	Catostomidae, Ictaluridae
E.J. West	White Sucker	250	47.2	Latent (48 hrs)	Catostomidae, Ictaluridae
Schaghticoke	White Sucker	175	40.6	Latent (48 hrs)	Catostomidae, Ictaluridae
Schaghticoke	White Sucker	250	14.1	Latent (48 hrs)	Catostomidae, Ictaluridae
Schaghticoke	White Sucker	250	8.5	Latent (48 hrs)	Catostomidae, Ictaluridae
Schaghticoke	White Sucker	175	13.7	Latent (48 hrs)	Catostomidae, Ictaluridae
Schaghticoke	White Sucker	175	31.4	Latent (48 hrs)	Catostomidae, Ictaluridae
White Rapids	White Sucker	176.5	6.8	Latent (48 hrs)	Catostomidae, Ictaluridae
Stevens Creek	Blueback Herring	165	5.7	Latent (48 hrs)	Clupeidae
E.J. West	Golden Shiner	175	4.5	Latent (48 hrs)	Cyprinidae
Stevens Creek	Spotted Sucker	165	11.7	Latent (48 hrs)	Catostomidae, Ictaluridae
Stevens Creek	Sunfish Spp	154	19.6	Latent (48 hrs)	Sunfish
E.J. West	Largemouth Bass	175	3.4	Latent (48 hrs)	Bass
E.J. West	Largemouth Bass	175	4.8	Latent (48 hrs)	Bass
Schaghticoke	Largemouth Bass	175	11.7	Latent (48 hrs)	Bass
Schaghticoke	Largemouth Bass	175	60.0	Latent (48 hrs)	Bass
E.J. West	White Sucker	100	54.8	Latent (48 hrs)	Catostomidae, Ictaluridae
Schaghticoke	White Sucker	100	10.3	Latent (48 hrs)	Catostomidae, Ictaluridae
White Rapids	White Sucker	114	11.8	Latent (48 hrs)	Catostomidae, Ictaluridae
Vernon	American Shad	95	5.3	Latent (48 hrs)	Clupeidae
E.J. West	Golden Shiner	100	27.0	Latent (48 hrs)	Cyprinidae

SITE NAME	SPECIES TESTED	LENGTH (mm)	MORTALITY (%)	TEST DURATION	FAMILY/GENUS GROUP REPRESENTED
Schaghticoke	Golden Shiner	100	7.7	Latent (48 hrs)	Cyprinidae
E.J. West	Bluegill	100	63.8	Latent (48 hrs)	Sunfish
E.J. West	Bluegill	100	42.4	Latent (48 hrs)	Sunfish
E.J. West	Bluegill	100	38.2	Latent (48 hrs)	Sunfish
Schaghticoke	Bluegill	100	14.8	Latent (48 hrs)	Sunfish
Schaghticoke	Bluegill	100	43.4	Latent (48 hrs)	Sunfish
Stevens Creek	Sunfish Spp	100	22.2	Latent (48 hrs)	Sunfish
White Rapids	Bluegill	82	14.8	Latent (48 hrs)	Sunfish
White Rapids	Bluegill	138	32.4	Latent (48 hrs)	Sunfish

Key:

hrs hours
mm millimeter

TABLE 3-11 MEAN TURBINE MORTALITY RATES FOR FAMILY AND SIZE GROUPS AT THE HARRIS PROJECT

Species	Size	Mortality (%)
Catostomidae	Small	25.61
Catostomidae	Large	22.85
Catostomidae	Average	24.23
Sunfish	Small	34.00
Sunfish	Large	19.64
Sunfish	Average	26.82
Bass	Small	19.95
Bass	Large	33.30
Bass	Average	26.63
Clupeidae	Small	5.30
Clupeidae	Large	5.70
Clupeidae	Average	5.50
Cyprinidae	Small	17.36
Cyprinidae	Large	4.55
Cyprinidae	Average	10.95
Ictaluridae	Small	25.61
Ictaluridae	Large	22.85
Ictaluridae	Average	24.23

TABLE 3-12 ESTIMATED TOTAL ENTRAINMENT FISH LOSS FOR SEASONAL LENGTH FREQUENCY BY FAMILY GROUPS FOR THE HARRIS PROJECT

Family/Genus Group	Size	Winter	Spring	Summer	Fall	Total
Catostomidae	Small	1	0	0	0	**1**
Catostomidae	Large	4	2	0	0	**6**
Sunfish	Small	107	457	144	31	**739**
Sunfish	Large	28	26	8	13	**75**
Bass	Small	1	3	0	0	**4**
Bass	Large	1	13	0	2	**16**
Clupeidae	Small	11,351	579	114	273	**12,317**
Clupeidae	Large	2,255	155	55	215	**2,680**
Cyprinidae	Small	43	24	3	9	**79**
Cyprinidae	Large	2	1	0	1	**4**
Ictaluridae	Small	1,322	21	15	395	**1,753**
Ictaluridae	Large	951	34	13	136	**1,134**
Total		**16,066**	**1,315**	**352**	**1,075**	**18,808**

Key:

Small 0 mm-150 mm

Large 151 mm-900 mm

5.0 SUMMARY

The total number of small and large fish estimated to be entrained annually at the Harris Project was 241,911 and 52,516 fish, respectively. Most Clupeids, Cyprinids, Ictalurids and Sunfish estimated to be entrained were small and most Catostomids and Bass were large.

A total of 18,808 fish were estimated to be killed annually by turbine entrainment at the Harris Project. Estimated fish entrainment loss is highest for Clupeids, representing 80 percent of the projected fish loss at the Harris Project. Estimated fish loss is greatest for the small Clupeids relative to the other family size groups.

6.0 REFERENCES

Alabama Department of Conservation and Natural Resources (ADCNR). 2016b. Wildlife Management Areas. Available at: http://www.outdooralabama.com/wildlife-management-areas. Accessed November 2016.

Alabama Power Company. 2018. Pre-Application Document for the Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL.

Cada, G.F. 1990. A Review of Studies Relating to the Effects of Propeller-Type Turbine Passage on Fish Early Life Stages. North American Journal of Fisheries Management 10: 418-426.

Eicher Associates, Inc. 1987. Turbine-related Fish Mortality: Review and Evaluation of Studies. Research Project 2694-4. Prepared for Electric Power Research Institute, Palo Alto, CA.

Electric Power Research Institute (EPRI). 1992. Final Report. Fish Entrainment and Turbine Mortality Review and Guidelines. Project 2694-01. Prepared for Stone & Webster Environmental Services, Boston, MA.

Electric Power Research Institute (EPRI). 1997. Unpublished Excel Fish Mortality Database.

Federal Energy Regulatory Commission (FERC). 1995. Preliminary Assessment of Fish Entrainment at Hydropower Projects – Volume 1 (Paper No. DPR-10). Office of Hydropower Licensing, FERC, Washington, DC.

Kleinschmidt Associates (Kleinschmidt). 2003. Final Report: Coosa and Warrior River Projects Desktop Fish Entrainment and Turbine Mortality Analysis. Prepared for Alabama Power Company, Birmingham, AL.

Kleinschmidt Associates (Kleinschmidt). 2007. Final Report: Saluda Hydro Project Desktop Fish Entrainment and Turbine Mortality Analysis. Prepared for South Carolina Electric & Gas Company, Columbia, SC.

Normandeau Associates, Inc. 2009. Final Report: Claytor Hydroelectric Project Desktop Fish Entrainment and Impingement Analysis. Prepared for Appalachian Power Company. Roanoke, VA.

Ruggles, C.P. and T.H. Palmeter. 1989. Fish Passage Mortality in a Tube Turbine. Canadian Technical Report of Fisheries and Aquatic Sciences No. 1664.

Semple, J.R. 1979. Downstream Migration Facilities and Turbine Mortality Evaluation, Atlantic Salmon Smolts at Malay Falls, Nova Scotia. Fisheries and Marine Services Manuscript Report No. 1541. Fisheries and Environmental Canada, Halifax, Nova Scotia.

APPENDIX A

FISH ENTRAINMENT DATABASE

APPENDIX B

SPECIES COMPOSITION OF ENTRAINED FISH FROM THE RICHARD B. RUSSELL ENTRAINMENT STUDY

APPENDIX C

FISH MORTALITY STUDIES FROM OTHER HYDROELECTRIC PROJECTS

APPENDIX G

WILDLIFE AND TERRESTRIAL RESOURCES

1. **WILDLIFE SPECIES POTENTIALLY OCCURRING IN THE HARRIS PROJECT VICINITY - TABLE**
2. **REPRESENTATIVE RIPARIAN AND LITTORAL BOTANICAL SPECIES POTENTIALLY OCCURRING IN THE LAKE HARRIS VICINITY - TABLE**
3. **BIRDS OF CONSERVATION CONCERN FOUND IN THE SKYLINE AND LAKE HARRIS PROJECT VICINITY**
4. **FOREST TYPES AT SKYLINE**
5. **2018 WETLAND DELINEATION AND STREAM ENVIRONMENTAL ASSESSMENT REPORT – SKYLINE**
6. **FOREST TYPES AT LAKE HARRIS AND DOWNSTREAM OF HARRIS DAM**
7. **2018 SENSITIVE AREA (WETLANDS) ASSESSMENT REPORT – LAKE HARRIS**

1. WILDLIFE SPECIES POTENTIALLY OCCURRING IN THE HARRIS PROJECT VICINITY - TABLE

Table 1: BIRD SPECIES POTENTIALLY OCCURRING IN THE HARRIS PROJECT VICINITY

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Anatidae	Canada Goose	*Branta Canadensis*	X	Fairly common in all seasons	Freshwater marshes, agricultural fields, and on lakes
Anatidae	Wood Duck	*Aix sponsa*	X	Common in all seasons	Wooded swamps, beaver ponds, bottomlands, creeks, and lakes
Anatidae	Gadwall	*Anas strepera*		Fairly common in winter and uncommon in fall and spring	Shallow freshwater ponds and lakes with abundant aquatic vegetation
Anatidae	American Wigeon	*Anas Americana*		Fairly common in winter, spring, and fall	Shallow freshwater ponds and lakes with abundant aquatic vegetation
Anatidae	Mallard	*Anas platyrhynchos*	X	Common in winter, fairly common in spring and fall, and uncommon in summer	Shallow water of ponds, lakes, and flooded fields
Anatidae	Blue-winged Teal	*Anas discors*		Common to fairly common in spring and fall	Shallow freshwater ponds, sloughs, creeks, and on lake mudflats
Anatidae	Northern Shoveler	*Anas clypeata*		Common in winter, spring and fall	Freshwater ponds, swamps, and on lakes
Anatidae	Northern Pintail	*Anas acuta*		Fairly common in winter, spring, and fall	Freshwater marshes, agricultural fields, and shallow portions of lakes, ponds, and rivers
Anatidae	Green-winged Teal	*Anas cerci*		Common in winter, spring, and fall	Shallow freshwater marshes, and on creeks, lakes, and mudflats
Anatidae	Ring-necked Duck	*Aythya collaris*		Common in winter, early spring, and late fall	Shallow, wooded, freshwater ponds, swamps, and lakes
Anatidae	Lesser Scaup	*Aythya affinisthrus*		Fairly common in winter, spring, and fall	Larger lakes and rivers
Anatidae	Bufflehead	*Bucephala albeola*		Common in winter, early spring, and late fall	Larger lakes and slow-moving rivers
Anatidae	Hooded Merganser	*Lophodytes cucullatus*	X	Fairly common in winter, spring, and fall, and rare in summer	Wooded freshwater ponds, lakes, and slow water river systems
Anatidae	Ruddy Duck	*Oxyura jamaicensis*		Fairly common in winter	Freshwater ponds, lakes, and slow-moving rivers
Phasianidae	Wild Turkey	*Meleagris gallopavo*	X	Fairly common in all seasons	Forested and partially forested habitats

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Odontophoridae	Northern Bobwhite	*Colinus virginianus*	X	Fairly common in all seasons in early successional habitats	Farms, along woodland edges, recently cut-over forest land, and in open country habitats dominated by old fields
Podicipedidae	Pied-billed Grebe	*Podilymbus podiceps*	X	Fairly common in spring, winter, and fall	Lakes and marshy ponds
Phalacrocoracidae	Double-crested Cormorant	*Phalacrocorax auritus*		Fairly common in fall, winter, and spring and uncommon in summer	Larger lakes, ponds, and rivers
Ardeidae	Great Blue Heron	*Ardea herodias*	X	Common in all seasons	Shallow water of ponds, lakes, and rivers
Ardeidae	Great Egret	*Ardea alba*	X	Common to fairly common in spring, summer, but uncommon to rare in winter	Shallow water of ponds, lakes, and rivers
Ardeidae	Little Blue Heron	*Egretta caerulea*	X	Rare to uncommon in spring to mid-summer, but fairly common in late summer and early fall	Shallow water of ponds, lakes, and rivers
Ardeidae	Green Heron	*Butorides virescens*	X	Common in spring, summer, and fall, but rare in winter	Edge of ponds, lakes, and rivers
Cathartidae	Black Vulture	*Coragyps atratus*	X	Common throughout year	Agricultural and livestock areas
Cathartidae	Turkey Vulture	*Cathartes aura*	X	Common in all seasons and regions	Wooded as well as open areas
Accipitridae	Osprey	*Pandion haliaetus*	X	Fairly common in spring and fall, and uncommon in summer	Large lakes and rivers
Accipitridae	Northern Harrier	*Circus cyaneus*		Fairly common in winter, spring, and fall	In and over old fields, marshes, meadows, and grasslands
Accipitradae	Red-shouldered Hawk	*Buteo lineatus*	X	Fairly common in all seasons	Moist woodlands and swamps
Accipitradae	Broad-winged Hawk	*Buteo platypterus*	X	Fairly common in spring and summer, common in fall, but rare in winter	Deciduous woodlands; during migration can be seen overhead of any habitat type
Accipitradae	Red-tailed Hawk	*Buteo jamaicensis*	X	Common winter and fairly common in spring, summer, and fall	Open country and woodland edges
Falconidae	American Kestrel	*Falco sparverius*	X	Common in winter, fairly common in spring and fall, but rare in summer	Open fields and woodland edges.
Rallidae	American Coot	*Fulica Americana*		Common in winter, common to uncommon in spring and fall, and rare in summer	Rivers, ponds, lakes, and swamps

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Charadriidae	American Golden-Plover	*Pluvialis dominica*		Fairly common in spring and uncommon to rare in fall	Short grasslands, flooded fields and on mudflats of lakes, ponds, and rivers
Charadriidae	Semipalmated Plover	*Charadrius semipalmatus*		Fairly common in spring and fall, and occasional in early winter	Mudflats of lakes, ponds, and rivers
Charadriidae	Killdeer	*Charadrius vociferous*	X	Common in all seasons	Short-grass fields, and mudflats and shorelines of lakes, ponds, and rivers
Scolopacidae	Greater Yellowlegs	*Tringa melanoleuca*		Fairly common in spring and fall, but uncommon in winter and late summer	Along shorelines of shallow ponds and lakes, marsh edges, in flooded fields, and on mudflats
Scolopacidae	Lesser Yellowlegs	*Tringa flavipes*		Common in spring and fall, rare in winter, uncommon to rare in summer	Along shorelines of shallow ponds and lakes, marsh edges, in flooded fields and on mudflats
Scolopacidae	Spotted Sandpiper	*Actitis macularius*	X	Common in spring, late summer and fall, but rare in winter	Along pond and lake margins, stream banks, and on mudflats
Scolopacidae	Solitary Sandpiper	*Tringa solitaria*		Common in spring, late summer, and fall	Along lake borders, stream banks, ponds, and marsh edges
Scolopacidae	Semipalmated Sandpiper	*Calidris pusilla*		Fairly common in spring and fall, and uncommon in late summer	On mudflats, and along pond edges and lakeshores
Scolopacidae	Least Sandpiper	*Calidris minutilla*		Common in spring, fairly common in fall, uncommon in winter and late summer, and occasional in early summer	On mudflats, and along pond edges and lakeshores
Scolopacidae	Pectoral Sandpiper	*Calidris melanotos*		Common in spring and fall, and uncommon in late summer	Wet meadows, flooded fields, on mudflats, and along shores of ponds, pools, and lakes
Scolopacidae	Common Snipe	*Gallinago*		Common in winter, spring, and fall	Marshes and wet grassy areas
Scolopacidae	American Woodcock	*Scolopax minor*	X	Fairly common in fall and winter, and occasional in spring	Moist shrubby woods, floodplains, thickets, and at edges of swamps
Laridae	Ring-billed Gull	*Larus delawarensis*		Fairly common in winter, spring and fall, and occasional in summer	Summer rivers, lakes, irrigated and plowed fields, and garbage dumps
Columbidae	Rock Pigeon	*Columba livia Exotic*	X	Common in all seasons	In cities, and on farms, bridges, cliffs
Columbidae	Mourning Dove	*Zenaida macroura*	X	Common in all seasons	Farms, and in towns, woodlots, agricultural fields, and grasslands
Cuculidae	Yellow-billed Cuckoo	*Coccyzus americanus*	X	Common in spring, summer, and fall	Woodlands, and on farmlands with scattered trees and orchards

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Strigidae	Eastern Screech-Owl	*Megascops asio*	X	Common in all seasons	Woodlands, especially near open areas
Strigidae	Great Horned Owl	*Bubo virginianus*	X	Fairly common in all seasons	Woodlands, parklands, and occasionally In wooded suburbs
Strigidae	Barred Owl	*Strix varia*	X	Common in all seasons	Moist woodlands and wooded swamps
Caprimulgidae	Chuck-will's-widow	*Anstrostomus carolinensis*	X	Common in spring, summer, and fall	Deciduous and pine woodlands
Caprimulgidae	Whip-poor-will	*Caprimulgus vociferous*	X	Locally common in spring, summer, and fall	Open and mix-forest woodlands
Apodidae	Chimney Swift	*Chaetura pelagica*	X	Common in spring, summer, and fall	Open areas, especially around human habitations
Trochilidae	Ruby-throated Hummingbird	*Archilochus colubris*	X	Common in spring, summer, and fall	Woodlands, gardens, along forest edges, and at feeders
Alcedinidae	Belted Kingfisher	*Ceryle alcyon*	X	Common in all seasons	Along wooded rivers, streams, lakes, ponds, and in marshes
Picidae	Red-headed Woodpecker	*Melanerpes erythrocephalus*	X	Fairly common in spring, summer, and fall, but uncommon in winter	Open woods, especially those containing numerous snags
Picidae	Red-bellied Woodpecker	*Melanerpes carolinus*	X	Common in all seasons	Woodlands
Picidae	Yellow-bellied Sapsucker	*Sphyrapicus varius*		Fairly common in winter, spring, and fall	Mixed hardwood and conifer forests
Picidae	Downy Woodpecker	*Picoides pubescens*	X	Common in all seasons	Woodlands, orchards, suburban areas, parks, and farm woodlots
Picidae	Red-cockaded Woodpecker	*Picoides borealis*	X	Rare and isolated in all seasons	Old growth pine with open mid-story
Picidae	Northern Flicker	*Colaptes auratus*	X	Fairly common in all seasons and regions	Open woodlands and fields, and on lawns and open meadows with large trees
Picidae	Pileated Woodpecker	*Dryocopus pileatus*	X	Fairly common in all	Mature woodlands with coniferous and hardwood trees
Tyrannidae	Eastern Wood-Pewee	*Contopus virens*	X	Common to fairly common in spring, summer, and fall	Open woodlands, parks, and along forest edges
Tyrannidae	Acadian Flycatcher	*Empidonax virescens*	X	Common in spring, summer, and fall	Moist deciduous woods, dense woodlands, and wooded swamps
Tyrannidae	Eastern Phoebe	*Sayornis phoebe*	X	Common in winter, spring, and fall	Open deciduous woodlands near bridges, cliffs, and eaves

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Tyrannidae	Great Crested Flycatcher	*Myiarchus crinitus*	X	Common in spring, summer, and fall	Woodlands, open country with scattered trees, and parks
Tyrannidae	Eastern Kingbird	*Tyrannus*	X	Common in spring, summer, and fall	Open rural areas with scattered trees and shrubs, along woodland edges, and in agricultural fields with hedgerows, especially near ponds or rivers
Laniidae	Loggerhead Shrike	*Lanius ludovicianus*	X	Fairly common in winter, spring, and fall, and uncommon in summer	Open country with scattered trees and shrubs, and in hedgerows along agricultural fields
Vireonidae	White-eyed Vireo	*Vireo griseus*	X	Common in spring, summer, and fall	Undergrowth, early successional fields, streamside thickets, and along woodland edges
Vireonidae	Yellow-throated Vireo	*Vireo flavifrons*	X	Common in spring, summer, and fall	Tall, open woodlands, especially near water
Vireonidae	Red-eyed Vireo	*Vireo olivaceus*	X	Common in spring, summer, and fall	Deciduous woods, mixed forests, shade trees, and woodlots
Corvidae	Blue Jay	*Cyanocitta cristata*	X	Common in all seasons	Forests, open woodlands, wooded residential areas, and parks
Corvidae	American Crow	*Corvus brachyrhynchos*	X	Common	All woodlands, farmlands, and suburban areas
Corvidae	Fish Crow	*Corvus ossifragus*	X	Fairly common to locally common in all seasons	Around swamplands, riverine areas, large lakes, urban and suburban areas, and farmlands
Hirundinidae	Purple Martin	*Progne subis*	X	Common in spring, summer, and early fall	Open rural and suburban areas and open farmlands, especially near water
Hirundinidae	Tree Swallow	*Tachycineta bicolor*	X	Common in fall, fairly common in spring, and rare in winter and summer	Open areas, and over ponds and lakes; nests in cavities in dead, standing timber and boxes
Hirundinidae	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	X	Common in spring, summer, and fall	Open areas, fields, swamps, and over ponds and lakes; nests in burrows in road cuts and steep banks
Hirundinidae	Bank Swallow	*Riparia*		Fairly common in spring and fall, and occasional	Summer in open habitats, especially near water
Hirundinidae	Cliff Swallow	*Petrochelidon pyrrhonota*	X	Fairly common in spring, summer, and fall	Open habitats near water; nests on dams and bridges

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Hirundinidae	Barn Swallow	*Hirundo rustica*	X	Common in spring, summer, and fall	Open habitats, under bridges and culverts, and in barns
Paridae	Carolina Chickadee	*Poecile carolinensis*	X	Common in all seasons	Woodlands and wooded suburbs
Paridae	Tufted Titmouse	*Baeolophus bicolor*	X	Common in all seasons	Woodlands and wooded suburbs
Sittidae	Brown-headed Nuthatch	*Sitta pusilla*	X	Locally common in all seasons	Open pine forests
Troglodytidae	Carolina Wren	*Thryothorus ludovicianus*	X	Common in all seasons	Thickets in woodlands, farmlands, and suburbs
Troglodytidae	House Wren	*Troglodytes aedon*	X	Fairly common in fall, uncommon in spring, and rare in winter and summer	Farmlands, thickets, and suburban yards with dense hedgerows
Regulidae	Golden-crowned Kinglet	*Regulus satrapa*		Common in winter, spring, and fall	Woodlands, especially with conifers
Regulidae	Ruby-crowned Kinglet	*Regulus calendula*		Common in winter, spring, and fall	Woodlands
Sylviidae	Blue-gray Gnatcatcher	*Polioptila caerulea*	X	Common in spring, summer, and fall, and rare in winter	Open woodlands, forest edges, and tree-lined fence rows
Turdidae	Eastern Bluebird	*Sialia sialis*	X	Common in all seasons	Open rural areas, farmlands, fence rows, open suburban areas, and parks with scattered trees
Turdidae	Swainson's Thrush	*Catharus ustulatus*		Fairly common in spring and fall	Woodlands with dense undergrowth
Turdidae	Hermit Thrush	*Catharus guttatus*		Common in winter, spring, and fall	Woodlands with dense undergrowth
Turdidae	Wood Thrush	*Hylocichla mustelina*	X	Common in spring, summer, and fall	Woodlands and wooded suburbs with understory
Turdidae	American Robin	*Turdus migratorius*	X	Common in all seasons	Short grass areas with scattered trees
Mimidae	Gray Catbird	*Dumetella carolinensis*	X	Common in spring and fall	Hedgerows, thickets, fence rows, and dense brushy vegetation bordering ponds and lakes
Mimidae	Northern Mockingbird	*Mimus polyglottos*	X	Common in all seasons	Openings with short grass, scattered shrubs, and trees
Mimidae	Brown Thrasher	*Toxostoma rufum*	X	Common in all seasons	Short ground cover vegetation near dense thickets, hedgerows, and shrubs
Motacillidae	American Pipit	*Anthus rubescens*		Fairly common in winter, spring, and fall	Open country, especially on plowed fields and mudflats

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Bombycillidae	Cedar Waxwing	*Bombycilla cedrorum*	X	Common in winter, spring, and fall, and occasional in summer	Areas with trees and shrubs that produce fruits, such as hackberry, mulberry, cedar, cherry, and holly
Parulidae	Tennessee Warbler	*Vermivora peregrine*		Common in spring and fall	Woodlands
Parulidae	Northern Parula	*Parula Americana*	X	Fairly common in spring, summer, and fall	Tall trees along streams, swamps, and lakes; woodlands during migration
Parulidae	Yellow Warbler	*Dendroica petechia*	X	Common in spring and fall, and rare in summer	Small trees and shrubs near water
Parulidae	Magnolia Warbler	*Dendroica magnolia*		Common in fall, fairly common in spring, and occasional in summer	Woodlands
Parulidae	Yellow-rumped Warbler	*Dendroica coronata*		Common in winter, spring, and fall	Woodlands
Parulidae	Black-throated Green Warbler	*Dendroica virens*	X	Common in fall, fairly common in spring and summer	Coniferous and deciduous forests; in migration, found in woodlands
Parulidae	Yellow-throated Warbler	*Dendroica dominica*	X	Fairly common in spring, summer, and fall, and occasional in winter	Older pine forests, and woodlands with sycamores, especially near water; in migration, found in woodlands
Parulidae	Pine Warbler	*Dendroica pinus*	X	Common in all seasons	Mature pine woodlands
Parulidae	Prairie Warbler	*Setophaga discolor*	X	Common in spring, summer and fall, and occasional in winter	Brushy early successional growth, particularly regenerating clearcuts
Parulidae	Palm Warbler	*Dendroica palmarum*		Common in spring, fairly common in fall, and rare in winter	Open areas with scattered shrubs and trees
Parulidae	Bay-breasted Warbler	*Dendroica castanea*		Fairly common in spring and fall	Woodlands
Parulidae	Black-and-white Warbler	*Mniotilta varia*	X	Common in spring and fall	Hardwood and mixed hardwood-coniferous forests; in migration, found in woodlands
Parulidae	American Redstart	*Setophaga ruticilla*	X	Common in spring and fall, and fairly common in summer	In breeding season, found in deciduous woods, especially riverine systems; in migration, found in woodlands
Parulidae	Prothonotary Warbler	*Protonotaria citrea*	X	Common in spring, summer, and early fall	Swamp and bottomland forests
Parulidae	Swainson's Warbler	*Limnothlypis swainsonii*	X	Fairly common in spring and summer, and uncommon to rare in fall	Dense thickets in swamps, along streams, and in woodland areas

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Parulidae	Ovenbird	*Seiurus aurocapillus*	X	Fairly common in spring and fall	In breeding season, found in deciduous forests; in migration, found in woodlands, especially with dense understory
Parulidae	Northern Waterthrush	*Seiurus noveboracensis*		Fairly common in spring and fall	Along shorelines of swamps, lakes, ponds, and streams
Parulidae	Louisiana Waterthrush	*Parkesia motacilla*	X	Common in spring, summer, and early fall	Older bottomland forests along streams
Parulidae	Kentucky Warbler	*Oporornis formosus*	X	Fairly common in spring, summer, and fall	Moist woodlands with dense herbaceous ground cover
Parulidae	Common Yellowthroat	*Geothlypis trichas*	X	Common in spring, summer, and fall, and rare in winter	Along woodland edges, and in hedgerows, thickets, marshes, and wet meadows
Parulidae	Hooded Warbler	*Wilsonia citrine*	X	Common in spring, summer, and fall	In breeding season, found in shrubby forests; in migration, found in woodlands, especially in understory
Parulidae	Yellow-breasted Chat	*Icteria virens*	X	Common in spring, summer, and fall, and occasional in winter	Early successional growth areas
Thraupidae	Summer Tanager	*Piranga rubra*	X	Common in spring, summer, and fall, and occasional in winter	In breeding season, found in open, mixed hardwood-coniferous forests and along forest edges
Thraupidae	Scarlet Tanager	*Piranga olivacea*	X	Fairly common in spring, summer, and fall	In breeding season, found in hardwood forests; in migration, found in woodlands
Emberizidae	Eastern Towhee	*Pipilo erythrophthalmus*	X	Common in all seasons	Brushy woodlands and early successional growth
Emberizidae	Chipping Sparrow	*Spizella passerine*	X	Common in all seasons	Open areas with short grass and scattered trees, especially conifers
Emberizidae	Field Sparrow	*Spizella pusilla*	X	Common to fairly common in all seasons	Early successional growth areas, especially with dense ground cover
Emberizidae	Savannah Sparrow	*Passerculus sandwichensis*		Common in winter, spring, and fall	Open grassy fields
Emberizidae	Song Sparrow	*Melospiza melodia*	X	Common in winter, spring, and fall, and uncommon to rare in summer	Open brushy and weedy areas
Emberizidae	Swamp Sparrow	*Melospiza Georgiana*		Common to fairly common in winter, spring, and fall	Freshwater marshes, and shrubby and weedy areas, especially near water
Emberizidae	White-throated Sparrow	*Zonotrichia albicollis*		Common in winter, spring, and fall, and rare in summer	Thickets and shrubby areas

FAMILY	COMMON NAME	SCIENTIFIC NAME	BREEDS IN PROJECT AREA	ABUNDANCE/ SEASONALITY	HABITAT
Emberizidae	Dark-eyed Junco	*Junco hyemalis*		Common in winter, spring, and fall, and occasional in summer	Open woodlands, and brushy and grassy areas
Cardinalidae	Northern Cardinal	*Cardinalis*	X	Common in all seasons	Shrubby areas, hedgerows, thickets, and suburban gardens
Cardinalidae	Rose-breasted Grosbeak	*Pheucticus ludovicianus*		Fairly common in spring and uncommon in fall	Woodlands, especially in the canopy
Cardinalidae	Blue Grosbeak	*Passerina caerulea*	X	Common in spring, summer, and fall	Open thickets and hedgerows, especially along field borders
Cardinalidae	Indigo Bunting	*Passerina cyanea*	X	Common in spring, summer, and fall, and occasional in winter	Brushy and weedy area, in early successional stages and woodland openings, and along woodland and field borders
Icteridae	Red-winged Blackbird	*Agelaius phoeniceus*	X	Common in all seasons	Marshes, and brushy, weedy and grassy areas, especially when wet
Icteridae	Eastern Meadowlark	*Sturnella magna*	X	Common in all seasons	Grassy, weedy fields, especially high grass
Icteridae	Common Grackle	*Quiscalus quiscula*	X	Common in all seasons	Open woodlands, especially those with pines and grassy areas; also fields with short grasses or in cultivated fields
Icteridae	Brown-headed Cowbird	*Molothrus ater*	X	Common in all seasons	Open areas, especially with livestock
Icteridae	Orchard Oriole	*Icterus spurious*	X	Common in spring, summer, and fall	In breeding season, found in open areas, with scattered trees, especially near water. In migration, found in woodlands
Icteridae	Baltimore Oriole	*Icterus galbula*	X	Fairly common in spring and fall, but rare in summer and winter	In breeding season, found in open areas, with scattered trees, especially near water. In migration, found in woodlands
Fringillidae	House Finch	*Carpodacus mexicanus*	X	Common in all seasons	Open woodlands
Fringillidae	American Goldfinch	*Carduelis tristis*	X	Common in winter, spring, and fall	Open woodlands, brushy areas, and willow thickets
Passeridae	House Sparrow	*Passer domesticus Exotic*	X	Common in all seasons	Urban and suburban areas, and open farmland

Source: Mirarchi 2004, Causey 2006

Table 2: Mammal Species Potentially Occurring in the Harris Project Vicinity

FAMILY	COMMON NAME	SCIENTIFIC NAME	ABUNDANCE IN PROJECT AREA	DISTRIBUTION IN ALABAMA	HABITAT
Didelphidae	Virginia Opossum	*Didelphis virginiana*	Common	Found statewide	All habitats, including urban areas
Soricidae	Least Shrew	*Cryptotis parva*	Poorly known	Found statewide	Grasslands and other upland areas, weedy fencerows, fields, roadsides, and meadows
Soricidae	Southeastern Shrew	*Sorex longirostris*	Poorly known	Found statewide, except southern tier of counties	Occupies a variety of habitats from bogs and marshes to upland grassy areas and forests, and even bare hillsides and dry upland hardwoods. May favor moist areas bordering swamps, marshes, lakes, and streams
Talpidae	Eastern Mole	*Scalopus aquaticus*	Poorly known	Found statewide and common in a variety of habitats	In both forested and unforested areas. Occupies moist, loose, sandy or loamy soils, and spends most of life underground
Vespertilionidae	Gray Myotis (bat)	*Myotis grisescens*		Found statewide, except for southwestern region	Occupies deep caves near permanent water in winter and summer. Forages primarily over water, along streams, and over lakes and ponds
Vespertilionidae	Northern Long-eared (bat)	Myotis *septentrionalis*	Poorly known	Found statewide, except southwestern region	Forested ridges appear favored over riparian woodlands. Hibernacula include caves and mines, but may use crevices in walls or ceilings. Summer roosts include tree holes, birdhouses, or behind loose bark or shutters of buildings
Vespertilionidae	Eastern Pipistrelle (bat)	*Pipistrellus subflavus*	Common	Found statewide	Occupies hollow trees, tree foliage, caves, mines, rock crevices, and buildings
Vespertilionidae	Big Brown Bat	*Eptesicus fuscus*	Common	Found statewide and common	Roosts typically in human-made structures, but also in caves, mines, hollow trees, and crevices, or behind loose bark. Commonly inhabits bat houses, attics, and louvered attic vents
Vespertilionidae	Eastern Red Bat	*Lasiurus borealis*	Common	Found statewide and common	Roosts in a variety of trees, but frequently uses clumps of Spanish moss
Vespertilionidae	Seminole Bat	*Lasiurus seminolus*	Common	Found statewide	Common in mixed coniferous and deciduous woodlands, often associated with Spanish moss. Mostly forages at tree-top level in forests, although also flies over open water, forest clearings, and along forest edges

FAMILY	COMMON NAME	SCIENTIFIC NAME	ABUNDANCE IN PROJECT AREA	DISTRIBUTION IN ALABAMA	HABITAT
Vespertilionidae	Evening Bat	*Nycticeius humeralis*	Common	Found statewide, but may be most common in southern half	Primary habitat is deciduous forest where it roosts in hollow trees, under loose bark, and in human-made structures, such as outbuildings, churches, belfries, and attics
Dasypodidae	Nine-banded Armadillo	*Dasypus novemcinctus*	Common	Found statewide	Woodlands, forest edges, savannas, and brushy areas
Leporidae	Swamp Rabbit	*Sylvilagus aquaticus*	Poorly known	Distributed statewide, except for southern tier of counties along Florida Panhandle	Floodplain forests, wooded bottomlands, briar and honeysuckle patches, and canebrakes
Leporidae	Eastern Cottontail	*Sylvilagus floridanus*	Common	Found statewide	Primarily occurs in deciduous forests and forest edges, but also in grasslands, along fencerows, and in urban areas
Sciuridae	Eastern Chipmunk	*Tamias striatus*	Common	Found statewide, except for extreme southwestern and southeastern regions	Occupies wooded areas with dense canopy and sparsely covered forest floor, open brushy habitats, ravines, deciduous growth along streams, and urban areas
Sciuridae	Woodchuck	*Marmota monax*	Poorly known	Distribution includes northern 2/3 of state	Occupies forest edges and open fields and pastures near brushy fencerows or other cover
Sciuridae	Gray Squirrel	*Sciurus carolinensis*	Common	Found statewide	Hardwood forests, mixed forests, and urban areas
Sciuridae	Fox Squirrel	*Sciurus niger*	Fairly Common	Found statewide	Favors mature deciduous and pine-oak woodlands, but also occurs at forest edges and in riparian woodlands
Sciuridae	Southern Flying Squirrel	*Glaucomys volans*	Common	Found statewide	Most common in mature, broad-leaved forests, but also found in coniferous-deciduous woodlands, and urban areas. Nocturnal existence belies its common occurrence
Castoridae	Beaver	*Castor Canadensis*	Common	Found statewide	All habitats with open water. Considered a pest in some areas
Muridae	Marsh Rice Rat	*Oryzomys palustris*	Common	Found statewide	Wet meadows and dense vegetation near marshes, swamps, streams, ponds, and ditches
Muridae	Eastern Harvest Mouse	*Reithrodontomys humulis*	Poorly known	Once common	Old fields containing dense stands of weeds and grasses, but may be declining in Alabama

FAMILY	COMMON NAME	SCIENTIFIC NAME	ABUNDANCE IN PROJECT AREA	DISTRIBUTION IN ALABAMA	HABITAT
Muridae	Cotton Mouse	*Peromyscus gossypinus*	Common	Found statewide	Dense underbrush, bottomland hardwood forests, and a variety of other habitats, including old fields, upland forests, hammocks, and swamps
Muridae	White-footed Mouse	*Peromyscus leucopus*	Poorly known	Occurs in northern 2/3 of state	Common in woodlands with fallen logs, brush piles, and rocks, and in shrubs along fencerows and streams
Muridae	Golden Mouse	*Ochrotomys nuttalli*	Common		Woodlands, floodplains, borders of fields, and thickets bordering swamps and dense woods
Muridae	Hispid Cotton Rat	*Sigmodon hispidus*	Found statewide	Populations fluctuate greatly among years.	Grassy areas of fields and along roadways,
Muridae	Eastern Woodrat	*Neotoma floridana*	Poorly known	No recent surveys; populations may be declining	Occupies woodland and brushy habitats south of Tennessee River. Usually found associated with rocky outcrops, but also in areas with dense vegetation
Muridae	Pine Vole	*Microtus pinetorum*		Found statewide, except for southwestern section	Occupies a wide range of habitats, including leaf litter, grassy fields with brush and brambles, and beneath mats of dense vegetation
Muridae	Muskrat	*Ondatra zibethicus*	Common	Found nearly statewide, except counties bordering Florida Panhandle	Habitats include saline, brackish, and freshwater streams; marshes; ponds; lakes; ditches; and rivers
Muridae	House Mouse	*Mus musculus Exotic*	Common	Found statewide	Often found in habitats associated with native rodents fairly distant from human habitation
Carnivora	Coyote	*Canis latrans*	Common in all habitats	Found statewide, including urban areas	Wide rage, upland forests and swamps to pastures and fields
Carnivora	Red Fox	*Vulpes*	Common	Found statewide	Forested uplands interspersed with pastures and farmland
Carnivora	Gray Fox	*Urocyon cinereoargenteus*	Common	Found statewide	Forested habitats statewide
Procyonidae	Raccoon	*Procyon lotor*	Common	Found statewide	All habitats statewide, including urban areas; often associated with water, especially bottomland swamps, marshes, and flooded woodlands

FAMILY	COMMON NAME	SCIENTIFIC NAME	ABUNDANCE IN PROJECT AREA	DISTRIBUTION IN ALABAMA	HABITAT
Mustelidae	Long-tailed Weasel	*Mustela frenata*	Poorly known	Probably found statewide, but little known about current status	Woodlands, forest edges, fencerows, agricultural, and urban areas
Mustelidae	Mink	*Mustela vison*	Poorly known	This semiaquatic species occurs statewide	Usually near permanent water
Mustelidae	River Otter	*Lontra Canadensis*	Poorly known	Probably present statewide	In association with rivers, creeks, and lakes, especially open water bordered with wooded habitat
Mephitidae	Striped Skunk	*Mephitis mephitis*	Common	Found statewide	Open areas, forest edges, and urban habitats
Mephitidae	Eastern Spotted Skunk	*Spilogale putorius*	Poorly known	Found statewide	Variety of habitats such as pastures, woodlands, forest edges, and farmlands
Felidae	Bobcat	*Lynx rufus*	Common	Found statewide	Wide array of habitats including dense understory, bottomland hardwood forests, swamps, and farmlands
Cervidae	White-tailed Deer	*Odocoileus virginianus*	Common and important game species	found statewide	Urban habitats
Suidae	Feral Swine	*Sus scrofa* *Exotic*	Fairly Common	Found statewide	Woodlands, swamps, and fields, primarily near water

Source: Mirarchi 2004, Causey 2006

Table 3: Reptile and Amphibian Species Potentially Occurring in the Harris Project Vicinity

FAMILY	COMMON NAME	SCIENTIFIC NAME	ABUNDANCE IN PROJECT AREA	HABITAT
Amphibians				
Bufonidae	American toad	*Bufo americanus*	Common	Upland forests, suburban areas
Bufonidae	Fowler's toad	*Bufo woodhousii*	Common	Sandy areas around shores of lakes, or in river valleys
Hylidae	northern cricket frog	*Acris crepitans*	Common	Creekbanks, lakeshores, and mudflats
Hylidae	Cope's gray treefrog	*Hyla chrysoscelis*	Common	Small trees or shrubs, typically over standing water; on ground or at water's edge during breeding season
Hylidae	green treefrog	*Hyla cinerea*	Moderately common	Permanent aquatic habitats
Hylidae	mountain chorus frog	*Pseudacris brachyphona*	Moderately Common	Forested areas in most of northern Alabama
Hylidae	northern spring peeper	*Pseudacris crucifer*	Common	Ponds, pools and swamps
Hylidae	upland chorus frog	*Pseudacris triseriata feriarum*	Moderately Common	Grassy swales, moist woodlands, river-bottom swamps, and environs of ponds, bogs and marshes
Microhylidae	eastern narrow-mouthed toad	*Gastrophyrne carolinensis*	Common	Variety of habitats providing suitable cover and moisture, including under logs and or leaf litter
Pelobatidae	eastern spadefoot toad	*Scaphiopus holbrooki*	Moderately	Forested areas of sandy or loose soil
Ranidae	bullfrog	*Rana catesbeiana*	Common	Permanent aquatic habitats
Ranidae	bronze frog	*Rana clamitans spp.*	Moderately Common	Rocks, stumps, limestone crevices of stream environs, bayheads and swamps
Ranidae	wood frog	*Rana sylvatica*	Uncommon	Moist wooded areas
Ranidae	southern leopard frog	*Rana pipiens sphenocephala*	Moderately Common, believed to be declining	All types of aquatic to slightly-brackish habitats
Ambystomatidae	spotted salamander	*Ambystoma maculatum*	Moderately Common, believed to be declining	Bottomland hardwoods, woodland pools
Ambystomatidae	marbled salamander	*Ambystoma opacum*	Common	Bottomland hardwoods, woodland pools
Plethodontidae	spotted dusky salamander	*Desmongnathus conanti*	Common	Damp habitats, seepage areas
Plethodontidae	Southern two-lined salamander	*Eurycea cirrigera*	Common	Shaded aquatic habitats
Plethodontidae	three-lined salamander	*Eurycea guttolineata*	Common	Shaded aquatic habitats, forested floodplains

FAMILY	COMMON NAME	SCIENTIFIC NAME	ABUNDANCE IN PROJECT AREA	HABITAT
Plethodontidae	Webster's salamander	*Plethodon websteri*	Moderately Common	Damp deciduous forest
Plethodontidae	Northern slimy salamander	*Plethodon glutinosus*	Common	Wide variety of habitats
Plethodontidae	Northern red salamander	*Pseudotriton ruber*	Common	Aquatic margins in forested areas
Salamandridae	Eastern newt	*Notophthalmus viridescens louisianensis*	Moderately Common	Terrestrial or aquatic habitats, depending on life stage
Salamandridae	central newt	*Notophthalmus viridescens*	Moderately Common	Terrestrial or aquatic habitats, depending on life stage
		Reptiles		
Chelydridae	common snapping turtle	*Chelydra serpentina*	Common	Aquatic habitats
Emydidae	painted turtle	*Chrysemys picta ssp.*	Moderately Common	Lakes, rivers, and ponds
Emydidae	Alabama map turtle	*Graptemys pulchra*	Moderately Common	Rivers and large streams in AL
Emydidae	river cooter	*Pseudemys concinna*	Common	Rivers, streams, and some lakes
Emydidae	eastern box turtle	*Terrapene carolina*	Common	Wooded uplands
Emydidae	yellow-bellied pond slider	*Pseudemys scripta*	Common	Ponds, rivers, creeks, and open swamps
Emydidae	red-eared pond slider	*Pseudemys scripta elegans*	Common	Ponds, rivers, creeks, and open swamps
Kinosternidae	eastern mud turtle	*Kinosternon subrubrum*	Common	Sluggish aquatic habitats
Kinosternidae	Loggerhead musk turtle	*Sternotherus minor ssp.*	Moderately Common	Creeks and rivers
Kinosternidae	Stinkpot	*Sternotherus odoratus*	Common	Sluggish aquatic habitats
Iguanidae	green anole	*Anolis carolinensis*	Common	Wide range of upland and riparian areas
Scincidae	common five-lined skink	*Eumeces fasciatus*	Common	Forests and a variety of other habitats
Scincidae	southern five-lined skink	*Eumeces inexpectatus*	Uncommon	Dry and relatively open forestlands
Scincidae	broad-headed skink	*Eumeces laticeps*	Moderately Common	Rotting logs, stumps, and tree cavities
Scincidae	ground skink	*Scincella lateralis*	Common, believed to be declining	Forested areas
Iguanidae	Eastern fence lizard	*Sceloporus undulatus*	Common	Wide range of upland and riparian areas

FAMILY	COMMON NAME	SCIENTIFIC NAME	ABUNDANCE IN PROJECT AREA	HABITAT
Colubridae	worm snake	*Carphophis amoenus ssp.*	Moderately Common	Fossorial, under rocks and in rotting logs
Colubridae	scarlet snake	*Cemphora coccinea*	Common, but believed to be declining	Areas with loose, well drained soils
Colubridae	black racer	*Coluber constrictor ssp.*	Common, believed to be declining	In or near water, streams passing through cypress swamps
Colubridae	ringneck snake	*Diadophis punctatus ssp.*	Common	Under shelter in upland areas near water
Colubridae	corn snake	*Elaphe guttata*	Moderately Common	Wide range of upland and riparian areas
Colubridae	rat snake	*Elaphe obsoleta ssp.*	Common	Wide range of upland and riparian areas
Colubridae	gray rat snake	*Elaphe obsoleta*	Common	Wide range of upland and riparian areas
Colubridae	eastern hognose snake	*Heterodon platyrhinos*	Uncommon, believed to be declining	Fields, open woods, disturbed areas
Colubridae	black kingsnake	*Lampropeltis getula niger*	Moderately Common	Dry rocky hills, open woods, dry prairies, and stream valleys
Colubridae	scarlet kingsnake	*Lampropeltis triangulum elapsoides*	Uncommon, believed to be declining	In or near woodlands, especially pinelands
Colubridae	Plain-bellied water snake	*Natrix erythrogaster ssp.*	Common	Riverbottoms, swamps, marshes, and river/lake edges
Colubridae	queen snake	*Regina septemvittata*	Common, believed to be declining	Streams and impoundments
Colubridae	Dekay's brown snake	*Storeria dekayi ssp.*	Common	Environs of Bogs, swaps, freshwater marshes, moist woods and hillsides
Colubridae	northern red-bellied snake	*Storeria occipitomaculata*	Common, believed to be declining	Mesic habitats in or near open woods; in or near sphagnum bogs
Colubridae	eastern ribbon snake	*Thamnophis sauritus*	Moderately Common	Semi-Aquatic
Colubridae	eastern garter snake	*Thamnophis sirtalis*	Moderately Common	Wide range of upland and riparian areas
Colubridae	rough earth snake	*Virginia striatula*	Moderately Common	Abandoned fields, deciduous forests
Colubridae	eastern smooth earth snake	*Virginia valeriae*	Moderately Common	Abandoned fields near deciduous forests
Viperidae	southern copperhead	*Agkistrodon contortrix*	Common	Upland forests and riparian zones
Viperidae	northern copperhead	*Agkistrodon contortrix mokeson*	Common	Upland forests and riparian zones
Viperidae	eastern cottonmouth	*Agkistrodon piscivorus*	Common	Aquatic
Viperidae	Florida cottonmouth	*Agkistrodon piscivorus conanti*	Common	Aquatic

FAMILY	COMMON NAME	SCIENTIFIC NAME	ABUNDANCE IN PROJECT AREA	HABITAT
Viperidae	western cottonmouth	*Agkistrodon piscivorus leucostoma*	Common	Aquatic
Viperidae	timber rattlesnake	*Crotalus horridus*	Common	Upland and bottomland forests, riparian zones

Source: Mirarchi 2004, Causey 2006

References:

Mirarchi, Ralph E., ed. 2004. Alabama Wildlife, Volume One. A Checklist of Vertebrates and Selected Invertebrates: Aquatic Mollusks, Fishes, Amphibians, Reptiles, Birds and Mammals. The University of Alabama Press, Tuscaloosa, AL.

2. REPRESENTATIVE RIPARIAN AND LITTORAL BOTANICAL SPECIES POTENTIALLY OCCURRING IN THE LAKE HARRIS VICINITY - TABLE

Table 1: Representative Riparian and Littoral Botanical Species Potentially Occurring in the Lake Harris Vicinity

FAMILY	SCIENTIFIC NAME	COMMON NAME
Aceraceae	*Acer barbatum*	southern sugar maple
Aceraceae	*Acer leucoderme*	chalk maple
Aceraceae	*Acer negundo*	box elder
Aceraceae	*Acer rubrum*	red maple
Aceraceae	*Acer saccharum*	sugar maple
Aquifoliaceae	*Ilex decidua*	possumhaw
Aquifoliaceae	*Ilex vomitoria*	yaupon holly
Araceae	*Arisaema triphyllum*	jack-in-the-pulpit
Aristolochiaceae	*Hexastylis arifolia*	littlebrownjug
Aspleniaceae	*Asplenium montanum*	mountain spleenwort
Aspleniaceae	*Asplenium ruta-muraria*	wall rue
Asteraceae	*Coreopsis major*	greater tickseed
Asteraceae	*Pityopsis graminifolia*	narrowleaf silkgrass
Asteraceae	*Verbesina alternifolia*	crownbeard
Betulaceae	*Betula nigra*	river birch
Caprifoliaceae	*Symphoricarpos orbiculatus*	coralberry
Caprifoliaceae	*Viburnum acerifolium*	mapleleaf viburnum
Caryophyllaceae	*Silene rotundifolia*	roundleaf catchfly
Celastraceae	*Euonymus americanus*	bursting-heart
Cornaceae	*Cornus florida*	flowering dogwood
Cupressaceae	*Juniperus virginiana*	eastern red cedar
Cupressaceae	*Thuja occidentalis*	northern white cedar
Cyperaceae	*Carex crinita*	fringed sedge
Cyperaceae	*Carex picta*	Boott’s sedge
Diapensiaceae	*Galax urceolata*	wandflower
Dryopteridaceae	*Athyrium filix-femina ssp. Asplenioides*	southern lady fern
Dryopteridaceae	*Onoclea sensibilis*	sensitive fern
Ericaceae	*Gaylussacia baccata*	black huckleberry
Ericaceae	*Gaylussacia ursina*	bear huckleberry
Ericaceae	*Vaccinium angustifolium*	lowbush blueberry
Ericaceae	*Vaccinium arboretum*	farkleberry
Ericaceae	*Vaccinium pallidum*	hillside blueberry
Ericaceae	*Vaccinium stamineum*	deerberry
Ericaceae	*Vaccinium stamineum*	deerberry
Ericaceae	*Kalmia latifolia*	mountain laurel
Ericaceae	*Rhododendron catawbiense*	purple rhododendron
Fabaceae	*Tephrosia virginiana*	goat’s rue
Fabaceae	*Desmodium nudiflorum*	nakedflower tick trefoil
Fabaceae	*Robinia pseudoacacia*	black locust
Fagaceae	*Castanea dentate*	American chestnut
Fagaceae	*Fagus grandifolia*	American beech

FAMILY	SCIENTIFIC NAME	COMMON NAME
Fagaceae	*Quercus alba*	white oak
Fagaceae	*Quercus coccinea*	scarlet oak
Fagaceae	*Quercus falcate*	southern red oak
Fagaceae	*Quercus michauxii*	swamp chestnut oak
Fagaceae	*Quercus muehlenbergii*	chinkapin oak
Fagaceae	*Quercus pagoda*	cherrybark oak
Fagaceae	*Quercus prinus*	chestnut oak
Fagaceae	*Quercus rubra*	red oak
Fagaceae	*Quercus shumardii*	Shumard’s oak
Fagaceae	*Quercus stellate*	post oak
Fagaceae	*Quercus velutina*	black oak
Hamamelidaceae	*Hamamelis virginiana*	American witch-hazel
Hamamelidaceae	*Liquidambar styraciflua*	American sweetgum
Hippocastanaceae	*Aesculus sylvatica*	painted buckeye
Hydrangeaceae	*Hydrangea quercifolia*	oakleaf hydrangea
Iridaceae	*Iris verna var. smalliana*	dwarf violet iris
Juglandaceae	*Carya alba*	mockernut hickory
Juglandaceae	*Carya glabra*	pignut hickory
Juglandaceae	*Juglans nigra*	eastern black walnut
Lauraceae	*Lindera benzoin*	spicebush
Magnoliaceae	*Liriodendron tulipifera*	tulip tree
Magnoliaceae	*Magnolia acuminate*	cucumber tree
Oleaceae	*Fraxinus Americana*	white ash
Oleaceae	*Fraxinus pennsylvanica*	green ash
Pinaceae	*Pinus echinata*	shortleaf pine
Pinaceae	*Pinus echinata*	Shortleaf pine
Pinaceae	*Pinus rigida*	pitch pine
Pinaceae	*Pinus strobus*	white pine
Pinaceae	*Pinus taeda*	loblolly pine
Pinaceae	*Pinus virginiana*	Virginia pine
Platanaceae	*Platanus occidentalis*	American sycamore
Poaceae	*Chasmanthium sessiliflorum*	longleaf woodoats
Poaceae	*Piptochaetium avenaceum*	black seed speargrass
Poaceae	*Danthonia spicata*	poverty oatgrass
Poaceae	*Schizachyrium scoparium*	little bluestem
Pteridaceae	*Adiantum pedatum*	northern maidenhair
Pteridaceae	*Pellaea atropurpurea*	purple cliffbrake
Ranunculaceae	*Actaea racemose*	black cohosh
Rubiaceae	*Galium circaezans*	licorice bedstraw
Rubiaceae	*Houstonia purpurea*	Venus’ pride
Saxifragaceae	*Saxifraga virginiensis*	early saxifrage
Saxifragaceae	*Heuchera* spp	coral bell
Staphyleaceae	*Staphylea trifolia*	bladdernut
Symplocaceae	*Symplocos tinctoria*	common sweetleaf

FAMILY	SCIENTIFIC NAME	COMMON NAME
Tiliaceae	*Tilia Americana*	American basswood
Ulmaceae	*Celtis laevigata*	sugarberry

Source: NatureServe 2009

Table 2: Representative Botanical Species Potentially Occurring in the Skyline Vicinity

FAMILY	SCIENTIFIC NAME	COMMON NAME
Acanthaceae	*Justicia americana*	American water-willow
Aceraceae	*Acer negundo*	box elder
Aceraceae	*Acer rubrum*	red maple
Aceraceae	*Ageratina altissima*	white snakeroot
Anacardiaceae	*Toxicodendron radicans*	eastern poison ivy
Annonaceae	*Asimina triloba*	pawpaw
Aquifoliaceae	*Ilex decidua*	possumhaw
Aquifoliaceae	*Ilex vomitoria*	yaupon holly
Araceae	*Arisaema triphyllum*	jack-in-the-pulpit
Asteraceae	*Eupatorium serotinum*	late flowering thoroughwort
Asteraceae	*Eurybia mirabilis*	bouquet aster
Asteraceae	*Rudbeckia auriculata*	eared coneflower
Asteraceae	*Solidago plumosa*	plumed goldenrod
Betulaceae	*Carpinus caroliniana*	American hornbeam
Betulaceae	*Betula nigra*	river birch
Boraginaceae	*Mertensia virginica*	Virginia bluebells
Cyperaceae	*Carex blanda*	eastern woodland sedge
Cyperaceae	*Carex crinita*	fringed sedge
Cyperaceae	*Carex grayi*	Gray's sedge
Cyperaceae	*Carex typhina*	cattail sedge
Cyperaceae	*Cyperus squarrosus*	bearded flatsedge
Dryopteridaceae	*Onoclea sensibilis*	sensitive fern
Ericaceae	*Kalmia latifolia*	mountain laurel
Fagaceae	*Fagus grandifolia*	American beech
Fagaceae	*Quercus michauxii*	swamp chestnut oak
Fagaceae	*Quercus pagoda*	cherrybark oak
Hamamelidaceae	*Hamamelis virginiana*	American witch-hazel
Hamamelidaceae	*Liquidambar styraciflua*	American sweetgum
Lauraceae	*Lindera benzoin*	spicebush
Magnoliaceae	*Liriodendron tulipifera*	tulip tree
Oleaceae	*Fraxinus pennsylvanica*	green ash
Onagraceae	*Ludwigia palustris*	marsh seedbox
Pinaceae	*Pinus taeda*	loblolly pine
Pinaceae	*Pinus virginiana*	Virginia pine
Platanaceae	*Platanus occidentalis*	American sycamore
Poaceae	*Chasmanthium latifolium*	Indian woodoats
Poaceae	*Eragrostis hypnoides*	teal lovegrass
Poaceae	*Elymus hystrix*	eastern bottlebrush grass
Poaceae	*Elymus virginicus*	Virginia wildrye
Polygonaceae	*Polygonum lapathifolium*	curlytop knotweed
Polygonaceae	*Polygonum pensylvanicum*	Pennsylvania smartweed
Polygonaceae	*Polygonum punctatum*	dotted smartweed

FAMILY	**SCIENTIFIC NAME**	**COMMON NAME**
Ranunculaceae	*Xanthorihiza simplicissima*	yellowroot
Salicaceae	*Salix nigra*	black willow
Scrophulariaceae	*Lindernia dubia*	yellowseed false pimpernel
Ulmaceae	*Celtis laevigata*	sugarberry
Urticaceae	*Boehmeria cylindrica*	smallspike false nettle
Urticaceae	*Laportea canadensis*	Canadian woodnettle

Source: NatureServe 2009

Reference:

NatureServe. 2009. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 06 February 2009. Available at: http://downloads.natureserve.org/get_data/data_sets/veg_data/nsDescriptions.pdf. Accessed November 11, 2016.

3. BIRDS OF CONSERVATION CONCERN FOUND IN THE SKYLINE AND LAKE HARRIS PROJECT VICINITY

BIRDS OF CONSERVATION CONCERN FOUND IN THE SKYLINE PROJECT VICINITY

COMMON NAME	SCIENTIFIC NAME	SEASON
Bald Eagle	*Haliaeetus leucocephalus*	Year-round
Blue-winged Warbler	*Vermivora cyanoptera*	Breeding
Chuck-will's-widow	*Antrostomus carolinensis*	Breeding
Dickcissel	*Spiza americana*	Breeding
Fox Sparrow	*Passerella iliaca*	Wintering
Kentucky Warbler	*Geothlypis formosus*	Breeding
Least Bittern	*Ixobrychus exilis*	Breeding
Loggerhead Shrike	*Lanius ludovicianus*	Year-round
Louisiana Waterthrush	*Parkesia motacilla*	Breeding
Prairie Warbler	*Setophaga discolor*	Breeding
Prothonotary Warbler	*Protonotaria citrea*	Breeding
Red Crossbill	*Loxia curvirostra*	Year-round
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Year-round
Rusty Blackbird	*Euphagus carolinus*	Wintering
Short-eared Owl	*Asio flammeus*	Wintering
Wood Thrush	*Hylocichla mustelina*	Breeding
Worm Eating Warbler	*Helmitheros vermivorum*	Breeding

Source: USFWS 2016b

BIRDS OF CONSERVATION CONCERN FOUND IN THE LAKE HARRIS PROJECT VICINITY

COMMON NAME	SCIENTIFIC NAME	SEASON
American Bittern	*Botaurus lentiginosus*	Wintering
Bachman's Sparrow	*Aimophila aestivalis*	Year-round
Bald Eagle	*Haliaeetus leucocephalus*	Year-round
Blue-winged Warbler	*Vermivora cyanoptera*	Breeding
Brown-headed Nuthatch	*Sitta pusilla*	Year-round
Chuck-will's-widow	*Antrostomus carolinensis*	Breeding
Fox Sparrow	*Passerella iliaca*	Wintering
Kentucky Warbler	*Geothlypis formosa*	Breeding
Le Conte's Sparrow	*Ammodramus leconteii*	Wintering
Least Bittern	*Ixobrychus exilis*	Breeding
Loggerhead Shrike	*Lanius ludovicianus*	Year-round
Louisiana Waterthrush	*Parkesia motacilla*	Breeding
Prairie Warbler	*Setophaga discolor*	Breeding
Prothonotary Warbler	*Protonotaria citrea*	Breeding
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Year-round
Rusty Blackbird	*Euphagus carolinus*	Wintering
Short-eared Owl	*Asio flammeus*	Wintering
Swainson's Warbler	*Limnothlypis swainsonii*	Breeding
Wood Thrush	*Hylocichla mustelina*	Breeding
Worm Eating Warbler	*Helmitheros vermivorum*	Breeding

Source: USFWS 2016a

References:

U.S. Fish and Wildlife Service (USFWS). 2016a. IPaC Trust Resources Report. R.L. Harris Project Lands Near Reservoir. Accessed November 9, 2016.

U.S. Fish and Wildlife Service (USFWS). 2016b. IPaC Trust Resources Report. R.L. Harris Skyline Wildlife Management Area. Accessed November 9, 2016.

4. FOREST TYPES AT SKYLINE

Forest Types – Skyline

Southern Ridge and Valley / Cumberland Dry Calcareous Forest
The Southern Ridge and Valley/Cumberland Dry Calcareous forest is comprised of dry-to-dry mesic calcareous forests in a variety of landscape positions, including ridge tops and upper and mid-slopes. They dominate vegetation type under natural conditions. High quality examples are characteristically dominated by white oak, chinkapin oak (*Quercus muehlenbergii*), post oak, and Shumard's oak (*Quercus shumardii*), with varying amounts of hickory, sugar maple (*Acer saccharum*), southern sugar maple, chalk maple (*Acer leucoderme*), red maple, and other species. This system also includes successional communities resulting from logging or agriculture and are dominated by tulip tree, pine, eastern red cedar (*Juniperus virginiana*), and black locust (*Robinia pseudoacacia*) (NatureServe 2009).

South-Central Interior Mesophytic Forest
The South-Central Interior Mesophytic forest is primarily deciduous forests that typically occur in deep, enriched soils in protected landscape settings such as covers or lower slopes. This forest is generally highly diverse and is dominated by sugar maple, American beech, tulip tree, American basswood (*Tilia americana*), northern red oak, cucumber tree (*Magnolia acuminata*), and eastern black walnut (*Juglans nigra*). Eastern hemlock (*Tsuga canadensis*) may be present in some stands. Common shrubs include coralberry (*Symphoricarpos orbiculatus*), bladdernut (*Staphylea trifolia*), bursting-heart, and flowering dogwood. The herb layer is often very plentiful and may include licorice bedstraw (*Galium circaezans*), black cohosh (*Actaea racemosa*), southern lady fern (*Athyrium filix-femina ssp. asplenioides*), and crownbeard (*Verbesina alternifolia*).

Allegheny-Cumberland Dry Oak Forest and Woodland
The Allegheny-Cumberland Dry Oak forest and woodland consists of dry hardwood forests found in nutrient-poor or acidic substrates on plateaus or ridges. Typical dominants include white oak, southern red oak, chestnut oak (*Quercus prinus*), scarlet oak, with lesser amounts of red maple, pignut hickory, and mockernut hickory. Shortleaf pine (*Pinus echinata*) and/or Virginia pine may occur in smaller amounts, particularly adjacent to steep cliffs or slopes or in area impacted by fire. White pine (*Pinus strobus*) may be prominent in some stands in the absence of fire. American chestnut (*Castanea dentata*) saplings may be found where it was once a common tree. The shrub layer may include lowbush blueberry (*Vaccinium angustifolium*), bear huckleberry (*Gaylussacia ursina*), deerberry (*Vaccinium stamineum*), hillside blueberry (*Vaccinium pallidum),* oakleaf hydrangea (*Hydrangea quercifolia*), and mapleleaf viburnum (*Viburnum acerifolium*). Common herbs include Boott's sedge (*Carex picta*), black seed speargrass (*Piptochaetium avenaceum*), nakedflower tick trefoil (*Desmodium nudiflorum*), longleaf woodoats (*Chasmanthium sessiliflorum*), and dwarf violet iris (*Iris verna var. smalliana*).

References:

NatureServe. 2009. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 06 February 2009. Available at: http://downloads.natureserve.org/get_data/data_sets/veg_data/nsDescriptions.pdf. Accessed November 11, 2016.

5. 2018 WETLAND DELINEATION AND STREAM ENVIRONMENTAL ASSESSMENT REPORT – SKYLINE

WETLAND DELINEATION AND STREAM ENVIRONMENTAL ASSESSMENT REPORT

ALABAMA POWER COMPANY
SKYLINE WILDLIFE MANAGEMENT AREA
JACKSON COUNTY, ALABAMA

PRELIMINARY INFORMATION DOCUMENT
R.L. HARRIS HYDROELECTRIC PROJECT
FERC PROJECT NO. 2628

Prepared for:
Alabama Power Company
Birmingham, Alabama

Alabama Power

Prepared by:

Cahaba Consulting, LLC
Birmingham, Alabama

January 2018

WETLAND DELINEATION AND STREAM ENVIRONMENTAL ASSESSMENT REPORT
ALABAMA POWER COMPANY
SKYLINE WILDLIFE MANAGEMENT AREA
JACKSON COUNTY, ALABAMA

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R.L. HARRIS HYDROELECTRIC PROJECT
FERC PROJECT NO. 2628

TABLE OF CONTENTS

1 INTRODUCTION AND SITE DESCRIPTION

1.1 Purpose

Alabama Power Company (APCO) is preparing to initiate the Federal Energy Regulatory Commission (FERC) relicensing of the 135-megawatt (MW) R.L. Harris Hydroelectric Project (Harris Project), FERC Project No. 2628. The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources. APCO contracted Cahaba Consulting, LLC to perform an environmental assessment for the James D. Martin-Skyline Wildlife Management Area (Skyline WMA). The project is located entirely in Jackson County on the Alabama-Tennessee border. This work was performed to identify and document potential and/or probable jurisdictional "waters of the United States," (waters) as defined by Section 404 of the Clean Water Act.

The Harris Project contains 15,063 acres of land within the Skyline WMA located in Jackson County, Alabama. These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigative Plan and Wildlife Management Plan for the original construction of the reservoir. The Skyline lands were incorporated into the 1995 approval of the updated Land Use Plan. These lands are leased to, and managed by, the State of Alabama for wildlife management and public hunting and are part of the Skyline WMA (ADCNR 2016b).

1.2 Site Description

1.2.1 Site Location

The Skyline WMA, subject tract of land, is approximately 19.5 square miles located in Jackson County, Alabama. Specifically, the very irregular shape of the property is located as far west as Sections 15 & 22, Township 1 & 2 South, and Range 5 East; as far south as Sections 12 & 7, Township 2 South, and Range 6 East; as far east as Section 7, Township 2 South, and Range 6 East; and as far north as Sections 3, 4 & 5, Township 1 South, and Range 6 East, along the state border. Within this large expanse are areas that are excluded from Skyline WMA as well as areas that area included. Approximate center coordinates of the project are: 34.9366° North (latitude) and 86.0141° West (longitude). See Attachment A for site location/USGS topographic and aerial maps showing the project area.

The primary drainages for the project area are the Big Coon Creek, Little Coon Creek, and Crow Creek and its tributaries. All creeks and tributaries flow to Guntersville Lake and the Tennessee River. Little Coon Creek is a 303 (d) listed stream, and is a major tributary to the Tennessee River in north eastern Alabama. Its uses are Fish and Wildlife.

1.2.2 Physiographic Characteristics

The entire county is in the Cumberland Plateau section of the Appalachian Plateaus. Before it was dissected by streams, the area was mainly a nearly level plain gently inclined toward the south. The sandstone plateaus include chiefly two areas, Sand Mountain in the southeastern part and the Cumberland Plateau in the north central part of the county. Most of the tributary streams originating in the plateau areas have cut deep gorges where they emerge from the plateaus. These channels form great V-shaped ravines or rock-walled gorges that separate the plateau. Except in the Tennessee River valley, the drainage pattern is dendritic.

The rocks in Jackson county are sedimentary in origin, being sandstone, shale, and limestone. The high plateaus are capped with sandstone about 100-200 feet thick. The Pottsville formation is of Pennsylvania age and is made up of a sandstone capping and the underlying shale bed. The capping is composed mainly of medium- to fine-grained sandstone, but in places it consists of conglomerates.

Many of the geologic formations outcropping in the valleys are covered by alluvium that varies greatly in age, depth, and composition. The formations of alluvium in the Tennessee River valley consist of mixed material transported from a broad area including considerable parts of the Cumberland Plateau, the Blue Ridge Province, and that part of the Ridge and Valley province known as the Great Valley.

1.2.3 HUC Classification

The project is located within HUC 0603000103 the Tennessee River-Big Coon Creek Watershed.

1.2.4 Soils

According to the Jackson County Soil Survey the project land is not suited for agriculture and is composed of mountainous terrain. The most significant agricultural areas are in the valleys and wide floodplains and terraces. Soils on the plateaus are used mostly for field and vegetable crops.

The major soil groups within the project are composed of Hartsells, Jefferson, Muskigum, Rough and Rolling Stony land (Muskigum and Colbert) and Limestone rockland association on steep mountainous areas.

2 METHODOLOGY

The review was performed utilizing USGS 7.5 Minute Quadrangles, the National Wetland Inventory (NWI) and Ortho Aerial Imagery. Assessment of potential waters were not verified in the field, other than minimal representative observations.

To determine the site layout and characteristics and assist in the identification and location of the jurisdictional wetlands and streams on the subject property, several readily-available maps and aerial photographs were reviewed, which are listed below.

- U.S. Geological Survey (USGS) 7.5 Minute topographic maps (See Attachment A)
- National Wetland Inventory (NWI) maps (See Attachment B)
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey reports and maps (See Attachment C)

2.1 Wetlands and Stream Assessment

2.1.1 Wetland and Stream Assessment Methods

Many procedures currently exist for assessing wetlands and their quality. Field verification for the presence of wetlands was not performed; but rather a desk-top assessment, that utilizes the best available stream and wetland information.

National Wetlands Inventory - Potential wetlands and streams were identified utilizing the National Wetland Inventory mapping. These maps are available on the U.S. fish and Wildlife Service website (https://www.fws.gov/wetlands/data/mapper.HTML). The USFWS created the National Wetland Inventory (NWI) in 1974 to "conduct a nationwide inventory of United States wetlands to provide its biologists and others with information on the distribution of wetlands to aid in wetland conservation efforts." The wetland classification system developed by Cowardin et al. (1979) is used as the federal standard of wetland classification.

USGS Quadrangle Topographic Maps - Topographic maps, depictions of the land surface features of an area, published by the U.S. Geological Survey (USGS) represent an easily obtained and inexpensive source of landscape information. USGS topographic maps are used by a range of citizens and professionals in public and private sectors for tasks such as site and regional planning, natural resource land management, environmental monitoring and planning, national defense, law enforcement, and outdoor recreation. Topographic maps portray a range of natural and cultural features. Some of the data used to create this atlas, such as topography, hydrology, and geology, originated with the USGS. The maps have various background "layers" that allow the user to choose map types; these layers include the USGS Topographic 1:24,000 scale, 7.5 Minute Quadrangles. These maps are general in nature and show topographic contours at 20' intervals and includes major streams and drainage features, including wetlands.

Web Soil Survey - The U.S. Department of Agriculture Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent soon. The site is updated and maintained online as the single authoritative source of soil survey information. (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm). These maps can provide valuable stream and wetland assessment data.

Figure 1 - Typical NWI map

Figure 2 – Typical USGS Topographical Map

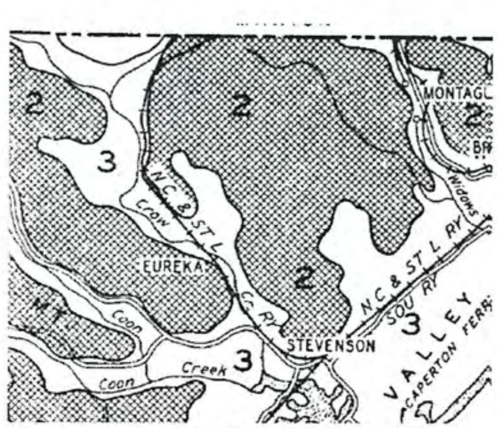


Figure 3 – Typical NRCS Soil Map

3 FINDINGS

The assessment for identifying wetlands and streams was conducted by Cahaba Consulting, LLC in December of 2017. Minimal wetlands were identified and forty-nine (49) streams and their tributaries were identified and are discussed in the following sections.

3.1 Wetlands and Streams

Due to extremely steep terrain and relatively small floodplains within Alabama Power's Skyline property, it is unlikely that large areas of wetlands would occur. According to the NWI data, there no wetlands and only a few freshwater ponds within Skyline boundary (USFWS NWI 2017).

Forty-nine (49) streams and their tributaries totaling approximately **237,425 linear feet** or **44.97 miles** were assessed on the subject site. Streams were of all classifications and include, perennial, intermittent, and ephemeral streams. Perennial streams flow throughout a typical year, intermittent streams typically flow seasonally, i.e. during the "wetter" season, and may not flow during summer and fall months; ephemeral streams generally flow during rainfall events and subside within 24 hours. Although the mapped streams as shown on the USGS maps, are shown as solid blue lines, which are usually interpreted as a perennial stream, is not accurate. Based on field observation of select streams, different classifications exist within the project.

Select streams were observed for general biological function based on the presence of macroinvertebrates, fish population and diversity. Stream evaluation on the perennial streams was selected to include examining riffle complexes, if present, for the presence of benthic macroinvertebrates assemblages such as mayflies, fishflies, alderflies, hellgrammites and other aquatic organisms. These species can be used as indicators of water quality and stream health. Smaller streams were primarily assessed utilizing visual observation, and included observation for erosion, adverse impacts and general stream integrity.

In general, the streams are typical medium steep gradient streams with minimal narrow flood plains. These streams are comprised of cobble, bolder and bed rock substrate. The intermittent (seasonal) streams on site are primarily 1st and 2nd order tributaries to larger perennial streams and generally are not as steep. It appears that many of the streams in the upper reaches would be considered ephemeral, transitioning into intermittent until they converge with the larger perennial streams. The perennial streams are flat with relatively wide floodplains, however, only a few of these exist within the project. The perennial streams would be considered receiving waters to the upper tributaries. The streams riparian zone consists of primarily mature forest vegetation.

The stream length is summarized below totaling **237,425** linear feet or **44.97** miles.

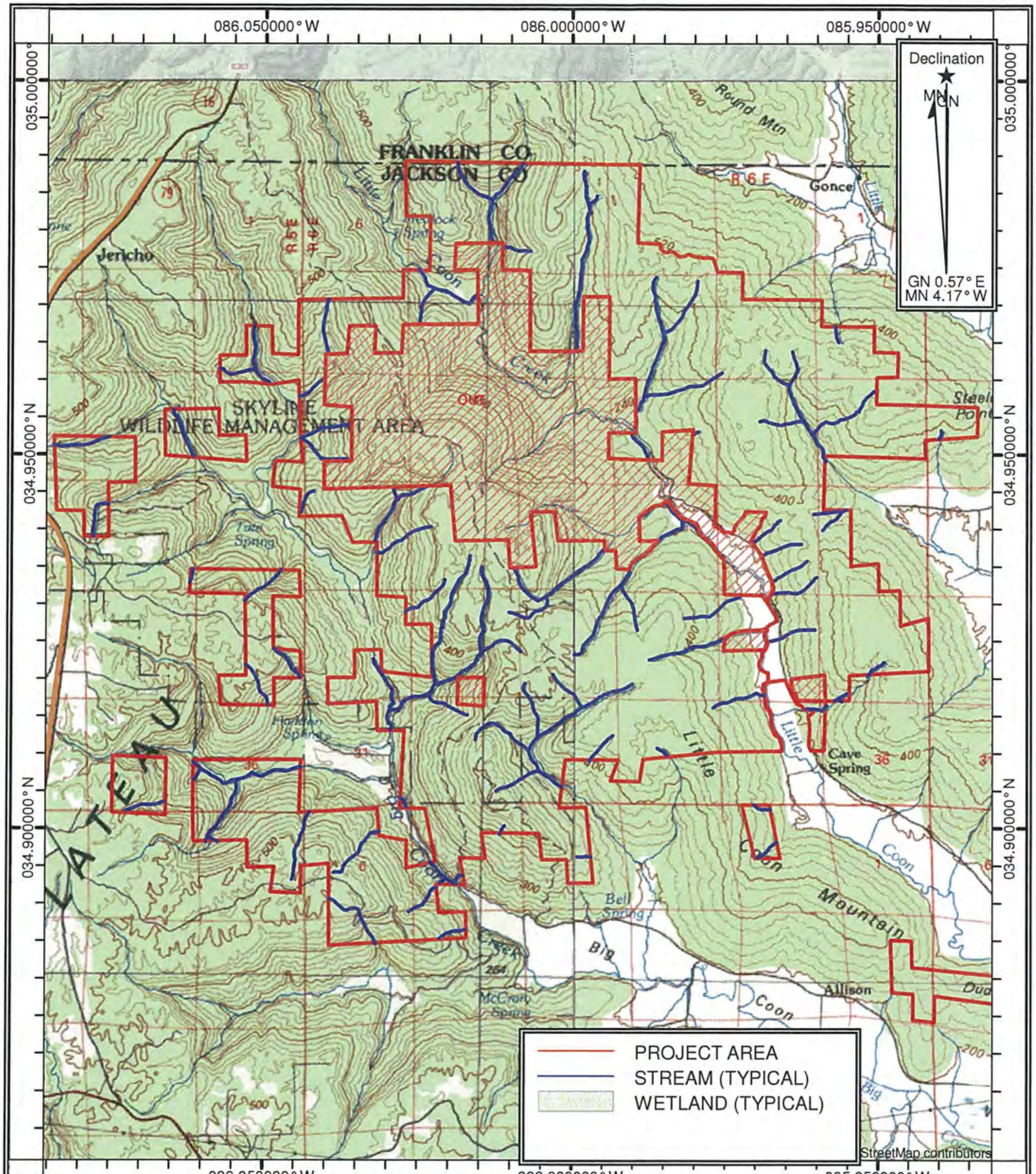
Table 1 - Streams

Stream	Length	Stream	Length	Stream	Length

1	2200	17 DS	1078	31	3324
1A	2362	17A	270	31A	2339
1B	2649	18	4265	31B	3543
1C	1424	18A	2271	31C	2835
2	8976	18B	1770	31D	4770
2A	607	18C	3960	31E	2865
3	6970	18D	2225	32	1712
3A	3176	19	824	33	1215
3B	4079	20	449	34	882
4 DS	8765	21	2698	35	2792
4A	1926	21 DS	1511	36	2121
4 US	3700	22	3133	37	683
4MID	1442	22A	1795	38	2358
4MM	4068	22B	2605	39	1920
5	1384	22C	2719	39 DS	678
5 US	6178	23	2516	40	5861
5A	2586	24	1287	40A	3517
6	8923	25	4050	40B	584
6A	2441	25A	707	41	3482
7	3160	26	3049	42	3285
8	3821	27	2609	43	1337
9	2684	28	3965	44	3538
10	589	28 MID	523	45	669
11	371	28 DS	1663	46 US	1861
12	1793	29	2823	46 DS	338
13	2016	29A	6811	47	1564
14	2036	29B	7180	47A	1358
15	2520	29C	2399	48	1943
16	2471	29D	2279	49	2349
17 US	1129	30	495	**237,425 LINEAR FEET**	
17 M	696	30 DS	631	**44.97 MILES**	

ATTACHMENTS

ATTACHMENT A
Site Location/USGS Topographic Maps



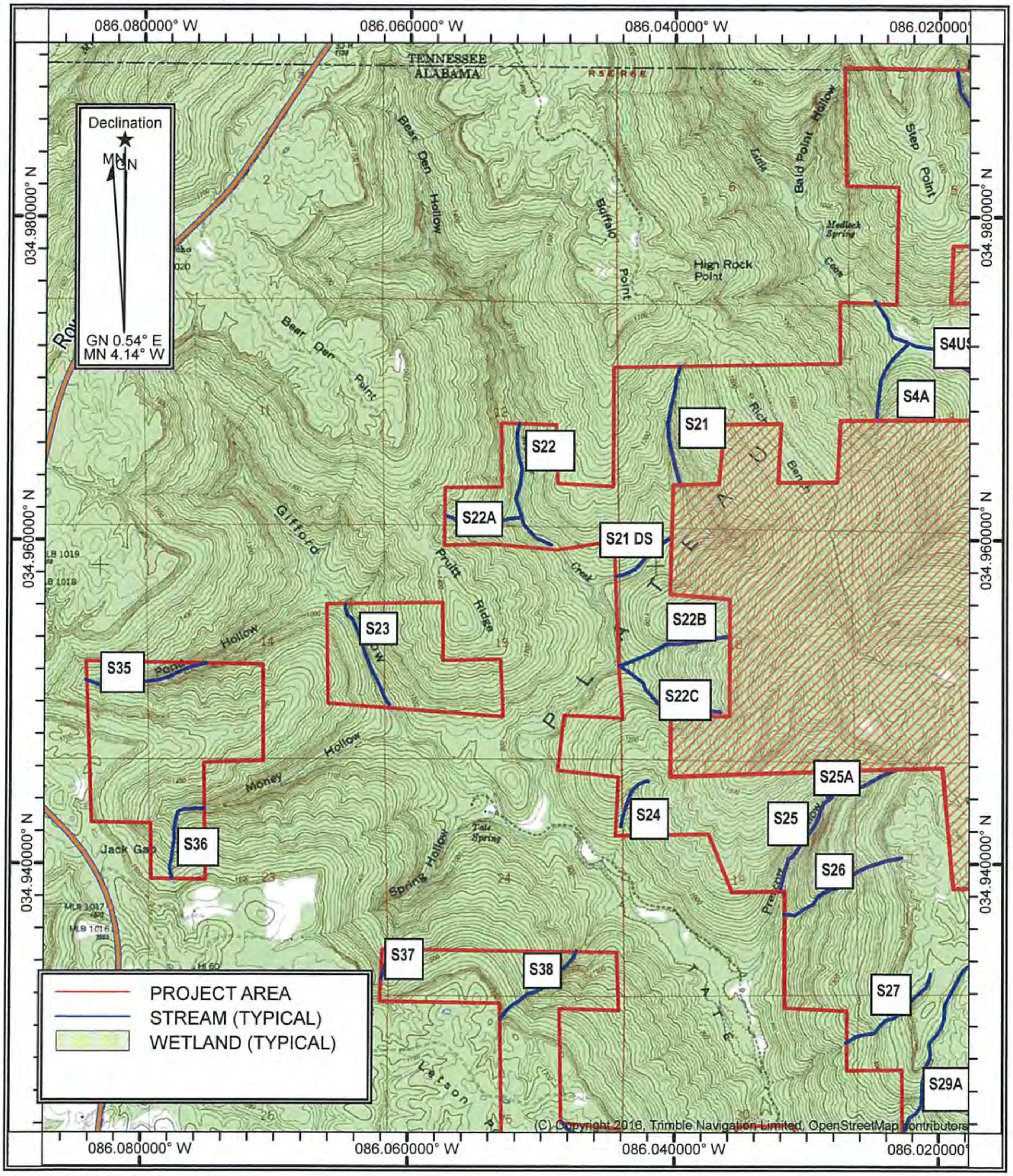
ALABAMA POWER COMPANY
RL Harris Relicense FERC - 2628
Wetland and Stream Assessment
South-East Sector
Project Map - 1:24000 Toporaphy - January 2108

Alabama Power

SCALE 1:80000

0 10000

Feet



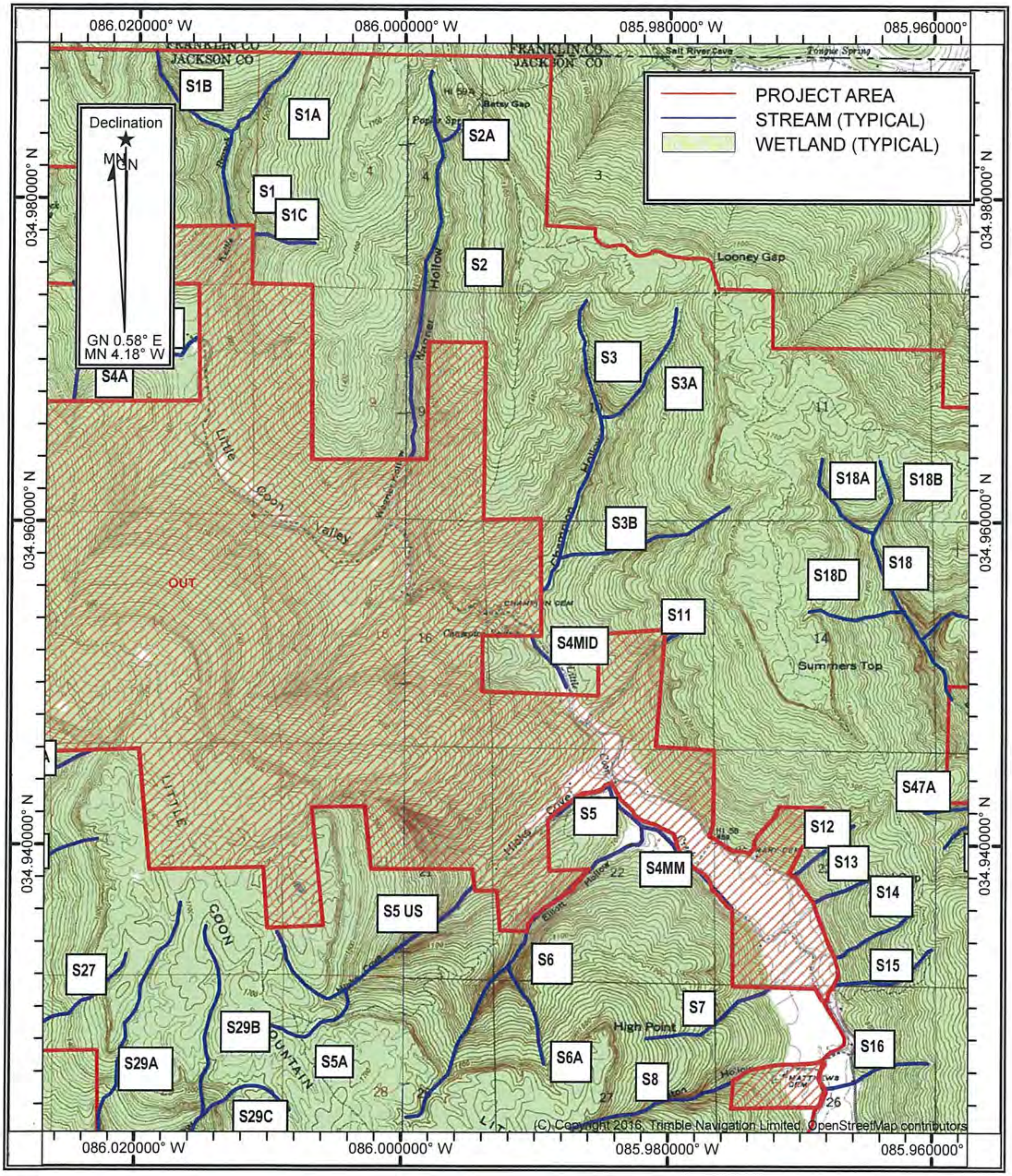
ALABAMA POWER COMPANY
RL Harris Relicense FERC - 2628
Wetland and Stream Assessment
North-West Sector
Map 1 - 1:24000 Toporaphy - January 2108

Alabama Power

SCALE 1:36112

0 1000 2000 3000 4000 5000 6000

Feet



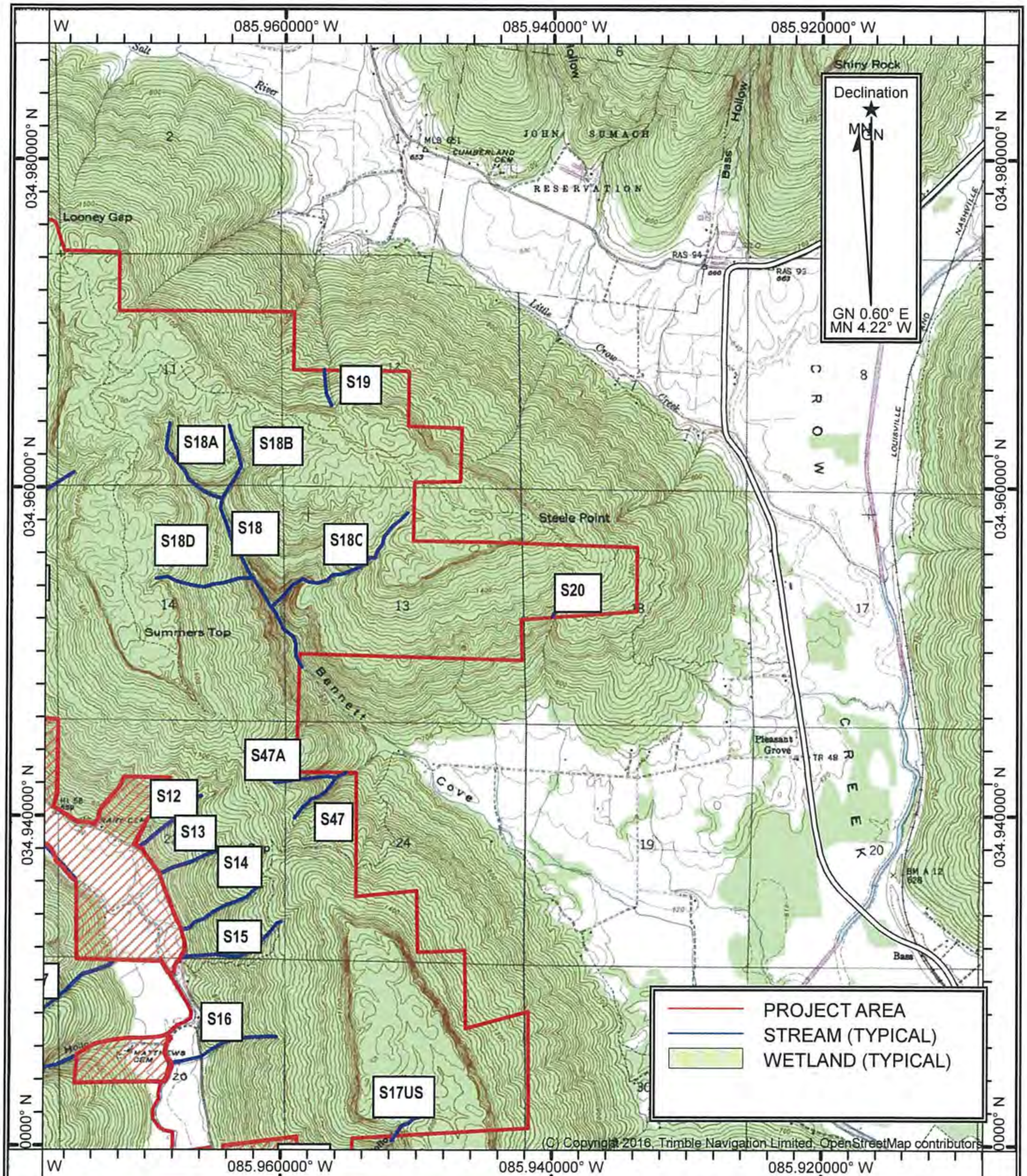
ALABAMA POWER COMPANY
RL Harris Relicense FERC - 2628
Wetland and Stream Assessment
North-Center Sector
Map 2 - 1:24000 Toporaphy - January 2108

Alabama Power

SCALE 1:36112

0 1000 2000 3000 4000 5000 6000

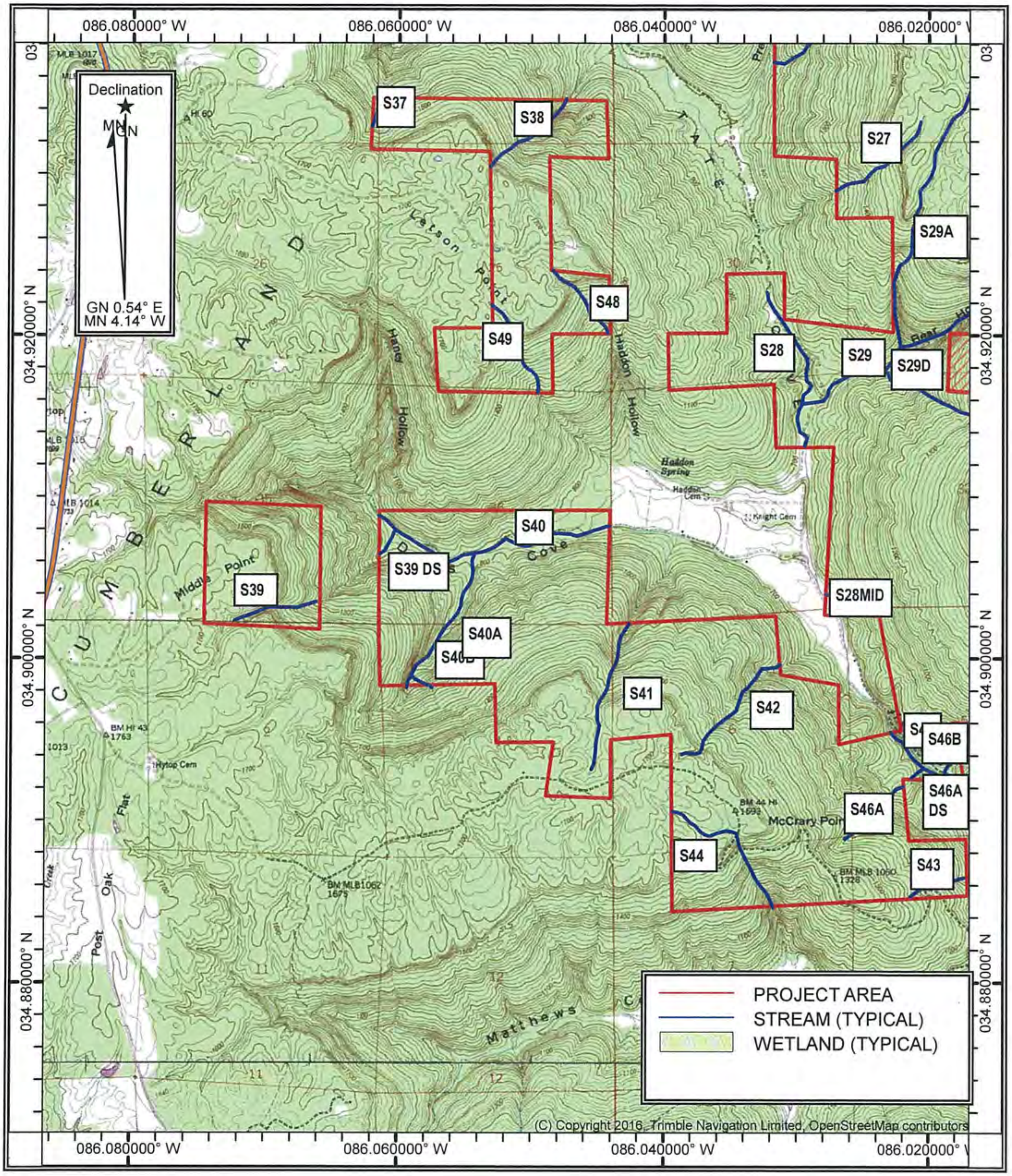
Feet



ALABAMA POWER COMPANY
RL Harris Relicense FERC - 2628
Wetland and Stream Assessment
North-East Sector
Map 3 - 1:24000 Toporaphy - January 2108

SCALE 1:36112

0 1000 2000 3000 4000 5000 6000
Feet



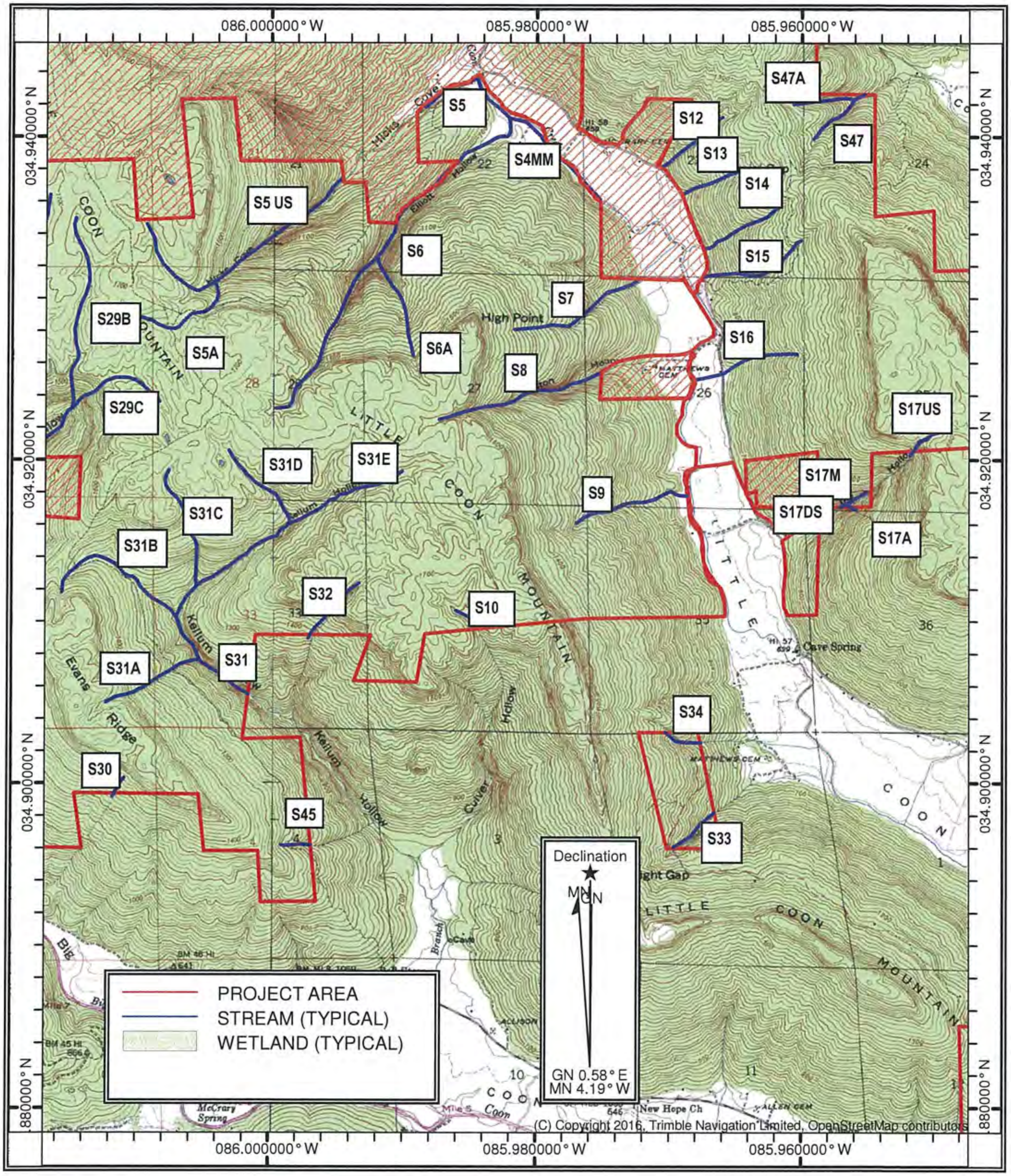
ALABAMA POWER COMPANY
RL Harris Relicense FERC - 2628
Wetland and Stream Assessment
South-West Sector
Map 4 - 1:24000 Toporaphy - January 2108

Alabama Power

SCALE 1:36112

0 1000 2000 3000 4000 5000 6000

Feet



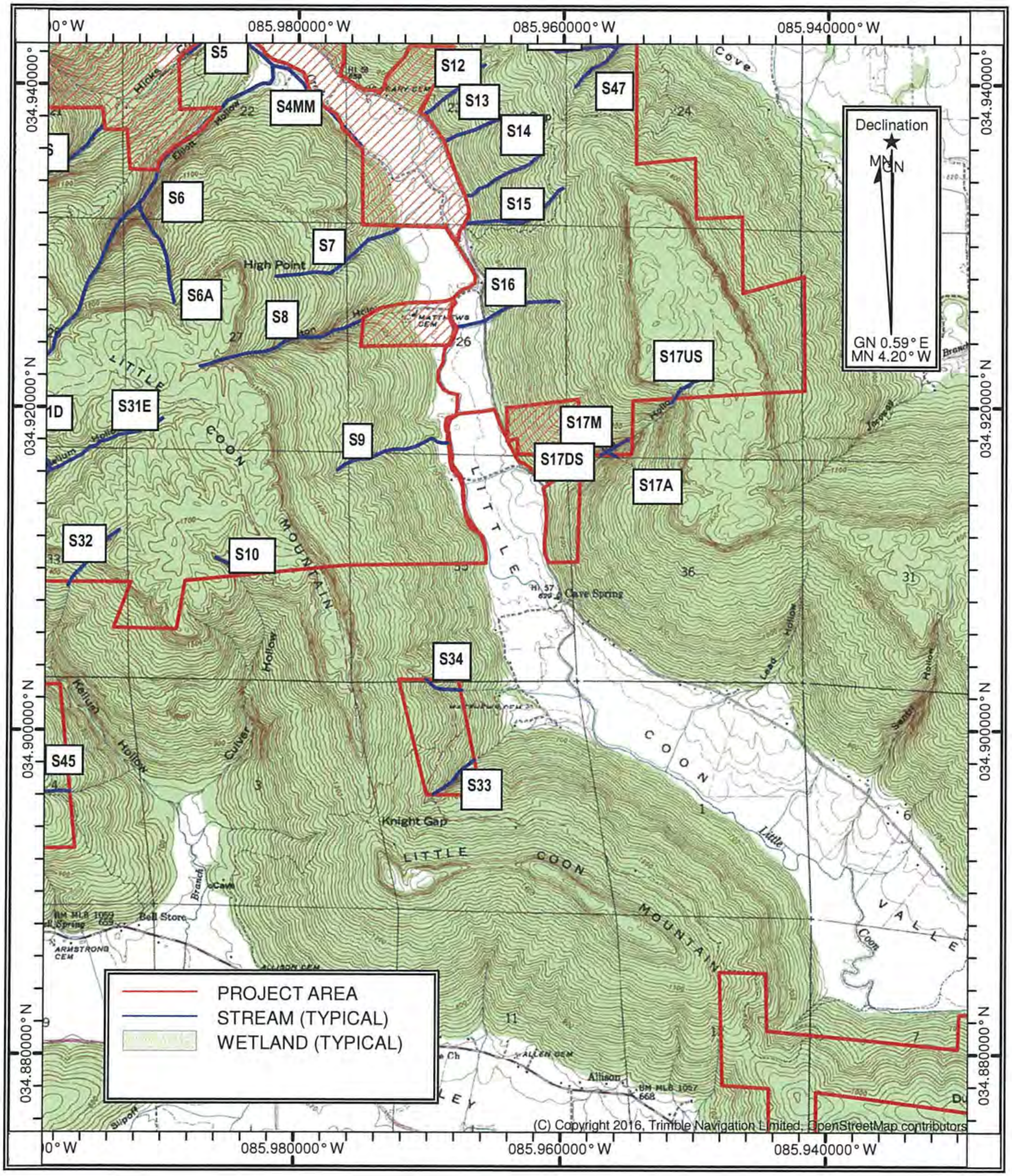
ALABAMA POWER COMPANY
RL Harris Relicense FERC - 2628
Wetland and Stream Assessment
South-Center Sector
Map 5 - 1:24000 Toporaphy - January 2108

Alabama Power

SCALE 1:36112

0 1000 2000 3000 4000 5000 6000

Feet



ALABAMA POWER COMPANY
RL Harris Relicense FERC - 2628
Wetland and Stream Assessment
South-East Sector
Map 6 - 1:24000 Toporaphy - January 2108

Alabama Power

SCALE 1:36112

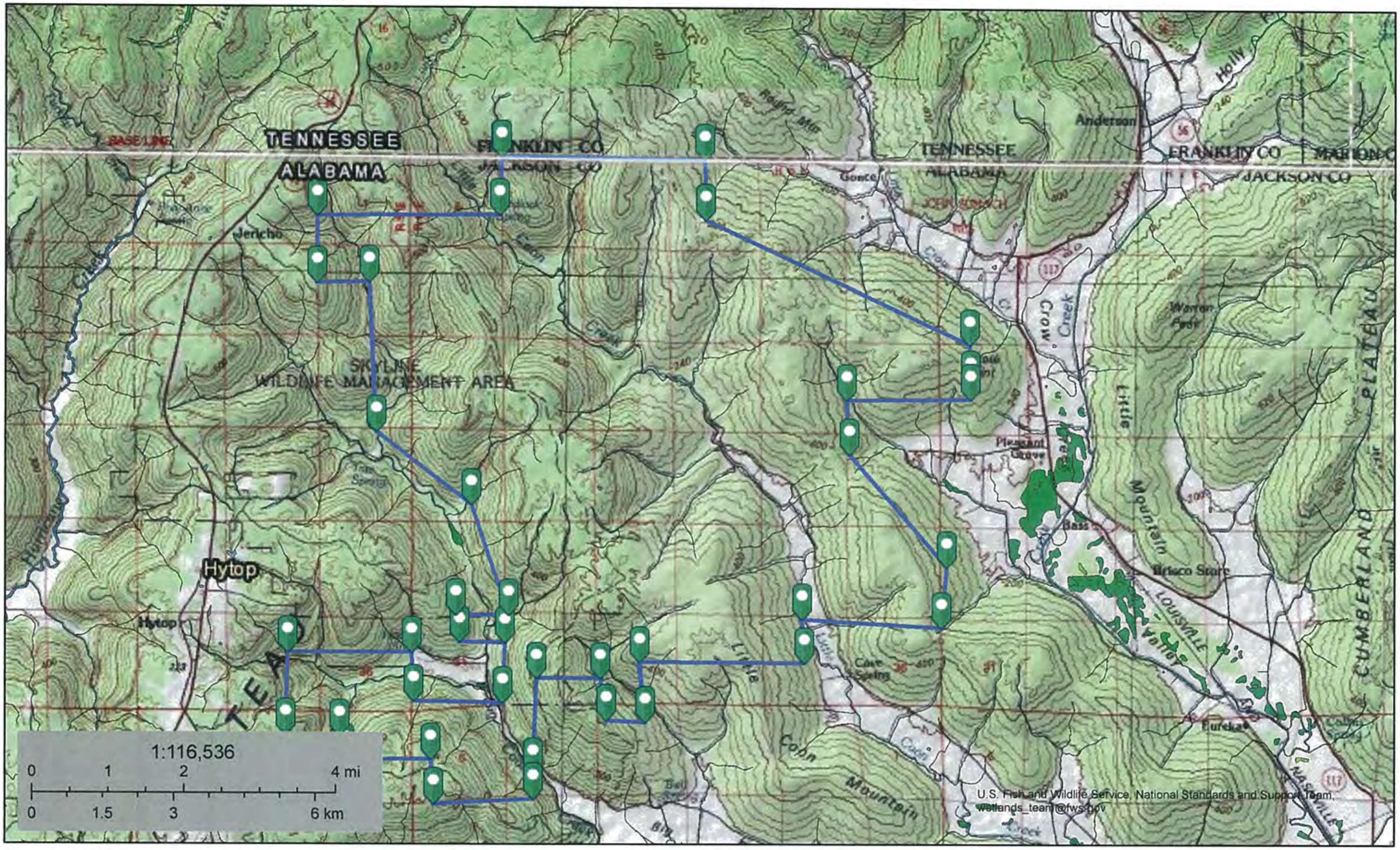
0 1000 2000 3000 4000 5000 6000
Feet

ATTACHMENT B
National Wetlands Inventory (NWI) Maps

U.S. Fish and Wildlife Service

National Wetlands Inventory

Sky Line WMA - RL Harris RL



January 5, 2018

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

ATTACHMENT C
Site Soil Types and Map

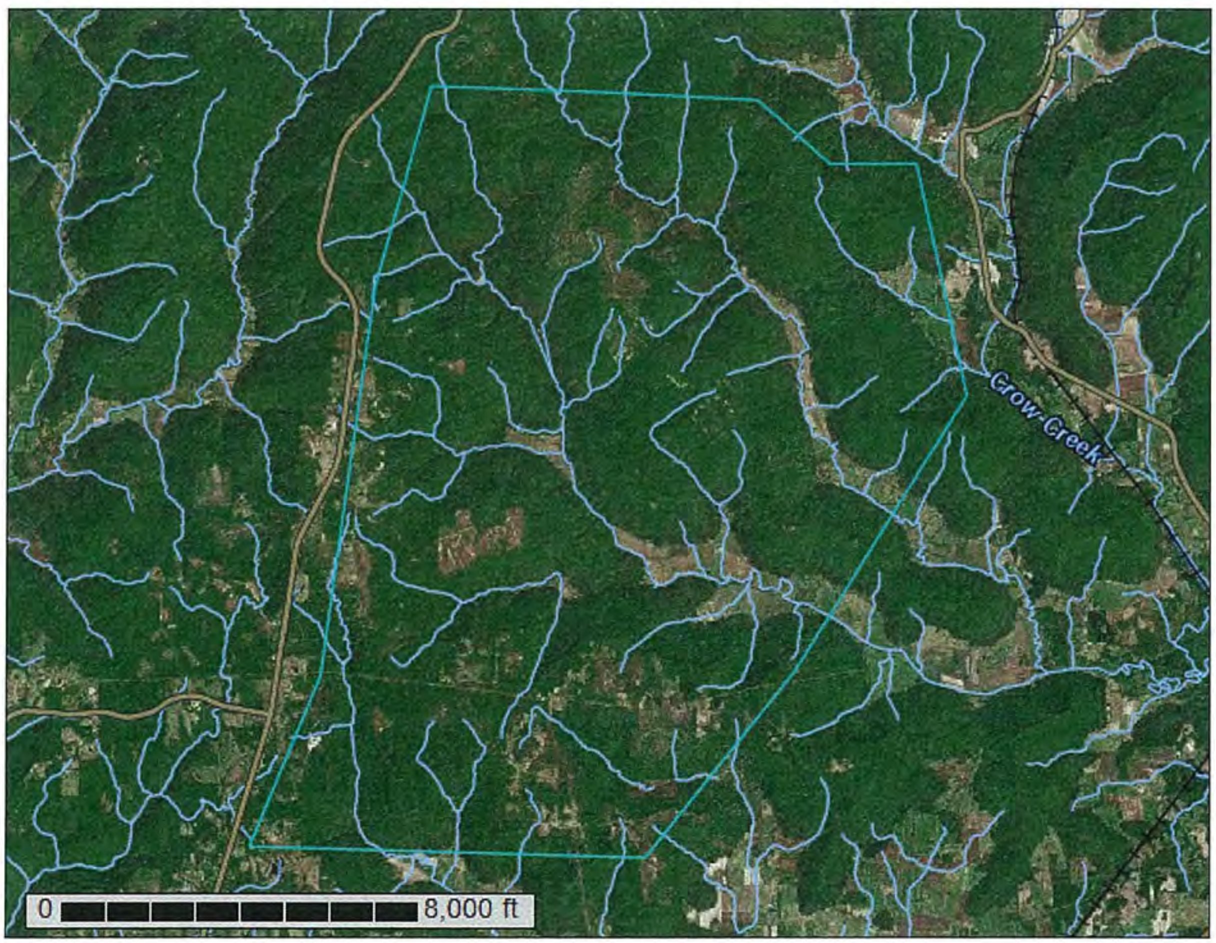
USDA United States Department of Agriculture

NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Jackson County, Alabama

Wetland and Stream Assessment



January 2, 2018

Soil Map


86° 7' 35" W
85° 54' 28" W
581000
584000
587000
590000
593000
596000
599000
35° 1' 16" N
34° 47' 0" N
3875000
3872000
3869000
3866000
3863000
3860000
3857000
3854000
3851000
N
Map Scale: 1:129,000 if printed on A portrait (8.5" x 11") sheet.
Meters
0 1500 3000 6000 9000
Feet
0 5000 10000 20000 30000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jackson County, Alabama
Survey Area Data: Version 9, Oct 6, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 12, 2011—Jan 4, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ade	Allen fine sandy loam, eroded, undulating phase	125.2	0.2%
Adh	Allen fine sandy loam, eroded, hilly phase	14.5	0.0%
Adn	Allen fine sandy loam, eroded, rolling phase	159.5	0.3%
Ado	Allen fine sandy loam, rolling phase	45.4	0.1%
Adu	Allen fine sandy loam, undulating phase	112.4	0.2%
Af	Abernathy-Emory fine sandy loams, 0 to 2 percent slopes	5.5	0.0%
Ald	Allen loam, severely eroded, rolling phase	57.5	0.1%
Alr	Allen loam, severely eroded, hilly phase	2.5	0.0%
Asu	Emory-Abernathy silt loams, 0 to 6 percent slopes	1.8	0.0%
Asv	Abernathy-Emory silt loams, 0 to 2 percent slopes	4.6	0.0%
BC	Barbourville-Cotaco fine sandy loams	18.3	0.0%
Bf	Bruno fine sandy loam	355.9	0.7%
Bu	Bruno loamy fine sand	84.8	0.2%
Cmn	Cumberland silty clay loam, eroded, rolling phase	9.2	0.0%
CTd	Colbert-Talbott stony silty clay loams, severely eroded, rolling phases	11.1	0.0%
Cto	Colbert silty clay loam, rolling phase	11.8	0.0%
Ctu	Colbert silty clay loam, undulating phase	1.3	0.0%
Du	Dunning silty clay	17.0	0.0%
Ede	Enders silt loam, eroded, undulating phase	4.1	0.0%
Edo	Enders silt loam, rolling phase	56.0	0.1%
Eg	Egam silt loam	60.4	0.1%
Esu	Etowah silt loam, 2 to 6 percent slopes	9.7	0.0%
Ewu	Etowah loam, 2 to 6 percent slopes	113.3	0.2%
Ewv	Etowah loam, 0 to 2 percent slopes	7.3	0.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Fch	Fullerton gravelly silt loam, 12 to 25 percent slopes, eroded	7.4	0.0%
Fcn	Fullerton gravelly silt loam, 5 to 12 percent slopes, eroded	4.4	0.0%
Fco	Fullerton gravelly silt loam, 5 to 12 percent slopes	0.0	0.0%
Fcu	Fullerton gravelly silt loam, 2 to 5 percent slopes	6.1	0.0%
Hcv	Hollywood silty clay, level phase	49.9	0.1%
Hfa	Hartsells fine sandy loam, eroded, rolling shallow phase	36.2	0.1%
Hfe	Hartsells (Wynnville) fine sandy loam, 2 to 6 percent slopes, eroded	4.8	0.0%
Hfg	Hartsells fine sandy loam, rolling, shallow phase	1,349.9	2.6%
Hfm	Hartsells fine sandy loam, undulating, shallow phase	2.7	0.0%
Hfn	Hartsells (Nauvoo) fine sandy loam, 6 to 10 percent slopes, eroded	181.9	0.4%
Hfo	Hartsells (Nauvoo) fine sandy loam, 6 to 10 percent slopes	6,623.4	13.0%
Hfu	Hartsells fine sandy loam, undulating phase	1,151.2	2.3%
Hl	Huntington silt loam	161.8	0.3%
Hno	Hanceville fine sandy loam, rolling phase	62.8	0.1%
Hnu	Hanceville fine sandy loam, undulating phase	12.1	0.0%
HsM	Hilly stony land	35.4	0.1%
Hth	Hermitage cherty silty clay loam, eroded, hilly phase	2.2	0.0%
Huu	Holston loam, 2 to 5 percent slopes	61.1	0.1%
Huv	Holston loam, level phase	58.9	0.1%
JAh	Jefferson-Allen loams, eroded, hilly phases	26.4	0.1%
JAl	Jefferson-Allen loams, hilly phases	119.0	0.2%
JAn	Jefferson-Allen loams, eroded, rolling phases	70.8	0.1%
JAr	Jefferson-Allen loams, severely eroded, hilly phases	422.0	0.8%
JAs	Jefferson-Allen loams, severely eroded, steep phases	72.6	0.1%
JAz	Jefferson-Allen loams, steep phases	148.5	0.3%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Jfe	Jefferson fine sandy loam, eroded, undulating phase	137.3	0.3%
Jfn	Jefferson fine sandy loam, eroded, rolling phase	89.7	0.2%
Jfo	Jefferson fine sandy loam, rolling phase	241.4	0.5%
Jfu	Jefferson fine sandy loam, undulating phase	312.3	0.6%
Lh	Limestone rockland, hilly	449.4	0.9%
Ll	Lindside silt loam	577.4	1.1%
Lr	Limestone rockland rough	16,451.0	32.2%
Mfh	Muskingum (Gorgas) fine sandy loam, 10 to 20 percent slopes, eroded	109.7	0.2%
Mfl	Muskingum (Gorgas) fine sandy loam, 10 to 20 percent slopes	2,028.5	4.0%
Ml	Melvin silt loam	193.3	0.4%
Mnu	Monongahela loam, undulating phase	4.7	0.0%
Mo	Melvin silty clay loam	20.2	0.0%
Msl	Muskingum (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony	3,464.6	6.8%
Msz	Muskingum (Gorgas) stony fine sandy loam, 20 to 45 percent slopes, very stony	1,459.7	2.9%
Os	Ooltewah silt loam	8.7	0.0%
PA	Philo-Atkins silt loams	3.0	0.0%
RgD	Rough gullied land, Dewey, Cumberland, and Colbert soil material	24.0	0.0%
RlM	Rolling stony land, Muskingum soil material	20.4	0.0%
RsC	Rolling stony land, Colbert soil material	82.6	0.2%
RsM	Rough stony land, Muskingum soil material	12,775.3	25.0%
Sce	Swaim silty clay loam, eroded, undulating phase	7.3	0.0%
Scn	Swaim silty clay loam, eroded, rolling phase	36.5	0.1%
Sco	Swaim silty clay loam, rolling phase	43.9	0.1%
Scu	Swaim silty clay loam, undulating phase	25.5	0.0%
Sfu	Sequatchie fine sandy loam, undulating phase	48.9	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Sfv	Sequatchie fine sandy loam, level phase	98.3	0.2%
St	Sturkie fine sandy loam	227.7	0.4%
StM	Stony alluvium	170.9	0.3%
Tcn	Talbott silty clay loam, eroded, rolling phase	16.5	0.0%
Tuv	Tupelo silt loam, level phase	17.5	0.0%
W	Water	16.0	0.0%
Wsu	Wolftever silt loam, undulating phase	3.6	0.0%
Wsv	Wolftever silt loam, level phase	7.9	0.0%
Totals for Area of Interest		**51,134.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

ATTACHMENT D
Representative Stream Description Forms and Photographs

Skyline Wildlife Management Area

Typical Stream # 36

Inspection Date: 12/30/2017 **Latitude**: 34. 9398

Stream Length: 2121' **Stream Width:** 6' **Longitude:** -86.0780

Stream Type: ☐ Perennial ☐ Intermittent ☒ Ephemeral

Stream Quality: ☒ Good ☐ Moderate ☐ Poor

Substrate: ☐ Bedrock ☒ Boulders ☒ Cobble ☐ Gravel/Soil

Notes: Typical steep ephemeral stream flowing north; continuous bed and bank with no groundwater influences. No flow occurring

Skyline Wildlife Management Area

Typical Stream # 36

Inspection Date: 12/30/2017 **Latitude**: 34. 9435

Stream Length: 2121' **Stream Width:** 8.5' **Longitude:** -86.0755

Stream Type: ☐ Perennial ☒ Intermittent ☐ Ephemeral

Stream Quality: ☐ Good ☐ Moderate ☒ Poor

Substrate: ☒ Bedrock ☐ Boulders ☒ Cobble ☒ Gravel/Soil

Notes: Intermittent section of stream flowing south-east; continuous bed and bank with groundwater influences. Stream is in steep valley with rock out crops. Minimal flow was occurring.

Skyline Wildlife Management Area

Typical Stream # 21 Downstream-off site

Inspection Date: 12/30/2017 **Latitude**: 34. 9428

Stream Length: NA **Stream Width: 25'** **Longitude:** -86.0488

Stream Type: ☒ Perennial ☐ Intermittent ☐ Ephemeral

Stream Quality: ☒ Good ☐ Moderate ☒ Poor

Substrate: ☐ Bedrock ☒ Boulders ☒ Cobble ☒ Gravel/Soil

Notes: Perennial receiving water from project streams. The stream is flowing south-east; continuous bed and bank with groundwater influences. Previously disturbed with roadway through stream. Small fish and macroinvertebrates present.

Skyline Wildlife Management Area

Typical Stream # 24

Inspection Date: 12/30/2017 **Latitude**: 34. 9426

Stream Length: 1287' **Stream Width:** 15' **Longitude:** -86.0438

Stream Type: ☐ Perennial ☒ Intermittent ☐ Ephemeral

Stream Quality: ☐ Good ☒ Moderate ☐ Poor

Substrate: ☐ Bedrock ☐ Boulders ☒ Cobble ☒ Gravel/Soil

Notes: Intermittent stream flowing south; stream is a tributary to a perennial stream. It possesses continuous bed and bank with groundwater influences and surface run-off.

Skyline Wildlife Management Area

Typical Stream # 13

Inspection Date: 12/30/2017 **Latitude**: 34. 9366

Stream Length: 2106' **Stream Width:** 12' **Longitude:** -85.9690

Stream Type: ☐ Perennial ☐ Intermittent ☒ Ephemeral

Stream Quality: ☐ Good ☐ Moderate ☒ Poor

Substrate: ☐ Bedrock ☐ Boulders ☒ Cobble ☒ Gravel/Soil

Notes: Ephemeral stream flowing west; continuous bed and bank with surface water run-off. Stream is a tributary to perennial stream. No flow occurring.

6. FOREST TYPES AT LAKE HARRIS AND DOWNSTREAM OF HARRIS DAM

Forest Types at Lake Harris and Downstream of Harris Dam

Southern Piedmont Dry Oak-(Pine) Forest

The Southern Piedmont Dry Oak forest occurs in upland ridges and mid-slopes and is typically comprised of upland oaks; pines may be a significant component, especially in the southern part of the range. Overstory vegetation commonly found within this forest type includes upland oaks such as white oak (Quercus alba), northern red oak (Quercus rubra), black oak (Quercus velutina), post oak (Quercus stellata), scarlet oak (Quercus coccinea), and southern red oak (Quercus falcata) as well as hickory species such as pignut hickory (Carya glabra) and mockernut hickory (Carya alba). Other common species include loblolly pine (Pinus taeda), shortleaf pine (Pinus echinata), Virginia pine (Pinus virginiana), red maple (Acer rubrum), American sweetgum (Liquidambar styraciflua), and tulip tree (Liriodendron tulipifera). Generally, there is a well-developed shrub layer, and species vary with soil chemistry. Shrub species may include mountain laurel (Kalmia latifolia), common sweetleaf (Symplocos tinctoria), flowering dogwood (Cornus florida), deerberry (Vaccinium stamineum), and farkleberry (Vaccinium arboretum). The herb layer is typically sparse (NatureServe 2009).

Reference:

NatureServe. 2009. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 06 February 2009. Available at: http://downloads.natureserve.org/get_data/data_sets/veg_data/nsDescriptions.pdf. Accessed November 11, 2016.

7. 2018 SENSITIVE AREA (WETLANDS) ASSESSMENT REPORT – LAKE HARRIS

SENSITIVE AREA (WETLANDS) ASSESSMENT REPORT

For

Alabama Power

FERC Project - 2628
R. L. Harris Reservoir
Randolph County, Alabama

Prepared By:

Cahaba Consulting, LLC
Birmingham, Alabama

November 2018

EXECUTIVE SUMMARY

In the fall of 2012 and spring of 2013, Alabama Power Company (APCO) contracted with Cahaba Consulting, LLC to perform a study to identify, assess and document possible U.S. Army Corps of Engineers' (COE) potential sensitive areas (wetlands) located at, or below APCO regulated property on RL Harris Reservoir.

Lakes and Dams

Four APCO dams form continuous impoundments over nearly the entire length of the Tallapoosa River located in Alabama, with each dam discharging into the upper end of the next downstream impoundment. RL Harris Reservoir is located in Upper Tallapoosa River Basin. The lower three dams (Martin, Yates, and Thurlow) are located in the Middle and Lower Tallapoosa Basins. RL Harris has an elevation of 793 feet above sea level. RL Harris (a.k.a. Lake Wedowee) was impounded by APCO in April, 1983 as the newest of the 14 Alabama Power hydroelectric developments. It was named in honor of Rother L. "Judge" Harris, an Alabama Power director and vice president of electric operations. He retired from the company in 1968 after 45 years of service. RL Harris is very fertile and supports high densities of sport fish and forage species. The lake was constructed to provide flood control, and supply hydroelectricity; however, the lake has become very popular for various types of recreation including boating, swimming and fishing. The dam is 150 ft. high, 135 ft. at its maximum depth, impounds 10,660 acres (28 km²), created 271 miles of shoreline and has a capacity of two units rating 67,500kW each.

The Tallapoosa River originates in Paulding County Georgia, just 40 miles west of Atlanta, at an elevation of about 1,145 feet. It flows in a south-westerly direction for about 195 miles into Alabama and then takes a big left hand turn to the west after meeting Uphapee Creek and continues westerly for 40 miles to join the Coosa River near Wetumpka. Its total length of 235 miles drains a watershed area of 4,680 square miles. Only 720 square miles lie in Georgia accounting for 15% of the total land area. The remaining 3,960 square miles lie in Alabama accounting for 85% of the land area. *(GA DNR)* The Upper Tallapoosa has one primary tributary, the Little Tallapoosa River, which originates slightly to the south of its older sibling, in Carroll County Georgia. Within Georgia, the Tallapoosa River and the Little Tallapoosa River form separate basins of almost equal drainage area. The Little Tallapoosa's total drainage area is 605 square miles. The main stem enters Alabama at Cleburne County and the Little Tallapoosa enters as the border between Cleburne and Randolph Counties. The two merge when they flow into Lake Wedowee. *(GA DNR)*

Other principal tributaries include Sougahatchee Creek, South Sandy Creek, Uphapee, and Hillabee Creeks in Alabama. *(GA DNR)*

This report includes the RL Harris Reservoir located in Randolph County in east central Alabama (Figure 1) and is located about 100 miles east and south of Birmingham.

Specifically, center coordinates of the project are approximately 33.3054° N and -85.5872°W.

Figure 1 – Tallapoosa River Basin

BACKGROUND

APCO manages its hydroelectric reservoir shorelines and project lands to comply with its Federal Energy Regulatory Commission (FERC) operating licenses. In an effort to guide existing and future management actions within the Project's FERC boundary, APC has developed a Shoreline Management Plan for its lake projects. The SMP was developed in accordance with established FERC guidelines for developing Shoreline Management Plans and in cooperation with relicensing stakeholders, including federal and state regulatory agencies, interested non-governmental organizations, and concerned citizens. In September of 2010, the COE issued a public notice for issuance of programmatic general permits (PGP) for all of APCO's impoundments. A subsequent revision is currently undergoing review by the Corps and council. The purpose of these proposed PGPs is to authorize work, including minor structures, and other activities within the Federal Energy Regulatory Commission (FERC) project boundaries of APCO reservoirs within the Coosa, Tallapoosa, and Warrior River Basins in the State of Alabama that would have minimal adverse impact on the aquatic environment.

APCO regulates all activities and structures within the boundaries of the hydroelectric reservoirs, and these activities and structures must be pre-approved and permitted by APCO. Under these proposed PGPs, a permit applicant will only apply to APCO, rather than applying to both APCO and the COE for permits for the same work. APCO will verify that a proposed project meets the terms and conditions of the PGPs and concurrently issue an APCO Shoreline Permit.

Regulations implemented by both FERC and COE require that sensitive resource lands be managed for protection and enhancement of sensitive resources. Sensitive resources include resources protected by state and/or federal law, executive order, and other natural features considered important to the area or natural environment. In an effort to identify these sensitive resources a study of the reservoir was conducted to locate and map areas of concern. The identified areas will be used in future submittals to FERC as part of the Shoreline Management Plan (SMP), as well as a tool to assist APCO's shoreline managers' permitting activities.

A Sensitive Resource "layer" on APCO mapping identified potential sensitive areas to be assessed to either clarify or identify these areas and record the resources. These predetermined areas had the potential for historic properties, endangered species, and wetlands.

Wetlands: These PGPs authorize the following work in or affecting navigable waters of the United States and discharges of dredge or fill material into waters of the United States (wetlands).

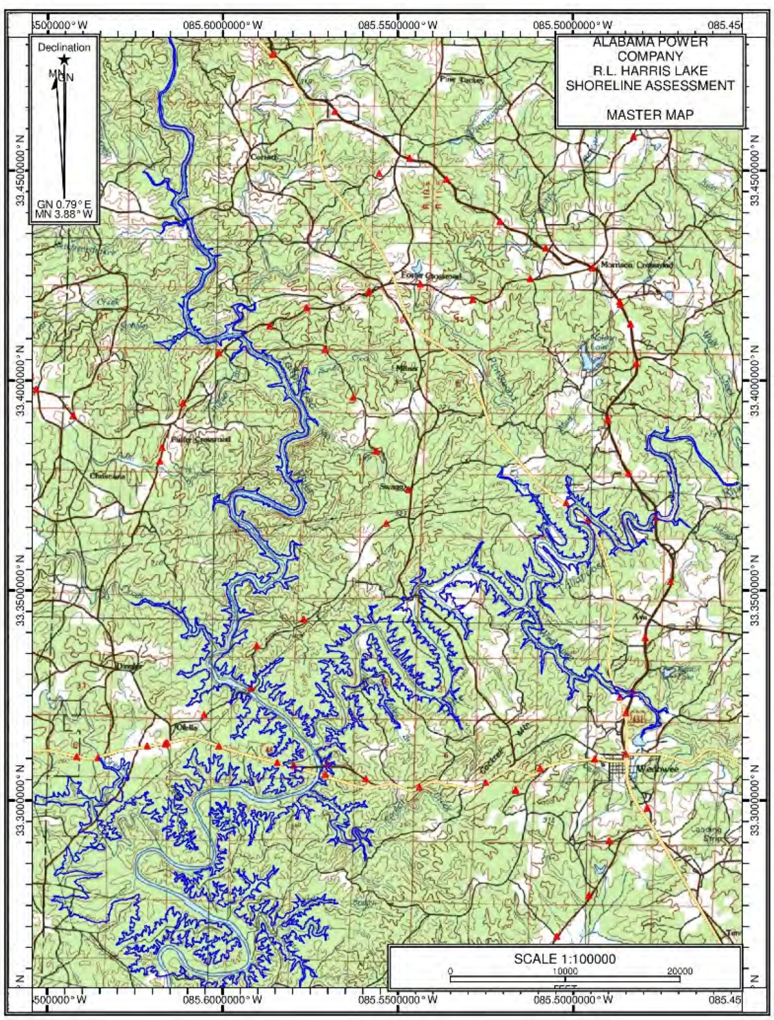


Figure 2-Study Area – RL Harris Reservoir

SITE CONDITIONS

Geology

The Upper Tallapoosa River Basin is located in the Piedmont Upland Physiographic Region, one of five physiographic regions in Alabama. The Piedmont consists of a plateau that slopes from the north, with elevations commonly above 1,000 feet, to the south, where it contacts the Coastal Plain at about 500 feet.

The Piedmont developed on northeast-southwest trending belts of Precambrian to Paleozoic (around 1.0 billion years to about 300 million years in age) metamorphic rocks that are highly deformed and bordered by faults.

Although described as a plateau, the relatively flat nature of the Piedmont is only obvious in its southern region. The northern part contains many of the highest peaks in the state, including Mt. Cheaha, the state's highest point at 2,407 feet, and numerous northeast-trending steep-sided ridges. The point at which the Piedmont's relatively rugged landscape becomes flat serves as a dividing line between the Northern Piedmont Upland district and the Southern Piedmont Upland district. The boundary is the Brevard Fault Zone, which roughly follows the course of the Tallapoosa River in the vicinity of Lake Martin, in Tallapoosa County. In Randolph County, the boundary swings toward the northeast and follows the valley of High Pine Creek, passing just north of Roanoke.

Figure 3 - Physiographic Provinces

Soils

Chewlaca, Altivista, Louisa, Madison, Wehadkee and Wickham soils dominate the areas adjacent to the water and upper slopes adjacent to the river. They are composed of sandy

– to gravelly fine sandy loam and clay subsoils and fine sandy loam surface layers. Areas of rock outcrops and an area of open pits occur in the project area.

Vegetation
Most of the project area contains hardwood forest on a flat, first terrace and adjacent slopes. The understory is open and includes a well-developed herbaceous layer throughout the project area, unless previously disturbed or developed. The hardwood forest occupies the floodplain along streams and adjacent to the shoreline in many instances in the area. Species dominating the canopy and shrub layer include *Fagus grandifolia* (American beech), *Quercus alba* (White oak), *Q. nigra* (Water oak), *Q. phellos* (Willow oak), *Liquidambar styraciflua* (Sweet gum), *Oxydendrum arboreum* (Sourwood), and *Liriodendron tulipifera* (Tulip poplar), *Acer rubrum* (Red maple), *Pinus taeda* (Loblolly pine), *Cephalanthis occendentalis* (Button bush), *Eupatorium perfoliatum* (Common boneset), and *Andropogon virginicus* (Broom sedge)

Common herbaceous species occurring within the floodplain and shoreline wetlands are diverse and include *Juncus effusus* (Soft rush), *Carex spp*. (Sedges), *Solidago caesia* (Goldenrod), *Solidago patula* (Goldenrod), *Panicum boscii* (Panic grass), *Solidago arguta* (Goldenrod), *Panicum polyanthes* (Panic grass) and *Chasmanthium sessifolium* (Spike grass). *Smilax bona-nox* (Catbrier), and *S. rotundifolia* (Catbrier), are common lianas found along the shoreline.

CLASSIFICATION OF SENSITIVE AREAS

Although the National Wetland Inventory (NWI) maps are a resourceful tool in identifying potential areas of wetlands, the NWI differs from criteria that render a wetland jurisdictional under Section 404 of the Clean Water Act. Furthermore, the NWI for the impoundment show preconstruction conditions, rendering the information not applicable to the assessment. It was determined as part of the Shoreline Management Plan as well as assistance to APCO shoreline managers, a wetland GIS “layer” would be generated from field verified wetland/shoreline assessments. This data can be utilized for future permitting decisions and used as a tool to assist managers to determine the need for additional fieldwork to identify wetlands, which could be impacted.

Figure 4-NWI Mapping

Lacustrine Fringe Wetlands – RL Harris

Three features characterize [jurisdictional] wetlands by definition: hydrology (hydroperiod, mean depth, etc.), the presence of hydric soils and the resulting biotic communities, particularly the presence of hydrophytic vegetation. Hydrology is considered the primary variable of wetland ecosystems, driving the development of wetland soils and leading to the development of the biotic communities (Mitsch and Gosselink 2000).

Lacustrine wetlands occur around the edges of a lake (palustrine in Cowardin). They are usually situated in topographic depressions, flat shorelines or in sloughs where streams flow into the reservoir. True fringe wetlands lack trees, shrubs or persistent emergents with > 30% areal coverage. Extends from the shoreward boundary of the system to a depth of 6.6 feet below low water or to the maximum extent of nonpersistent emergents, if these grow deeper than 6.6 feet. These systems may include cattail (*Typha spp*.), bulrush (*Scirpus spp*.), "persistent emergent" vegetation meaning coming up out of water & lasting until start of next growing season.

Lacustrine Fringe Benefits - These systems provide critical protein waterfowl need for egg laying and development of young. If preferred prey organisms are unavailable, foraging will be less effective and populations of fish, waterfowl, and amphibians may suffer. Although many wetland areas are composed of "nuisance" plant species, the ecological benefits still exist. These benefits are realized by the following:

- Potential for removing sediment
- Potential for removing nutrients
- Potential for removing toxic metals and toxic organic compounds
- Habitat for invertebrates
- Habitat for anadromous and resident fish

- Habitat for wetland associated avian species
- Habitat for wetland associated terrestrial species
- Native plant richness
- Shoreline stabilization
- Base of the aquatic food chain.

Classifications

Both small and large expanses of wetland fringe exist on the system. These were primarily located along shoreline at or near the 793' elevation. Many wetlands are located along the shoreline, at the confluence of the reservoir and streams, and their resulting alluvial plains, as well as being present on point bars, in sloughs, or at, or below the ordinary lake pool.

Riverine Wetlands - Many of the streams that flow into the reservoir have the potential for the presence of wetlands. These areas are primarily located adjacent to the larger first order streams with gentle topography located within the water. Riverine wetlands also occur in floodplains and riparian corridors in association with stream channels. Dominant water sources are overbank flow from the channel or subsurface hydraulic connections between the stream channel and wetlands. Additional water sources may be interflow and return flow from adjacent uplands, occasional overland flow from adjacent uplands, tributary inflow, and precipitation. First-order streams, usually designated by solid blue lines on U.S. Geological Survey (USGS) 7.5-min topographic maps (scale 1:24,000), are normally associated with riverine wetlands. They may also continue farther upstream where broken blue lines on topographic maps indicate the presence of channels. Perennial flow is not a requirement for a wetland to be classified as riverine.

Emergent/Lacustrine Fringe - Fringe wetlands are located along lakeshores where the water elevation of the lake determines the water table of the adjacent wetland (Figure 6). In some cases, they consist groundwater discharge, the latter dominating where lacustrine fringe wetlands intergrade with uplands or slope wetlands. Lacustrine wetlands lose water during reservoir draw-down, by saturation surface flow, and by evapotranspiration. Organic matter normally accumulates in areas protected from shoreline wave erosion. These wetlands are usually dominated by small shrubs, herbaceous and emergent hydrophytic vegetation. These wetland areas located along the shoreline were classified as "fringe" wetlands, if the criteria were met.

Alluvial Forested, Scrub-Shrub Wetlands – These wetlands are generally located in areas where perennial or intermittent streams flow into the reservoir. As sediment and other organic debris accumulate, land mass is formed which allows for the formation of these wetlands. These areas are at or near the surface elevation of the reservoir. Saturated soils were common in these formations and in turn, have allowed for the formation of hydric soils and the propagation of saplings, large shrubs and herbaceous hydrophytic vegetation. In many instances, these wetlands were classified as forested, if topography and/or the presence of a floodplain located above the full pool was present.

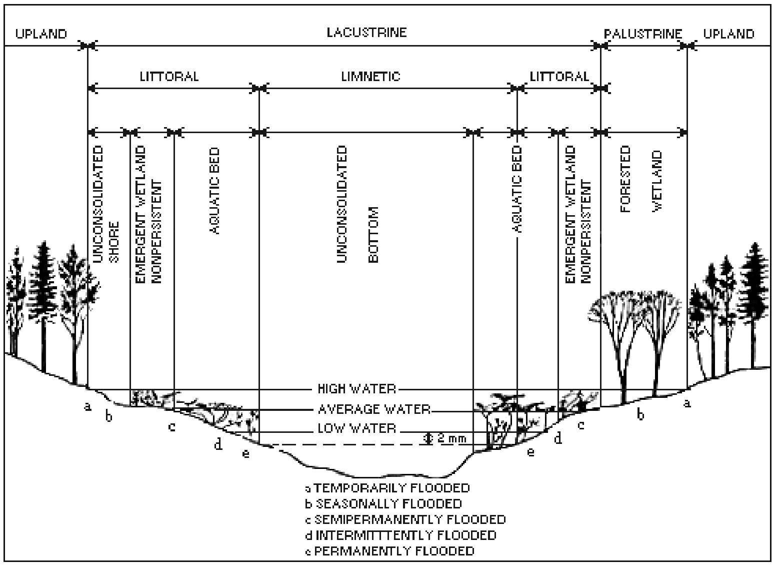


Figure 5-Cross-Sectional View of Wetlands

Wetland Assessment Methods and Procedures

A field plan was prepared to assist in the identification and location of wetlands within the subject property. Utilizing existing topographic maps, aerial photography, and field reconnaissance, wetlands were identified. Consultation with the COE was conducted to determine what areas would be considered a jurisdictional wetland. Within the reservoir, topography, geology and soils are an initial indicator for the likelihood of the presence of wetlands. Although the entire accessible shoreline was assessed, the aforementioned indicators were areas of concentration for assessment.

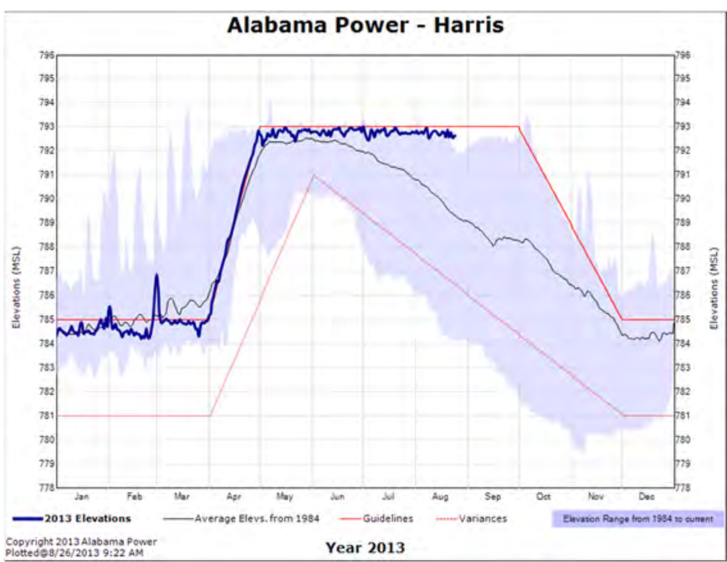


Figure 6-2013 Reservoir Elevation

Wetlands were accessed either by boat or foot. Criteria for identifying wetlands and their limits were set prior to fieldwork utilizing the normal pool elevation of 793' AMSL, which was the limits of assessment. During the initial winter 2012 assessment, the water elevation was at approximately 786’ AMSL. This elevation allowed for potential wetlands to be accessed for in-depth analysis and characterization. Wetlands were numbered by assigning “WL” numbers, which can be utilized for future reference. During the spring 2013 assessment, the reservoir was at full pool, and this allowed for boat access to areas further upstream, which were not accessible in the draw-down period.

One of the initial indicators that prompted an assessment was the presence of hydrophytic vegetation. Based on COE criteria and professional judgment, a determination was made if a site was a wetland and if so, it would be recorded. Wetland assessments included visual observation, collection of general biological data, which included random soil analysis, aquatic species observations, if present, and habitat assessment, as well as assessment of hydrologic conditions. A Garmin GPSmap76 hand held GPS unit marked wetlands. Wetlands were subsequently assessed (not delineated); using applicable procedures described in the 1987 U.S. Army Corps of Engineers’ Wetland Delineation Manual and the Alabama Power Programmatic General Permit Program Reservoir Wetland Characterization Methodology, which is discussed below. Reference points were mapped and plotted on the project site map.

Wetland Characterization Methodology The RL Harris assessment included a wetland quality characterization, in addition to mapping. The characterization included a assigning a color for mapping, based on the assessment. Wetlands were coded as Green (*Good and 75-100% coverage*), Yellow (*Moderate and 50-75% coverage*) or Red (*Poor and < 50% coverage*), each color representing the wetland segments’ characteristics and vegetation coverage. Criteria for the assessments included:

- Coverage/Continuity of Lacustrine Fringe segment
- Plant species diversity
- Shoreline stability
- Topography
- Location
- Wildlife usage
- Presence or absence of development

Over the last few years, new wetland assessment procedures have been under development by APCO personnel, with assistance from Cahaba Consulting. These procedures have been developed exclusively for use under the Alabama Power Programmatic General Permit Program, and rely, in part, on APCO’s wetland presence/absence mapping efforts associated with the relicensing of APCO projects with the Federal Energy Regulatory Commission. When a project is proposed in an area where wetlands have been mapped by APCO, or where APCO personnel have observed emergent vegetation, or shoreline vegetation consisting of herbaceous, scrub shrub, or forested vegetation, the proposed Alabama Power Programmatic General Permit Program Reservoir Wetland Characterization Methodology (WCM) will be used to determine the percent coverage of wetland vegetation and the species comprising a representative area of the wetland proposed to be impacted.

WCM is described as follows:

1. Areas that are evaluated by boat for FERC mapping purposes or on-site for residential development shall be rated poor, moderate, or high as herein described:

a. *Poor Quality Wetland* – A wetland that consist primarily of a single species of noxious or invasive vegetated plants/stems in an emergent shallow water condition.

b. *Moderate Quality Wetland* – A wetland that consist of noxious or invasive vegetation where there are a minimum of 2 additional hydrophytic plant species present.

c. *Good Quality Wetland* – A wetland of native hydrophytic vegetation that consist typically of 3 or more species. Generally, high quality wetland would include two layers of strata (i.e. herbaceous, scrub shrub, forested). Noxious or invasive species may be present but are not dominant within the wetland area being evaluated.

Note: Factors pertaining to wetland characterization rating include: overall vegetative species diversity, species density, shoreline physical conditions (i.e. erosion, site development) wildlife habitat, buffer types (i.e. natural undeveloped or developed). These factors, if present, will be documented by EA Compliance and EA's Environmental Contractor.

RL Harris Summary

A **total of 165 wetlands** were identified and mapped on R.L. Harris Reservoir during the assessment (*Attachment 1-Wetland Maps*). Wetland assessments included visual observation, collection of general biological data, which included random soil analysis, aquatic species observations, if present, and habitat assessment, as well as assessment of hydrologic conditions.

The RL Harris assessment included a wetland quality characterization, in addition to mapping.

The characterization included assigning a color for mapping, based on the assessment. Wetlands were coded as Green (Good and 75-100% coverage), Yellow (Moderate and 50-75% coverage) or Red (Poor and < 50% coverage), each color representing the wetland segments' characteristics and vegetation coverage. A description sheet (*Attachment 2-Wetland Data Sheets*) describes the wetland and its attributes.

Of the approximately **271** miles of shoreline and islands, **11.35** miles **(14.98 acres)** were characterized as wetland habitat.

The following table shows the linear feet, quality and type of wetland recorded.

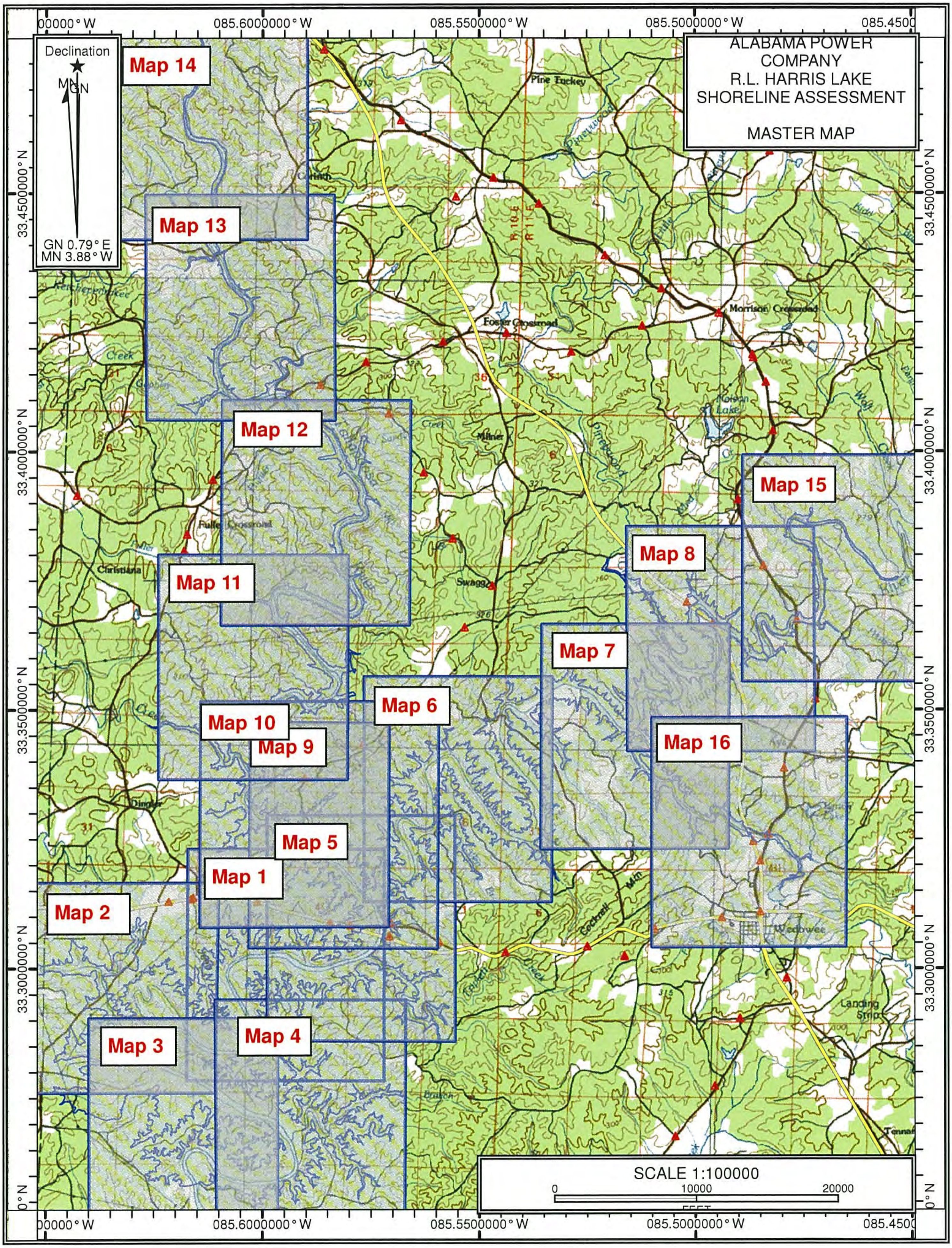
See the attached Figures (USGS 7.5 Minute Quadrangle) (*Attachment 1-Wetland Maps*) that show the locations of the wetlands.

Lacustrine/Littoral Wetland Quality	**Lacustrine/Littoral Wetlands on Shoreline**		
	Linear Feet	**Miles**	**WL Acres**
Poor	5268	1.00	2.16
Moderate	24,258	4.59	3.45
Good	30,430	5.76	9.28
Total	**59,956**	**11.35**	**14.98**

Figure 7- R.L. Harris Reservoir Wetlands

Attachment 1

Wetland Maps


ALABAMA POWER COMPANY
R.L. HARRIS LAKE
SHORELINE ASSESSMENT
MASTER MAP
Declination
MN
GN
GN 0.79° E
MN 3.88° W
085.6000000° W
085.5500000° W
085.5000000° W
33.4500000° N
33.4000000° N
33.3500000° N
33.3000000° N
Map 14
Map 13
Map 12
Map 11
Map 10
Map 9
Map 6
Map 5
Map 1
Map 2
Map 3
Map 4
Map 7
Map 8
Map 15
Map 16
Pine Tuckey
Morrison Crossroad
Foster Crossroad
Miner
Swagg
Fuller Crossroad
Christiana
Wedowee
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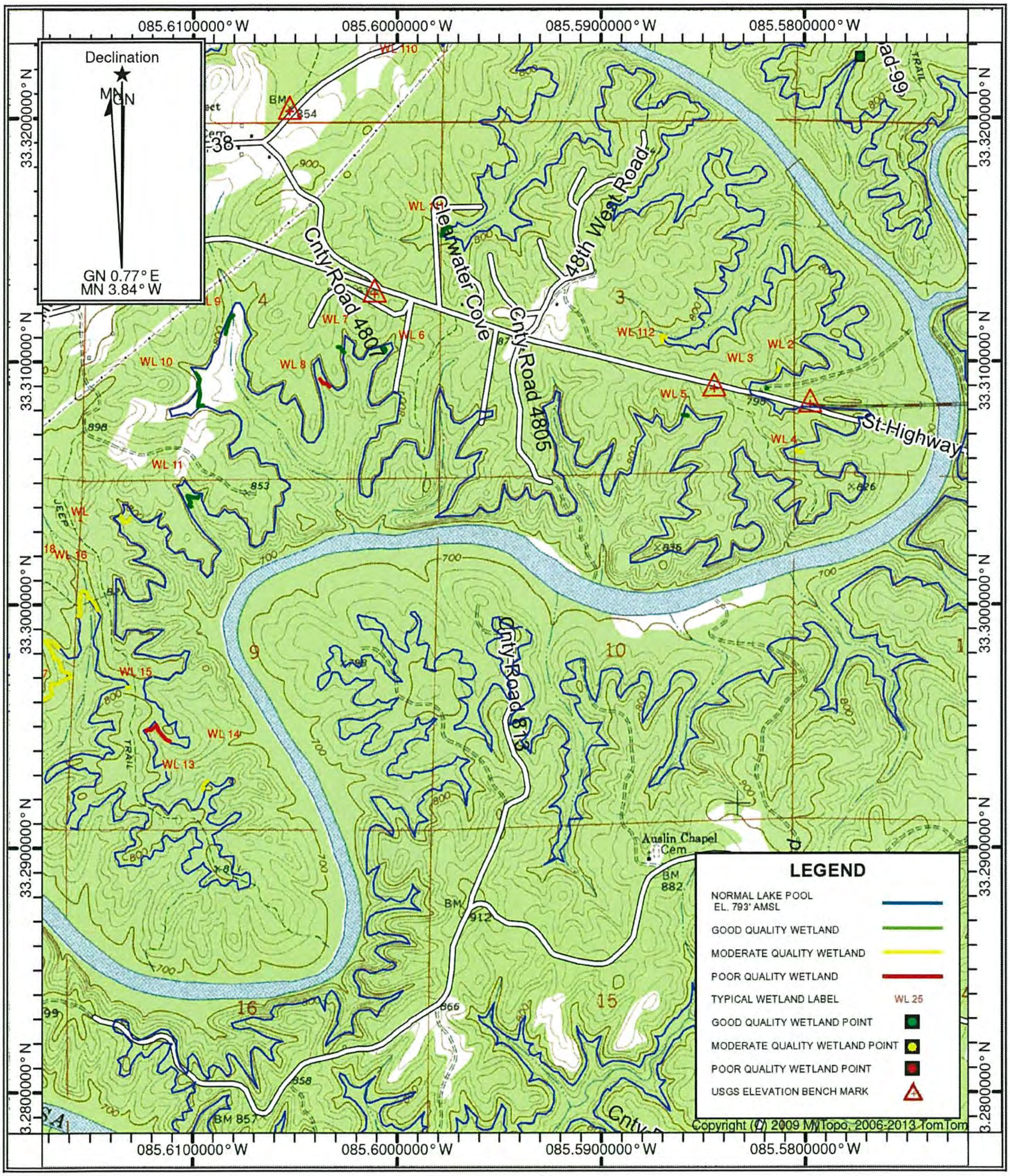

ALABAMA POWER CO.
RL Harris Reservoir Shoreline
Wetland Assessment.
March 2013
Map 1

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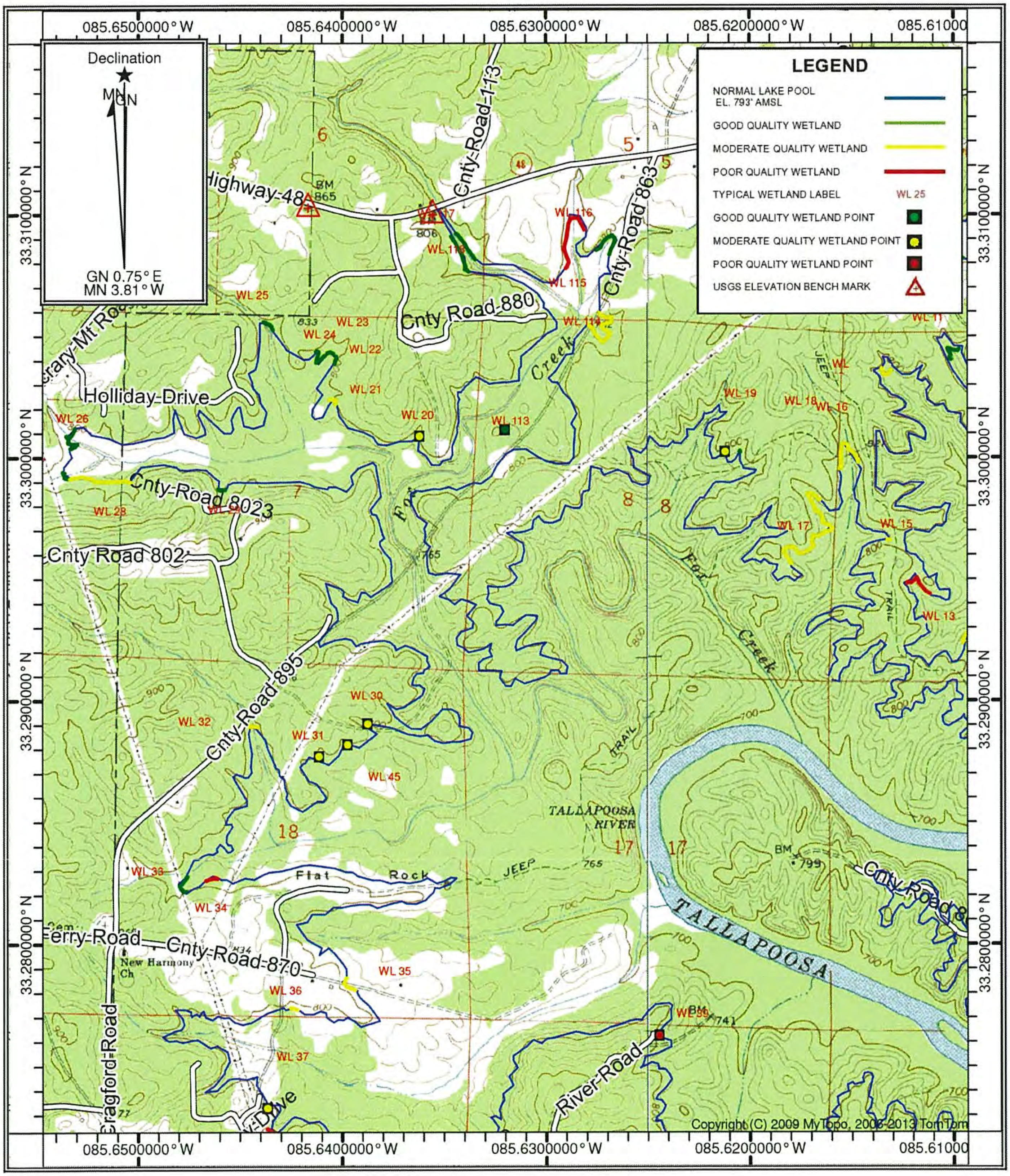

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 2

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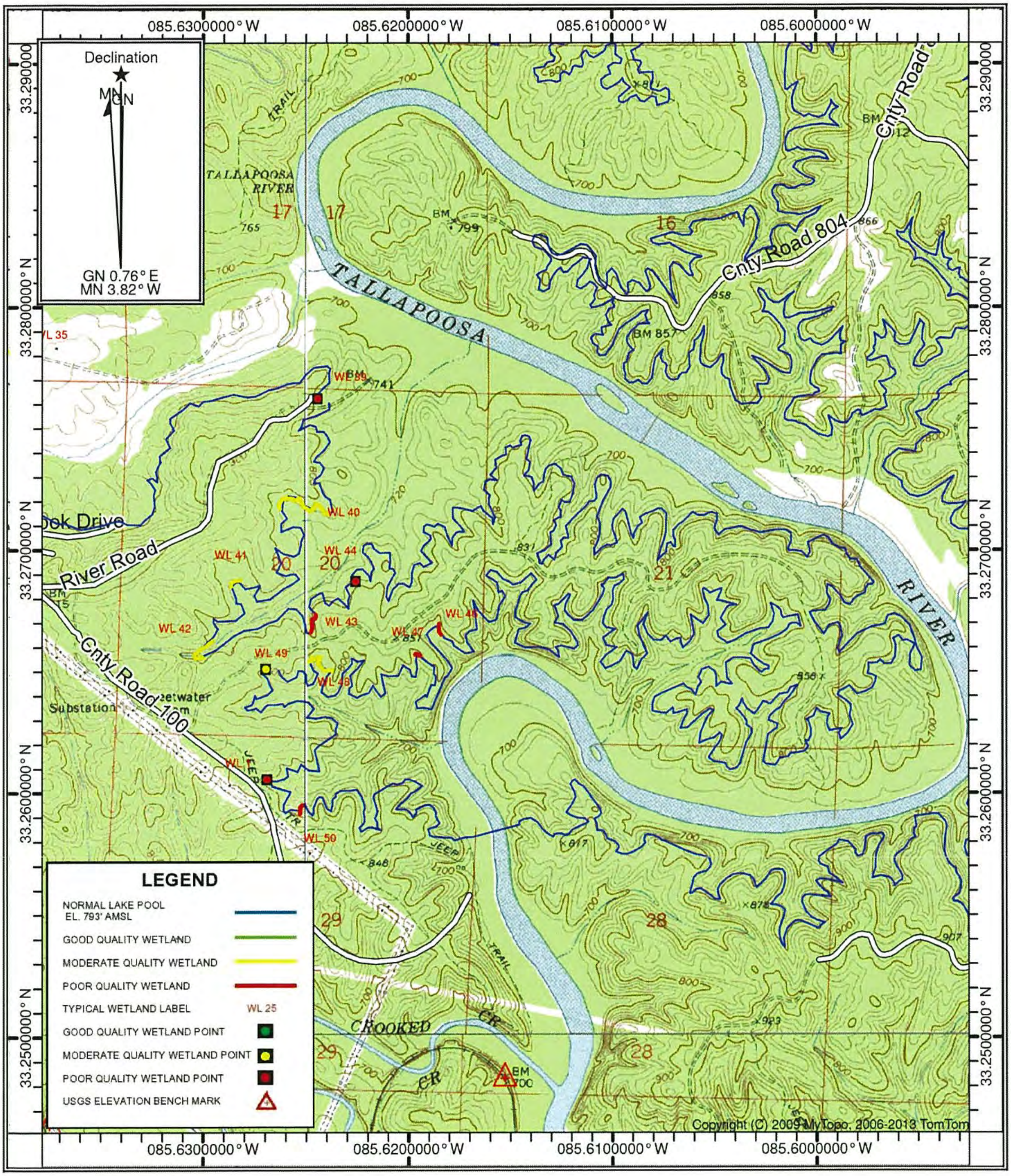

ALABAMA POWER CO.
RL Harris Reservoir Shoreline
Wetland Assessment.
March 2013
Map 3

Cahaba Consulting Environmental & Mining

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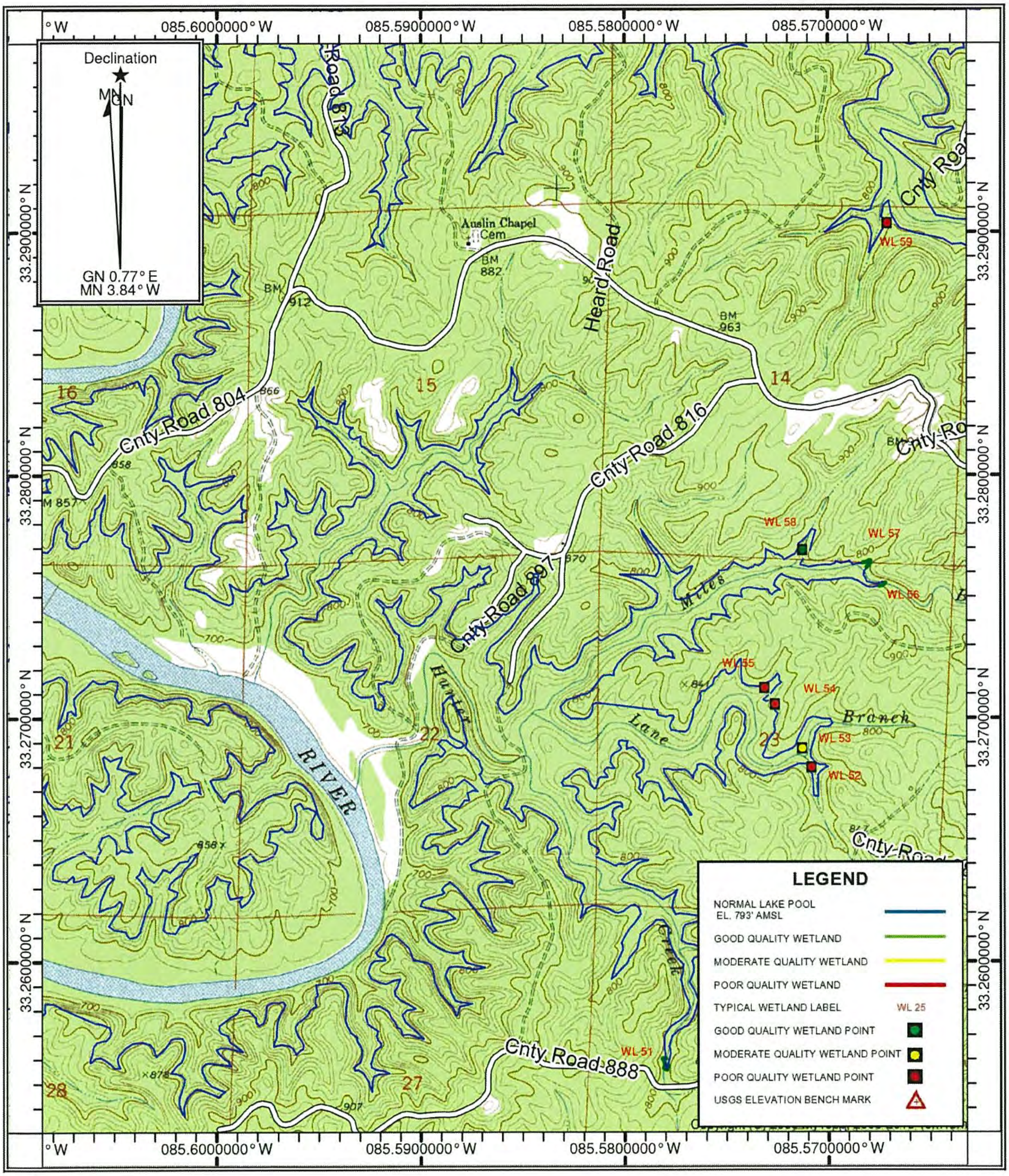

ALABAMA POWER CO.
RL Harris Reservoir Shoreline
Wetland Assessment.
March 2013
Map 4

Cahaba Consulting Environmental & Mining

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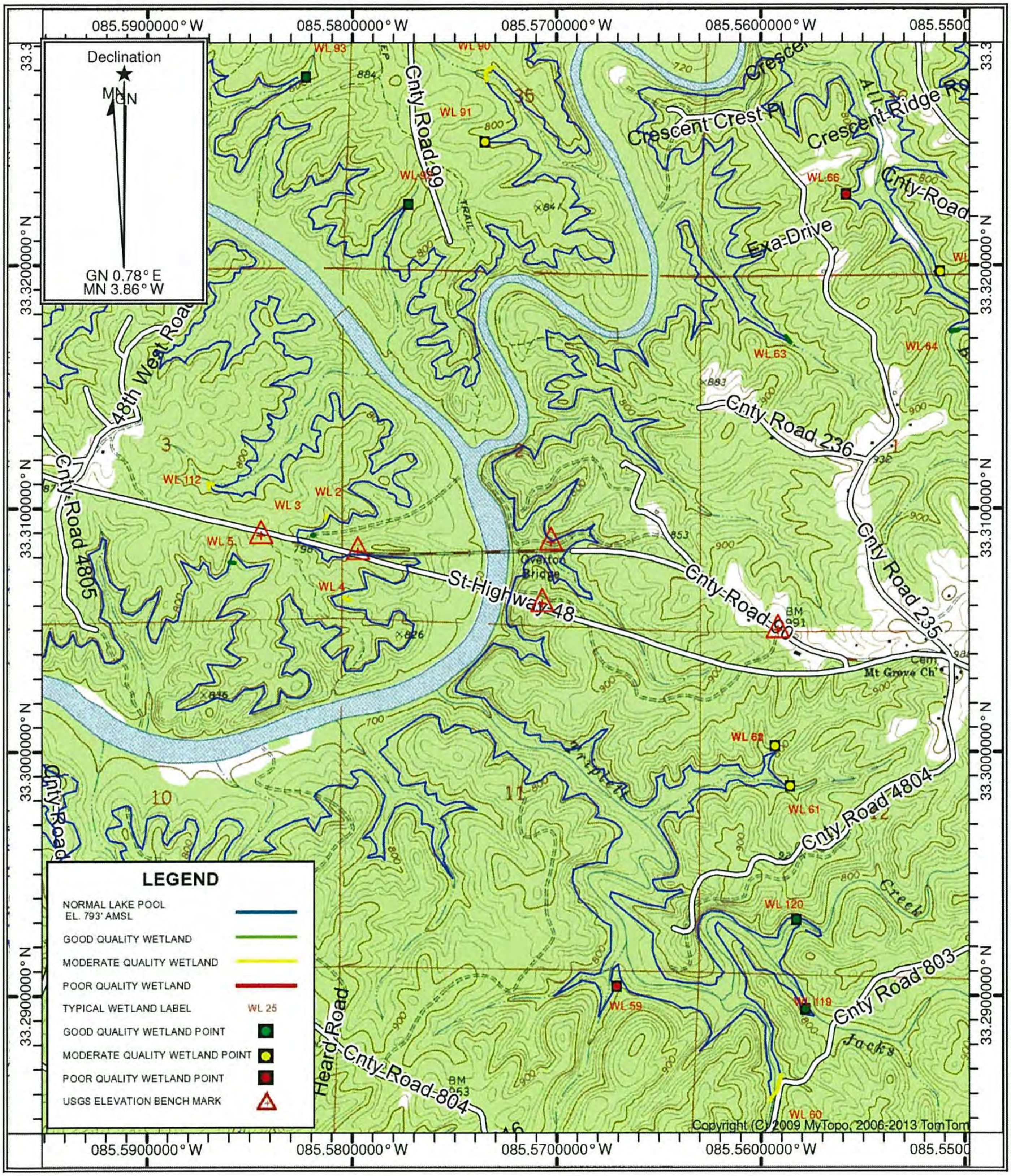

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 5

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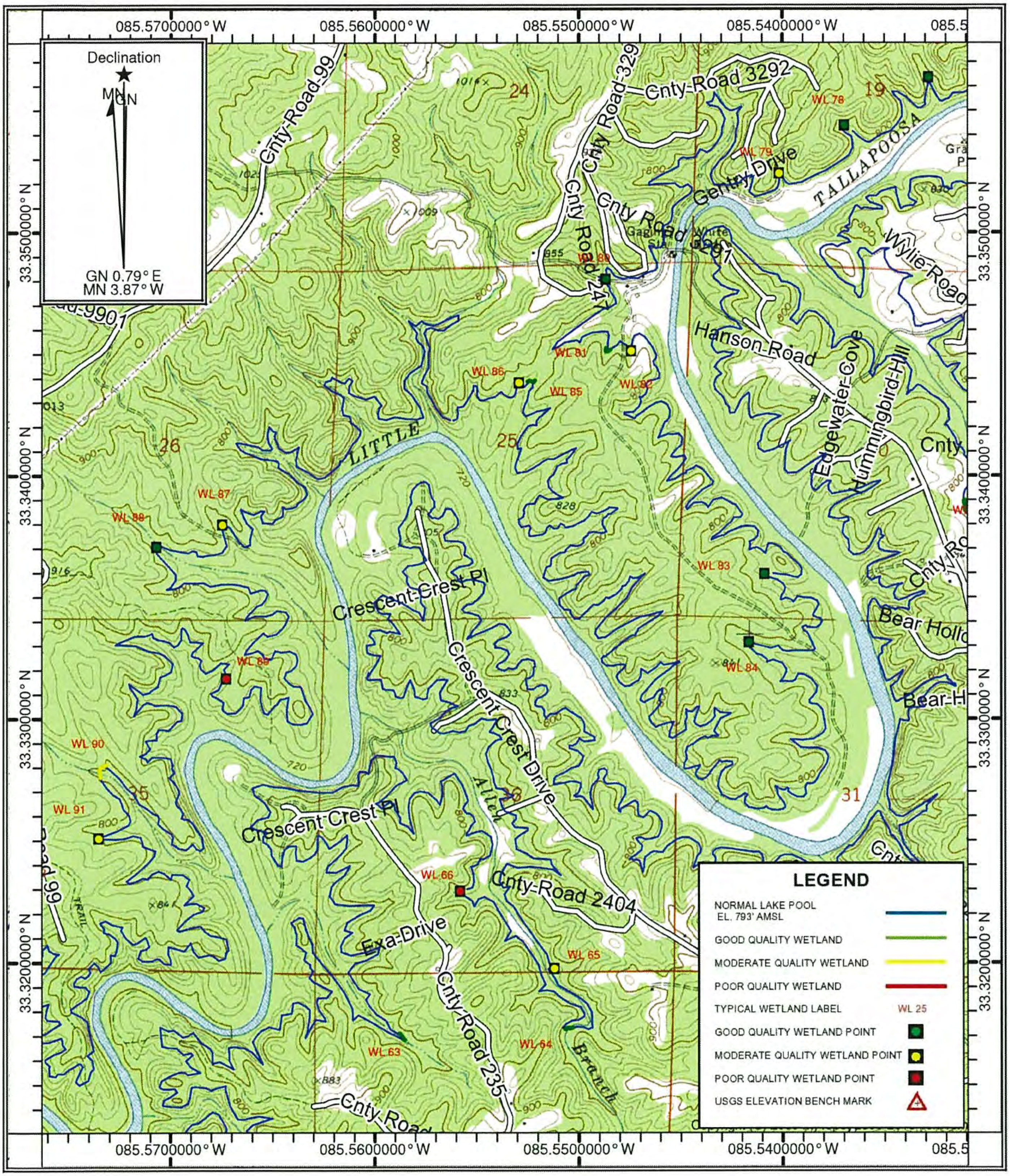

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 6

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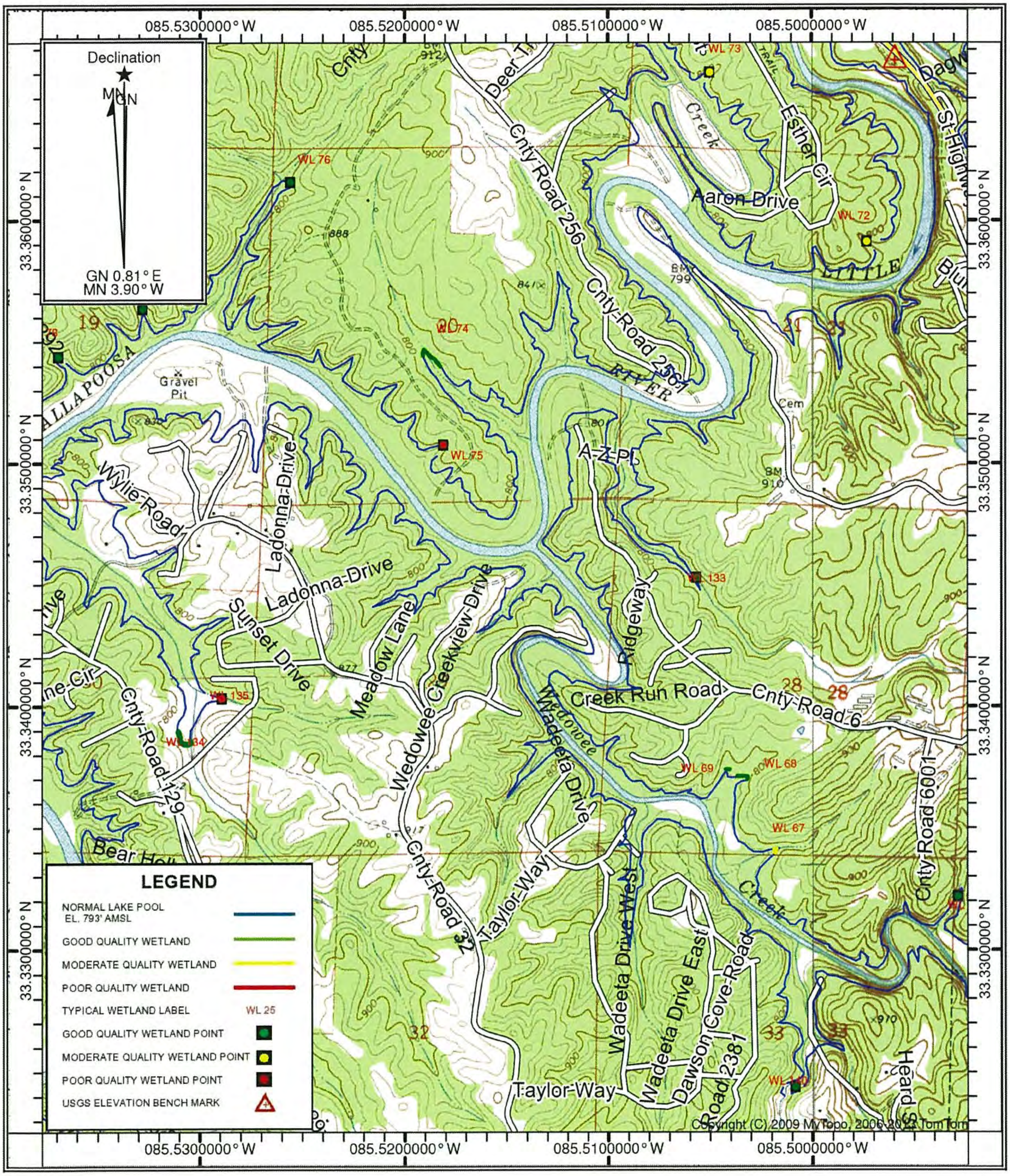

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 7

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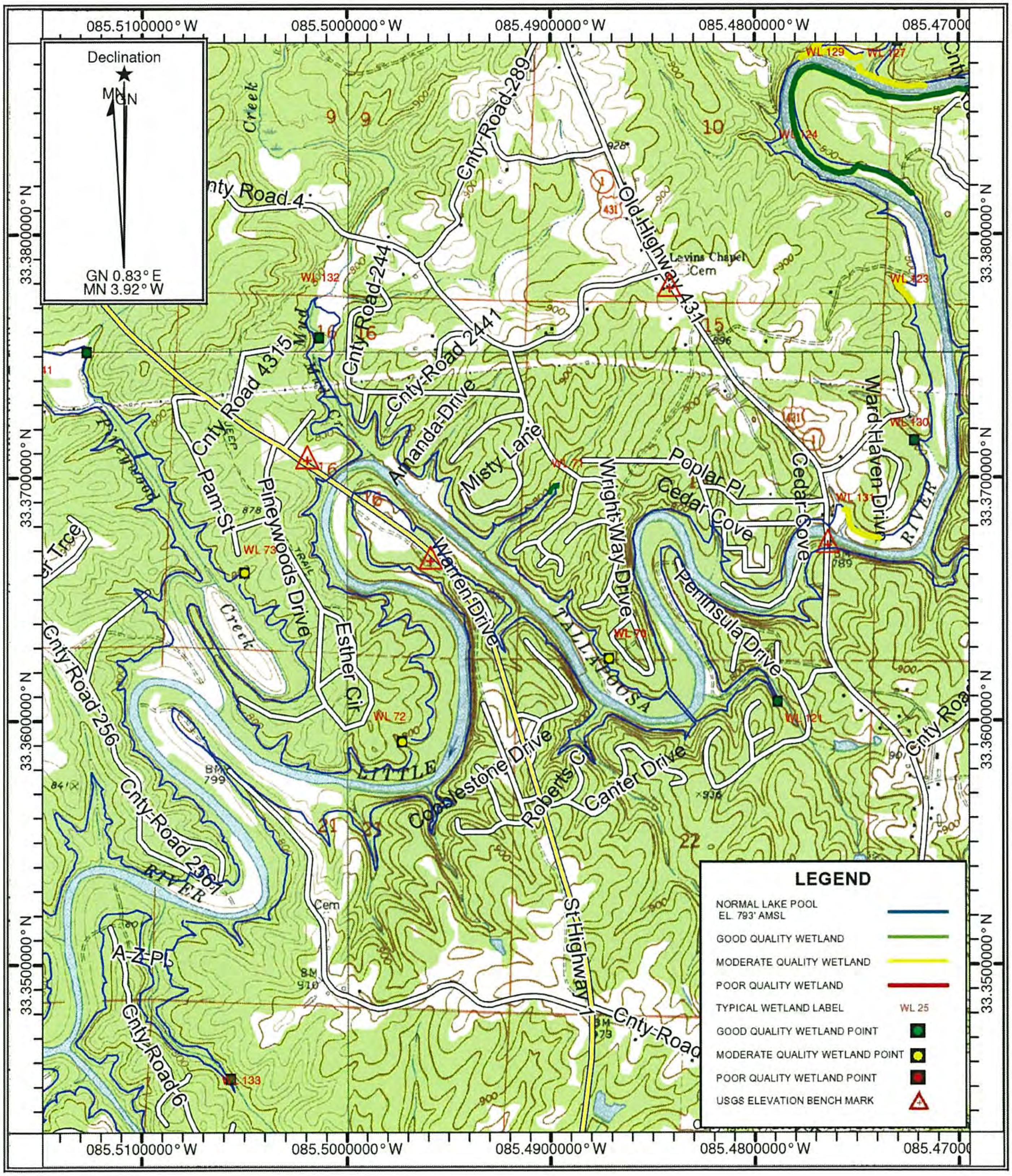

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 8

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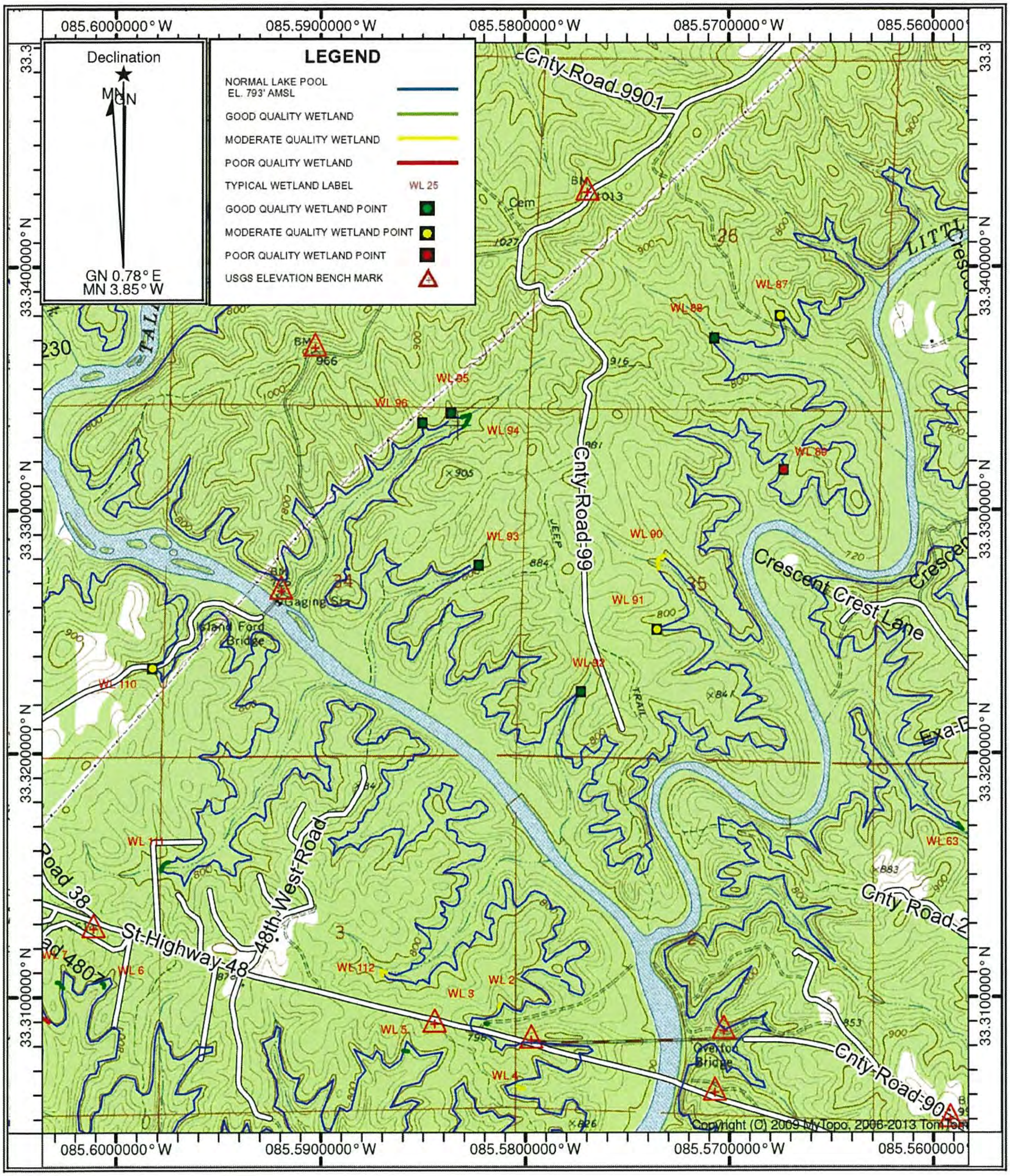

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 9

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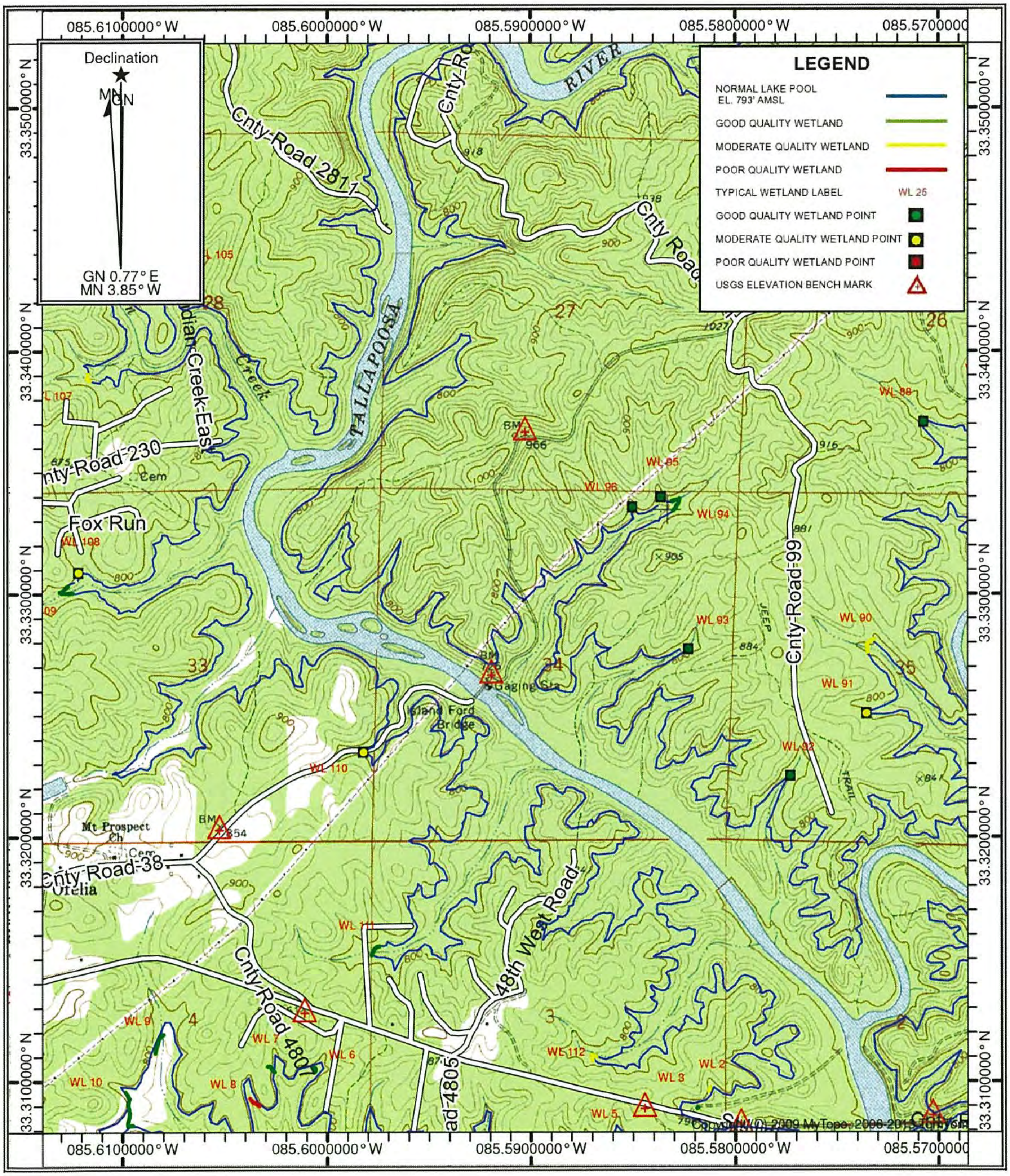

ALABAMA POWER CO
RL Harris Reservoir Shoreline
Wetland Assessment
March 2013
Map 10

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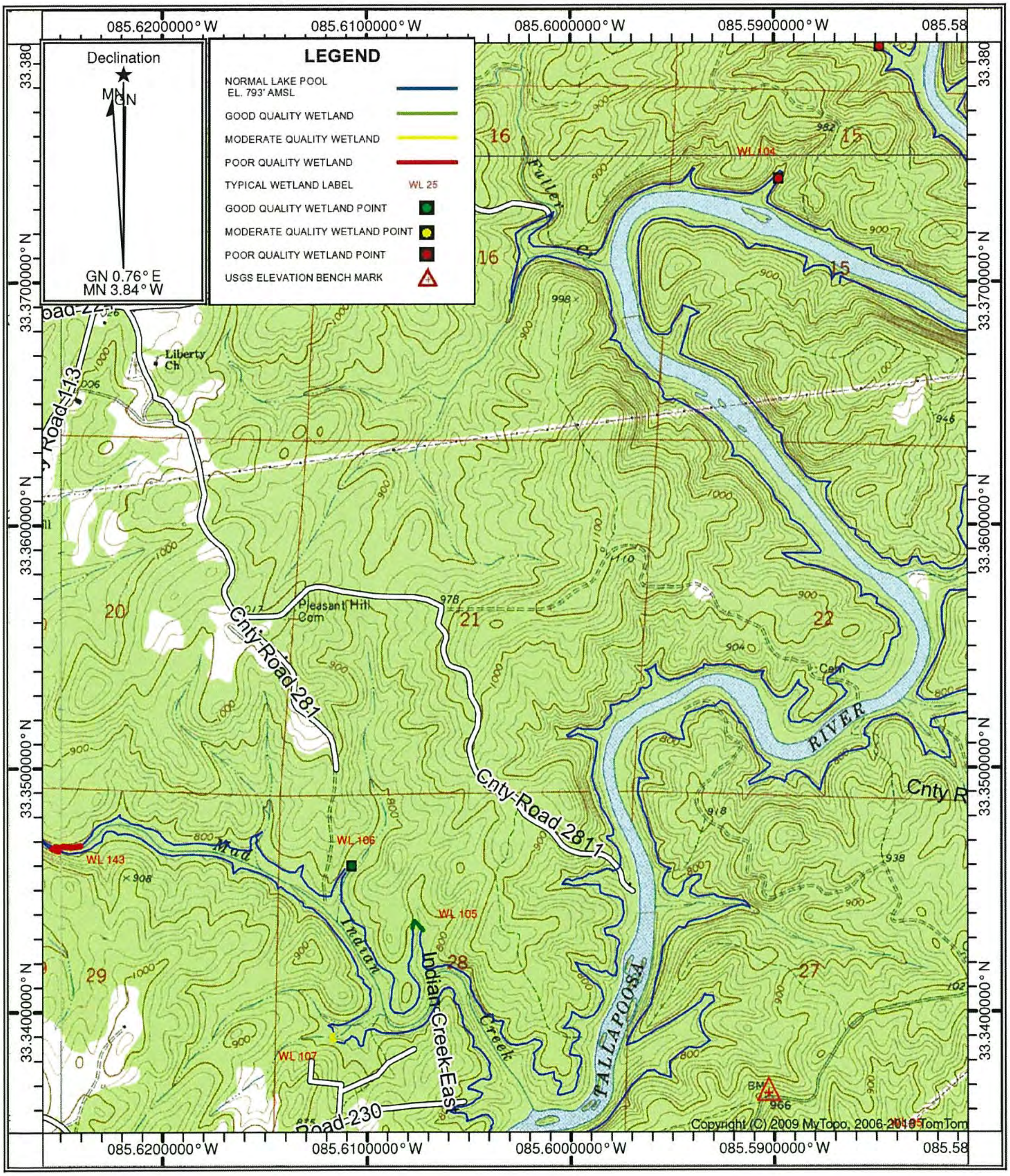

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 11

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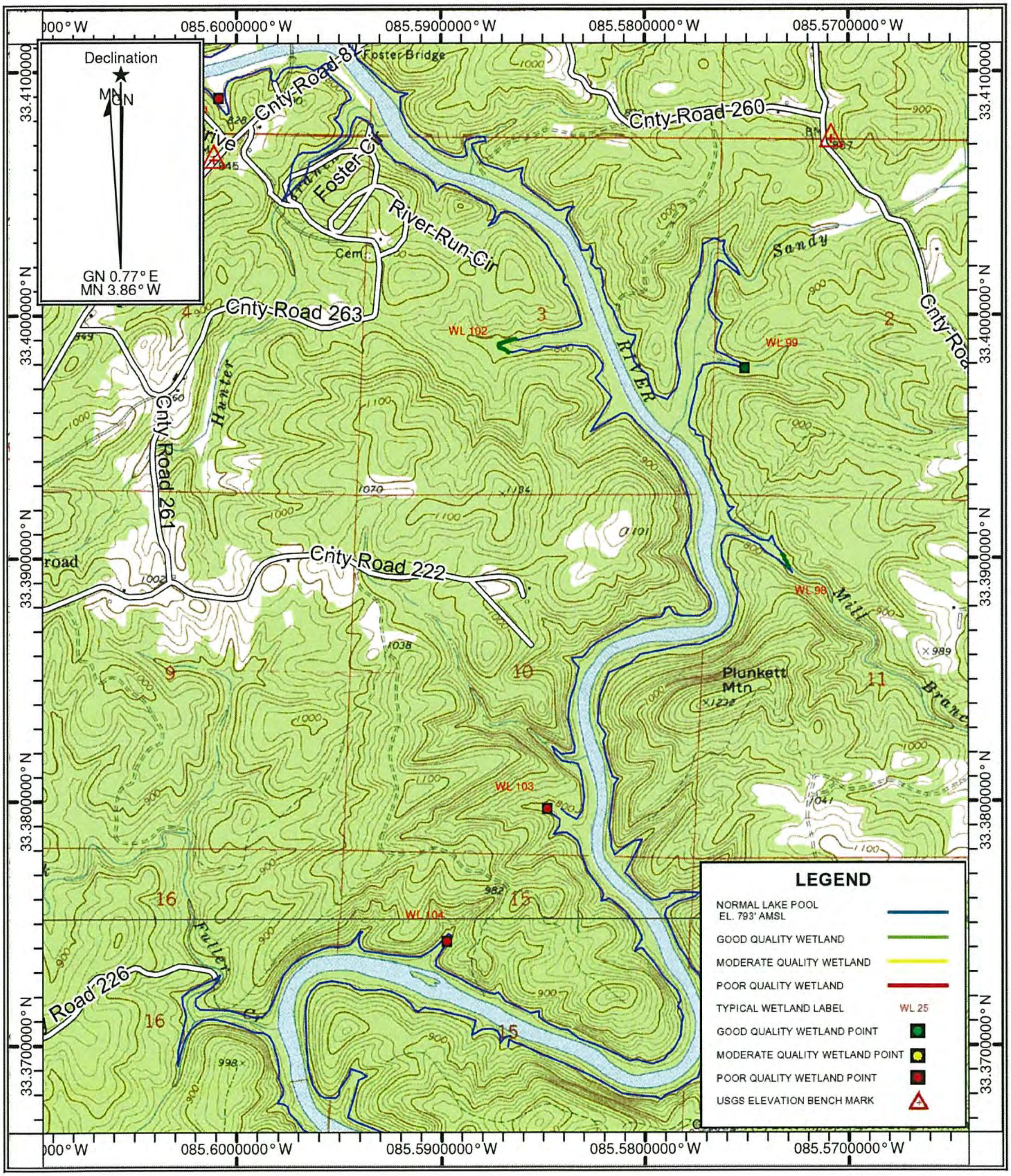

ALABAMA POWER CO.
RL Harris Reservoir Shoreline
Wetland Assessment
March 2013
Map 12

Cahaba Consulting
Environmental & Mining

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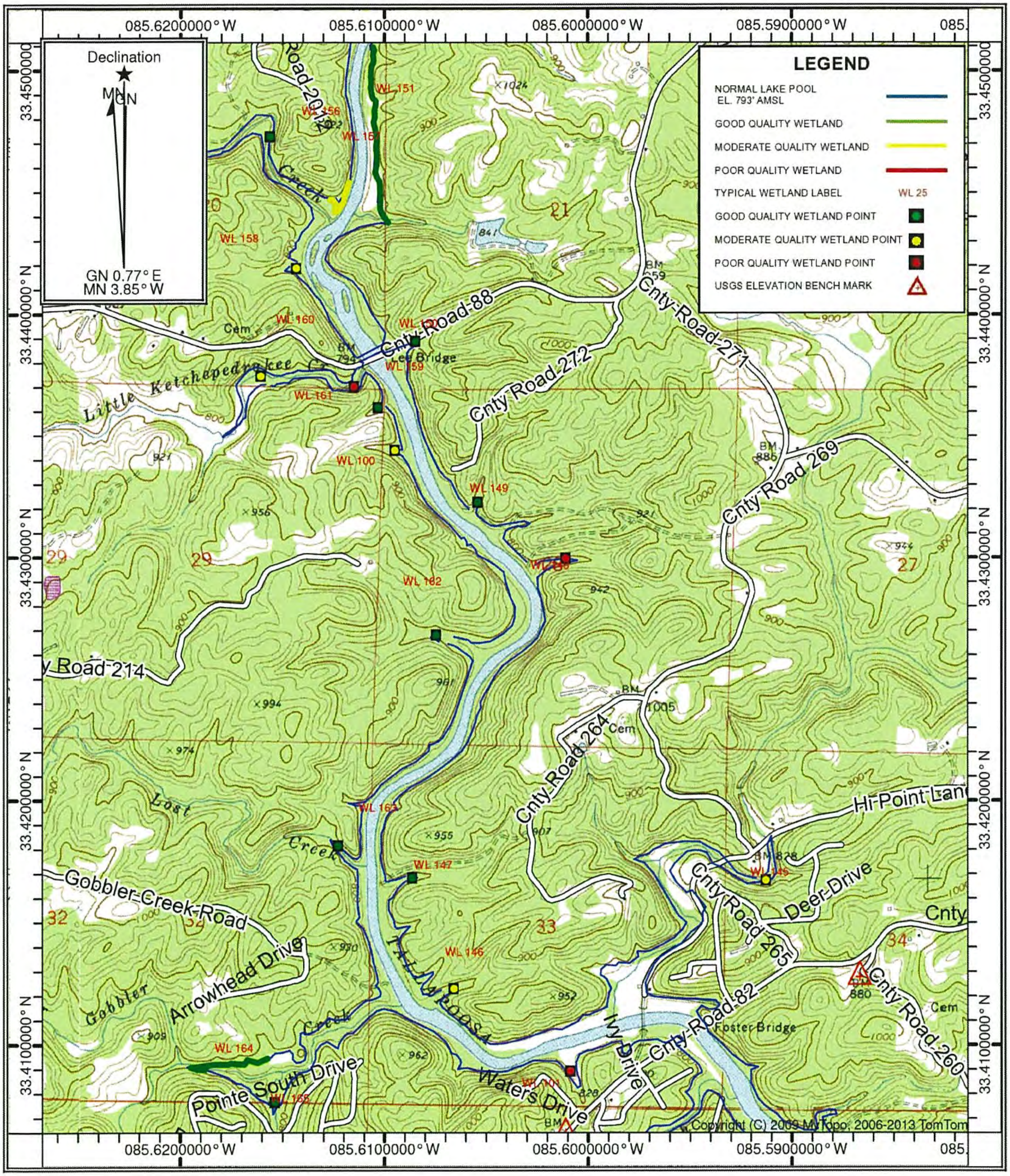

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 13

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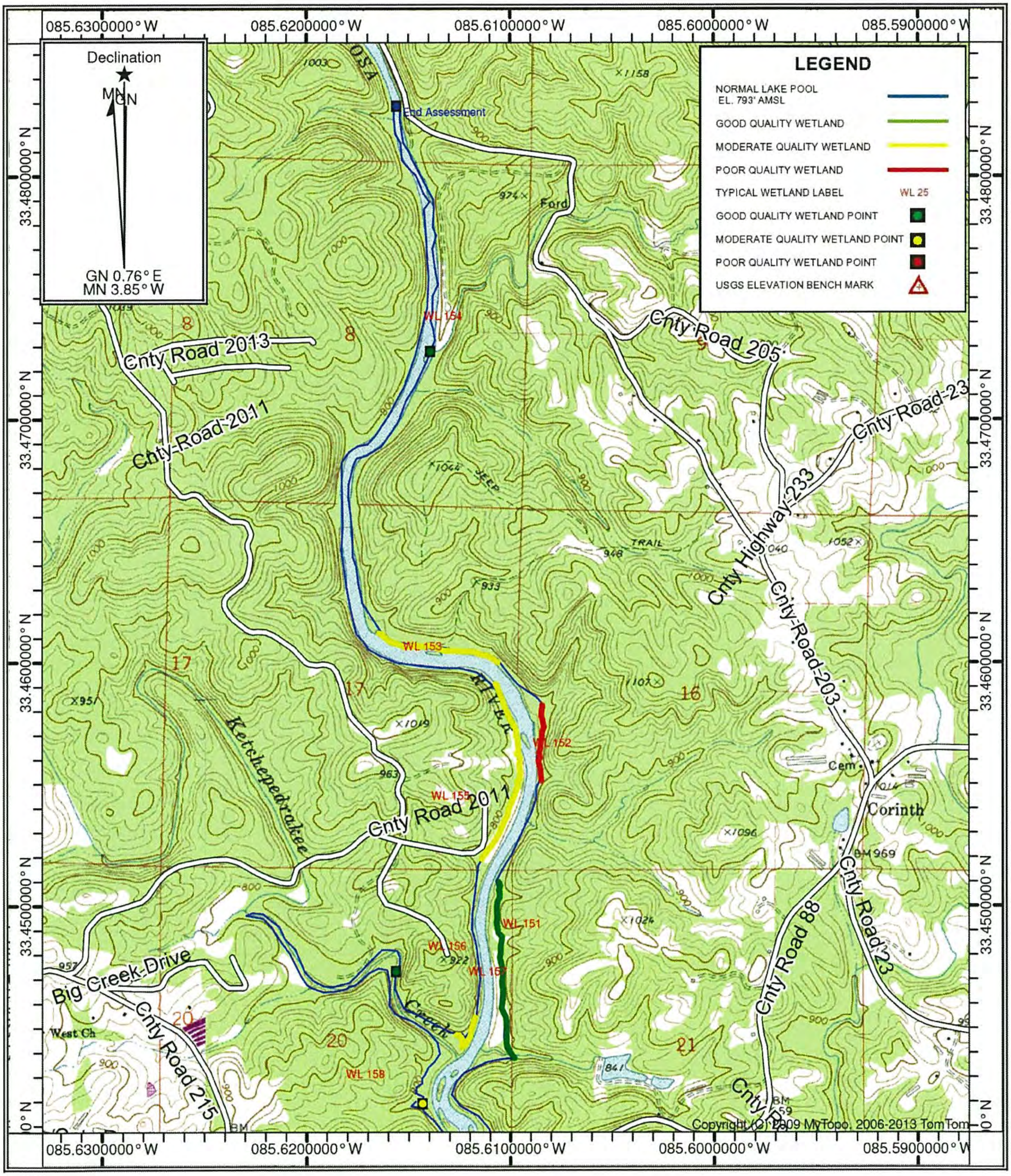

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 14

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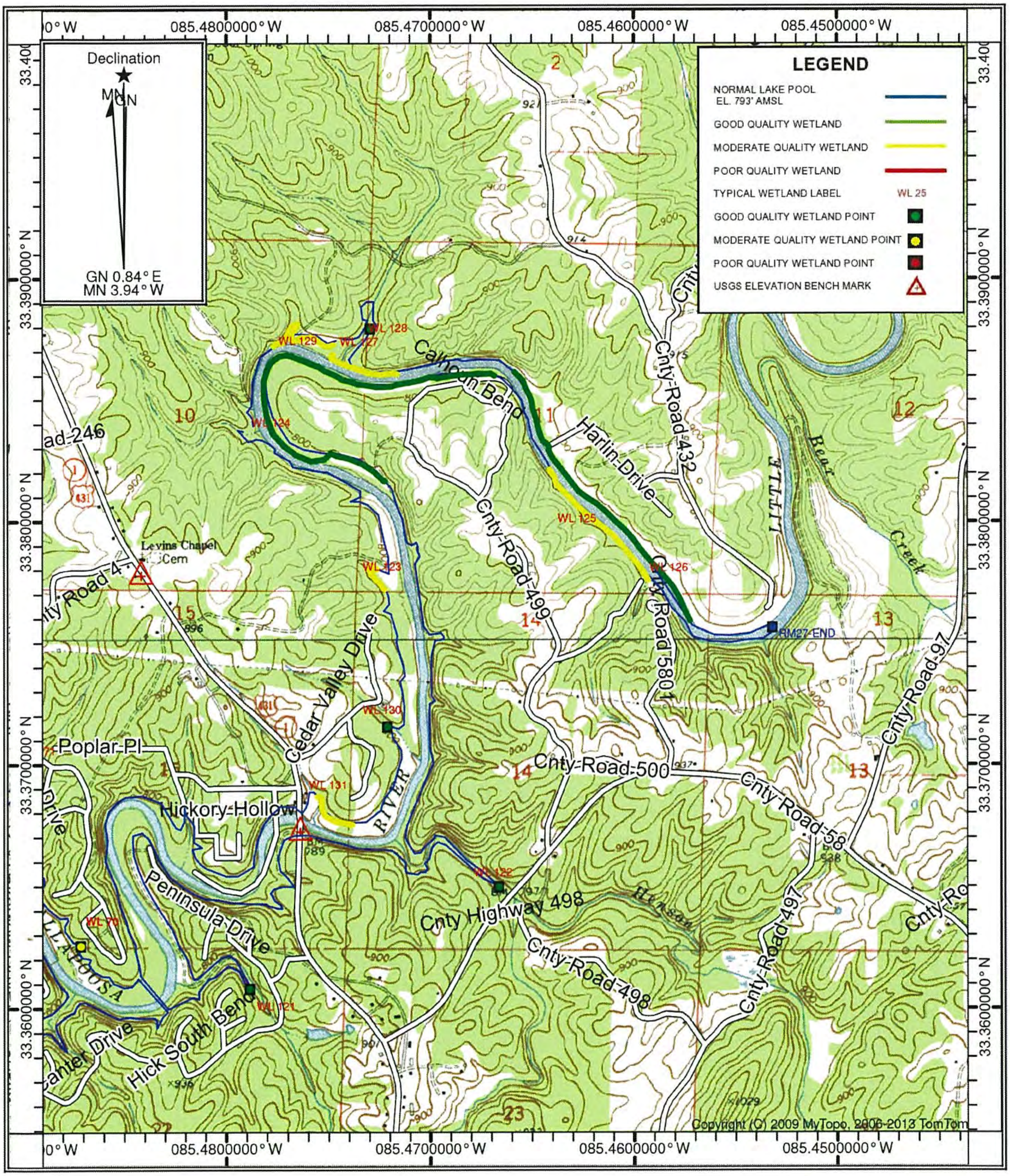

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 15

Cahaba Consulting

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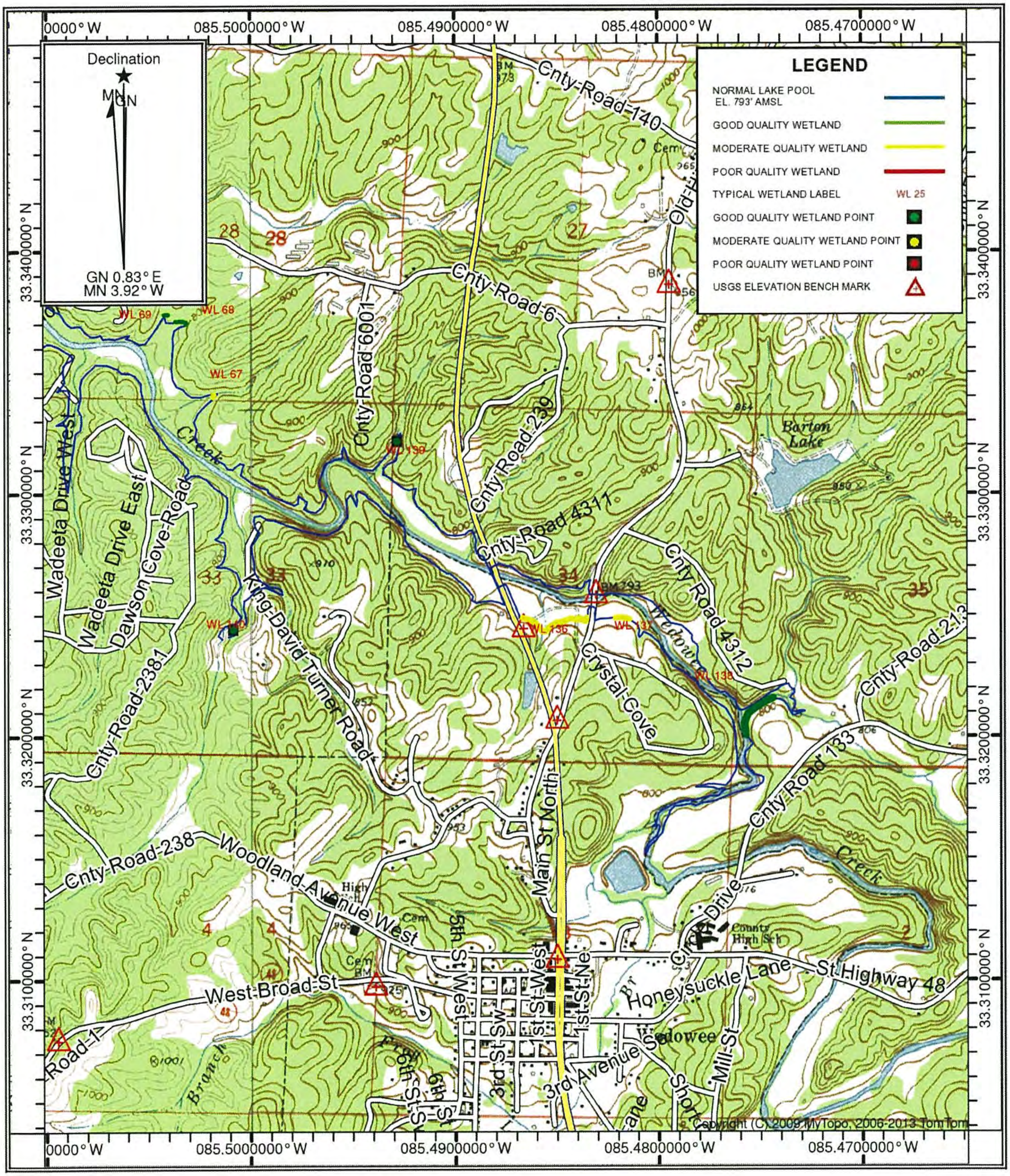

ALABAMA POWER CO.
RL Harris Reservoir
Shoreline Wetland Assessment
March 2013
Map 16

SCALE 1:24000

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Attachment 2

Wetland Data Sheets

Wetland 1

Map # 3

Inspection Date: 11/19/12

GPS Point(s):
WL1 19-NOV-12 2:49:41PM N33.26056 W85.62692

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe WL in alluvial area of drainage to lake.

Wetland 2
Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL2-1	20-NOV-12 10:29:56AM	N33.30961 W85.58128
WL2-2	20-NOV-12 10:31:01AM	N33.30971 W85.58124

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe WL in alluvial area of ephemeral stream,

Wetland 3
Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL3-1	20-NOV-12 10:34:36AM	N33.30892 W85.58191
WL3-2	20-NOV-12 10:35:15AM	N33.30894 W85.58191

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality Lacustrine fringe in alluvial area of stream with diverse vegetation.

Wetland 4

Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL4-1	20-NOV-12 10:56:26AM	N33.30635 W85.58042
WL4-2	20-NOV-12 10:57:19AM	N33.30623 W85.58009

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe located on stable shoreline.

Wetland 5
Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL5-1	20-NOV-12 11:50:21AM	N33.30778 W85.58576
WL5-2	20-NOV-12 11:50:57AM	N33.30781 W85.58598

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS lacustrine fringe in small slough with no stream.

Wetland 6
Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL6-1	20-NOV-12 12:25:40PM	N33.31042 W85.60056
WL6-2	20-NOV-12 12:26:22PM	N33.31057 W85.60070

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☒ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☒ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested SS emergent wetland located in alluvial area of intermittent stream.

Wetland 7
Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL7-1	20-NOV-12 12:34:12PM	N33.31037 W85.60261
WL7-2	20-NOV-12 12:35:06PM	N33.31060 W85.60292

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☒ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☒ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS emergent wetland located in slough with diverse emergent, herbaceous and woody shrubs.

Wetland 8

Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL8-1	20-NOV-12 12:46:03PM	N33.30898 W85.60329
WL8-2	20-NOV-12 12:47:52PM	N33.30930 W85.60380

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☒ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe with monoculture hydrophytic vegetation.

Wetland 9

Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL9-1	20-NOV-12 1:08:26PM	N33.31113 W85.60842
WL9-3	20-NOV-12 1:10:20PM	N33.31192 W85.60803

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☒ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe with diverse emergent, herbaceous and woody shrubs. Mud flats/alluvial area of perennial stream on shoreline.

Wetland 10

Map # 1 & 2

Inspection Date: 11/20/12

GPS Point(s):

WL10-1	20-NOV-12 1:15:37PM	N33.30956 W85.60986
WL10-2	20-NOV-12 1:17:55PM	N33.30812 W85.60952

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☒ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☒ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Good quality forested SS emergent lacustrine fringe located on shoreline in alluvial area of 2 streams.

Wetland 11
Map # 1 & 2

Inspection Date: 11/20/12

GPS Point(s):

WL11-1	20-NOV-12 1:45:17PM	N33.30441 W85.60979
WL11-2	20-NOV-12 1:47:02PM	N33.30403 W85.61010

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested SS lacustrine fringe in small slough. Diverse trees and shrubs.

Wetland 12
Map # 1 & 2

Inspection Date: 11/20/12

GPS Point(s):

WL12-1	20-NOV-12 1:59:04PM	N33.30360 W85.61305
WL12-2	20-NOV-12 2:01:16PM	N33.30369 W85.61350

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality forested SS lacustrine fringe WL located in small slough with diverse herbaceous vegetation.

Wetland 13

Map # 1 & 2

Inspection Date: 11/20/12

GPS Point(s):

WL13-1	20-NOV-12 2:48:25PM	N33.29479 W85.61230
WL13-2	20-NOV-12 2:51:58PM	N33.29439 W85.61112

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☐ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe with minimal diversity of herbaceous vegetation. Some trees and located on 5' wide strip of shoreline.

Wetland 14
Map # 1

Inspection Date: 11/20/12

GPS Point(s):

WL14-1	20-NOV-12 3:00:12PM	N33.29235 W85.60944
WL14-2	20-NOV-12 3:01:35PM	N33.29271 W85.60923

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine and scrub shrub fringe with herbaceous vegetation.

Wetland 15

Map # 1 & 2

Inspection Date: 11/26/12

GPS Point(s):

WL15-1	26-NOV-12 10:42:51AM	N33.29653 W85.61307
WL15-2	26-NOV-12 10:43:37AM	N33.29666 W85.61300

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

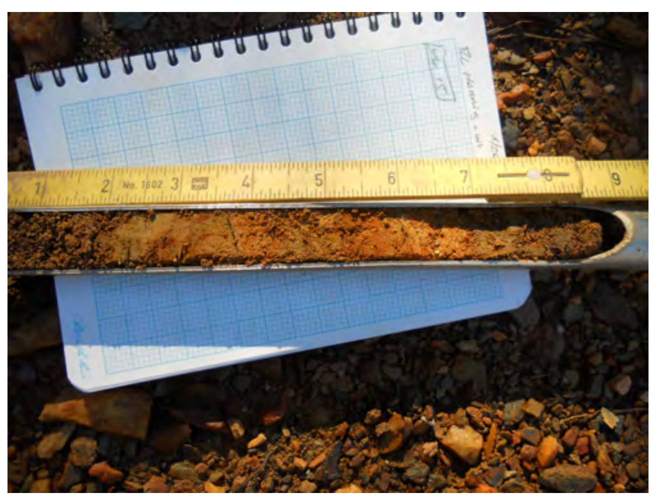
Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality scrub shrub lacustrine fringe wetland located in small slough. Soil profile taken.



Wetland 16

Map # 1 & 2

Inspection Date: 11/26/12

GPS Point(s):

WL16-1	26-NOV-12 11:06:16AM	N33.29973 W85.61465
WL16-2	26-NOV-12 11:14:12AM	N33.29955 W85.61563

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☐ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☐ Stable Shoreline ☒ Other ☐
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe located on shoreline and historical intermittent stream. Both herbaceous and SS/forested at alluvial area.

Wetland 17
Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL17-1	26-NOV-12 11:25:18AM	N33.29828 W85.61659
WL17-2	26-NOV-12 11:38:37AM	N33.29564 W85.61796

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringee WL in small slough. Alluvial area along intermittent stream. Diverse herbacoues and SS vegetation.

Wetland 18

Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL18-1	26-NOV-12 12:26:47PM	N33.30027 W85.62048
WL18-2	26-NOV-12 12:27:18PM	N33.30030 W85.62059

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS and forested wetland located in small slough. No stream present.

Wetland 19
Map # 2

Inspection Date: 11/26/12

GPS Point(s):
WL19 26-NOV-12 12:34:48PM N33.30024 W85.62119

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe located on shoreline with herbaceous and woody vegetation.

Wetland 20
Map # 2

Inspection Date: 11/26/12

GPS Point(s):
WL20 26-NOV-12 1:38:14PM N33.30089 W85.63622

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture ☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe with SS and located in small drainage feature. No stream present.

Wetland 21
Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL21-1	26-NOV-12 1:58:20PM	N33.30226 W85.64019
WL21-2	26-NOV-12 1:59:32PM	N33.30240 W85.64062

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality SS wetland located in small slough.

Wetland 22

Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL22-1	26-NOV-12 2:16:58PM	N33.30387 W85.64037
WL22-2	26-NOV-12 2:17:39PM	N33.30420 W85.64029

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☐ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS located in lacustrine fringe at stream. Diverse forest.

Wetland 23
Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL23-1	26-NOV-12 2:18:33PM	N33.30430 W85.64040
WL23-2	26-NOV-12 2:19:14PM	N33.30431 W85.64072

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☒ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality alluvial diverse wetland.

Wetland 24

Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL24-1	26-NOV-12 2:23:00PM	N33.30433 W85.64094
WL24-2	26-NOV-12 2:23:47PM	N33.30439 W85.64131

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☐ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☒ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe located at stream convergence. Diverse, woody SS, forested and herbaceous vegetation.

Wetland 25
Map # 2

Inspection Date: 11/26/12

GPS Point(s):
WL25-400' 26-NOV-12 2:33:42PM N33.30428 W85.64327

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality herbecaous lacustrine fringe in slough of stream confluence.

Wetland 26
Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL26-1	26-NOV-12 3:03:33PM	N33.30124 W85.65308
WL26-2	26-NOV-12 3:05:44PM	N33.30048 W85.65338

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality forested and SS wetland located on flood plain and confluence of large perennial stream.

Wetland 27
Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL27-1	26-NOV-12 3:10:06PM	N33.29941 W85.65369
WL27-2/WL28-1	26-NOV-12 3:12:41PM	N33.29915 W85.65338

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☒ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested SS wetland located on flood plain and alluvial area of stream. Diverse trees, shrubs and herbaceous vegetation. Wildlife evident. Well developed gleyed-hydric soils.


Wetland 28

Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL27-2/WL28-1	26-NOV-12 3:12:41PM	N33.29915 W85.65338
WM28-2	26-NOV-12 3:21:13PM	N33.29901 W85.65036

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe on shoreline. Shrubs and herbaceous vegetation is present.

Wetland 29

Map # 2

Inspection Date: 11/26/12

GPS Point(s):

WL29-1	26-NOV-12 3:30:30PM	N33.29871 W85.64611
WL29-2	26-NOV-12 3:31:24PM	N33.29869 W85.64571

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe in small drain alluvial area of stream. Diverse herb and shrub vegetation.

Wetland 30

Map # 2

Inspection Date: 11/26/12

GPS Point(s):
WL30 26-NOV-12 3:55:03PM N33.28904 W85.63875

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality forested and scrub/shrub wetland in small slough.

Wetland 31

Map # 2

Inspection Date: 12/11/12

GPS Point(s):
WL31 11-DEC-12 11:18:36AM N33.28770 W85.64115

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☒ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located on small point bar at confluence of slough. Herbaceous and wood hydrophytic vegetation.

Wetland 32
Map # 2

Inspection Date: 12/11/12

GPS Point(s):
W32 11-DEC-12 11:32:59AM N33.28774 W85.64406

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☐ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located in alluvial are on shoreline. Small intermittent stream herbaceous and woody vegetation.

Wetland 33
Map # 2

Inspection Date: 12/11/12

GPS Point(s):

WL33-1	11-DEC-12 11:47:10AM	N33.28219 W85.64766
WL33-2	11-DEC-12 11:49:19AM	N33.28278 W85.64764

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☒ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine and forested SS wetland located at confluence of stream and lake and at APCO ROW crossing. Diverse saplings, shrubs and herbaceous vegetation. Wildlife evidence.

Wetland 34

Map # 2

Inspection Date: 12/11/12

GPS Point(s):

WL34-1	11-DEC-12 11:54:09AM	N33.28255 W85.64663
WL34-2	11-DEC-12 11:55:46AM	N33.28265 W85.64616

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture ☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located on shoreline with minimal diversity.

Wetland 35
Map # 2

Inspection Date: 12/11/12

GPS Point(s):

WL35-1	11-DEC-12 12:23:19PM	N33.27809 W85.63941
WL35-2	11-DEC-12 12:24:45PM	N33.27862 W85.63981

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☐ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located on disturbed shoreline with diverse herbaceous vegetaton.

Wetland 36
Map # 2

Inspection Date: 12/11/12

GPS Point(s):

WL36-1	11-DEC-12 12:56:07PM	N33.27732 W85.64218
WL36-2	11-DEC-12 12:58:00PM	N33.27740 W85.64259

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland locate on shoreline and small drain with saplings and shrubs and herbaceous vegetation.

Wetland 37
Map # 2

Inspection Date: 12/11/12

GPS Point(s):
WL37 11-DEC-12 1:23:52PM N33.27328 W85.64369

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located on ROW with diverse herbaceous vegetation.

Wetland 38

Map # 2

Inspection Date: 12/11/12

GPS Point(s):

WL38-1	11-DEC-12 1:33:27PM	N33.27238 W85.64362
WL38-2	11-DEC-12 1:34:37PM	N33.27225 W85.64320

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located at confluence of small stream in a small slough/alluvial area.

Wetland 39
Map # 2 & 3

Inspection Date: 12/11/12

GPS Point(s):
WL39 11-DEC-12 1:53:05PM N33.27624 W85.62444

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☒ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe located in small slough of shoreline with monoculture vegetation.

Wetland 40

Map # 3

Inspection Date: 12/11/12

GPS Point(s):

WL40-1	11-DEC-12 2:06:44PM	N33.27148 W85.62389
WL40-2	11-DEC-12 2:11:29PM	N33.27171 W85.62632

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located on shoreline with minimal diversity of herbacesous vegetation.

Wetland 41

Map # 3

Inspection Date: 12/11/12

GPS Point(s):

WL41-1	11-DEC-12 2:27:48PM	N33.26888 W85.62821
WL41-2	11-DEC-12 2:28:58PM	N33.26846 W85.62863

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located in alluvial area in small slough/stream with diverse herbaceous vegetation.

Wetland 42
Map # 3

Inspection Date: 12/11/12

GPS Point(s):

WL42-1	11-DEC-12 2:36:27PM	N33.26629 W85.62956
WL42-2	11-DEC-12 2:38:21PM	N33.26551 W85.63007

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located in alluvial area in small slough/stream with diverse herbaceous vegetation.

Wetland 43

Map # 3

Inspection Date: 12/11/12

GPS Point(s):

WL43-1	11-DEC-12 2:59:49PM	N33.26647 W85.62479
WL43-2	11-DEC-12 3:01:07PM	N33.26738 W85.62452

Wetland Type: [x] Lacustrine Fringe [ ] Aquatic Bed [ ] Emergent [ ] Alluvial [ ] Forested [ ] Riverine

Quality:
- [ ] Good (Green) 75-100% Coverage
- [ ] Moderate (Yellow) 50-75 % Coverage
- [x] Poor (Red) <50% Coverage

Vegetation: [ ] Diverse [x] Monoculture
[ ] Emergent [x] Herbaceous [ ] Shrubs [ ] Trees/Forest

Physical Features:
Topography: [ ] Steep [ ] Moderate Slope [x] Gentle Slope [ ] Flat
Location: [x] Shoreline [ ] Stream [ ] Point Bar [x] Slough [ ] Alluvial

Physical Characteristics:
- [ ] Highly Developed
- [ ] Moderately Developed
- [ ] Minimally Developed
- [x] Pristine
- [x] Stable Shoreline
- [ ] Eroded Shoreline
- [ ] Seawall
- [ ] Rock/Riprap
- [ ] Other

Notes:
Poor quality lacustrine fringe located on shoreline in a small area of monoculture herbaceous vegetation.

Wetland 44

Map # 3

Inspection Date: 12/11/12

GPS Point(s):
WL44 11-DEC-12 3:11:36PM N33.26871 W85.62258

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe located on shoreline in a small area of monoculture herbaceous vegetation.

Wetland 45

Map # 2

Inspection Date: 12/11/12

GPS Point(s):
WL SP (WL45) 11-DEC-12 11:14:17AM N33.28818 W85.63976

Wetland Type:
- ☒ Lacustrine Fringe
- ☐ Aquatic Bed
- ☐ Emergent
- ☐ Alluvial
- ☐ Forested
- ☐ Riverine

Quality:
- ☐ Good (Green) 75-100% Coverage
- ☒ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation:
- ☒ Diverse
- ☐ Monoculture
- ☐ Emergent
- ☒ Herbaceous
- ☒ Shrubs
- ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat

Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
- ☐ Highly Developed
- ☐ Moderately Developed
- ☐ Minimally Developed
- ☒ Pristine
- ☒ Stable Shoreline
- ☐ Eroded Shoreline
- ☐ Seawall
- ☐ Rock/Riprap
- ☐ Other

Notes:
Moderate quality lacustrine fringe wetland with juncus and buttonbush.

Wetland 46

Map # 3

Inspection Date: 12/18/12

GPS Point(s):

WL46-1	18-DEC-12 1:18:22PM	N33.26651 W85.61838
WL46-2	18-DEC-12 1:19:34PM	N33.26700 W85.61848

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located in small slough at a pool. Herbs and small shrubs.

Wetland 47

Map # 3

Inspection Date: 12/18/12

GPS Point(s):

WL47-1	18-DEC-12 1:31:02PM	N33.26568 W85.61945
WL47-2	18-DEC-12 1:31:41PM	N33.26569 W85.61968

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located in small slough/alluvial area on shoreline with few species.

Wetland 48

Map # 3

Inspection Date: 12/18/12

GPS Point(s):

WL48-1	18-DEC-12 1:54:35PM	N33.26502 W85.62375
WL48-2	18-DEC-12 1:57:11PM	N33.26540 W85.62493

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe located in slough with ephemeral streams flowing to lake. Herbaceous and wood hydrophytic vegetation.

Wetland 49

Map # 3

Inspection Date: 12/18/12

GPS Point(s):

WL49 18-DEC-12 2:07:19PM N33.26511 W85.62698

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Moderate quality lacustrine fringe wetland located at alluvial area of groundwater seeps. Herbaceous with few saplings.

Wetland 50

Map # 3

Inspection Date: 12/18/12

GPS Point(s):

WL50-1	18-DEC-12 2:18:08PM	N33.25913 W85.62531
WL50-2	18-DEC-12 2:19:09PM	N33.25948 W85.62515

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☒ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☒ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located on shoreline to point bar to small slough with monoculture vegetation.

Wetland 51

Map # 4

Inspection Date: 12/18/12

GPS Point(s):

WL51-1	18-DEC-12 4:00:16PM	N33.25604 W85.57814
WL51-2	18-DEC-12 4:01:24PM	N33.25574 W85.57788

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☒ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality scrub shrub wetland located at confluence of perennial stream at alluvial area. Diverse emergent, herbaceous and woody vegetation.

Wetland 52

Map # 4

Inspection Date: 12/21/12

GPS Point(s):
WL52 21-DEC-12 12:28:55PM N33.26796 W85.57081

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☒ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located on steep shoreline in small slough. Monoculture herbaceous vegetation.

Wetland 53

Map # 4

Inspection Date: 12/21/12

GPS Point(s):
WL53 21-DEC-12 12:31:35PM N33.26874 W85.57127

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located on shoreline in small slough. Monoculture herbaceous and scrub shrub vegetatio.n

Wetland 54

Map # 4

Inspection Date: 12/21/12

GPS Point(s):
WL54 21-DEC-12 12:38:33PM N33.27055 W85.57260

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☒ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located on shoreline in small slough. Monoculture herbaceous vegetation.

Wetland 55

Map # 4

Inspection Date: 12/21/12

GPS Point(s):

WL55 21-DEC-12 12:49:06PM N33.27122 W85.57313

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☒ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Poor quality lacustrine fringe wetland located on steep shoreline in small slough. Monoculture herbaceous vegetation.

Wetland 56

Map # 4

Inspection Date: 12/21/12

GPS Point(s):

WL56-1	21-DEC-12 1:29:43PM	N33.27539 W85.56741
WL56-2	21-DEC-12 1:30:45PM	N33.27559 W85.56709

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality scrub/shrub forested wetland at confluence of perennial stream and large alluvial area of large slough. Diverse herbaceous and sapling vegetation.

Wetland 57

Map # 4

Inspection Date: 12/21/12

GPS Point(s):

WL57-1	21-DEC-12 1:35:19PM	N33.27620 W85.56809
WL57-2	21-DEC-12 1:36:36PM	N33.27649 W85.56822

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality scrub/shrub forested wetland at confluence of intermittent stream and large alluvial area of large slough. Diverse herbaceous and sapling vegetation.

Wetland 58
Map # 4

Inspection Date: 12/21/12

GPS Point(s):
WL58 21-DEC-12 1:43:27PM N33.27691 W85.57125

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality scrub/shrub forested wetland at confluence of intermittent stream and large alluvial area of large slough. Diverse herbaceous and sapling vegetation.

Wetland 59
Map # 4

Inspection Date: 1/4/13

GPS Point(s):
WL59 04-JAN-13 11:39:44AM N33.29037 W85.56707

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe located on shoreline. Monoculture herbaceous vegetation.

Wetland 60
Map # 5

Inspection Date: 1/4/13

GPS Point(s):

WL60-1	04-JAN-13 12:25:07PM	N33.28574 W85.55957
WL60-2	04-JAN-13 12:27:07PM	N33.28676 W85.55907

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe located on shoreline at alluvial area of perennial and intermittent stream. Road backs up to WL and buffer wildlife usafe. Some diversity present.

Wetland 61
Map # 5

Inspection Date: 1/4/13

GPS Point(s):
WL61 04-JAN-13 12:55:16PM N33.29855 W85.55857

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe WL located in small slough confluence of intermittent stream.

Wetland 62
Map # 5

Inspection Date: 1/4/13

GPS Point(s):
WL62 04-JAN-13 12:59:57PM N33.30022 W85.55931

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality forested WL located at confluence of intermittent stream and alluvial area. Diverse shrubs and herbaceous vegetation.

Wetland 63
Map # 5

Inspection Date: 1/4/13

GPS Point(s):

WL63-1	04-JAN-13 2:04:19PM	N33.31678 W85.55853
WL63-2	04-JAN-13 2:05:32PM	N33.31709 W85.55861

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS wetland located at confluence of intermittent stream in alluvial area in small slough. Diverse woody vegetation.

Wetland 64

Map # 5

Inspection Date: 1/4/13

GPS Point(s):

WL64-1	04-JAN-13 2:44:13PM	N33.31726 W85.55067
WL64-2	04-JAN-13 2:45:41PM	N33.31725 W85.55031

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested SS wetland in depositional area of perennial stream confluence. Diverse trees, shrubs, herbaceous.

Wetland 65
Map # 6

Inspection Date: 1/4/13

GPS Point(s):
WL65 04-JAN-13 2:55:38PM N33.31974 W85.55119

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☒ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Small moderate quality scrub/shrub lacustrine fringe wetland located on shoreline. Diverse shrubs and herbaceous vegetation.

Wetland 66

Map # 5

Inspection Date: 1/4/13

GPS Point(s):

WL66 04-JAN-13 3:01:43PM N33.32290 W85.55581

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located on small slough on shoreline. Monoculture herbaceous vegetaion.

Wetland 67

Map # 6

Inspection Date: 1/11/13

GPS Point(s):

WL67-1	11-JAN-13 2:02:20PM	N33.33399 W85.50184
WL67-2	11-JAN-13 2:03:23PM	N33.33413 W85.50191

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

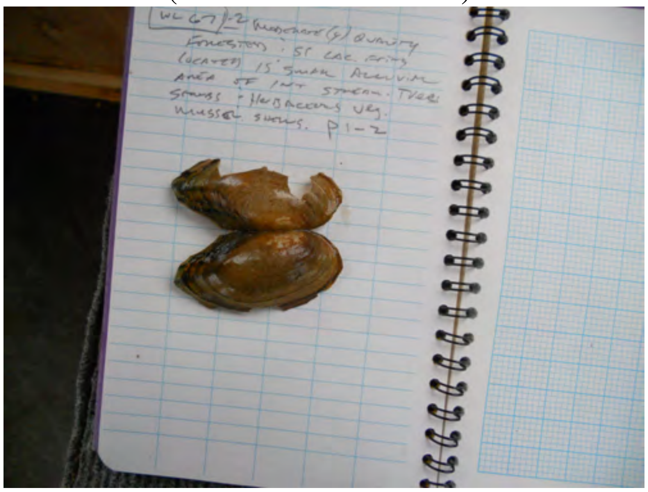
Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality forested and SS lacustrine fringe located in small alluvial area of intermittent stream. Diverse trees, shrubs and herbaceous vegetation and mussel shells (Utterbackia imbecillis).



Wetland 68
Map # 6

Inspection Date: 1/11/13

GPS Point(s):

WL68-1	11-JAN-13 2:17:48PM	N33.33702 W85.50316
WL68-2	11-JAN-13 2:19:55PM	N33.33714 W85.50367

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested and SS lacustrine fringe located at comfluence of alluvial area of intermittent stream. Diverse trees, shrubs and herbaceous vegetation.

Wetland 69
Map # 6

Inspection Date: 1/11/13

GPS Point(s):

WL69-1	11-JAN-13 2:21:26PM	N33.33740 W85.50403
WL69-2	11-JAN-13 2:22:04PM	N33.33741 W85.50425

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested and SS lacustrine fringe located at comfluence of alluvial area of intermittent stream. Diverse trees, shrubs and herbaceous vegetation.

Wetland 70

Map # 8

Inspection Date: 1/18/13

GPS Point(s):

WL70 18-JAN-13 12:38:07PM N33.36214 W85.48805

Wetland Type:
- ☐ Lacustrine Fringe
- ☐ Aquatic Bed
- ☐ Emergent
- ☐ Alluvial
- ☒ Forested
- ☐ Riverine

Quality:
- ☐ Good (Green) 75-100% Coverage
- ☒ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation:
- ☐ Diverse
- ☐ Monoculture
- ☐ Emergent
- ☐ Herbaceous
- ☒ Shrubs
- ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat

Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
- ☐ Highly Developed
- ☐ Moderately Developed
- ☒ Minimally Developed
- ☒ Pristine
- ☒ Stable Shoreline
- ☐ Eroded Shoreline
- ☐ Seawall
- ☐ Rock/Riprap
- ☐ Other

Notes:

Moderate quality scrub shrub wetland located on shoreline. Diverse shrubs and herbaceous vegetation.

Wetland 71
Map # 8

Inspection Date: 1/18/13

GPS Point(s):

WL71-2	18-JAN-13 12:57:49PM	N33.36944 W85.49006
WL71-1	18-JAN-13 12:56:36PM	N33.36965 W85.48965

Wetland Type: ☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested and SS lacustrine fringe located at confluence of alluvial area of intermittent stream.Small impoundment located upstream.

Wetland 72

Map # 7

Inspection Date: 1/18/13

GPS Point(s):

WL72 18-JAN-13 1:50:18PM N33.35911 W85.49730

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Moderate quality Lacustrine Fringe wetland located on shoreline. Forested and shrubs and dead falls. Small drainage feature.

Wetland 73
Map # 7

Inspection Date: 1/18/13

GPS Point(s):
WL73 18-JAN-13 2:09:00PM N33.36585 W85.50533

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality forested and SS lacustrine fringe located at shoreline in small drain at confluence of lake.

Wetland 74

Map # 7

Inspection Date: 1/18/13

GPS Point(s):

WL74-1	18-JAN-13 2:57:19PM	N33.35403 W85.51816
WL74-2	18-JAN-13 2:59:13PM	N33.35447 W85.51913

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested and SS lacustrine fringe located in slough at alluvial area of lake at perennial/intermittent stream. Wildlife usage evident.

Wetland 75

Map # 7

Inspection Date: 1/18/13

GPS Point(s):

WL75 18-JAN-13 3:15:19PM N33.35077 W85.51811

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Poor quality lacustrine fringe wetland located on shoreline. Primarily shrubs and dead fall.

Wetland 76

Map # 7

Inspection Date: 1/18/13

GPS Point(s):

WL76 18-JAN-13 3:33:38PM N33.36158 W85.52560

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Good quality forested and SS lacustrine fringe located on inside of meander of perennial stream. Diverse trees, shrubs, saplings and herbaceous vegetation. Mussel shell found (Utterbackia imbecillis).

Wetland 77
Map # 7

Inspection Date: 1/24/13

GPS Point(s):
WL77 24-JAN-13 10:50:15AM N33.35637 W85.53284

Wetland Type:
- ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
- ☒ Alluvial ☒ Forested ☐ Riverine

Quality:
- ☒ Good (Green) 75-100% Coverage
- ☐ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation:
- ☒ Diverse ☐ Monoculture
- ☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
- Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
- Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
- ☐ Highly Developed ☒ Stable Shoreline ☐ Other
- ☐ Moderately Developed ☐ Eroded Shoreline
- ☐ Minimally Developed ☐ Seawall
- ☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested /SS wetland located at confluence of Alluvial area of lake and intermittent stream. Diverse trees, shrubs and herbaceous vegetation.

Wetland 78

Map # 6

Inspection Date: 1/24/13

GPS Point(s):

WL78 24-JAN-13 11:09:56AM N33.35440 W85.53696

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Good quality lacustrine fringe wetland located in drain with shrubs and herbs. Alluvial area of groundwater seeps.

Wetland 79
Map # 6

Inspection Date: 1/24/13

GPS Point(s):
WL79 24-JAN-13 11:20:48AM N33.35260 W85.54012

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality Lacustrine Fringe wetland located at alluvial area of drain on shoreline.Shrubs and herbaceous vegetation.

Wetland 80

Map # 6

Inspection Date: 1/24/13

GPS Point(s):

WL80 24-JAN-13 11:44:43AM N33.34809 W85.54867

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:

Good quality lacustrine fringe forested/SS wetland located at confluence of small intermittent stream. Developed area with trees, shrubs and herbaceous vegetation.

Wetland 81
Map # 6

Inspection Date: 1/24/13

GPS Point(s):

WL81-1	24-JAN-13 11:53:51AM	N33.34518 W85.54841
WL81-2	24-JAN-13 11:54:37AM	N33.34524 W85.54862

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested and SS lacustrine fringe located on shoreline in small ephemeral drain. Wildlife usage present.

Wetland 82

Map # 6

Inspection Date: 1/24/13

GPS Point(s):

WL82	24-JAN-13 11:57:30AM	N33.34514 W85.54743
WL82-1	24-JAN-13 2:49:19PM	N33.34387 W85.55220

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located in small drain. Primarily shrubs and minimal herbaceous vegetation.

Wetland 83
Map # 6

Inspection Date: 1/24/13

GPS Point(s):
WL83 24-JAN-13 12:51:20PM N33.33595 W85.54088

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture ☐ Emergent ☐ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested lacustrine fringe wetland located in ephemeral/intermittent stream drainage at confluence.

Wetland 84

Map # 6

Inspection Date: 1/24/13

GPS Point(s):

WL84 24-JAN-13 1:03:50PM N33.33314 W85.54165

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Good quality forested located in alluvial area at confluence of lake and intermittent stream. Trees, shrubs and herbaceous vegetation.

Wetland 85

Map # 6

Inspection Date: 1/24/13

GPS Point(s):

WL85-2 24-JAN-13 2:50:18PM N33.34392 W85.55251

Wetland Type:
- ☒ Lacustrine Fringe
- ☐ Aquatic Bed
- ☐ Emergent
- ☒ Alluvial
- ☒ Forested
- ☐ Riverine

Quality:
- ☒ Good (Green) 75-100% Coverage
- ☐ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation:
- ☒ Diverse
- ☐ Monoculture
- ☐ Emergent
- ☒ Herbaceous
- ☒ Shrubs
- ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat

Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
- ☐ Highly Developed
- ☐ Moderately Developed
- ☐ Minimally Developed
- ☒ Pristine
- ☒ Stable Shoreline
- ☐ Eroded Shoreline
- ☐ Seawall
- ☐ Rock/Riprap
- ☐ Other

Notes:

Good quality forested and SS lacustrine fringe located in alluvial area on intermittent stream. Diverse trees, shrubs, and herbaceous vegetation. Wildlife usage evidence.

Wetland 86

Map # 6

Inspection Date: 1/24/13

GPS Point(s):

WL86 24-JAN-13 2:55:20PM N33.34395 W85.55294

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Moderate quality SS and lacustrine fringe wetlane located on shoreline in slough. Diverse shrubs, woody vines and herbaceous vegetation.

Wetland 87

Map # 6

Inspection Date: 1/29/13

GPS Point(s):

WL87 29-JAN-13 3:30:07PM N33.33798 W85.56747

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe wetland located small slough at confluence of ephemeral stream. Diverse shrubs and herbaceous vegetation. Mussel shell found (Utterbackia imbecillis).

Wetland 88

Map # 6

Inspection Date: 1/29/13

GPS Point(s):

WL88 29-JAN-13 3:39:04PM N33.33665 W85.56985

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☒ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS, emergent and lacustrine fringe located in slough at confluence of intermittnet stream. Alluvial area.

Wetland 89
Map # 6

Inspection Date: 1/29/13

GPS Point(s):
WL89 29-JAN-13 4:06:45PM N33.33164 W85.56729

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe located in small slough on shoreline. Monoculture of juncus.

Wetland 90

Map # 6

Inspection Date: 1/29/13

GPS Point(s):

WL90-1	29-JAN-13 4:24:35PM	N33.32815 W85.57322
WL90-2	29-JAN-13 4:25:54PM	N33.32755 W85.57346

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested and SS lacustrine fringe located in alluvial are of intermittnet stream. Wildlife usage evident.

Wetland 91
Map # 5

Inspection Date: 1/29/13

GPS Point(s):
WL91 29-JAN-13 4:34:48PM N33.32506 W85.57354

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☒ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality SS emergent lacustrine fringe. Minimal diversity located in alluvial area.

Wetland 92
Map # 5

Inspection Date: 2/13/13

GPS Point(s):
WL92 13-FEB-13 10:21:41AM N33.32250 W85.57727

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested wetland located at confluence of intermittent stream and lake. Diverse forested shrubbery.

Wetland 93
Map # 9

Inspection Date: 2/13/13

GPS Point(s):
WL93 13-FEB-13 10:51:34AM N33.32773 W85.58228

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☒ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS and forested wetland located in alluvial area of intermittent stream and lake. Diverse trees, shrubs and herbaceous vegetation.

Wetland 94
Map # 9

Inspection Date: 2/13/13

GPS Point(s):

WL94-1	13-FEB-13 11:17:25AM	N33.33344 W85.58304
WL94-2	13-FEB-13 11:20:11AM	N33.33390 W85.58310

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS wetland located in flood plain area of intermittent stream. Diverse shrubs and herbaceous vegetation.

Wetland 95
Map # 9

Inspection Date: 2/13/13

GPS Point(s):
WL95 13-FEB-13 11:21:29AM N33.33399 W85.58362

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

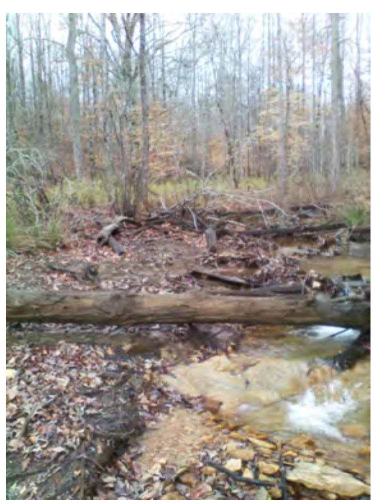
Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS/Forested wetland located in alluvial area of intermittnet stream and lake.



Wetland 96

Map # 9

Inspection Date: 2/13/13

GPS Point(s):
WL96- 13-FEB-13 11:28:02AM N33.33358 W85.58501

Wetland Type:
- [x] Lacustrine Fringe
- [ ] Aquatic Bed
- [ ] Emergent
- [ ] Alluvial
- [x] Forested
- [ ] Riverine

Quality:
- [x] Good (Green) 75-100% Coverage
- [ ] Moderate (Yellow) 50-75 % Coverage
- [ ] Poor (Red) <50% Coverage

Vegetation:
- [ ] Diverse
- [ ] Monoculture
- [ ] Emergent
- [ ] Herbaceous
- [ ] Shrubs
- [ ] Trees/Forest

Physical Features:

Topography:
- [ ] Steep
- [ ] Moderate Slope
- [x] Gentle Slope
- [ ] Flat

Location:
- [x] Shoreline
- [x] Stream
- [ ] Point Bar
- [ ] Slough
- [x] Alluvial

Physical Characteristics:
- [ ] Highly Developed
- [x] Stable Shoreline
- [ ] Other
- [ ] Moderately Developed
- [ ] Eroded Shoreline
- [ ] Minimally Developed
- [ ] Seawall
- [x] Pristine
- [ ] Rock/Riprap

Notes:
Good quality SS/Forested wetlant located in alluvial area of intermittnet stream and lake.

Wetland 97

Map # 11 (off map to the right)

Inspection Date: 2/13/13

GPS Point(s):

WL97 13-FEB-13 1:37:55PM N33.35313 W85.57929

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☒ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality SS wetland located on shoreline. Shrubs and herbaceous vegetation. Developed shoreline.

Wetland 98

Map # 12

Inspection Date: 2/18/13

GPS Point(s):

WL98-1	18-FEB-13 11:54:32AM	N33.38965 W85.57298
WL98-2	18-FEB-13 11:57:08AM	N33.39016 W85.57327

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe located in alluvial area of 12' wide pernnial stream. Scrub/shrub awith herbaceous vegetation. Wildlife evidence. Mussell shell found in mudflats (Utterbackia imbecillis).

Wetland 99

Map # 12

Inspection Date: 2/18/13

GPS Point(s):

WL99 18-FEB-13 1:02:56PM N33.39782 W85.57509

Wetland Type:
- ☒ Lacustrine Fringe
- ☐ Aquatic Bed
- ☐ Emergent
- ☐ Alluvial
- ☒ Forested
- ☐ Riverine

Quality:
- ☒ Good (Green) 75-100% Coverage
- ☐ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation:
- ☒ Diverse
- ☐ Monoculture
- ☐ Emergent
- ☒ Herbaceous
- ☒ Shrubs
- ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat

Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
- ☐ Highly Developed
- ☐ Moderately Developed
- ☐ Minimally Developed
- ☒ Pristine
- ☒ Stable Shoreline
- ☐ Eroded Shoreline
- ☐ Seawall
- ☐ Rock/Riprap
- ☐ Other

Notes:

Good quality SS forested lacustrine fringe weltand located in alluvial area in slough of 18' wide intermittent/perennial stream. Mussell shell found in mudflats (Utterbackia imbecillis).

Wetland 100
Map # 13

Inspection Date: 2/26/13

GPS Point(s):
WL100 26-FEB-13 12:36:17PM N33.43436 W85.60893

Wetland Type:
☐ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☒ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation:
☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality forested SS wetland located in small flood plain of intermittent stream.

Wetland 101
Map # 13

Inspection Date: 2/26/13

GPS Point(s):
WL101 26-FEB-13 1:06:33PM N33.40892 W85.60087

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☒ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Poor quality SS wetland located in small slough at confluence of lake and stream.

Wetland 102

Map # 12

Inspection Date: 2/26/13

GPS Point(s):

WL102-1	26-FEB-13 1:27:27PM	N33.39902 W85.58631
WL102-2	26-FEB-13 1:30:30PM	N33.39844 W85.58669

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS and lacustrine fringe wetland located on shoreline in slough at confluence of three intermittent streams flowing into lake. Forested, SS, and herbaceous vegetation.

Wetland 103

Map # 12

Inspection Date: 2/26/13

GPS Point(s):

WL103 26-FEB-13 2:19:59PM N33.37966 W85.58481

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Poor quality lacustrine fringe wetland located in alluvial area of intermittent stream. Monocultural herbaceous vegetation.

Wetland 104

Map # 12

Inspection Date: 2/26/13

GPS Point(s):

WL104 26-FEB-13 2:34:35PM N33.37424 W85.58976

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located in alluvial area of intermittent stream. Monocultural herbaceous vegetation.

Wetland 105

Map # 11

Inspection Date: 2/26/13

GPS Point(s):

WL105-1	26-FEB-13 3:23:19PM	N33.34331 W85.60720
WL105-2	26-FEB-13 3:24:51PM	N33.34345 W85.60779

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality alluvial shoreline SS wetland located in wide and flat flood plain of intermittent stream. Diverse saplings and herbaceous vegetation.

Wetland 106

Map # 11

Inspection Date: 2/26/13

GPS Point(s):

WL106 26-FEB-13 3:43:49PM N33.34596 W85.61077

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality alluvial shoreline SS wetland located in flood plain of stream. Forested scrub/shrub and and herbaceous vegetation.

Wetland 107

Map # 11

Inspection Date: 2/26/13

GPS Point(s):

WL107-1	26-FEB-13 4:00:18PM	N33.33912 W85.61167
WL107-2	26-FEB-13 4:01:00PM	N33.33878 W85.61165

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☐ Stable Shoreline ☐ Other
☐ Moderately Developed ☒ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality SS wetland located in alluvial area of eroded intermittent stream. Diverse shrubsand herbaceous vegetation.

Wetland 108
Map # 10

Inspection Date: 3/8/13

GPS Point(s):
WL108 08-MAR-13 9:38:24AM N33.33090 W85.61217

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☒ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located in small alluvial area of intermittent stream. Moderate development with seawall and piers.

Wetland 109

Map # 10

Inspection Date: 3/8/13

GPS Point(s):

W109-1	08-MAR-13 9:40:17AM	N33.33041 W85.61277
WL109-2	08-MAR-13 9:42:43AM	N33.33007 W85.61246

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☒ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality scrub/shrub wetland located in alluvial area of stream at confluence of lake. Some forested and diverse shrubs and herbaceous vegetation.

Wetland 110

Map # 10

Inspection Date: 3/8/13

GPS Point(s):

WL110 08-MAR-13 10:49:02AM N33.32352 W85.59798

Wetland Type:
- ☒ Lacustrine Fringe
- ☐ Aquatic Bed
- ☐ Emergent
- ☒ Alluvial
- ☒ Forested
- ☐ Riverine

Quality:
- ☐ Good (Green) 75-100% Coverage
- ☒ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation:
- ☒ Diverse
- ☐ Monoculture
- ☐ Emergent
- ☒ Herbaceous
- ☒ Shrubs
- ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☒ Moderate Slope ☐ Gentle Slope ☐ Flat

Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
- ☐ Highly Developed
- ☐ Moderately Developed
- ☐ Minimally Developed
- ☒ Pristine
- ☒ Stable Shoreline
- ☐ Eroded Shoreline
- ☐ Seawall
- ☐ Rock/Riprap
- ☐ Other

Notes:

Moderate quality lacustrine fringe and forested wetland located in alluvial area of confluence of lake and strream. Trees, shrubs, and herbaceous vegetation.

Wetland 111

Map # 1

Inspection Date: 3/8/13

GPS Point(s):

WL111-1	08-MAR-13 11:13:47AM	N33.31553 W85.59744
WL111-2	08-MAR-13 11:15:01AM	N33.31516 W85.59789

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe wetland located in alluvial area on shoreline. Forested scrub/shrub - herbaceous vegetation adjacent to stream.

Wetland 112

Map # 1

Inspection Date: 3/8/13

GPS Point(s):

W112-1	08-MAR-13 12:08:49PM	N33.31101 W85.58679
WL112-2	08-MAR-13 12:10:25PM	N33.31084 W85.58701

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located in alluvial area of lake and intermittent stream. Shrubs and herbaceous vegetation.

Wetland 113

Map # 2

Inspection Date: 4/25/13

GPS Point(s):

WL113 25-APR-13 1:31:45PM N33.30116 W85.63197

Wetland Type:
- ☒ Lacustrine Fringe
- ☐ Aquatic Bed
- ☐ Emergent
- ☐ Alluvial
- ☐ Forested
- ☐ Riverine

Quality:
- ☒ Good (Green) 75-100% Coverage
- ☐ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation:
- ☒ Diverse
- ☐ Monoculture
- ☐ Emergent
- ☒ Herbaceous
- ☒ Shrubs
- ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat

Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
- ☐ Highly Developed
- ☒ Moderately Developed
- ☐ Minimally Developed
- ☐ Pristine
- ☒ Stable Shoreline
- ☐ Eroded Shoreline
- ☒ Seawall
- ☐ Rock/Riprap
- ☐ Other

Notes:

Good quality lacustrine fringe wetland located on shoreline. Diverse shrubs and herbs at waterline.

Wetland 114
Map # 2

Inspection Date: 4/25/13

GPS Point(s):

W114 25-APR-13 1:42:08PM N33.30560 W85.62788

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐Monoculture
☒ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located in in small slough. Diverse vegetation.

Wetland 115
Map # 2

Inspection Date: 4/25/13

GPS Point(s):
WL115 25-APR-13 1:49:36PM N33.30861 W85.62707

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality SS and forested wetland located in alluvial area of Little Fox Creek. Diverse trees, shrubs and herbs. Wildlife present.

Wetland 116

Map # 2

Inspection Date: 4/25/13

GPS Point(s):

WL116-1	25-APR-13 1:56:22PM	N33.30926 W85.62839
WL116-2	25-APR-13 2:00:49PM	N33.30775 W85.62886

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland monoculture of juncus only along shoreline. No erosion.

Wetland 117

Map # 2

Inspection Date: 4/25/13

GPS Point(s):

W117-1	25-APR-13 2:11:25PM	N33.30814 W85.63349
WL117-2	25-APR-13 2:14:36PM	N33.30922 W85.63441

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

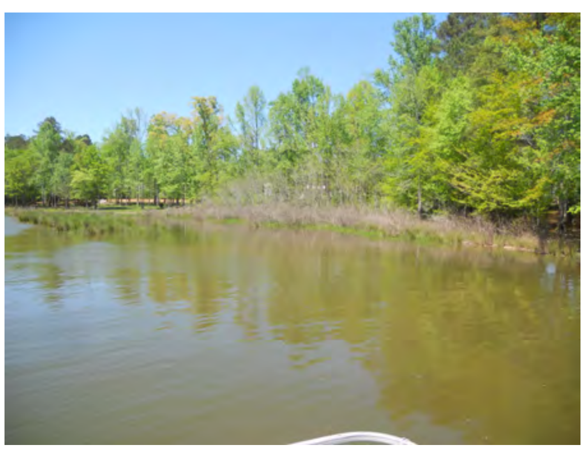
Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe wetland located on shoreline of large perennial stream. Diverse SS-herbaceous vegetation.



Wetland 118

Map # 2

Inspection Date: 4/25/13

GPS Point(s):

WL118-1	25-APR-13 2:15:33PM	N33.30912 W85.63458
WL118-2	25-APR-13 2:18:15PM	N33.30779 W85.63372

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe wetland located on shoreline of large perennial stream. Diverse SS-herbaceous vegetation.

Wetland 119
Map # 5

Inspection Date: 4/25/13

GPS Point(s):

WL119 25-APR-13 3:22:19PM N33.28944 W85.55783

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS lacustrine fringe wetland located in alluvial area at confluence of stream and lake. Preimarily herbaceous vegetation.

Wetland 120
Map # 5

Inspection Date: 4/25/13

GPS Point(s):
WL120 25-APR-13 3:30:09PM N33.29309 W85.55827

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☐ Forested ☐ Riverine

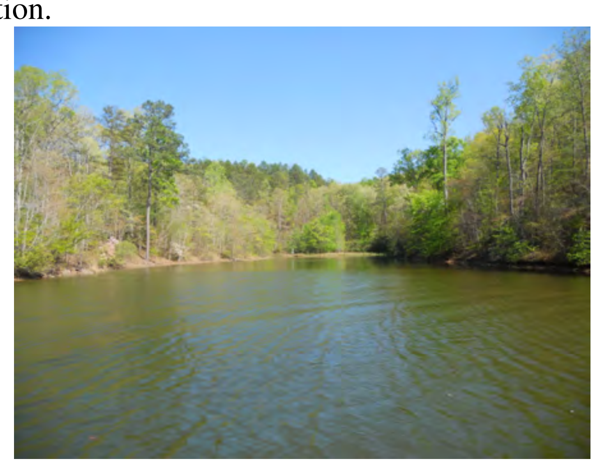
Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS lacustrine fringe wetland located in alluvial area at confluence of stream and lake. Primarily herbaceous vegetation.



Wetland 121

Map # 15

Inspection Date: 5/8/13

GPS Point(s):
WL121 08-MAY-13 2:45:03PM N33.36077 W85.47887

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☒ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe wetland located on shoreline in flood plain of perennial stream. Diverse shrubs and herbs at waterline.

Wetland 122

Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL122 08-MAY-13 3:20:37PM N33.36495 W85.46663

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☒ Riverine

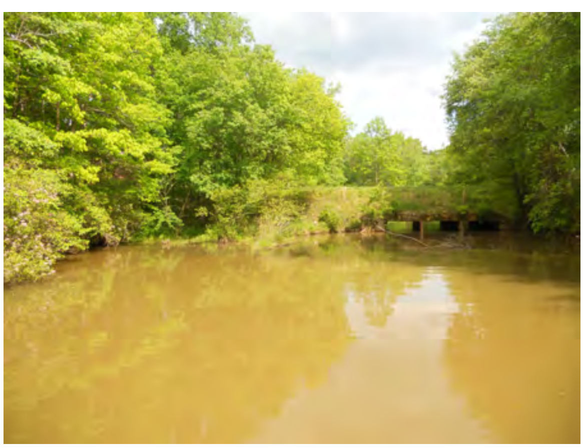
Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☒ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☒ Other Bridge
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Forested wetland located on shoreline. Bridged culverts stops navigation. Diverse shrubs, trees, and herbaceous, and emergent vegetation



Wetland 123

Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL123	08-MAY-13 3:41:39PM	N33.37795 W85.47272
WL123-2	08-MAY-13 3:45:01PM	N33.37723 W85.47215
WL123-3	08-MAY-13 4:09:25PM	N33.38613 W85.46679

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes: Moderate quality lacustrine fringe wetland with primarily herbaceous vegetation and shrubs on shoreline.

Wetland 124

Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL124-1	08-MAY-13 3:50:04PM	N33.38155 W85.47241
WL124-2	08-MAY-13 4:00:49PM	N33.38696 W85.47738

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage ☐ Moderate (Yellow) 50-75 % Coverage ☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat

Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☐ Moderately Developed ☒ Minimally Developed ☒ Pristine

☒ Stable Shoreline ☐ Eroded Shoreline ☐ Seawall ☐ Rock/Riprap

☐ Other

Notes:

Good quality large expance of primarily lacustrine fringe along floop plain. Some residential +/- 1000' impacts. Diverse trees, forest, shrubs and herbs

Wetland 125

Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL125-1	08-MAY-13 4:14:18PM	N33.38215 W85.46396
WL125-2	08-MAY-13 4:21:02PM	N33.37770 W85.45909

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☒ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located on shoreline. Residential, so good quality where not impacted.

Wetland 126

Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL126-1	08-MAY-13 4:32:59PM	N33.37582 W85.45733
WL126-2	08-MAY-13 4:51:13PM	N33.38606 W85.46591

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
500-900' maintained shoreline with good quality forested and lacustrine fringe wetland for remainder of wetland.

Wetland 127

Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL127-1	08-MAY-13 4:54:35PM	N33.38590 W85.47160
WL127-2	08-MAY-13 4:58:48PM	N33.38683 W85.47479

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality forest and lacustrine fringe wetland located on shoreline and ending at slough.

Wetland 128
Map # 15

Inspection Date: 5/8/13

GPS Point(s):
WL128 08-MAY-13 5:02:15PM N33.38794 W85.47295

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS lacustrine fringe wetland located in alluvial area. Primarily shrubs and trees.

Wetland 129
Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL129-1	08-MAY-13 5:06:08PM	N33.38721 W85.47474
WL129-2	08-MAY-13 5:09:37PM	N33.38714 W85.47755

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality SS lacustrine fringe wetland located in alluvial area. Primarily juncus.

Wetland 130

Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL130 08-MAY-13 5:19:06PM N33.37153 W85.47213

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality SS lacustrine fringe wetland located in small slough with a house.

Wetland 131
Map # 15

Inspection Date: 5/8/13

GPS Point(s):

WL131-1	08-MAY-13 5:23:16PM	N33.36730 W85.47383
WL131-2	08-MAY-13 5:26:35PM	N33.36841 W85.47565

Wetland Type: [x] Lacustrine Fringe [ ] Aquatic Bed [ ] Emergent [ ] Alluvial [ ] Forested [ ] Riverine

Quality:
- [ ] Good (Green) 75-100% Coverage
- [x] Moderate (Yellow) 50-75 % Coverage
- [ ] Poor (Red) <50% Coverage

Vegetation: [x] Diverse [ ] Monoculture [ ] Emergent [x] Herbaceous [x] Shrubs [ ] Trees/Forest

Physical Features:

Topography: [ ] Steep [ ] Moderate Slope [ ] Gentle Slope [ ] Flat

Location: [x] Shoreline [ ] Stream [ ] Point Bar [x] Slough [ ] Alluvial

Physical Characteristics:
- [ ] Highly Developed
- [ ] Moderately Developed
- [ ] Minimally Developed
- [x] Pristine
- [x] Stable Shoreline
- [ ] Eroded Shoreline
- [ ] Seawall
- [ ] Rock/Riprap
- [ ] Other

Notes:
Moderate quality SS lacustrine fringe wetland located on shoreline into the end of a small slough at bridge.

Wetland 132

Map # 8

Inspection Date: 5/8/13

GPS Point(s):

WL132 08-MAY-13 5:53:06PM N33.37575 W85.50137

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Good quality SS lacustrine fringe wetland located along shoreline. Primarily herbs and a few shrubs.

Wetland 133
Map # 8

Inspection Date: 5/8/13

GPS Point(s):
WL133 08-MAY-13 6:15:51PM N33.34530 W85.50566

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☒ Riverine

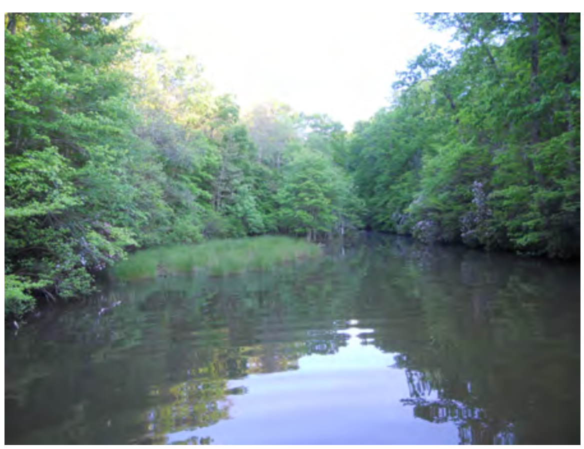
Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS lacustrine fringe wetland located on shoreline in large perennial stream.



Wetland 134
Map # 7

Inspection Date: 5/8/13

GPS Point(s):

WL134-1	09-MAY-13 7:55:05AM	N33.33893 W85.53073
WL134-2	09-MAY-13 7:57:41AM	N33.33855 W85.53046

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☒ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe wetland located on shoreline. Forested in shrubs in intermittent stream alluvial area.

Wetland 135

Map # 7

Inspection Date: 5/8/13

GPS Point(s):

WL135 09-MAY-13 8:05:12AM N33.34031 W85.52893

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Poor quality lacustrine fringe wetland located in small developed slough with no diversity.

Wetland 136
Map # 16

Inspection Date: 5/8/13

GPS Point(s):

WL136-1	09-MAY-13 9:34:54AM	N33.32501 W85.48662
WL136-2	09-MAY-13 9:39:08AM	N33.32487 W85.48358

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☒ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes: Moderate quality lacustrine fringe wetland. Diverse shrubs and herbaceous vegetation. No erosion. No buffer/field.

Wetland 137
Map # 16

Inspection Date: 5/8/13

GPS Point(s):
WL137-1 09-MAY-13 9:52:47AM N33.32507 W85.48208

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Moderate quality 200+' lacustrine fringe wetland along shoreline. No erosion.

Wetland 138

Map # 16

Inspection Date: 5/8/13

GPS Point(s):

WL138	09-MAY-13 10:05:50AM	N33.31993 W85.47596
WL138-2	09-MAY-13 10:33:31AM	N33.32192 W85.47392

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☒ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested SS wetland - riverine located within channel/backwater of Wedowee Creek. Continues to perennial tributaries downstream. Diverse SS-herbaceous vegetation.

Wetland 139

Map # 16

Inspection Date: 5/8/13

GPS Point(s):

WL139 09-MAY-13 10:47:04AM N33.33216 W85.49282

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☒ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested wetland located at confluence of intermittent stream and lake.

Wetland 140
Map # 16

Inspection Date: 5/8/13

GPS Point(s):
WL140 09-MAY-13 10:56:42AM N33.32439 W85.50084

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality SS lacustrine fringe wetland located in alluvial area at confluence of perennial stream in alluvial area. Diverse shrubs, saplings nd herbs.

Wetland 141

Map # 8 (far rt)

Inspection Date: 5/8/13

GPS Point(s):

WL141 09-MAY-13 11:25:51AM N33.37518 W85.51272

Wetland Type:
- ☒ Lacustrine Fringe
- ☐ Aquatic Bed
- ☐ Emergent
- ☒ Alluvial
- ☐ Forested
- ☐ Riverine

Quality:
- ☒ Good (Green) 75-100% Coverage
- ☐ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation:
- ☒ Diverse
- ☐ Monoculture
- ☐ Emergent
- ☒ Herbaceous
- ☒ Shrubs
- ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat

Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
- ☐ Highly Developed
- ☐ Moderately Developed
- ☐ Minimally Developed
- ☒ Pristine
- ☒ Stable Shoreline
- ☐ Eroded Shoreline
- ☐ Seawall
- ☐ Rock/Riprap
- ☐ Other

Notes:

Good quality SS lacustrine fringe wetland located in alluvial area at confluence of intermittent stream and lake.

Wetland 142

Map # 8 (off map to rt)

Inspection Date: 5/8/13

GPS Point(s):

WL142 09-MAY-13 11:33:43AM N33.37695 W85.51966

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Poor quality SS lacustrine fringe wetland located on both sides of stream on shorelined that is moderately developed.

Wetland 143
Map # 11

Inspection Date: 5/8/13

GPS Point(s):

WL143-1	09-MAY-13 1:16:24PM	N33.34676 W85.62396
WL143-2	09-MAY-13 1:19:06PM	N33.34660 W85.62502

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality SS lacustrine fringe monoculture wetland. End of navigable perennial stream (Mad Indian Creek).

Wetland 144

Map # 12 (at top hidden)

Inspection Date: 5/15/13

GPS Point(s):

WL144-1	15-MAY-13 11:40:44AM	N33.40575 W85.59721
WL144-2	15-MAY-13 11:44:02AM	N33.40525 W85.59733

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☒ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe wetland located on shoreline of perennial tributary. Diverse shrubs on both sides of slough..

Wetland 145

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL145 15-MAY-13 12:06:19PM N33.41672 W85.59127

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture
☐ Emergent ☒ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☒ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:

Moderate quality lacustrine fringe wetland located on shoreline with piers and steep topo. 80% juncus

Wetland 146

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL146 15-MAY-13 12:22:18PM N33.41229 W85.60659

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes: Moderate quality lacustrine fringe wetland located in small alluvial area. Diverse shrubs and herbaceous vegetation. Dirt road.

Wetland 147

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL147 15-MAY-13 12:31:14PM N33.41682 W85.60865

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

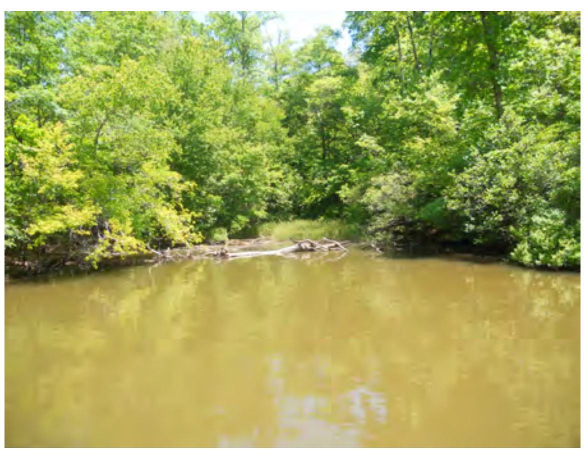
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Good quality SS lacustrine fringe wetland along shoreline in small slough/alluvial area. Diverse shrubs and herbs.



Wetland 148

Map # 13

Inspection Date: 5/15/13

GPS Point(s):
WL148 15-MAY-13 12:44:54PM N33.42997 W85.60109

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality: ☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality forested SS wetland located in alluvial area of small slough. Few species of herbaceous vegetation and developed.

Wetland 149

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL149 15-MAY-13 12:50:54PM N33.43228 W85.60544

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:

Topography: ☒ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Good quality forested wetland located at confluence of drain and lake.

Wetland 150

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL150 15-MAY-13 1:12:15PM N33.43889 W85.60848

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☐ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested wetland located at confluence of drain and lake.

Wetland 151

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

Wl151-1	15-MAY-13 1:20:53PM	N33.44375 W85.60998
WL151-2	15-MAY-13 1:30:51PM	N33.45099 W85.61084

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☒ Riverine

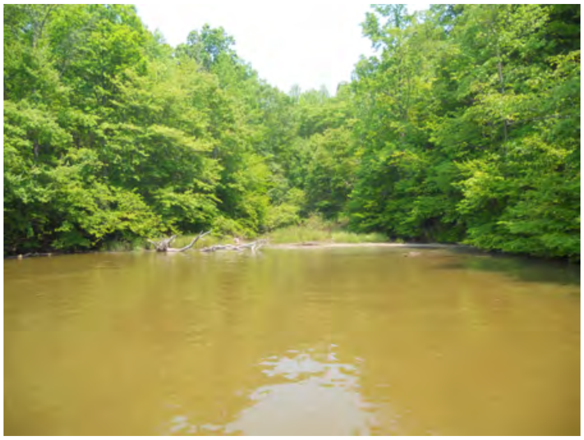
Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Large expanse of good quality SS lacustrine fringe wetland located along shoreline. Begins with forested/SS area then alluvial area nd continuing on in moderate quality along the river.



Wetland 152

Map # 14

Inspection Date: 5/15/13

GPS Point(s):

WL152-1	15-MAY-13 1:34:57PM	N33.45512 W85.60866
WL152-2	15-MAY-13 1:40:28PM	N33.45816 W85.60873

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Poor quality SS lacustrine fringe wetland located onriver shoreline. 30% coverage is 90% juncus.Track ends with a good wuality forested area.


Wetland 153

Map # 14

Inspection Date: 5/15/13

GPS Point(s):

WL153-1	15-MAY-13 1:52:34PM	N33.45993 W85.61073
WL153-2	15-MAY-13 2:00:10PM	N33.46118 W85.61647

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☒ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☒ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality riverine shoreline lacustrine fringe wetland. Juncus and a few shrubs. Diverse with good habitat possibility.

Wetland 154

Map # 14

Inspection Date: 5/15/13

GPS Point(s):

WL154 15-MAY-13 2:10:11PM N33.47280 W85.61393

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☒ Forested ☒ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:
Good quality forested wetland located at confluence of intermittent stream and river.

Wetland 155

Map # 14

Inspection Date: 5/15/13

GPS Point(s):

WL155-1	15-MAY-13 2:41:54PM	N33.45916 W85.61062
WL155-2	15-MAY-13 2:46:42PM	N33.45187 W85.61111

Wetland Type: [x] Lacustrine Fringe [ ] Aquatic Bed [ ] Emergent [ ] Alluvial [ ] Forested [ ] Riverine

Quality:
- [ ] Good (Green) 75-100% Coverage
- [x] Moderate (Yellow) 50-75 % Coverage
- [ ] Poor (Red) <50% Coverage

Vegetation: [x] Diverse [ ] Monoculture [ ] Emergent [x] Herbaceous [x] Shrubs [ ] Trees/Forest

Physical Features:

Topography: [ ] Steep [ ] Moderate Slope [ ] Gentle Slope [x] Flat

Location: [x] Shoreline [ ] Stream [ ] Point Bar [ ] Slough [ ] Alluvial

Physical Characteristics:
- [ ] Highly Developed
- [x] Moderately Developed
- [ ] Minimally Developed
- [ ] Pristine
- [x] Stable Shoreline
- [ ] Eroded Shoreline
- [ ] Seawall
- [ ] Rock/Riprap
- [ ] Other

Notes:
Good quality lacustrine fringe wetland located on developed shoreline. Primarily juncus and other herbs within piers and boat houses.

Wetland 156

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL156-1	15-MAY-13 2:50:42PM	N33.44544 W85.61159
WL156-2	15-MAY-13 2:53:57PM	N33.44442 W85.61273

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☒ Riverine

Quality:
- ☐ Good (Green) 75-100% Coverage
- ☒ Moderate (Yellow) 50-75 % Coverage
- ☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
- ☐ Highly Developed
- ☐ Moderately Developed
- ☐ Minimally Developed
- ☒ Pristine
- ☒ Stable Shoreline
- ☐ Eroded Shoreline
- ☐ Seawall
- ☐ Rock/Riprap
- ☐ Other

Notes:
Moderate quality riverine wetland located on inside bend of river at confluence of perennial stream and river. Herbs, shrubs and trees.

Wetland 157

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

W157 15-MAY-13 2:58:08PM N33.44730 W85.61563

Wetland Type:
- [x] Lacustrine Fringe
- [ ] Aquatic Bed
- [ ] Emergent
- [ ] Alluvial
- [ ] Forested
- [x] Riverine

Quality:
- [x] Good (Green) 75-100% Coverage
- [ ] Moderate (Yellow) 50-75 % Coverage
- [ ] Poor (Red) <50% Coverage

Vegetation:
- [x] Diverse
- [ ] Monoculture
- [ ] Emergent
- [x] Herbaceous
- [x] Shrubs
- [ ] Trees/Forest

Physical Features:

Topography: [ ] Steep [ ] Moderate Slope [ ] Gentle Slope [x] Flat

Location: [x] Shoreline [x] Stream [ ] Point Bar [x] Slough [ ] Alluvial

Physical Characteristics:
- [ ] Highly Developed
- [x] Moderately Developed
- [ ] Minimally Developed
- [ ] Pristine
- [x] Stable Shoreline
- [ ] Eroded Shoreline
- [x] Seawall
- [ ] Rock/Riprap
- [ ] Other

Notes:

Good quality lacustrine fringe wetland located on right shoreline and in a small slough. Riverine wetland on island.

Wetland 158
Map # 13

Inspection Date: 5/15/13

GPS Point(s):
WL158 15-MAY-13 3:06:07PM N33.44189 W85.61435

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☐ Moderately Developed ☐ Eroded Shoreline
☒ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Moderate quality lacustrine fringe wetland located on shoreline in small slough. Diverse shrubs and herbs.

Wetland 159

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL159 15-MAY-13 3:13:19PM N33.43704 W85.61151

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☐ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☒ Poor (Red) <50% Coverage

Vegetation: ☐ Diverse ☒ Monoculture ☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☒ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☒ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Poor quality monoculture lacustrine fringe wetland located on point bar of creek.

Wetland 160

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL160 15-MAY-13 3:19:00PM N33.43747 W85.61608

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☒ Emergent
☐ Alluvial ☐ Forested ☒ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☒ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☒ Emergent ☐ Herbaceous ☐ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☐ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☐ Slough ☐ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:

Moderate - good quality emergent backwater wetland of primarily juncus.

Wetland 161
Map # 13

Inspection Date: 5/15/13

GPS Point(s):
WL161 15-MAY-13 3:27:19PM N33.43616 W85.61032

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☒ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☐ Stream ☐ Point Bar ☒ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☒ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality forested wetland located in small slough/drainage. Trees and shrubs.

Wetland 162
Map # 13

Inspection Date: 5/15/13

GPS Point(s):
WL162 15-MAY-13 3:35:29PM N33.42680 W85.60746

Wetland Type:
- [x] Lacustrine Fringe
- [ ] Aquatic Bed
- [ ] Emergent
- [ ] Alluvial
- [x] Forested
- [ ] Riverine

Quality:
- [x] Good (Green) 75-100% Coverage
- [ ] Moderate (Yellow) 50-75 % Coverage
- [ ] Poor (Red) <50% Coverage

Vegetation:
- [x] Diverse
- [ ] Monoculture
- [ ] Emergent
- [x] Herbaceous
- [x] Shrubs
- [ ] Trees/Forest

Physical Features:

Topography:
- [ ] Steep
- [ ] Moderate Slope
- [ ] Gentle Slope
- [x] Flat

Location:
- [x] Shoreline
- [ ] Stream
- [ ] Point Bar
- [x] Slough
- [x] Alluvial

Physical Characteristics:
- [ ] Highly Developed
- [ ] Moderately Developed
- [ ] Minimally Developed
- [x] Pristine
- [x] Stable Shoreline
- [ ] Eroded Shoreline
- [ ] Seawall
- [ ] Rock/Riprap
- [ ] Other

Notes:
Good quality forested and lacustrine fringe wetland located at confluence of drain and lake. Forested alluvial area in slough.

Wetland 163

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL163 15-MAY-13 3:47:20PM N33.41813 W85.61230

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☒ Seawall
☒ Pristine ☐ Rock/Riprap

Notes:

Good quality lacustrine fringe and alluvial area forested SS wetland located at confluence of stream and lake.

Wetland 164

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL164-1	15-MAY-13 3:57:13PM	N33.40929 W85.61575
WL164-2	15-MAY-13 4:01:15PM	N33.40902 W85.61871

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent ☐ Alluvial ☐ Forested ☐ Riverine

Quality:
☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:
Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:
☐ Highly Developed ☒ Stable Shoreline ☐ Other
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:
Good quality lacustrine fringe wetland extending along shoreline to perennial stream with riffles. Diverse SS and moderately developed with piers.

Wetland 165

Map # 13

Inspection Date: 5/15/13

GPS Point(s):

WL165 15-MAY-13 4:07:40PM N33.40764 W85.61540

Wetland Type: ☒ Lacustrine Fringe ☐ Aquatic Bed ☐ Emergent
☐ Alluvial ☒ Forested ☐ Riverine

Quality: ☒ Good (Green) 75-100% Coverage
☐ Moderate (Yellow) 50-75 % Coverage
☐ Poor (Red) <50% Coverage

Vegetation: ☒ Diverse ☐ Monoculture
☐ Emergent ☒ Herbaceous ☒ Shrubs ☐ Trees/Forest

Physical Features:

Topography: ☐ Steep ☐ Moderate Slope ☐ Gentle Slope ☒ Flat
Location: ☒ Shoreline ☒ Stream ☐ Point Bar ☐ Slough ☒ Alluvial

Physical Characteristics:

☐ Highly Developed ☒ Stable Shoreline ☒ Other Boat ramp
☒ Moderately Developed ☐ Eroded Shoreline
☐ Minimally Developed ☐ Seawall
☐ Pristine ☐ Rock/Riprap

Notes:

Good quality lacustrine fringe and forested wetland at confluence of perennial stream and lake.Diverse trees, shrubs and herbs. Boat ramp.

APPENDIX H

THREATENED AND ENDANGERED SPECIES

1. ALABAMA STATE STATUS CODE DEFINITIONS
2. STATE PROTECTED SPECIES LIST

1. ALABAMA STATE STATUS CODE DEFINITIONS

State - Alabama Department of Conservation and Natural Resources (ADCNR)

Wildlife & Freshwater Fisheries Division

Alabama does not have a state law equivalent to the federal endangered species act so species do not have regulatory protection as state endangered or threatened species. However, some species do receive regulatory protection through the *Alabama Regulations on Game Fish and Fur Bearing Animals* published annually. These are the primary regulations affording state protection for some species in Alabama, and are administered by the Alabama Department of Conservation and Natural Resources. Copies of these regulations may be obtained from the Division of Wildlife & Freshwater Fisheries, Alabama Department of Conservation & Natural Resources, 64 North Union Street, Montgomery, AL 36104. A digital version of these regulations is available online at http://www.outdooralabama.com/season-and-bag-limits.

State Status Code Definitions

SP – State Protected: Species protected by Regulation 220-2-.92 (Nongame Species Regulation), 220-2-.98 (Invertebrate Species Regulation), 220-2-.26(4) (Protection of Sturgeon), 220-2-.94 (Prohibition of Taking or Possessing Paddlefish), or 220-2-.97 (Alligator Protection Regulation).

PSM – Partial Status Mussels: All mussel species not listed as a protected species under the Invertebrate Species Regulation are partially protected by other regulations of the Alabama Game, Fish, and Fur Bearing Animals Regulations. Regulation 220-2-.104 prohibits the commercial harvest of all but the 11 mussel species for which commercial harvest is legal. Regulation 220-2-.52 prohibits the take, capture, kill, or attempt to take, capture, or kill of any freshwater mussel from Wheeler Lake from Guntersville Dam downstream to the mouth of Shoal Creek and from the upstream end or head of Hobbs Island downstream to Whitesburg Bridge, Pickwick Lake from Wilson Dam downstream to the upper end or head of Seven Mile Island, Wilson Lake from Wheeler Dam downstream to the mouth of Town Creek on the south bank and the mouth of Bluewater Creek on the north bank, and the Cahaba River.

RT – Regulated Turtle: Species for which the Turtle Catcher/Dealer/Farmer Regulation (Regulation 220-2-.142) imposes a limit on the number which can be possessed or size limits.

GA – Game Animal (Managed hunting regulations).

GANOS – Game Animal - No Open Season: Species designated a game animal by Regulation 220-2-.07, but for which there is no open season.

GB – Game Bird (Managed hunting regulations).

GBNOS – Game Bird - No Open Season: Species designated a game bird by Regulation 220-2-.04, but for which there is no open season.

GF – Game Fish (Managed fishing regulations).

GF-HP – Game Fish – Harvest Prohibited: Species designated a game fish by Regulation 220-2-.34, but harvest of the species in the state is prohibited.

CNGF – Commercial or Non-Game Fish (Managed fishing regulations).

2. STATE PROTECTED SPECIES LIST

State Protected Species Occurring in Counties within the Project Vicinity						
	Family	**Scientific Name**		**Counties of Occurrence with Project Vicinity**	**Known Relationship to Project Vicinity**	**State Status**
Birds	Ardeidae	*Ixobrychus exilis*	Least Bittern	Jackson		SP
	Threskiornithidae	*Eudocimus albus*	White Ibis	Cleburne		SP
	Falconidae	*Falco sparverius*	American Kestrel	Clay, Jackson	Potentially occurs within Project Vicinity	SP
	Phasianidae	*Bonasa umbellus*	Ruffed Grouse	Jackson		GBNOS
	Scolopacidae	*Scolopax minor*	American Woodcock	Chambers, Cleburne, Jackson, Tallapoosa	Potentially occurs within Project Vicinity	GB
	Columbidae	*Columbina passerine*	Common Ground-dove	Chambers, Clay, Cleburne, Randolph, Tallapoosa		SP
	Cuculidae	*Coccyzus erythropthalmus*	Black-billed Cuckoo	Jackson		SP
	Picidae	*Picoides borealis*	Red-cockaded Woodpecker	Clay, Cleburne, Tallapoosa	See Kleinschmidt (2021c)	SP
	Tyrannidae	*Tyrannus forficatus*	Scissor-tailed Flycatcher	Jackson		SP
	Vireonidae	*Vireo solitarius*	Blue-headed Vireo	Clay, Cleburne, Jackson, Randolph, Tallapoosa		SP
		Vireo gilvus	Warbling Vireo	Jackson		SP
	Corvidae	*Corvus corax*	Common Raven	Jackson		SP
	Troglodytidae	*Thyromanes bewickii*	Bewick's Wren	Clay[1], Jackson[1], Randolph[1]		SP
	Parulidae	*Dendroica petechia*	Yellow Warbler	Jackson	Potentially occurs within Project Vicinity	SP
		Setophaga cerulea	Cerulean Warbler	Jackson		SP
	Emberizidae	*Peucaea aestivalis*	Bachman's Sparrow	Chambers, Cleburne, Jackson[1]	In Project Vicinity	SP
		Chondestes grammacus	Lark Sparrow	Jackson		SP
	Fringillidae	*Loxia curvirostra*	Red Crossbill	Cleburne	In Project Vicinity	SP
Mammals	Dipodidae	*Zapus hudsonius*	Meadow Jumping Mouse	Chambers		SP
	Leporidae	*Sylvilagus obscurus*	Appalachian Cottontail	Clay		GA
	Soricidae	*Sorex fumeus*	Smoky Shrew	Jackson		SP
		Sorex hoyi	American Pygmy Shrew	Jackson		SP
	Vespertilionidae	*Corynorhinus rafinesquii*	Rafinesque's Big-eared Bat	Jackson		SP
		Myotis grisescens	Gray Bat	Clay[2], Cleburne[2], Jackson	See Kleinschmidt (2021c)	SP
		Myotis septentrionalis	Northern Long-eared Bat	Clay[3], Cleburne[3], Randolph[3], Chambers[3], Tallapoosa[3], Jackson[3]	See Kleinschmidt (2021c)	SP
		Myotis sodalis	Indiana Bat	Clay, Cleburne[2], Jackson	See Kleinschmidt (2021c)	SP
	Ursidae	*Ursus americanus*	Black Bear[4]	Chambers, Cleburne, Randolph, Tallapoosa		SP
	Mustelidae	*Mustela frenata*	Long-tailed Weasel	Jackson	In Project Vicinity	SP
	Mephitidae	*Spilogale putorius*	Eastern Spotted Skunk	Chambers, Clay, Cleburne, Tallapoosa	In Project Vicinity	SP

State Protected Species Occurring in Counties within the Project Vicinity						
	Family	**Scientific Name**		**Counties of Occurrence with Project Vicinity**	**Known Relationship to Project Vicinity**	**State Status**
Amphibians	Cryptobranchidae	*Cryptobranchus alleganiensis*	Hellbender	Jackson		SP
	Plethodontidae	*Aneides aeneus*	Green Salamander	Jackson		SP
		Desmognathus aeneus	Seepage Salamander	Clay, Cleburne, Randolph		SP
		Desmognathus monticola	Seal Salamander	Chambers, Clay, Cleburne, Jackson, Randolph, Tallapoosa		SP5
		Gryinophilus palleucus palleucus	Pale Salamander	Jackson		SP
Reptiles	Anguidae	*Ophisaurus attenuatus*	Glass Lizard	Chambers, Cleburne, Tallapoosa		SP
	Scincidae	*Eumeces inexpectatus*	Southern Five-lined Skink	Chambers, Clay, Cleburne, Randolph, Tallapoosa	In Project Vicinity	SP
	Colubridae	*Coluber flagellum*	Coachwhip	Chambers, Tallapoosa		SP
		Lampropeltis getula	Eastern Kingsnake	Chambers		SP
		Pituophis melanoleucus melanoleucus	Northern Pinesnake	Jackson		SP
	Emydidae	*Graptemys pulchra*	Alabama Map Turtle	Tallapoosa	In Project Vicinity	SP
Fishes [6]	Lepisosteidae	*Lepisosteus platostomus*	Shortnose Gar	Jackson[1]		CNGF
	Cyprinidae	*Notropis albizonatus*	Palezone Shiner	Jackson	See Kleinschmidt (2021c)	SP
		Erimonax monachus	Spotfin Chub	Jackson[3]	See Kleinschmidt (2021c)	SP
	Catostomidae	*Moxostoma anisurum*	Silver Redhorse	Jackson	In Project Vicinity	CNGF
		Moxostoma breviceps	Shorthead Redhorse	Jackson	In Project Vicinity	CNGF
	Ictaluridae	*Ameiurus brunneus*	Snail Bullhead	Chambers, Randolph	See Alabama Power and Kleinschmidt (2021c)	CNGF
		Noturus crypticus	Chucky Madtom	Jackson[1]		CNGF
		Noturus elegans	Elegant Madtom	Jackson[1]	Historically In Project Vicinity	CNGF
	Amblyopsidae	*Typhlichthys subterraneus*	Southern Cavefish	Jackson	In Project Vicinity	SP
	Percidae	*Crystallaria asprella*	Crystal Darter	Tallapoosa		SP
		Etheostoma chuckwachatte	Lipstick Darter	Chambers, Clay, Cleburne, Randolph, Tallapoosa	In Project Vicinity	SP
		Percina burtoni	Blotchside Logperch	Jackson	In Project Vicinity	SP
Mussels	Unionidae	*Actinonaias ligamentina*	Mucket	Jackson[1]		PSM
		Actinonaias pectorosa	Pheasantshell	Jackson[1]		PSM
		Alasmidonta marginata	Elktoe	Jackson		PSM
		Alasmidonta viridis	Slippershell Mussel	Jackson		SP
		Cyprogenia stegaria	Fanshell	Jackson[1]		SP
		Dromus dromas	Dromedary Pearlymussel	Jackson[1]		SP

State Protected Species Occurring in Counties within the Project Vicinity						
	Family	**Scientific Name**		**Counties of Occurrence with Project Vicinity**	**Known Relationship to Project Vicinity**	**State Status**
		Elliptio arca	Alabama Spike	Chambers, Cleburne, Randolph	See Alabama Power and Kleinschmidt (2021c)	PSM
		Elliptio arctata	Delicate Spike	Cleburne, Randolph	See Alabama Power and Kleinschmidt (2021c)	PSM
		Elliptio dilatata	Spike	Jackson		PSM
		Epioblasma brevidens	Cumberlandian Combshell	Jackson[1]		SP
		Epioblasma capsaeformis	Oyster Mussel	Jackson		SP
		Epioblasma triquetra	Snuffbox	Jackson	See Kleinschmidt (2021c)	PSM
		Fusconaia cor	Shiny Pigtoe	Jackson	See Kleinschmidt (2021c)	SP
		Fusconaia cuneolus	Fine-rayed Pigtoe	Jackson	See Kleinschmidt (2021c)	SP
		Fusconaia subrotunda	Longsolid	Jackson		PSM
		Hamiota altilis[7]	Finelined Pocketbook	Clay, Cleburne	See Kleinschmidt (2021c)	SP
		Lampsilis abrupta	Pink Mucket	Jackson[1]		SP
		Lampsilis fasciola	Wavyrayed Lampmussel	Jackson		PSM
		Lampsilis ovata	Pocketbook	Jackson		PSM
		Lampsilis virescens	Alabama Lampmussel	Jackson	See Kleinschmidt (2021c)	SP
		Lasmigona complanata	White Heelsplitter	Jackson		PSM
		Lasmigona costata	Flutedshell	Jackson		PSM
		Lasmigonia etowaensis	Etowah Heelsplitter	Cleburne		PSM
		Lasmigona holstonia	Tennessee Heelsplitter	Jackson		PSM
		Lemiox rimosus	Birdwing Pearlymussel	Jackson[1]		SP
		Ligumia recta	Black Sandshell	Jackson		PSM
		Medionidus conradicus	Cumberland Moccasinshell	Jackson		SP
		Obovaria retusa	Ring Pink	Jackson		SP
		Obovaria subrotunda	Round Hickorynut	Jackson		PSM
		Plethobasus cicatricosus	White Wartyback	Jackson		SP
		Plethobasus cooperianus	Orangefoot Pimpleback	Jackson[1]		SP
		Plethobasus cyphyus	Sheepnose	Jackson		SP
		Pleurobema clava	Clubshell	Jackson		SP
		Pleurobema cordatum	Ohio Pigtoe	Jackson[1]		PSM
		Pleurobema decisum	Southern Clubshell	Cleburne		SP
		Pleurobema georgianum	Southern Pigtoe	Clay, Cleburne	See Kleinschmidt (2021c)	SP
		Pleurobema hanleyianum	Georgia Pigtoe	Clay[1]		SP
		Pleurobema oviforme	Tennessee Clubshell	Jackson		PSM
		Pleurobema plenum	Rough Pigtoe	Jackson[1]		SP
		Pleurobema rubrum	Pyramid Pigtoe	Jackson[1]		SP
		Pleurobema sintoxia	Round Pigtoe	Jackson[1]		SP

State Protected Species Occurring in Counties within the Project Vicinity						
	Family	**Scientific Name**		**Counties of Occurrence with Project Vicinity**	**Known Relationship to Project Vicinity**	**State Status**
		Pleuronaia barnesiana	Tennessee Pigtoe	Jackson		PSM
		Pleuronaia dolabelloides	Slabside Pearlymussel	Jackson	See Kleinschmidt (2021c)	SP
		Potamilus ohiensis	Pink Papershell	Jackson		PSM
		Ptychobranchus fasciolaris	Kidneyshell	Jackson		PSM
		Ptychobranchus foremanianus	Rayed Kidneyshell	Cleburne		SP
		Ptychobranchus subtentus	Fluted Kidneyshell	Jackson		SP
		Pyganodon cataracta	Eastern Floater	Tallapoosa		PSM
		Quadrula cylindrica cylindrica	Rabbitsfoot	Jackson	See Kleinschmidt (2021c)	SP
		Quadrula infucata	Sculptured Pigtoe	Chambers[1]		PSM
		Quadrula metanevra	Monkeyface	Jackson		PSM
		Strophitus connasaugaensis	Alabama Creekmussel	Clay, Cleburne		PSM
		Toxolasma corvunculus	Southern Purple Lilliput	Clay		PSM
		Toxolasma cylindrellus	Pale Lilliput	Jackson	See Kleinschmidt (2021c)	SP
		Toxolasma lividum	Purple Lilliput	Jackson		PSM
		Toxolasma parvum	Lilliput	Clay, Jackson, Tallapoosa		PSM
		Truncilla donaciformis	Fawnsfoot	Jackson		PSM
		Truncilla truncata	Deertoe	Jackson		PSM
		Villosa iris	Rainbow	Jackson		PSM
		Villosa nebulosa	Alabama Rainbow	Clay		PSM
		Villosa taeniata	Painted Creekshell	Jackson		PSM
		Villosa trabalis	Cumberland Bean	Jackson	See Kleinschmidt (2021c)	SP
		Villosa umbrans	Coosa Creekshell	Clay		PSM
		Villosa vanuxemensis	Mountain Creekshell	Jackson		PSM
Snails	Pleuroceridae	*Athearnia anthonyi*	Anthony Riversnail	Jackson		SP
		Elimia haysiana	Silt Elimia[8]	unknown[9]	unknown[9]	SP
Crustaceans	Cambaridae	*Cambarus englishi*	Tallapoosa Crayfish	Clay, Cleburne, Randolph, Tallapoosa	See Kleinschmidt and Alabama Power (2021c)	SP
True Insects	Silphidae	*Nicrophorus americanus*	American Burying Beetle	unknown[9]	unknown[9]	SP
	Corduliidae	*Somatochlora hineana*	Hine's Emerald	Jackson[10]		SP
Sources: Alabama Natural Heritage Program® 2020; Mirarchi 2004; Causey 2006; Mettee et al. 1996; Boschung and Mayden 2004; Johnson 1997 as cited in Alabama Power and Kleinschmidt 2021c; Mirarchi et al. 2004 as cited in Kleinschmidt 2021c; USFWS 2016a as cited in Kleinschmidt 2021c; USFWS 2016b as cited in Kleinschmidt 2021c; Williams et al. 2008 as cited in Kleinschmidt 2021c; FERC 2018 as cited in Kleinschmidt 2021c; USFWS 2016a as cited in Alabama Power 2018; USFWS 2016b as cited in Alabama Power 2018						
1	Historic occurrence					
2	Historic occurrence, no recent information although it still likely occurs in the county					

State Protected Species Occurring in Counties within the Project Vicinity						
	Family	**Scientific Name**		**Counties of Occurrence with Project Vicinity**	**Known Relationship to Project Vicinity**	**State Status**
3	Alabama Natural Heritage Program® (2020) does not show this species as occurring in any counties within the Project Vicinity; however, Kleinschmidt (2021c) reports the species as potentially occurring in counties within the Project Vicinity.					
4	*Ursus americanus* is not included in the list of protected species in Nongame Species Regulation 220-2-.92, but is protected under Alabama Game, Fish and Wildlife Laws, Section 9-11-480-481 which makes it illegal to hunt, wound, injure, kill, trap, collect, or capture a black bear, or to attempt to engage in that conduct during the closed season for black bear. It is designated a game animal by Regulation 220-2-.06 of the Alabama Regulations on Game, Fish, and Fur Bearing Animals, but there is no open season for the species.					
5	Only populations of Coastal Plain origin are protected by the Nongame Species Regulation.					
6	Distribution information in Mettee et al. (1996) and Boschung and Mayden (2004) was used to narrow the Fishes category to species existing within the Project Vicinity. Therefore, fishes occurring in counties within the Project Vicinity but not within the Project Vicnity are not displayed in this table.					
7	Species in the genus *Hamiota* were previously considered to be in the genus *Lampsilis*. Species listed under the Endangered Species Act were listed under the genus *Lampsilis*. Roe and Hartfield (2005) placed these four species in the new genus *Hamiota*. The U.S. Fish and Wildlife Service still uses *Lampsilis* on their website except for *Hamiota australis*.					
8	Alabama endemic					
9	Distribution information is not provided					
10	Species may occur in any county if suitable habitat exists					

APPENDIX I

RECREATION AND LAND USE

1. RV PARKS AND CAMPGROUNDS WITHIN 50 MILES OF LAKE HARRIS - TABLE

1. RV PARKS AND CAMPGROUNDS WITHIN 50 MILES OF LAKE HARRIS - TABLE

RV Parks and Campgrounds within 50 Miles of Lake Harris

Facility Name	Town	Distance (miles)	Ownership	RV Camping	Tent Camping	Primitive Camping
3 Creeks Campground	LaGrange, GA	25-50	Commercial	48		
Alabama Gold Camp	Lineville, AL	<10	Commercial	Available	Available	Available
Amity Campground	Lanett, AL	25-50	USACE	75		Available
Anniston Army Depot RV Park	Anniston, AL	25-50	Commercial	8		8
Auburn Legends Resort	Auburn, AL	25-50	Commercial	40		
Auburn RV Park at Leisure Time Campground	Auburn, AL	25-50	Commercial	Available	60	
B&B RV Park	Valley, AL	25-50	Commercial	25		
Bakers Trailer Park and Campground	Opelika, AL	25-50	Commercial	Available		
Banning Mills RV Park	Whitesburg, GA	25-50	Commercial	40		
Bar-W RV Park	Auburn, AL	50	Commercial	37		40
Big Oak RV Park	Tallapoosa, GA	25-50	Commercial	51		4
Bows Family RV Park	Eastaboga, AL	25-50	Commercial	9		
Caloosahatchee Campground	Ohatchee, AL	25-50	Commercial	Available		
Cane Creek RV Park & Campground	Heflin, AL	25-50	Commercial	39		5
Cedar Creek Campground	Fayetteville, AL	25-50	Commercial			
Chattahoochee Bend State Park	Newnan, GA	25-50	State	37		28
Cheaha State Park (Talladega National Forest)	Delta, AL	10-25	State	77	Available	54
Chewacla State Park	Auburn, AL	25-50	State	36		10
Chief Ladiga Trail Campground	Borden Springs, AL	25-50	Commercial	160		Available
Chinnabee Recreation Area (Talladega National Forest)	Talladega, AL	10-25	Federal			8
Clear Creek Cove RV Resort	Talladega, AL	25-50	Commercial	150		
Clear Creek Harbor	Talladega, AL	25-50	Commercial	Available	Available	

Facility Name	Town	Distance (miles)	Ownership	RV Camping	Tent Camping	Primitive Camping
Coleman Lake Recreation Area (Talladega National Forest)	Heflin, AL	25-50	Federal	39		39
Coosa River Camp Retreat	Harpersville, AL	25-50	Commercial	3		
Coosa Willow Point Campground & Marina	Ohatchee, AL	25-50	Commercial	Available	74	
Country Court RV Park	Anniston, AL	25-50	Commercial	68		
De Soto Caverns Park	Childersburg, AL	25-50	Commercial	16	Available	Available
Down in the Boondocks RV Park	Sylacauga, AL	25-50	Commercial	10		
Eagle Landing RV Park	Auburn, AL	25-50	Commercial	60		
Flat Creek Campground	Hogansville, GA	25-50	Commercial	5		
General Lee Marina & Campground	Cropwell, AL	25-50	Commercial	111	Available	Available
Georgia-Bama RV Park	Heflin, AL	25-50	Commercial	12		
Highland Marina Resort	LaGrange, GA	25-50	Commercial	Available		
Hilltop Campground	Wedowee, AL	<10	Commercial	87		
Holiday Campground/West Point Lake COE	LaGrange, GA	25-50	USACE	114		
John Tanner State Park	Carrolton, GA	25-50	State	31		Available
Knox Landing Campgrounds	Pell City, AL	25-50	Commercial			30
Kudzu Campground	Talladega, AL	25-50	Commercial	50		
Kymulga Grist Mill & Park	Childersburg, AL	25-50	Commercial	12	12	
Lake Hill RV & Mobile Home Park	Alexander City, AL	25-50	Commercial			
Lakeside Landing RV Park and Marina	Cropwell, AL	25-50	Commercial	180	180	
Lakeside RV Park	Opelika, AL	25-50	Commercial	86		Available
Lakeway Campground	Equality, AL	10-25	Commercial	17		
Little Tallapoosa Park	Carrolton, GA	25-50	Commercial	23	32	

Facility Name	Town	Distance (miles)	Ownership	RV Camping	Tent Camping	Primitive Camping
Logan Landing RV & Cabin Resort	Alpine, AL	25-50	Commercial	91		
McIntosh Reserve Park	Whitesburg, GA	25-50	Commercial			30
Memory Lane RV Park and Campground	Lincoln, AL	25-50	Commercial	50		Available
Michael Tucker Park & Campground	Anniston, AL	25-50	Commercial	Available	Available	Available
Old Shocco RV Park	Talladega, AL	25-50	Commercial	24	Available	
Pine Glen Recreation Area (Talladega National Forest)	Heflin, AL	25-50	Federal	21		
Powell's RV Park & Campground	Pell City, AL	25-50	Commercial	Available	Available	
R & R Campground	Lincoln, AL	25-50	Commercial			
R. Shaefer Heard COE	West Point, GA	25-50	USACE	117		
Real Island Marina and Campground	Equality, AL	10-25	Commercial			
Safe Harbor RV Park	Riverside, AL	25-50	Commercial	106		
Scenic Drive RV Park and Campground	Heflin, AL	25-50	Commercial	40		
Serenity Stables RV Park	Waverly, AL	25-50	Commercial	15		
Shady Oaks Campground	Lincoln, AL	25-50	Commercial	Available	Available	
Spring Villa Park	Opelika, AL	25-50	Commercial	30		
Sundance Marina	Cropwell, AL	25-50	Commercial	52		
Sunset Marina	Sylacauga, AL	10-25	Commercial	13		
Talladega Creekside Resort	Talladega, AL	25-50	Commercial	10	Available	
Talladega National Forest	Talladega, AL	25-50+	Federal			
Talladega RV Park	Lincoln, AL	25-50	Commercial	298		
Talladega Taz RV Park and Campground	Lincoln, AL	25-50	Commercial	200	Available	Available
Top Trails OHV Park	Talladega, AL	25-50	Commercial	25		Available

Facility Name	Town	Distance (miles)	Ownership	RV Camping	Tent Camping	Primitive Camping
Turnipseed Campground (Talladega National Forest)	Lineville, AL	10-25	Federal	8		8
Warden Station Camp (Talladega National Forest)	Heflin, AL	25-50	Federal	45		
Wazoo Campground	Lincoln, AL	25-50	Commercial			
Whispering Springs	Eclectic, AL	25-50	Commercial			
Whitetail Ridge	LaGrange, GA	25-50	USACE	58		
Wind Creek State Park	Alexander City, AL	25-50	State	586		
Yellowleaf Campground	Harpersville, AL	25-50	Commercial	Available		
Yogi Bear Jellystone Park	Bremen, GA	25-50	Commercial	90		Available

Source: Alabama RV Parks 2020; Georgia RV Parks 2020; All Campgrounds 2020; All Stays 2020

References:

All Campgrounds. 2020. http://www.allcampgrounds.com/al.html. Accessed October 2020.

All Stays. 2020. Map of all Alabama Campgrounds. Available at: https://www.allstays.com/Campgrounds/Alabama-campgrounds.htm. Accessed October 2020.

RV Park Reviews: Georgia (Georgia RV Parks). 2020. Available at: http://www.rvparkreviews.com/regions/georgia. Accessed October 2020.