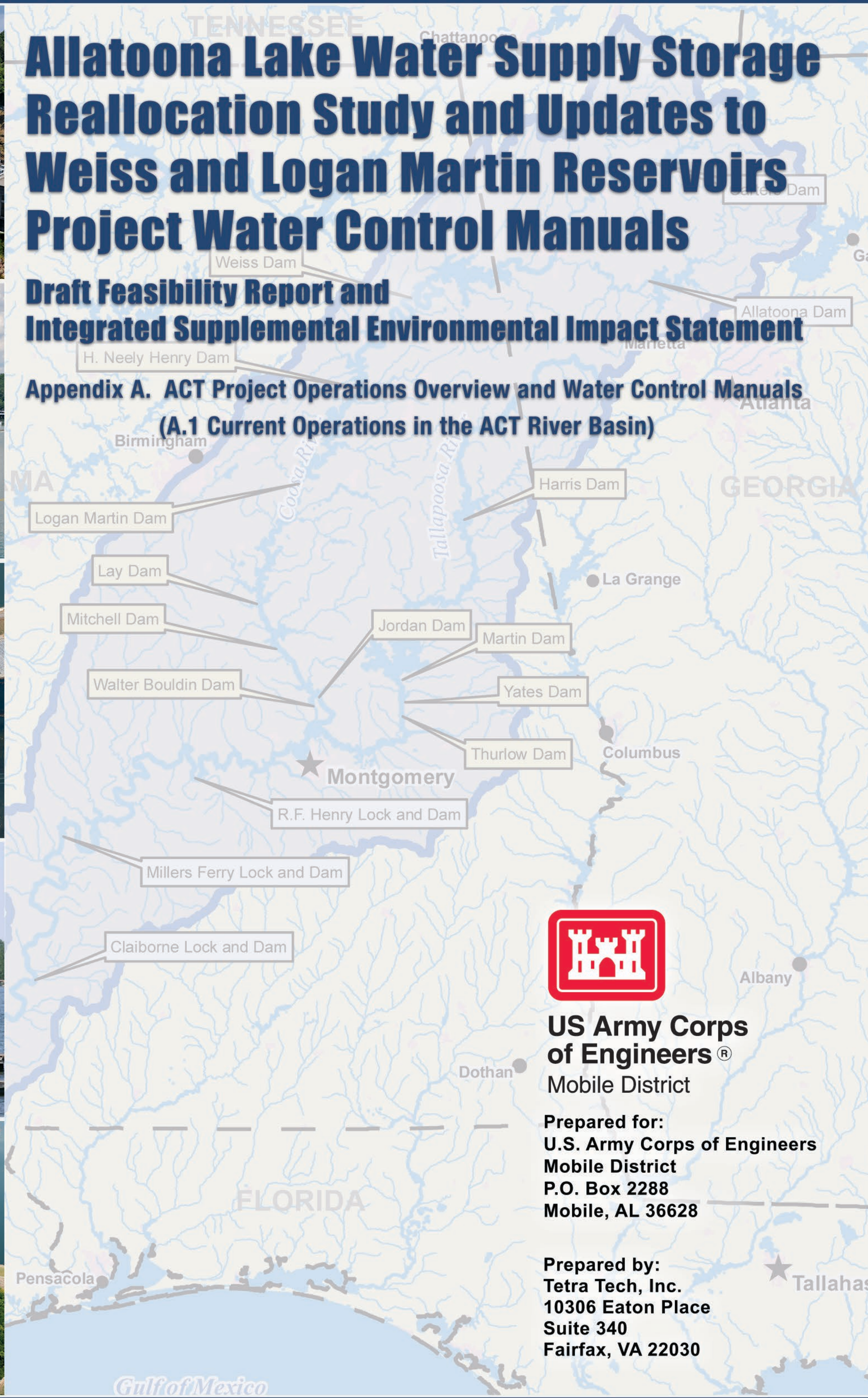
November 2019

Allatoona Lake Water Supply Storage Reallocation Study and Updates to Weiss and Logan Martin Reservoirs Project Water Control Manuals

Draft Feasibility Report and Integrated Supplemental Environmental Impact Statement

Appendix A. ACT Project Operations Overview and Water Control Manuals (A.1 Current Operations in the ACT River Basin)



US Army Corps of Engineers®
Mobile District

Prepared for:
U.S. Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, AL 36628

Prepared by:
Tetra Tech, Inc.
10306 Eaton Place
Suite 340
Fairfax, VA 22030

APPENDIX A. OPERATIONS AND WATER CONTROL MANUALS

CONTENTS

FIGURES

TABLES

A.1 Current Operations in the ACT River Basin

USACE Engineering Regulation (ER) 1110-2-240, Water Control Management (dated 30 May 2016) requires USACE to develop a Water Control Manual (WCM) for each reservoir project and a basin Master Water Control Manual (Master Manual) for the coordinated operation of multiple projects in a river basin. They also require that the manuals be updated or revised as necessary to conform with changing requirements resulting from developments in the project area and downstream, improvements in technology, new legislation, and other relevant factors if the updates or revisions comply with existing federal regulations and established USACE policy. The original approved *Alabama-Coosa-Tallapoosa River Basin Reservoir Regulation Manual* was published in December 1951. The most recent update of the manual, the *Alabama-Coosa-Tallapoosa River Basin Master Water Control Manual*, is dated May 2015. The Master Manual contains WCMs for the nine individual USACE and nonfederal projects within the Alabama-Coosa-Tallapoosa (ACT) River Basin each presented as an appendix. Of the nine WCMs, USACE updated seven of them in May 2015. Only the WCMs for Alabama Power Company's (APC's) Weiss and Logan Martin reservoir projects were not updated in 2015. USACE intends to update those two WCMs as part of this effort.

Principal purposes for which USACE operates its projects in the ACT River Basin are fish and wildlife conservation, flood risk management, hydropower, navigation, recreation, water quality, and water supply. Flood risk management, hydropower, and navigation were purposes specifically cited in the original authorizations of the ACT River Basin projects. Fish and wildlife conservation, recreation, water quality, and water supply are considered purposes under general legislation—the Flood Control Act of 1944 (Public Law [P.L.] 78-534); Federal Water Project Recreation Act (Public Law [P.L.] 89-72); and Fish and Wildlife Coordination Act of 1958 (P.L. 85-624). USACE policy states that project purposes authorized under general legislation receive equal consideration by USACE in making water control decisions to specifically authorized project purposes.

Water control operations in the ACT River Basin encompass all project functions and accommodate the full range of hydrologic conditions, from flood to drought. Because actions taken in the upstream portion of the basin affect conditions downstream, the ACT River Basin projects (including APC projects) are operated to the maximum extent possible as a system rather than as a series of individual, independent projects. The approach to balancing water control operations to meet the requirements of each authorized purpose varies across the individual projects and at different times of year. The projects' managers must consider the often-competing purposes and conduct operations accordingly. When possible, they manage reservoir operations to complement and accommodate those purposes. For example, flood waters are evacuated to the maximum extent practicable through the powerhouse turbines at the project dams to produce electricity. In addition to the original purposes for which the projects were operated, the additional purposes of in-stream recreation, municipal and industrial (M&I) water supply, and water quality are today also dependent on the operational patterns of the projects.

Traditionally, the ACT River Basin projects have been operated and controlled to meet hydropower requirements during the summer months, when energy demands are high and to meet navigation needs during the fall, in the low-flow months. When rainfall causes water levels to rise excessively, flood-risk management operations have overridden other project functions. During extreme drought conditions, water supply and water quality requirements have been the major operating concerns. That approach to water management recognizes that extreme droughts can produce *either/or* situations under which project purposes are nearly fully served or operations are directed primarily at meeting minimum water supply/water quality requirements, with other purposes relegated to a secondary, or restricted, function. The remainder of Section A.1 will provide a brief summary of each of the reservoirs in the basin, the project purposes, flow targets, drought management and other operations.

A.1.1 ACT River Basin Reservoirs

Modern dam construction in the ACT River Basin dates from the middle to the latter part of the 1800s. Navigation locks and small dams provided sufficient depths for slack-water river traffic on the Coosa River in the early 1900s. Those dams are no longer in service. By 1930 two dams were built on the Coosa River and three on the Tallapoosa River to take advantage of the natural stream gradients for power production. During the mid-1900s, large, multipurpose reservoirs were built throughout the basin for hydropower, navigation, recreation, and water supply (USACE Mobile District, 1997). The last dam—R.L. Harris Lake on the Tallapoosa River (known locally as Lake Wedowee)—was completed in 1983.

There are 17 major dams in the ACT River Basin (Jordan Dam and Bouldin Dam on the Coosa River share a common reservoir). USACE owns and operates six of the dams and APC owns and operates 11. Of the 17 dams, two are on the Coosawattee River, one is on the Etowah River, seven are on the Coosa River, four are on the Tallapoosa River, and three are on the Alabama River. Figure A-1 shows the locations of the projects, and Table A-1 presents pertinent data on them. One small low-head dam on the Etowah River at Cartersville, GA—Thompson-Weinman Dam—is not included on Figure A-1. It was built in the early 1900s and is about 3.5 miles downstream of Allatoona Dam. It has been abandoned and no longer serves a useful purpose.

This paragraph describes, in simplified terms, the general process by which reservoir release decisions are made. Storage reservoirs (not run-of-river reservoirs) are typically subdivided into separate storage levels, as shown in Figure A-2. The lowest level is the top of the inactive pool. No reservoir releases are made when the pool level is below that level. Level 2 is usually associated with the top of the conservation pool.

Conservation storage is defined as the volume of reservoir storage available to meet authorized project purposes other than flood risk management (e.g., hydropower, recreation, and water supply). There is a recognition that available space in the conservation storage will assist the flood risk management operation. Conservation storage is equivalent to the storage volume between the top of the inactive pool and the top of the conservation pool in each reservoir. The conservation pool can be subdivided into multiple *action zones*. For the APC projects the conservation storage is subdivided into drought zone and black start levels. Action zones are discussed in detail in the sections describing the Allatoona and Carters projects. Each action zone triggers a different operating schedule. Level 3 is the top of the flood risk management pool. Typically, the area between the top of the conservation pool and the top of the flood risk management pool is active flood storage. Water is stored in that area when it cannot be safely passed through the downstream channel system. Usually, the top of the flood risk management level is not the maximum level (USACE Mobile District, 1998).

At the run-of-river projects, the upper pool level is regulated within maximum and minimum operating limits during normal conditions. The minimum operating limit may be lowered during extreme drought conditions. During floods and normal high flow events, run-of-river projects generate power continuously and pass flows, which exceed the power generation capacity, through spillway gates.

Of the 16 major reservoirs in the ACT River Basin (considering Jordan Dam and Lake and Bouldin Dam as one reservoir), Martin Lake on the Tallapoosa River has the greatest amount of storage, containing about 46 percent of the total conservation storage. Allatoona Lake, Weiss Lake, R.L. Harris Lake, and Carters Lake are the next four largest reservoirs in terms of amount of conservation storage (see Figure A-3). Thurlow Lake (known locally as Lake Talisi) is not included on Figure A-3 because of its negligible storage capacity relative to the other projects. APC controls about 80 percent of the available conservation storage in the ACT River Basin; USACE projects (Robert F. Henry Lock and Dam (L&D), Millers Ferry L&D, Allatoona Lake, and Carters Lake) control about 20 percent. The two USACE reservoirs farthest upstream, Allatoona Lake and Carters Lake, account for about 16 percent of the total basin conservation storage.

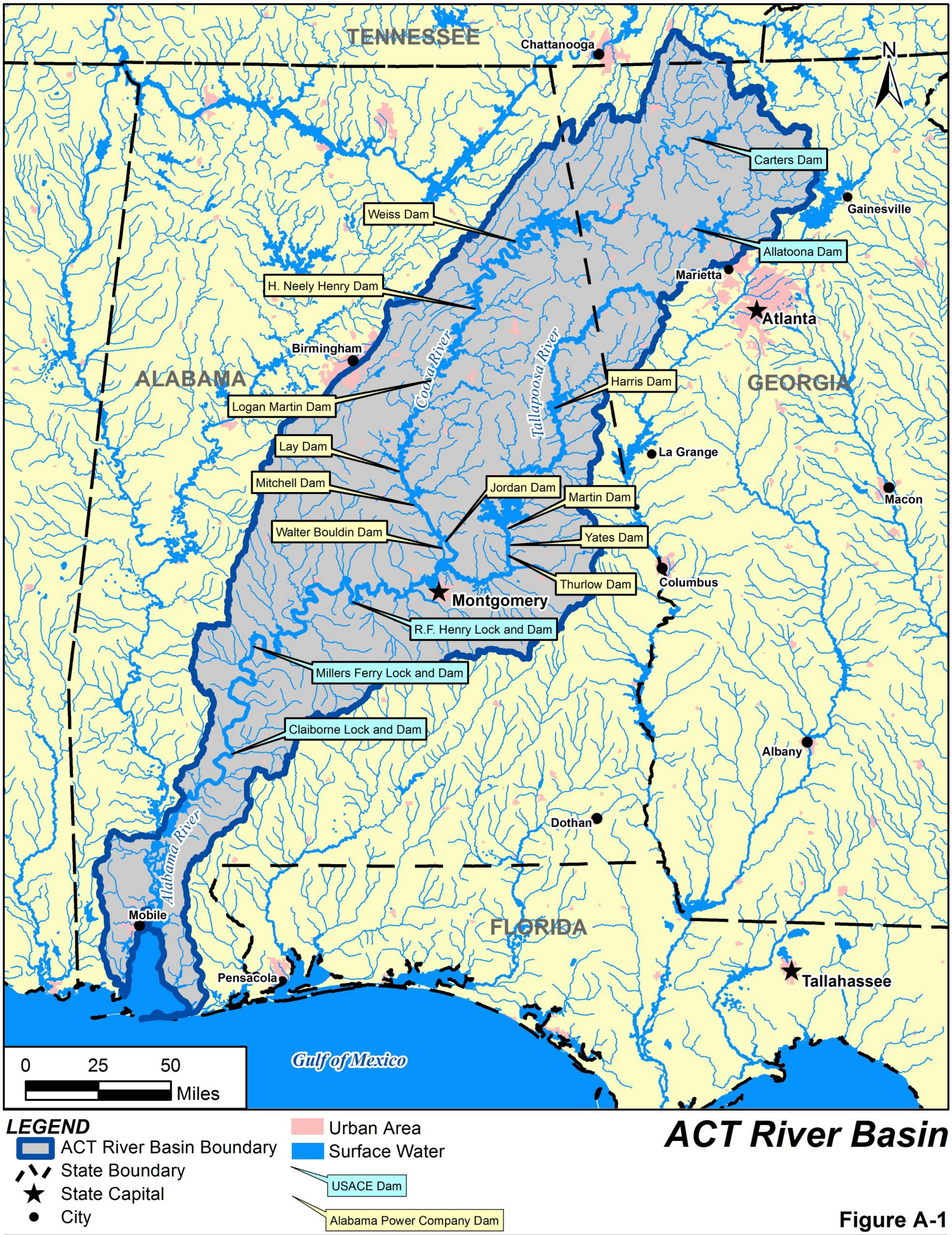

TENNESSEE
Chattanooga
Carters Dam
Gainesville
Weiss Dam
Allatoona Dam
Marietta
H. Neely Henry Dam
Atlanta
Birmingham
Coosa River
Tallapoosa River
ALABAMA
Harris Dam
GEORGIA
Logan Martin Dam
Lay Dam
La Grange
Mitchell Dam
Jordan Dam
Martin Dam
Macon
Walter Bouldin Dam
Yates Dam
Thurlow Dam
Columbus
Montgomery
R.F. Henry Lock and Dam
Millers Ferry Lock and Dam
Claiborne Lock and Dam
Albany
Dothan
Alabama River
Mobile
FLORIDA
Pensacola
Tallahassee
0 25 50
Miles
Gulf of Mexico
LEGEND
ACT River Basin Boundary
State Boundary
State Capital
City
Urban Area
Surface Water
USACE Dam
Alabama Power Company Dam
ACT River Basin

Figure A-1

Table A-1. USACE and APC Reservoirs in the ACT River Basin - Project Data

Basin/river/ project name	Owner/state/ year initially completed	Drainage area (sq mi) [a]	Normal (summer) lake elev (ft) [b]	Reservoir size at normal (summer) pool (ac) [i]	Total storage at normal (summer) pool (ac-ft) [i]	Conservation storage (ac-ft)	Top of flood pool elev (ft)[c]	Total storage at top of flood pool (ac-ft)[i]	Flood storage (ac-ft) [i]	Power capacity (megawatt [MW])
Coosawattee River		*862*								
Carters Dam and Lake	USACE/GA/1974	374	1,074	3,275	383,564	141,402[j]	1099	472,757	89,192	600[d]
Carters Reregulation Dam	USACE/GA/1974	520	698	990	17,380	16,571i	*NA*	NA	NA	None
Etowah River		*1,861*								
Allatoona Dam and Lake	USACE/GA/1949	1,122	840	11,164	338,253	270,247i	860	626,860	288,606	82.2 [d]
Coosa River		*10,156*								
Weiss Dam and Lake	APC/AL/1961	5,270	564	30,027	306,655	263,417i	574	704,414	397,759[i]	87.75 [e]
H. Neely Henry Dam and Lake	APC/AL/1966	6,596	508	11,235	120,853	118,210i	508	NA	0	72.9 [e]
Logan Martin Dam and Lake	APC/AL/1964	7,743	465	15,269	273,467	144,383[b]	477	519,110	245,643[i]	128.25 [e]
Lay Dam and Lake	APC/AL/1914	9,053	396	11,795	262,887	92,352[b]	NA	NA	NA	177 [e]
Mitchell Dam and Lake	APC/AL/1923	9,778	312	5,855	170,783	51,577[b]	NA	NA	NA	170 [e]
Jordan Dam and Lake [f]	APC/AL/1929	10,102	252	5,937	210,198	19,057[f]	NA	NA	NA	100 [e]
Bouldin Dam [f]	APC/AL/1967	10,102	252	734	----[f]	----[f]	NA	NA	NA	225 [e]
Tallapoosa River		*4,687*								
R.L. Harris Dam and Lake	APC/AL/1982	1,454	793	10,660	425,721	207,318[i]	795	447,501	21,780	135 [b]
Martin Dam and Lake	APC/AL/1927	2,984	491[g]	39,807	1,667,814	1,202,340[b]	NA	NA	NA	182.5 [b]
Yates Dam and Lake	APC/AL/1928	3,293	345 [g]	2,045	55,992	6,928[b]	NA	NA	NA	44.25 [b]
Thurlow Dam and Lake	APC/AL/1930	3,308	289 [g]	585	18,494	NA	NA	NA	NA	81.35 [b]
Alabama River		*22,739*								
R F. Henry Lock and Dam/ R.E. "Bob" Woodruff Lake	USACE/AL/1972	16,233	126 [h]	13,500	247,210	36,450[j]	NA	NA	NA	82 [d]
Millers Ferry Lock and Dam/ William "Bill" Dannelly Lake	USACE/AL/1969	20,637	80.8 [h]	18,528	346,254	46,704[j]	NA	NA	NA	90 [d]
Claiborne Lock, Dam, and Lake	USACE/AL/1969	21,473	36 [h]	6,290	102,408	None	NA	NA	NA	None

a. Source: USGS HUC Units and stream gage data (Subregion 0315)
b. Source: USACE projects – verified by USACE (June 2014); APC projects – values verified by USACE coordination with APC via email (June 2014)
c. Source: USACE email (April 2019), placemat and WCM
d. Declared Power Capacity. 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
e. Source: (FERC, 2009)
f. Jordan and Bouldin Dams both impound the same reservoir and share the same reservoir storage.
g. Subtract one (1) ft to convert from ft NGVD29 to Martin datum. Source: Martin Dam FERC FEIS April 2015 (page 13)
h. Represents the upper limit elevation of the normal operating range
i. Source: All projects – verified by USACE ResSim Input (April 2019)
j. Source: USACE Water Control Manuals

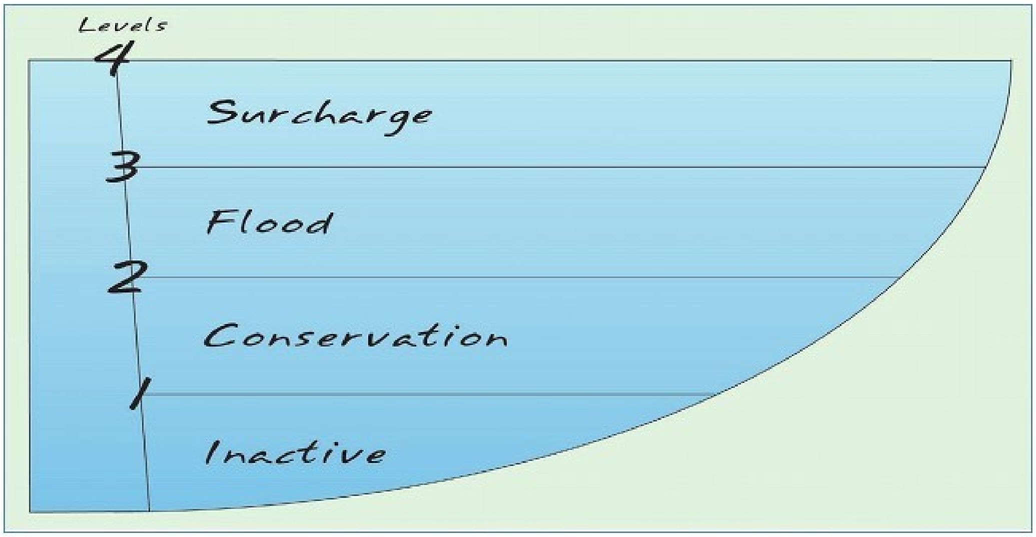


Figure A-2. General Schematic of Reservoir Storage.

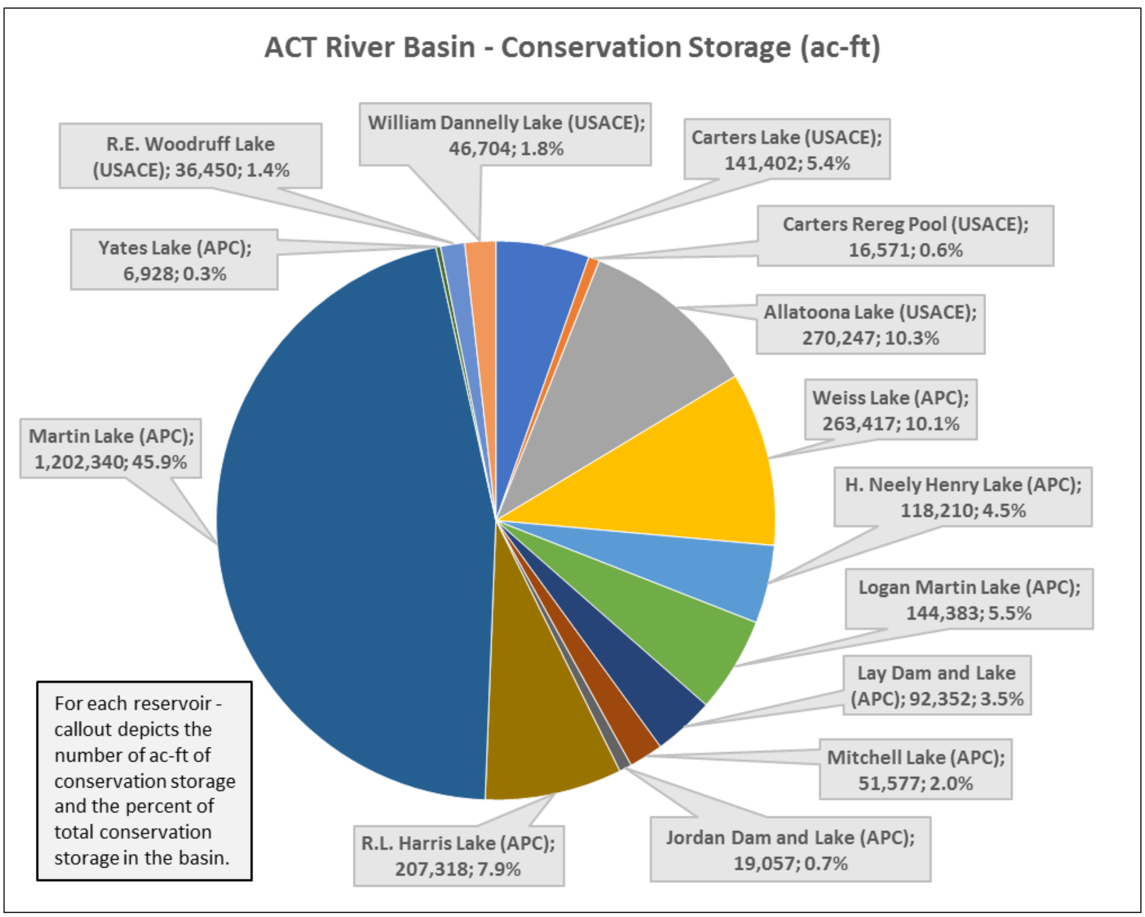


Figure A-3. ACT River Basin Reservoir Conservation Storage (Percent of Storage by Project).

Most of the dams in the ACT River Basin are operated to generate electricity using hydropower. Hydropower dams convert the force of falling water into electrical power. While it is not the primary source of energy in the United States, hydropower is a very important source of electricity because generation from the turbines can be started quickly to provide for immediate needs.

The USACE and APC reservoirs on the mainstem rivers of the ACT River Basin cumulatively have about 1.04 million ac-ft of dedicated flood storage above the normal summer pool level at two USACE and three APC projects in the basin: Allatoona Lake, Carters Lake, Logan Martin Lake, R.L. Harris Lake, and Weiss Lake. As shown in Figure A-4, about 89 percent of the dedicated flood storage capacity is located in Weiss Lake, Allatoona Lake, and Logan Martin Lake. Lowering the pool levels at these projects and at the APC H. Neely Henry project during the winter months provides additional flood storage capacity during that period.

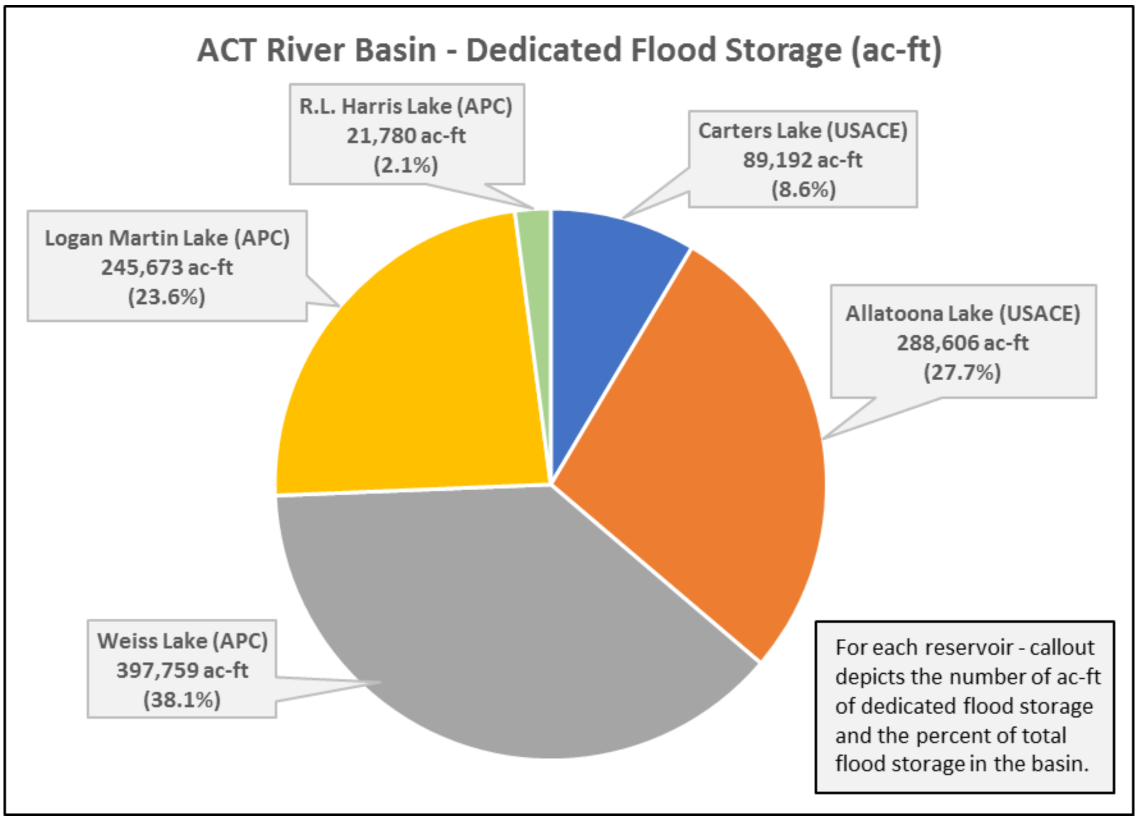


Figure A-4. ACT River Basin Reservoir Dedicated Flood Storage Composition.

Much of the hydropower generation is *peaking* power. The generators are turned on when there is the highest, or *peak*, demand for power. Air conditioning and heating are the power uses that most often cause the peak demand for electric power so the hydropower releases are usually made when temperatures are extreme. Peaking hydropower projects typically generate power during the peak electrical demand hours on weekdays (generally from 2 to 8 hours per day) and then generally do not operate on the weekend. In contrast, the *run-of-river* hydropower projects in the ACT River Basin typically generate power by passing the available inflows from upstream peaking projects. However, run-of-river projects do normally operate for a portion of the day, significantly influencing daily flows in the tailrace and downstream water courses. Unlike storage projects, run-of-river hydropower facilities do not follow a guide curve, nor do they fluctuate appreciably or redistribute flows seasonally.

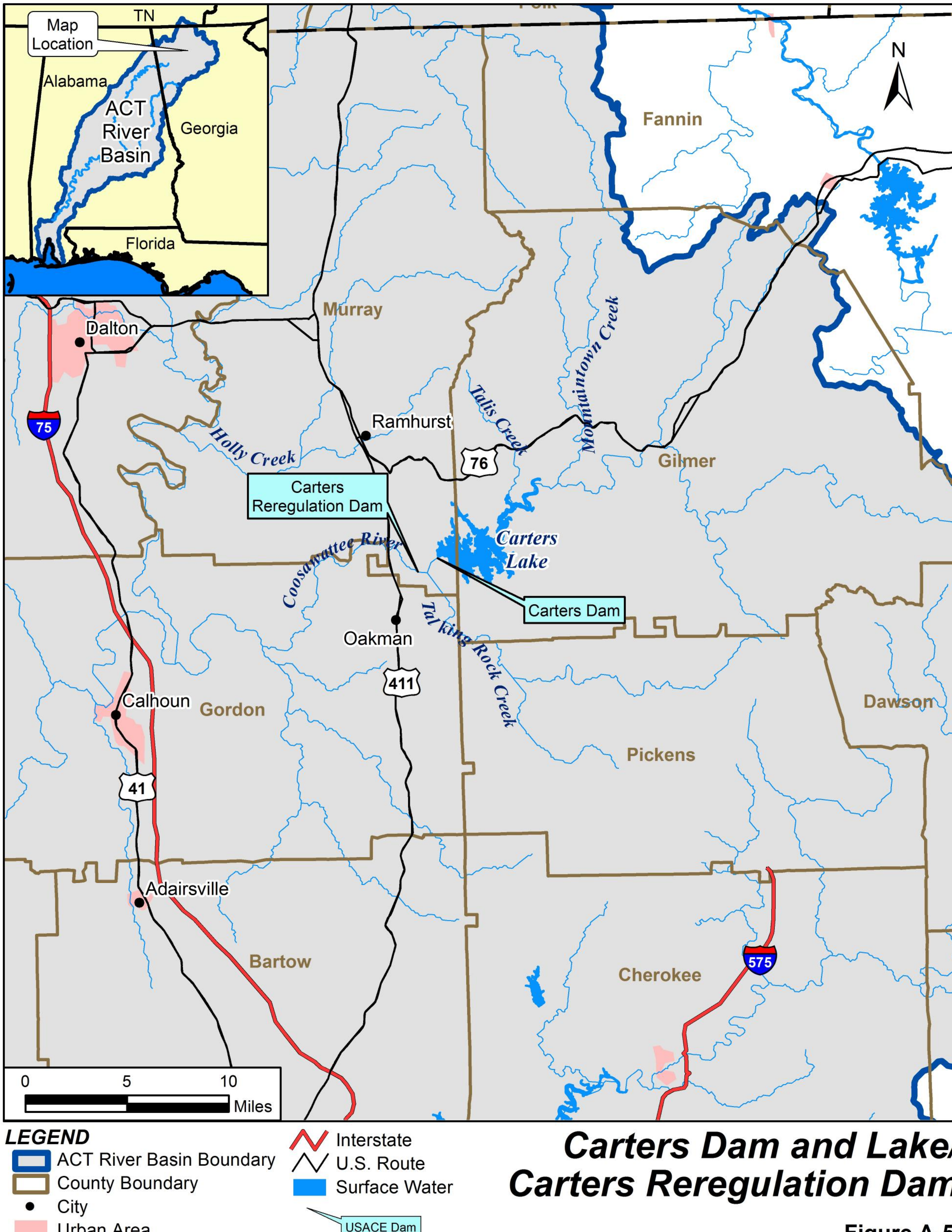
A.1.1.1 Carters Dam and Lake and Carters Reregulation Dam

The USACE Carters Dam and Lake and Carters Reregulation Dam on the Coosawattee River is a multipurpose project completed in 1974. Authorized project purposes include flood risk management, hydropower, navigation, recreation, water quality, water supply, and fish and wildlife conservation. Figure A-5 provides a general map depicting Carters Lake. The Carters Lake 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 pool. USACE generates power at Carters Lake only a few hours each weekday, when demand for electricity is highest. When demand for electricity is low, usually during the night or on weekends, two of the four generating units can be reversed to pump water back up from the reregulation pool to Carters Lake. Water is available again for hydropower generation in the next peak-use period, and Carters Lake is maintained at its optimal power generation level. In addition to providing a lower pool to support pumped storage operations, the Reregulation Dam reregulates peaking flows from Carters Lake to provide more stable downstream flow conditions.

The Carters Lake project has a hydropower generating capacity of 600 megawatts (MW), the largest capacity of any project in the ACT River Basin and one of the largest plants in the Southeastern Power Administration's (SEPA's) Georgia-Alabama-South Carolina system for marketing of hydropower generated by USACE projects. SEPA's mission and the marketing of hydropower from USACE projects in the region are discussed in more detail in Section A.1.2.2.

Carters Lake has a total storage capacity of 472,757 acre-feet (ac-ft) at elevation 1,099 feet (ft). Of that, available conservation storage is 141,402 ac-ft, flood risk management storage is 89,191 ac-ft, and inactive storage is 242,163 ac-ft. The top of the conservation pool is at elevation 1,074 ft in the summer and 1,072 ft in the winter and it gradually transitions between the summer and winter pools over a four-week period in both April and November. The bottom of the conservation pool is elevation 1,022 ft. Carters Lake has a surface area of 3,275 acres (ac) at elevation 1,074 ft. The normal year-round operating range for the pool above the Carters Reregulation Dam is elevation 677–696 ft NGVD29. The Reregulation Dam, which has 16,571 ac-ft of available conservation storage, provides a minimum continuous flow of 240 cubic feet per second (cfs) to the Coosawattee River. However, the minimum releases will vary by month from 865 cfs to 240 cfs when the lake is operating in Action Zone 1. Further discussion of the action zones is found in the paragraphs below.

As would be 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 1–2 ft per day. However, levels can rise more than that during flooding events as the lake captures and temporarily retains flood flows. 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 nonpeak hours. The reregulation pool will likely reach both its normal maximum elevation of 698 ft and its minimum elevation of 674 ft at least once each week because of the effects of hydropower generation and pumpback operations.



Carters Dam and Lake/ Carters Reregulation Dam

Figure A-5

A seasonal pool regulation guide curve and conservation storage action zones have been developed to guide the water control management decisions in meeting the balanced strategy. Carters Lake conservation includes two action zones, which are used as a general guide to determine the minimum discharge releases available from the Reregulation Dam. The Carters Lake guide curve is shown in Figure A-6. Typical release patterns that can occur at Carters Lake over a 1-week period under normal, wet, and dry conditions, respectively, are depicted on Figure A-7, Figure A-8, and Figure A-9. Each figure presents data for Carters Lake inflows, pool elevation, and discharges to and from the downstream reregulation pool. The normal conditions hydrograph for Carters Lake shows weekday peaks in discharge for power generation, and recirculation flows from the reregulation pool back into the main reservoir. Those recirculation flows are indicated by negative flow values on the hydrograph. The peaks are for daily power generation when power demand is highest and power generation is most cost-effective. Discharges cease on the weekend to allow the reservoir to recharge to ensure water is available for the following week's power generation. Recirculation from the reregulation pool continues on the weekend. Figure A-8 shows the wet condition for Carters Lake, which illustrates a higher discharge volume and recirculation volume from the normal condition. The higher discharge volumes are associated with having a higher pool elevation during the wet period as more is needed to be released. The dry condition for Carters Lake shows inflow near zero. Discharges are kept to a minimum to meet only power supply demands. The pool elevation fluctuates as discharge continues on weekdays but ceases on the weekend.

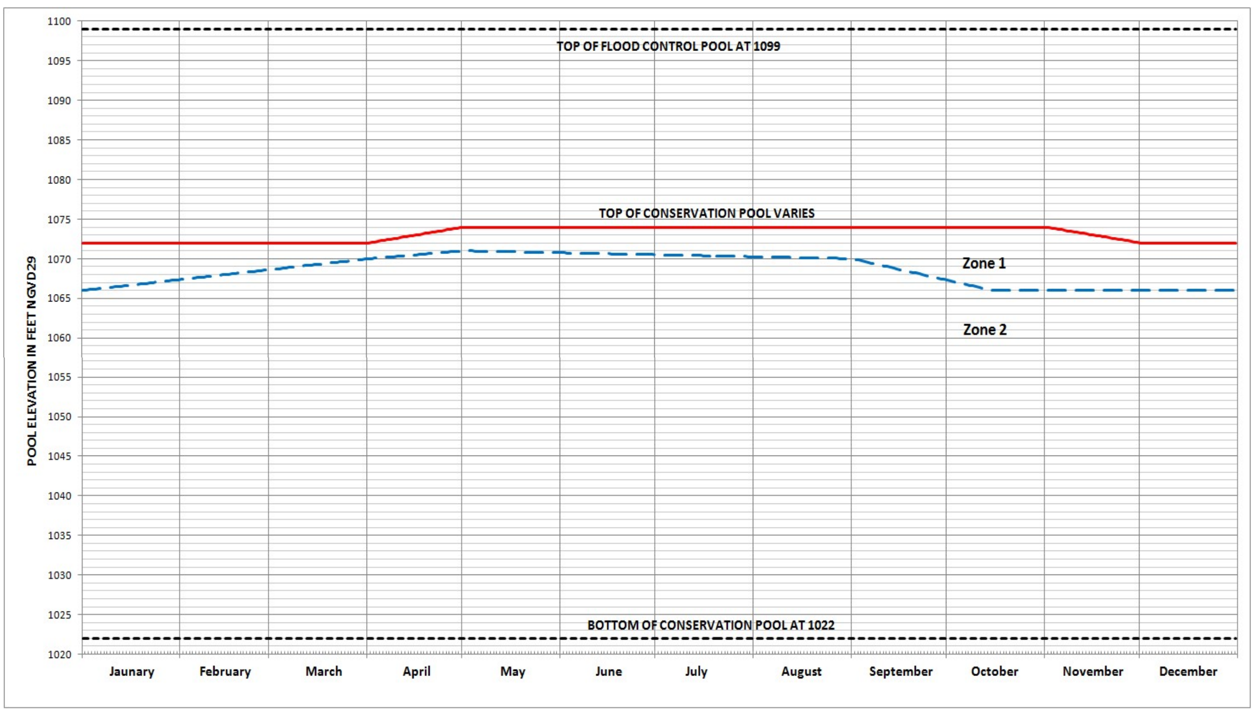


Figure A-6. Carters Lake Guide Curve and Action Zones.

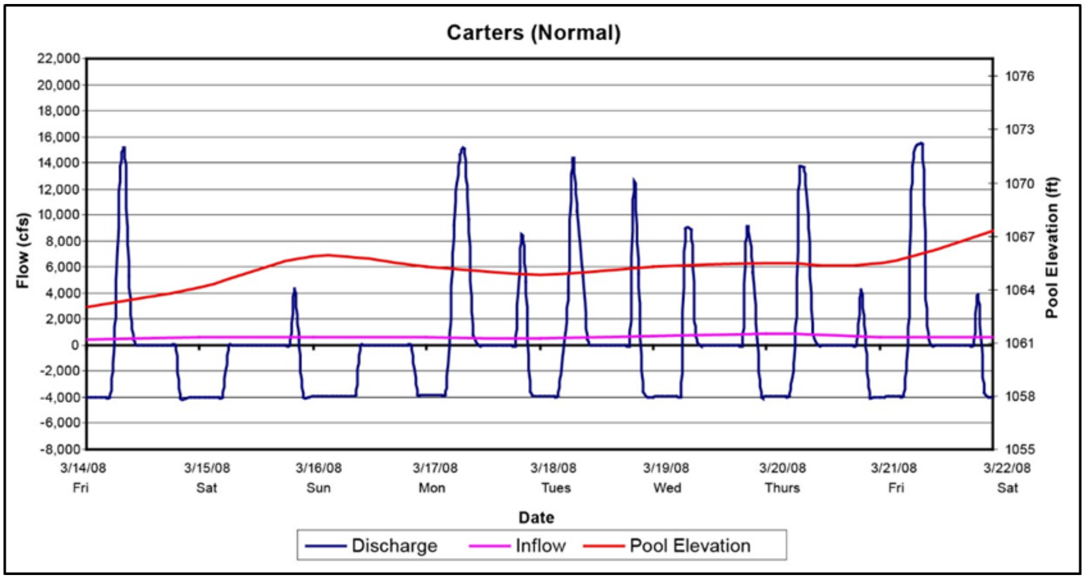


Figure A-7. Carters Dam and Lake Typical Release Pattern in Normal Conditions.

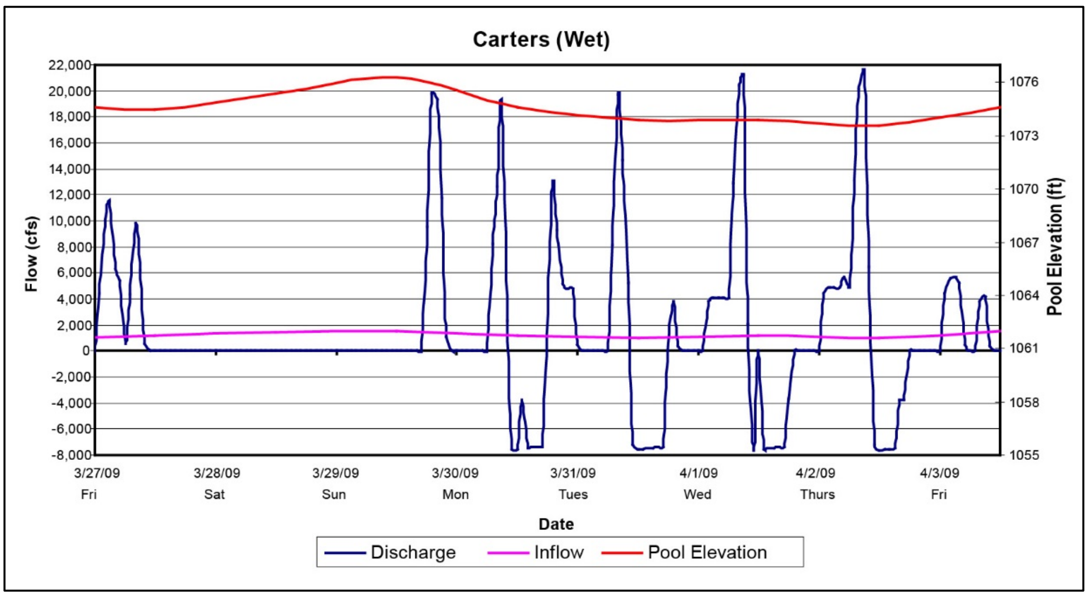


Figure A-8. Carters Dam and Lake Typical Release Pattern in Wet Conditions.

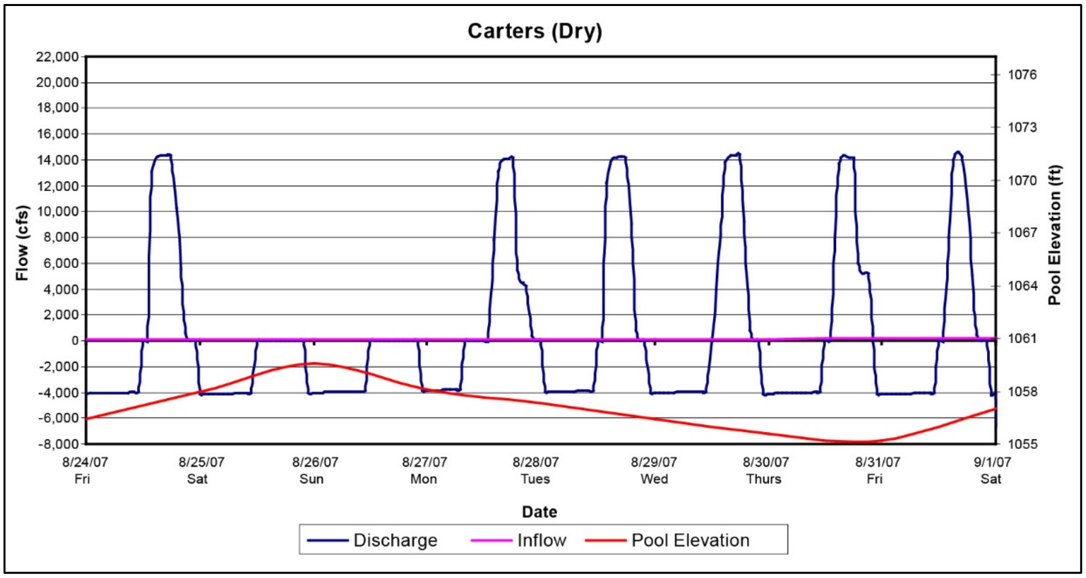


Figure A-9. Carters Dam and Lake Typical Release Pattern in Dry Conditions.

As indicated earlier, a continuous minimum flow release of 240 cfs is required from the Reregulation Dam to the Coosawattee River. When hydrologic conditions are wetter than normal, Carters Lake will more than likely operate within Zone 1. When the reservoir is operating in Zone 1, a seasonally variable release will be made from the Reregulation Dam, as shown in Figure A-10. When the reservoir is in Zone 2, the seasonally varying minimum flow is suspended and a continuous minimum flow of 240 cfs is released from the Reregulation Dam.

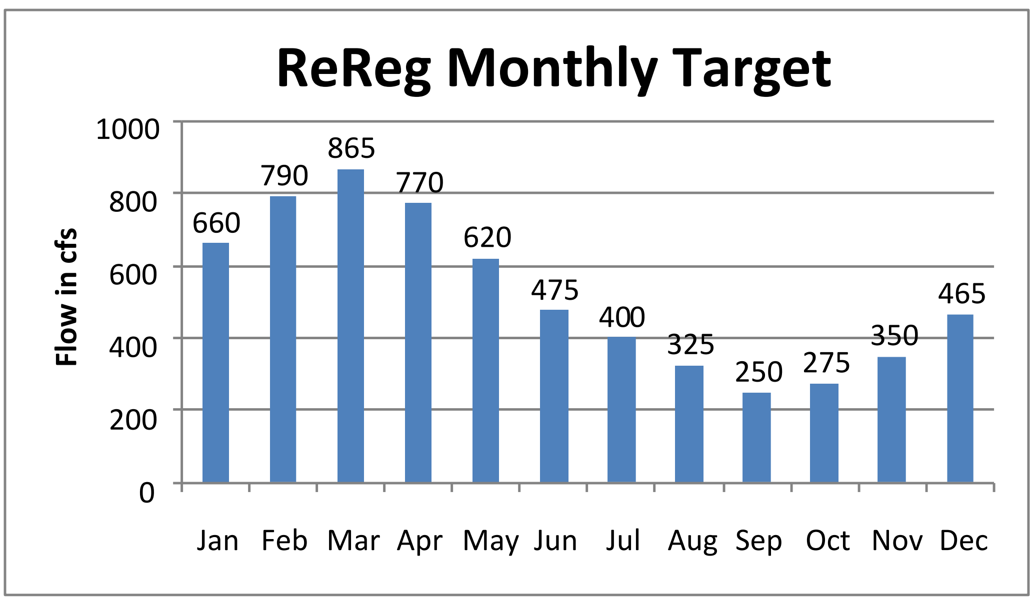


Figure A-10. Carters Reregulation Dam—Seasonal Minimum Release Targets.

The Carters's project allows for the storing and controlled release of floodwaters from the upstream basin thereby lowering peak flows in flood prone downstream areas. Peak discharges in the Coosawattee River downstream of the Carters Lake project have been substantially reduced compared to pre-project conditions. Mean monthly flows at the U.S. Geological Survey (USGS) gage 02382500 (Coosawattee River at Carters, GA) since completion of the Carters Lake project range from a low of 560 cfs in September to a high of 1,600 in March. Figure A-11 depicts annual peak discharges for most years between 1897 and 2018. Since 1974 (completion of Carters Lake project), annual peak discharges have not exceeded 10,000 cfs, whereas numerous peak discharges occurred before the project that were between 10,000 and 30,000 cfs and as high as 46,000 cfs (1938) and 57,000 cfs (1951).

The presence of the reregulation pool and the nature of the pumpback operation at the Carters Lake project preclude the daily rapid rise and fall in stages downstream of the Reregulation Dam in the Coosawattee River that would normally be associated with peaking hydropower operations. Consequently, river stages downstream of the Reregulation Dam tend to be stable and prone to minimal deviation over a 24-hour period during normal operations, typically ranging up to 0.2 ft. As releases from the dam can be incrementally increased or decreased, particularly during high rainfall periods, stages in the Coosawattee River downstream of the Reregulation Dam can temporarily vary by several feet over a period of a few days.

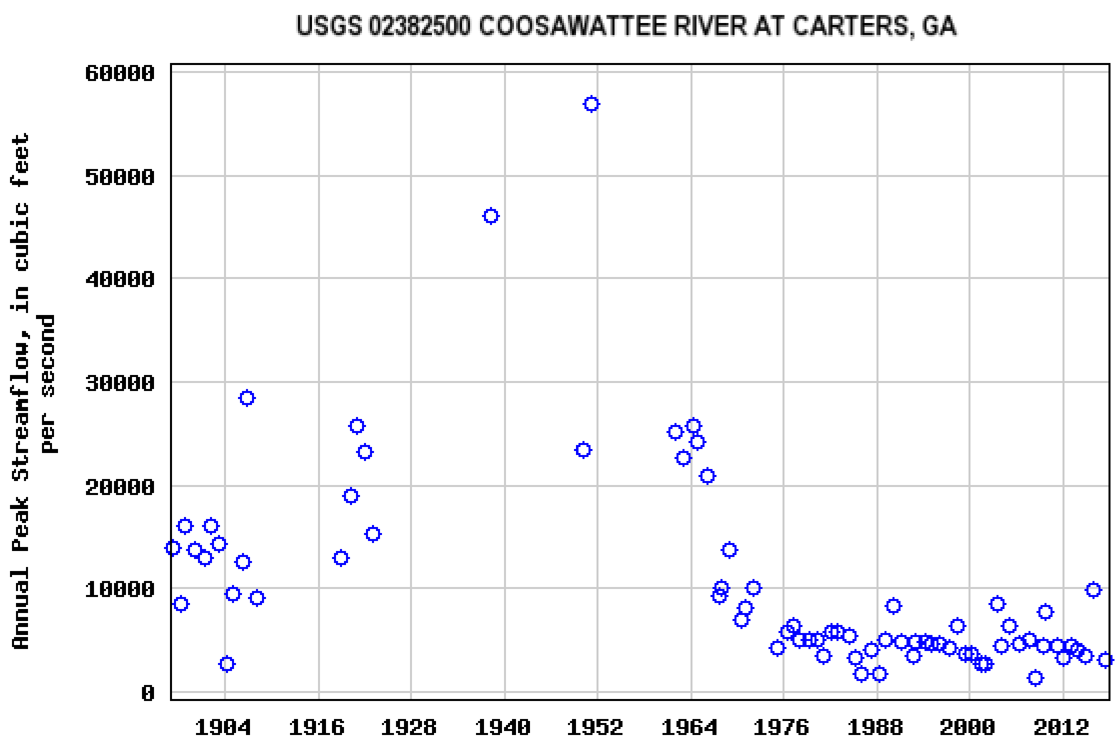


Figure A-11. Coosawattee River at Carters, GA (USGS 02382500) Annual Peak Streamflow (1897–2018).

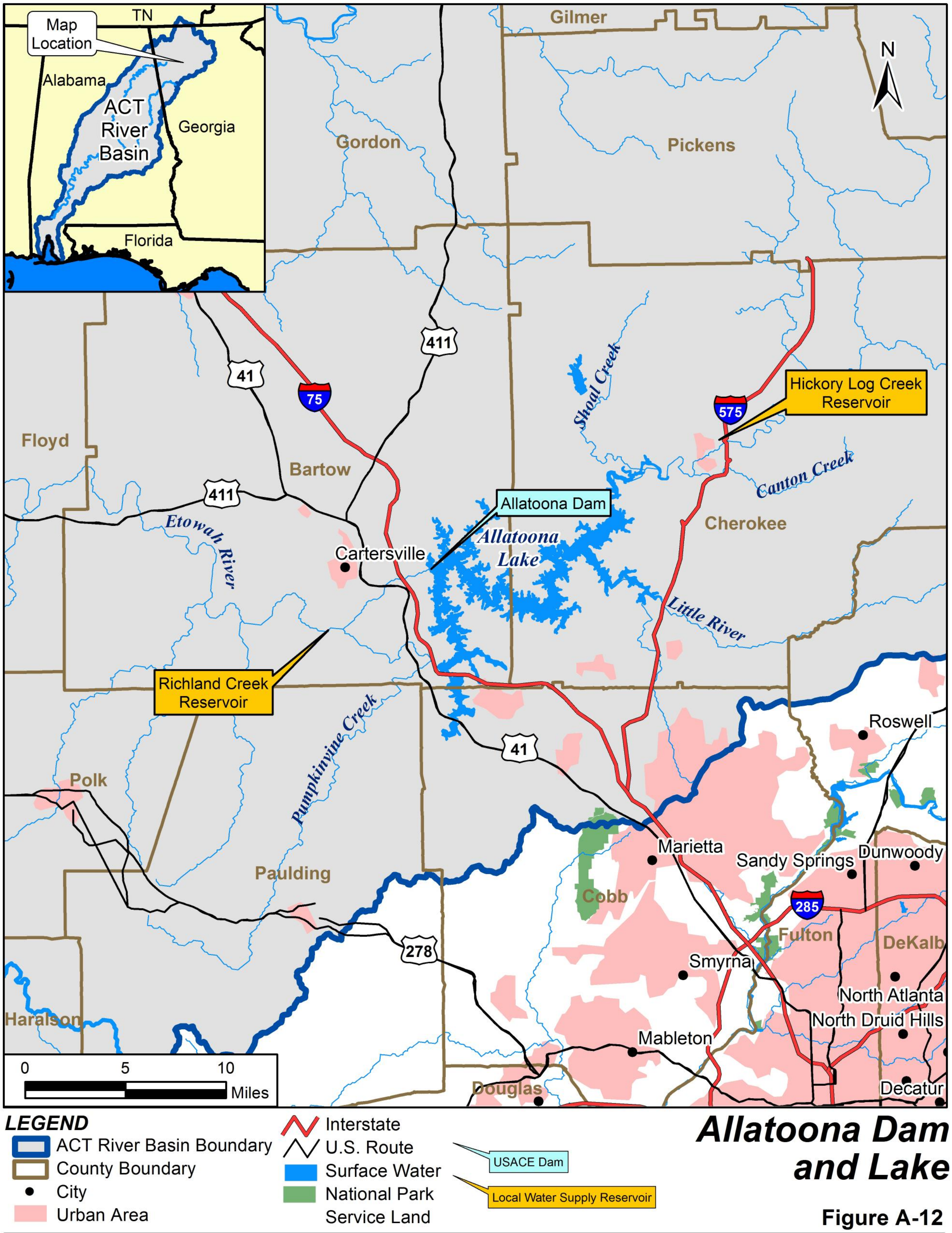
Beginning shortly after the construction of the Carters Lake project, hydropower interests in the private sector began to pursue efforts to acquire a license from the Federal Energy Regulatory Commission (FERC) to add non-USACE hydropower generation at the Carters Reregulation Dam. Energos Management, Inc., applied to FERC for a preliminary permit to pursue a non-USACE hydropower license at the Carters Reregulation Dam in November 1982 (FERC Project No. 6897) (FERC, 2010a). After several years of effort to develop the proposed project, FERC accepted Energos Management's request to surrender its license for the project in April 1991. The licensee indicated that the project was not economically feasible at that time because of the low price it would receive for the power and the high interest rates it would pay for financing (FERC, 2010b). In June 1992, Fall Line Hydro Company, Inc., applied to FERC for a preliminary permit to pursue a hydropower license at the Carters Lake project. FERC granted the preliminary permit to Fall Line Hydro in November 1992 to evaluate the feasibility of a hydropower facility at the site (FERC Project No. 11301). In November 1995, Fall Line Hydro submitted an application for a FERC license for the project, and FERC subsequently granted a license (July 2001) to construct, operate, and maintain a non-USACE hydropower facility at the Carters Lake project. Fall Line Hydro failed to construct the facility, and FERC terminated the license in January 2006. Shortly thereafter, Fall Line Hydro filed a new preliminary permit application, reflecting essentially the same project plan as was proposed for its previously terminated project. In October 2006, Fall Line Hydro was granted a preliminary permit (FERC Project No. 12655). After only limited action by the applicant, Fall Line Hydro’s preliminary permit expired on October 1, 2009 (FERC, 2010c).

On October 1, 2009, Northbrook Carters Lake, LLC, applied to FERC for a preliminary permit to pursue a hydropower license at the Carters Lake project. FERC granted the preliminary permit on April 2, 2010 (FERC Project No. 13598) (FERC, 2010c). On February 28, 2011, Northbrook Carters Lake submitted a petition to surrender the preliminary permit to FERC after preliminary analysis of the potential project. On March 2, 2011, FERC issued a notice of surrender of the preliminary permit (FERC, 2013a). On April 3, 2019, Cherokee Rivers Company, LLC filed an application for a Preliminary Permit for the Lower Coosawattee Hydroelectric Project at the Carters Reregulation Dam (FERC, 2019b). As of the publication of this document, the Preliminary Permit application was pending. On August 22, 2019, Cherokee Rivers Company, LLC provided FERC a notice of intent to file a license application for the Lower Coosawattee Hydroelectric Project at the Carters Reregulation Dam (FERC, 2019a).

A.1.1.2 Allatoona Dam and Lake

The USACE Allatoona Dam on the Etowah River creates the 11,164 ac Allatoona Lake. Completed in 1949, the dam was built for flood risk management, hydropower, recreation, and regulation of stream flow for navigation. Other purposes of the project are fish and wildlife conservation, water quality, and water supply. Authorized project purposes, including both specific and general authorizations, are discussed in detail in sections A.1.2 through A.1.2.8. The City of Cartersville, GA, and the Cobb County-Marietta Water Authority (CCMWA) withdraw water from Allatoona Lake for water supply. Cobb County’s Northwest Water Reclamation Facility also discharges into the lake. Allatoona Lake has a flood storage capacity of 288,607 ac-ft and a conservation storage capacity of 270,247 ac-ft. Figure A-12 provides a general map of Allatoona Lake.

The Allatoona Lake top of conservation pool is elevation 840 ft National Geodetic Vertical Datum of 1929 (NGVD29) during the late spring and summer months (May–August); transitions to elevation 835 ft NGVD29 in the fall (October–mid-November); transitions to a winter drawdown to elevation 823 ft 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 A-13). However, the lake level can 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. Figure A-13 also shows the four action zones within the conservation storage at Allatoona Lake. The action zones provide water control regulation guidance to meet water conservation requirements while balancing the use of available storage to meet project purposes. Under drier conditions, when basin inflows are reduced, project operations are adjusted to conserve storage in Allatoona Lake while continuing to serve project purposes in accordance with the four action zones shown on Figure A-13.



Allatoona Dam and Lake

Figure A-12

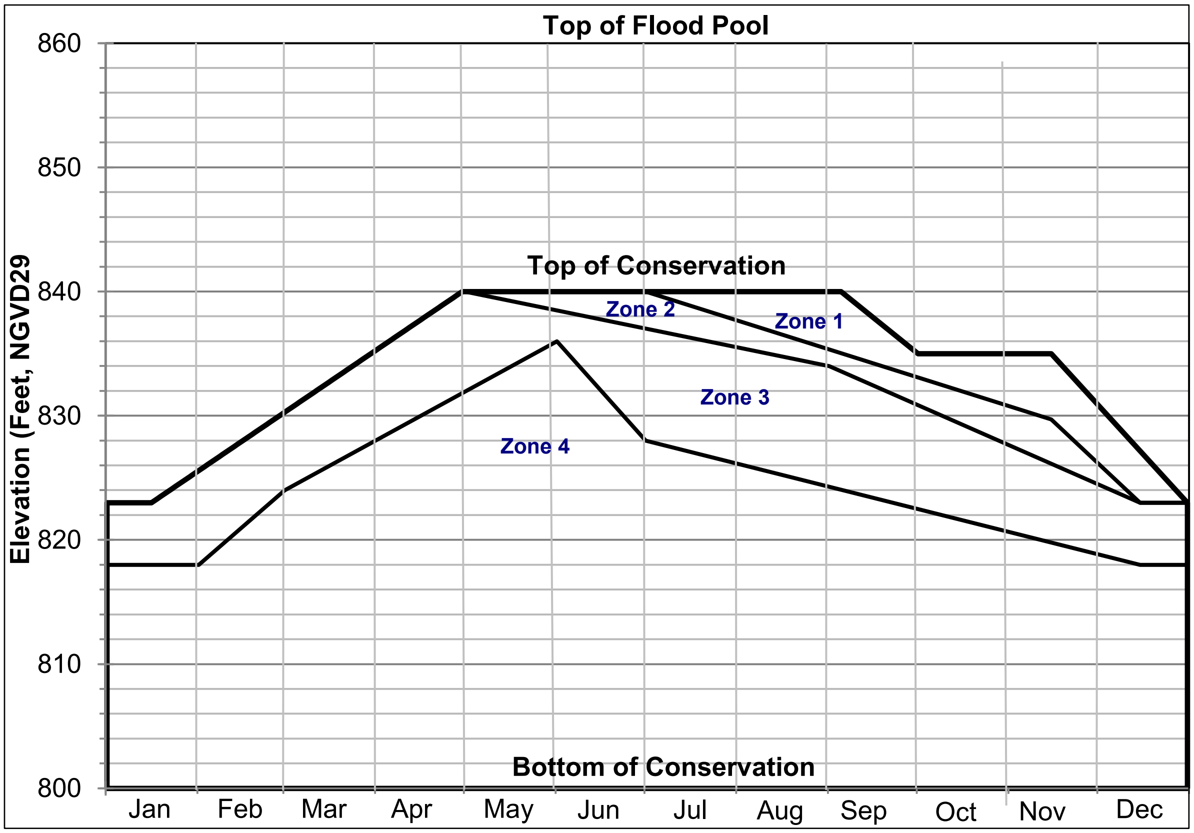


Figure A-13. Allatoona Lake Action Zones for Project Operation.

A notable feature of the Allatoona Dam and Lake project is the Acworth subimpoundment. The subimpoundment, known as Lake Acworth, is located on the Proctor Creek arm of Allatoona Lake in the extreme northwest corner of Cobb County, GA. The subimpoundment dam was completed in July 1950 (GADNR-HPD 2005). The 325-ac subimpoundment directly supports the project purposes of recreation and conservation of fish and wildlife. The Acworth subimpoundment facilities are owned and maintained by USACE. The earth-filled subimpoundment dam provides a nonfluctuating pool level generally at about elevation 848 feet NGVD29 and is 1,500 feet long with a 60-foot concrete spillway flanked on each side by concrete nonoverflow sections 61 feet long. The ungated spillway has a crest elevation of 848 feet and two 24-inch sluices, one at each end of the spillway.

Current project operations are governed by action zones that define general operating principles and parameters when lake-level conditions are below the top of the conservation pool at any point during the year. Figure A-13. shows the action zones for Allatoona Lake. The line between zones is a guideline that does not dictate any mandatory, absolute change in outflow policy. Operating conditions for each zone are as follows (USACE Mobile District, 2015a):

- Zone 1: While Allatoona Lake 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. USACE will give full consideration to meeting hydropower demand by typically providing up to 4 hours of peak generation. However, the duration of peak generation could be zero or exceed 4 hours based on various factors or activities such as maintenance and repair of turbines, emergency situations such as a drowning or chemical spill, drawdowns for shoreline maintenance, drought operations, or increased or decreased hydropower demand.

- Zone 2: While Allatoona Lake 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 3 hours of peak generation. However, the duration of peak generation could be zero or exceed 3 hours based on various factors or activities such as maintenance and repair of turbines, emergency situations such as a drowning or chemical spill, drawdowns for shoreline maintenance, drought operations, or increased or decreased hydropower demand.
- Zone 3: Zone 3 will typically indicate drier than normal conditions or impending drought conditions. USACE will make careful, long-range analyses and projections of inflows, pool levels, and upstream and downstream water needs when pool levels are in Zone 3. While in Zone 3 during the months of January–April, USACE will provide a reduced amount of peaking generation to meet system hydropower demand while making water control regulation decisions to ensure refilling the reservoir to elevation 840 feet NGVD29 by May 1. 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 2 hours of peak generation. However, the duration of peak generation could be zero or exceed 2 hours based on various factors or activities such as maintenance and repair of turbines, emergency situations such as a drowning or chemical spill, drawdowns for shoreline maintenance, drought operations, or increased or decreased hydropower demand.
- Zone 4: Reservoir elevations in Zone 4 indicate severe drought conditions. USACE will make careful, long-range analyses and projections of inflows, pool levels, and upstream and downstream water needs when pool levels are in Zone 4. Peak generation will typically be suspended. Continuous operation of the small unit will continue to maintain the 240-cfs minimum flow release.

Figure A-14, Figure A-15, and Figure A-16 depict typical release patterns that can occur at Allatoona Lake over a 1-week period under normal, wet, and dry conditions, respectively. Each figure presents data for inflows to Allatoona Lake, lake elevations, and discharges from the dam to the Etowah River. The normal conditions hydrograph for Allatoona Lake shows weekday peaks in discharge. The peaks are for daily power generation when power demand is highest and power generation is most cost-effective. Discharges cease on the weekend to allow the reservoir to recharge to ensure water is available for the following week's power generation. In Figure A-15 for the wet condition, a 24-hour discharge is seen during the weekdays. The high volume of discharge is caused by high inflows and a high pool elevation. A decline in pool elevation occurs as discharge continues through the week. Low inflows and a low pool elevation can be seen in Figure A-16 for the dry condition at Allatoona Lake. Discharges are kept to a minimum and in short duration on weekdays to only meet power demands.

Tailwater stages can vary significantly daily because of peaking hydropower operations at Allatoona Lake, characterized by a rapid rise in river stage immediately after generation is initiated and a rapid fall in stage as generation is ceased, generally from 2 to several hours later, depending on available basin inflows. Figure A-17 depicts river stages immediately downstream of Allatoona Lake over a typical 1-week period in late summer under normal conditions. River stages rise and fall by 2.5–3.0 ft before, during, and following peak hydropower generation. Except during high-flow conditions when hydropower can be generated for more extended periods of time, this peaking power generation scenario with daily fluctuating stages downstream is repeated nearly every week day (not generally on the weekend).

Peak discharges in the Etowah River downstream of Allatoona Lake have been substantially reduced compared to preproject conditions. Figure A-18 depicts peak discharges between 1920 and 2018. Since 1949 (when Allatoona Lake was completed), annual peak discharges have not exceeded 10,500 cfs, except in 1964 when the peak discharge reached 22,600 cfs. Before Allatoona Lake was created, peak discharges were as high as 40,000 cfs in 1920 and 1946 and typically fell within the range of 11,000–28,000 cfs.

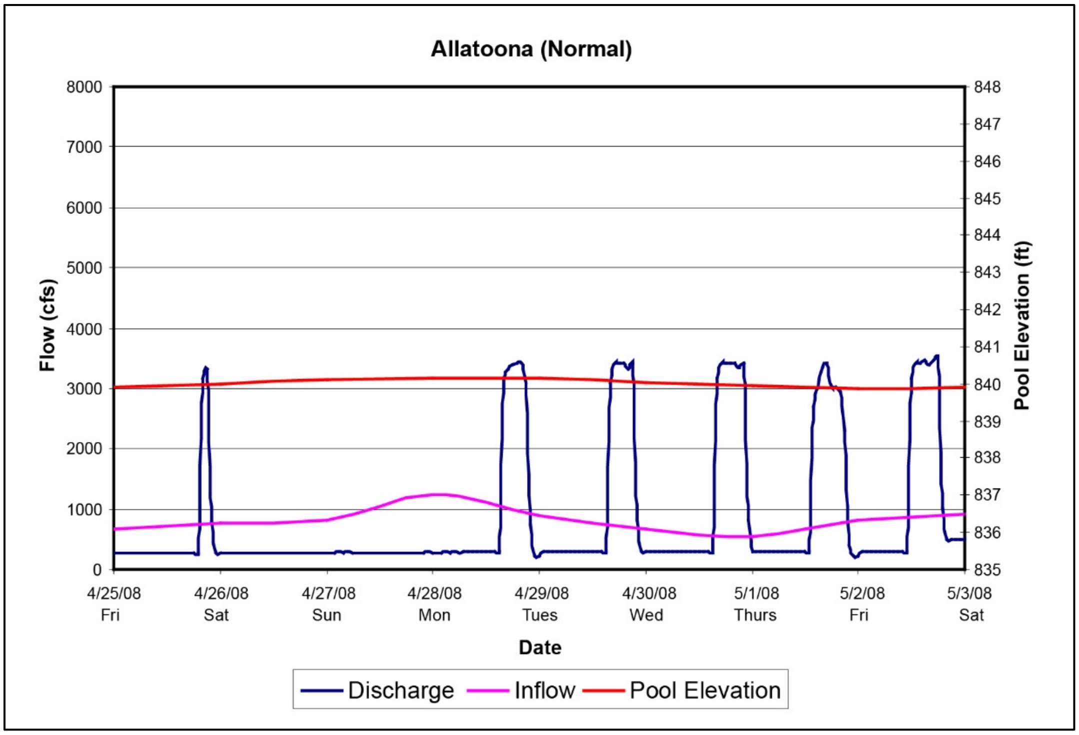


Figure A-14. Allatoona Dam and Lake Typical Release Pattern in Normal Conditions.

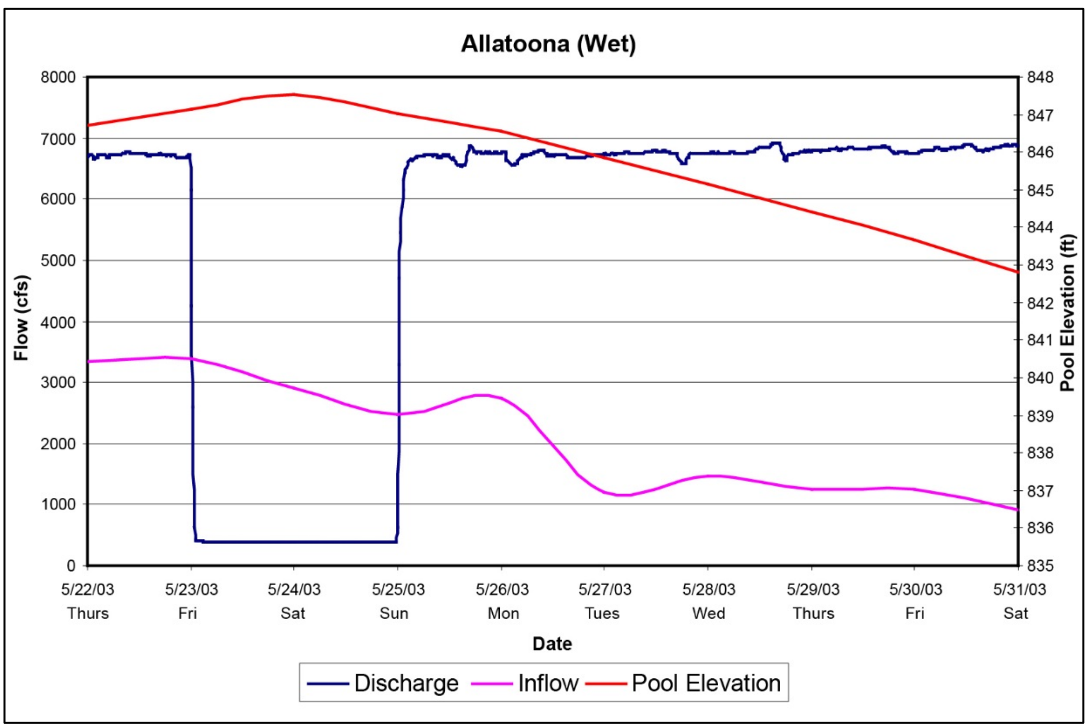


Figure A-15. Allatoona Dam and Lake Typical Release Pattern in Wet Conditions.

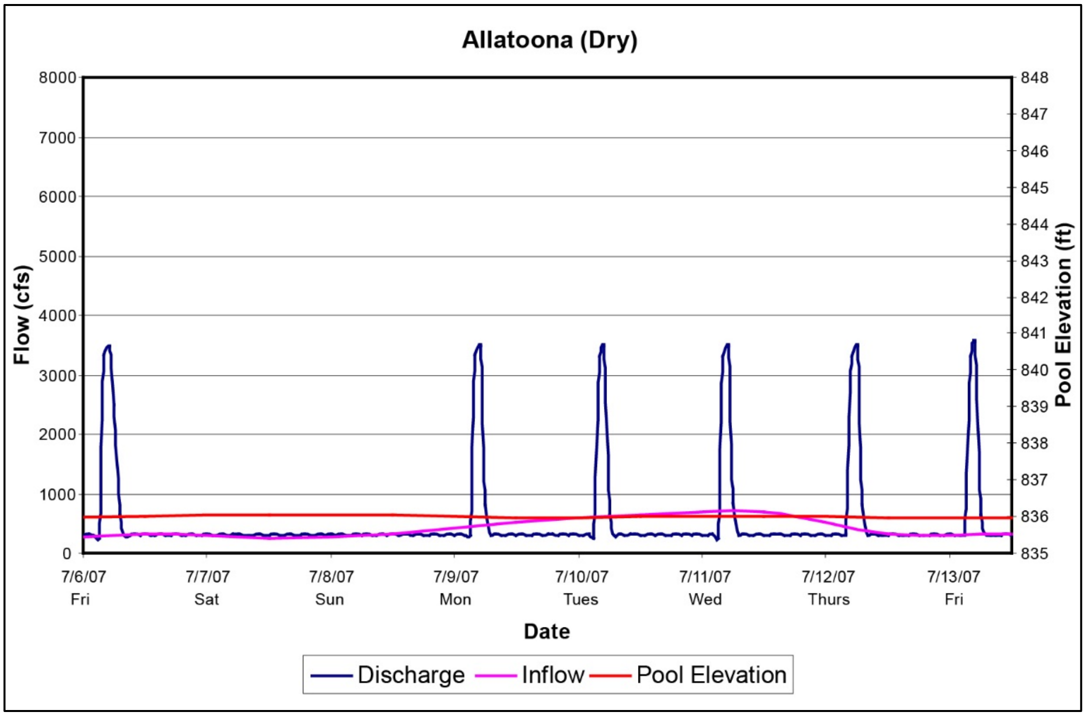


Figure A-16. Allatoona Dam and Lake Typical Release Pattern in Dry Conditions.

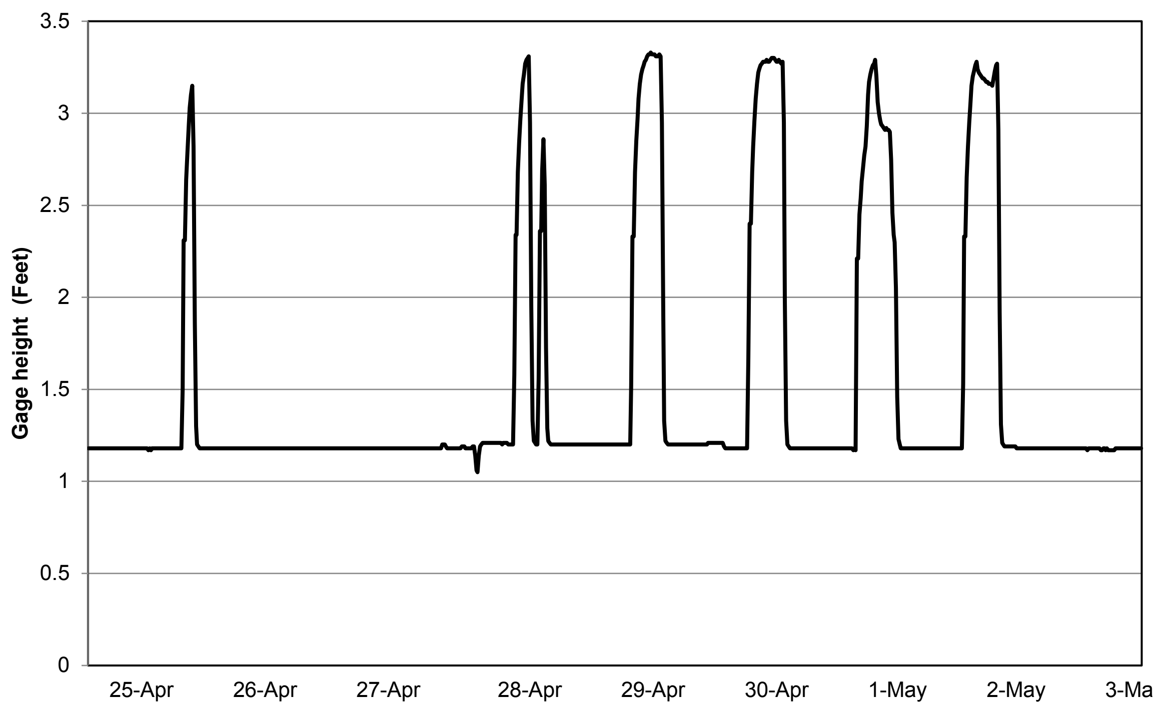


Figure A-17. Etowah River at Allatoona Lake above Cartersville, GA (USGS 02394000), Tailrace Gage Height (2011).

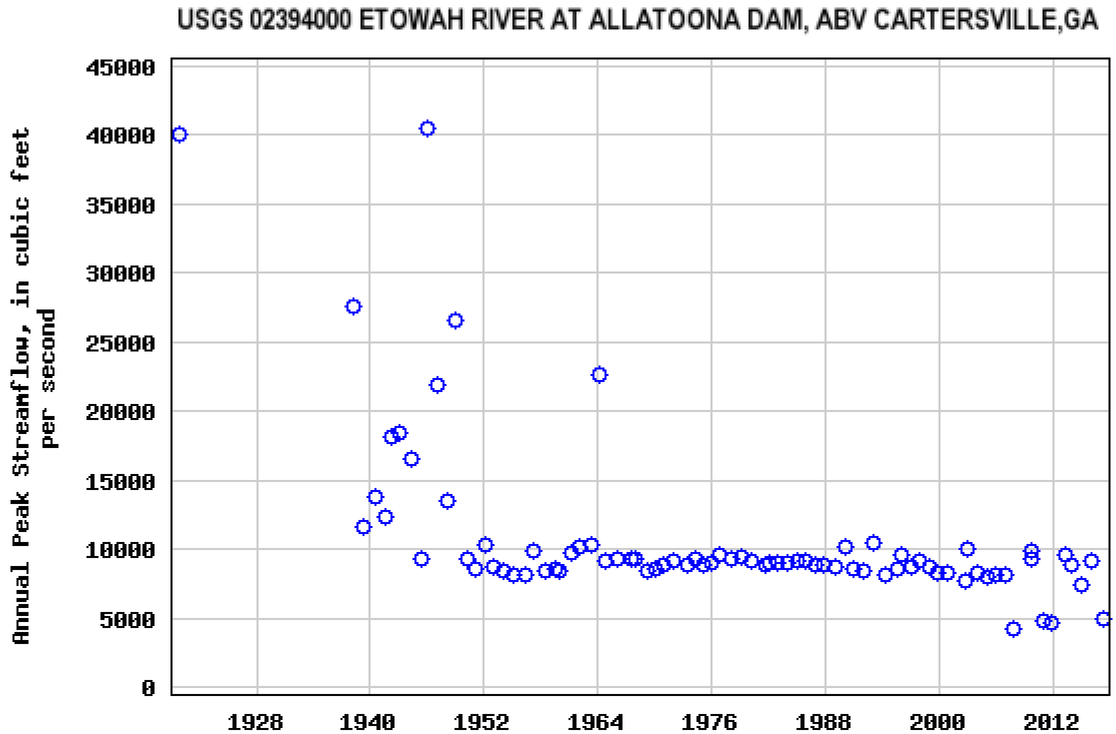


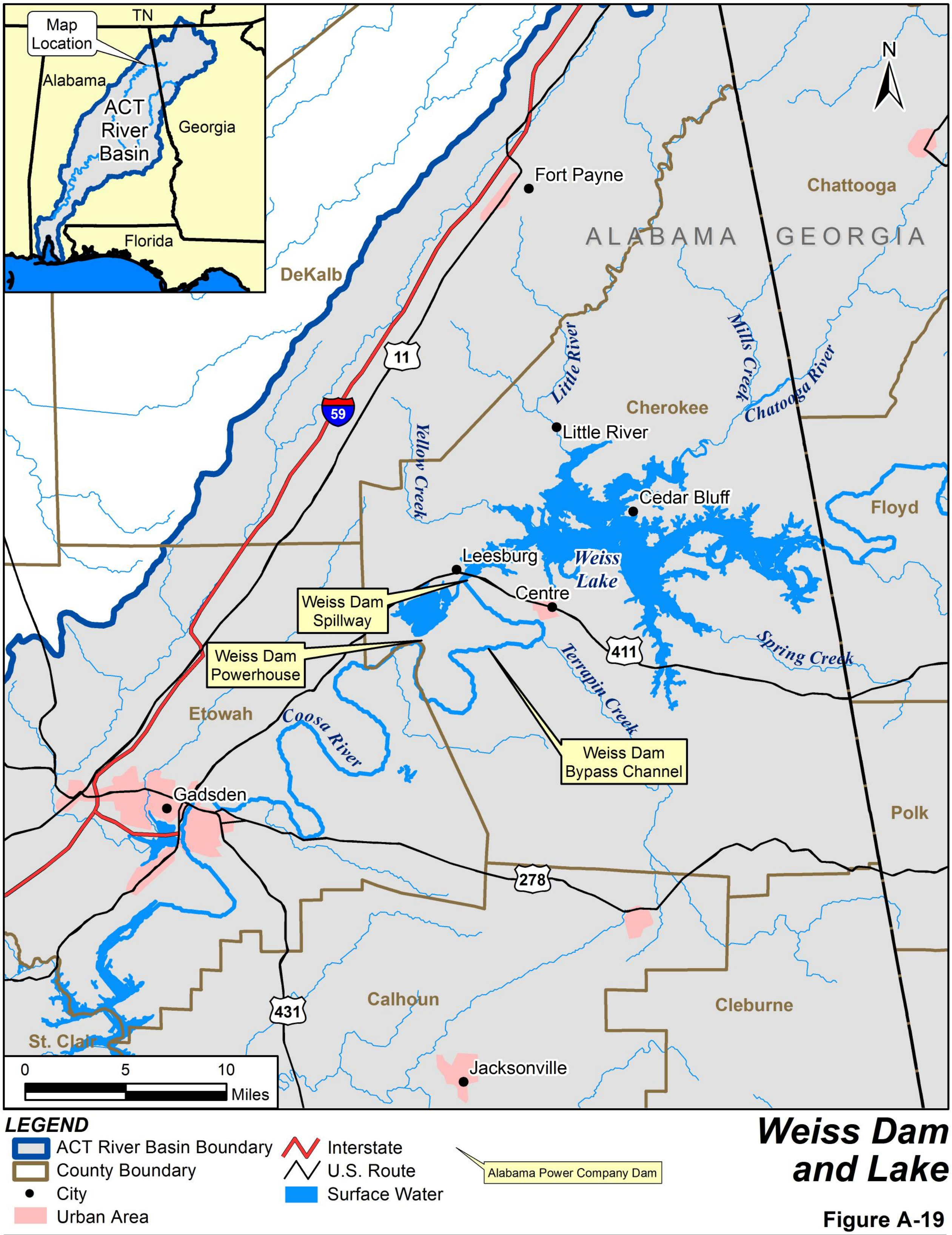
Figure A-18. Etowah River at Allatoona Lake above Cartersville, GA (USGS 02394000), Annual Peak Streamflow (1920–2018).

A.1.1.3 Weiss Dam and Lake

Weiss Lake is the furthest upstream of seven APC reservoirs on the Coosa River, in northeastern Alabama and northwestern Georgia, and has a surface area of 30,027 ac. The reservoir extends about 52 river miles (RMs) upstream from Weiss Dam, and about 11 mi of it are in Georgia. It has 447 mi of shoreline and a maximum depth of 62 ft and is relatively shallow with a depth of around 10 ft at normal pool elevation. Figure A-19 provides a map of Weiss Lake.

Weiss Lake is used for hydropower generation, flood risk management, navigation flow augmentation, maintenance of water quality, M&I water supply, irrigation withdrawals, recreation, and habitat for fish and wildlife conservation (FERC, 2009). From May through the end of August, the reservoir is normally operated near full pool elevation of 564 ft during normal inflows and average system generating requirements. A drawdown of the reservoir begins in September and continues to the end of December, when the level is lowered to elevation 558 ft. The reservoir begins refilling on January 1 and continues to refill until April 30, when full pool is normally reached. Available conservation storage is 263,417 ac-ft (USACE Mobile District, 2014a). Conservation storage is used for hydropower augmenting low inflow and seasonally for flood risk management capability for small flood events. The dedicated flood risk management pool for Weiss Lake is from 564 to 574 ft and provides 397,759 ac-ft of storage (FERC, 2009).

APC normally operates the Weiss Lake development in a peaking mode with generation units kept in the spinning mode to allow for quick hydropower production when needed by the electrical grid. Typical operation for power generation ranges from 1 to 6 hours per day during the week with no generation on the weekend. The generating capacity of the project is 87.75 MW. A canal about 7,000 ft long carries water from the main reservoir to the



Weiss Dam and Lake

Figure A-19

forebay at the powerhouse. Discharges through the Weiss Lake powerhouse flow into a 1,300-ft-long, man-made tailrace canal to reenter the Coosa River at the downstream end of the bypass reach. Discharges from the powerhouse tailrace enter the upper reaches of APC's downstream H. Neely Henry Lake, which has a normal full pool elevation of 508 ft (FERC, 2009). The H. Neely Henry Lake pool inundates the Weiss Lake tailwater at the power plant. The dam's operation is coordinated with releases from H. Neely Henry Lake to keep the pool levels in balance and fairly stable (USACE, Mobile District 1997). A spillway along the original river alignment is used to pass flood waters in excess of the discharge capacity of the powerhouse, which is 24,650 cfs with all three units in operation. The Weiss Lake bypass reach, the original meandering river channel of the Coosa River downstream of the spillway, is about 20 mi long. Prior to the issuance of a new FERC license for operation of Weiss Dam and Lake in June 2013, the project did not have a specific minimum flow requirement.

APC operates Weiss Lake in coordination with its other hydropower projects on the Coosa River for flood risk management in accordance with regulations prescribed by the Secretary of the Army (Title 33 of the *Code of Federal Regulations* [CFR] 208.65). APC and USACE adopted a Memorandum of Understanding (MOU) in December 1965 on the operation of the Weiss Lake project, which, along with the USACE 1965 WCM for the project, is used to implement the prescribed regulations. The purpose of the MOU and the associated WCM is to clarify the responsibilities of the two agencies in operating the project for flood risk management and other purposes and to provide for the orderly exchange of hydrologic data (USACE, Mobile District 1965). In 2004, an administrative update to the Weiss water control manual was approved by SAM District Commander.

Whenever the basin inflow causes the reservoir to rise above the guide curve elevation, APC operates the power plant at full gate capacity around the clock until the reservoir recedes to the level of the guide curve. When the reservoir level is at elevation 564 ft, all inflow is passed through the power plant until its discharge capacity is exceeded. Thereafter, as inflows and pool levels can increase, excess flows are passed through the spillway in accordance with specific operational procedures until the pool levels recede to the guide curve elevation and within the discharge capacity of the powerhouse, as described in the WCM for the project.

As part of the FERC relicensing process for the Coosa River project, APC proposed the following modifications to operations at Weiss Lake:

- Raise the winter guide curve by 3 ft from elevation 558 ft to 561 ft from December 1 through March 1. That will result in a constant rise in the Weiss Lake reservoir until the normal summer elevation of 564 ft is reached on May 1. The summer guide curve would be extended from August 31 to September 30 with the same summer elevation as operated. That proposal could have some adverse effects on the flood risk management function of the Weiss Lake project. Before implementing the proposed increases in winter pool elevations, additional analyses (and National Environmental Policy Act [NEPA] documentation) would have been required to allow revisions to the project manual and to the ACT Master Manual. In May 2015, USACE completed a long-term effort to update the Master Manual, but the proposed APC changes were deferred at that time due to the requirement for additional studies. As part of this current action, USACE is now considering the proposed APC changes.
- Release a variable continuous minimum flow into the bypassed river reach downstream of the spillway at the Weiss Lake project to enhance aquatic habitat and water quality for aquatic organisms as part of a comprehensive adaptive management plan. The continuous minimum flow would range from 4 to 9 percent of the flows occurring at the upstream Mayo's Bar gage (USGS gage no. 02397000), depending on the month, with an adjustment of that flow twice per week (Tuesday and Friday), according to the actual flow occurring at the Mayo's Bar gage. This target flow is used with the previous midnight Weiss Lake elevation (rounded to the nearest tenth) as a lookup in the trash gate rating table to find the gate setting that will produce a flow within the 10-percent daily volume range. (APC, 2019)

A.1.1.4 H. Neely Henry Dam and Lake

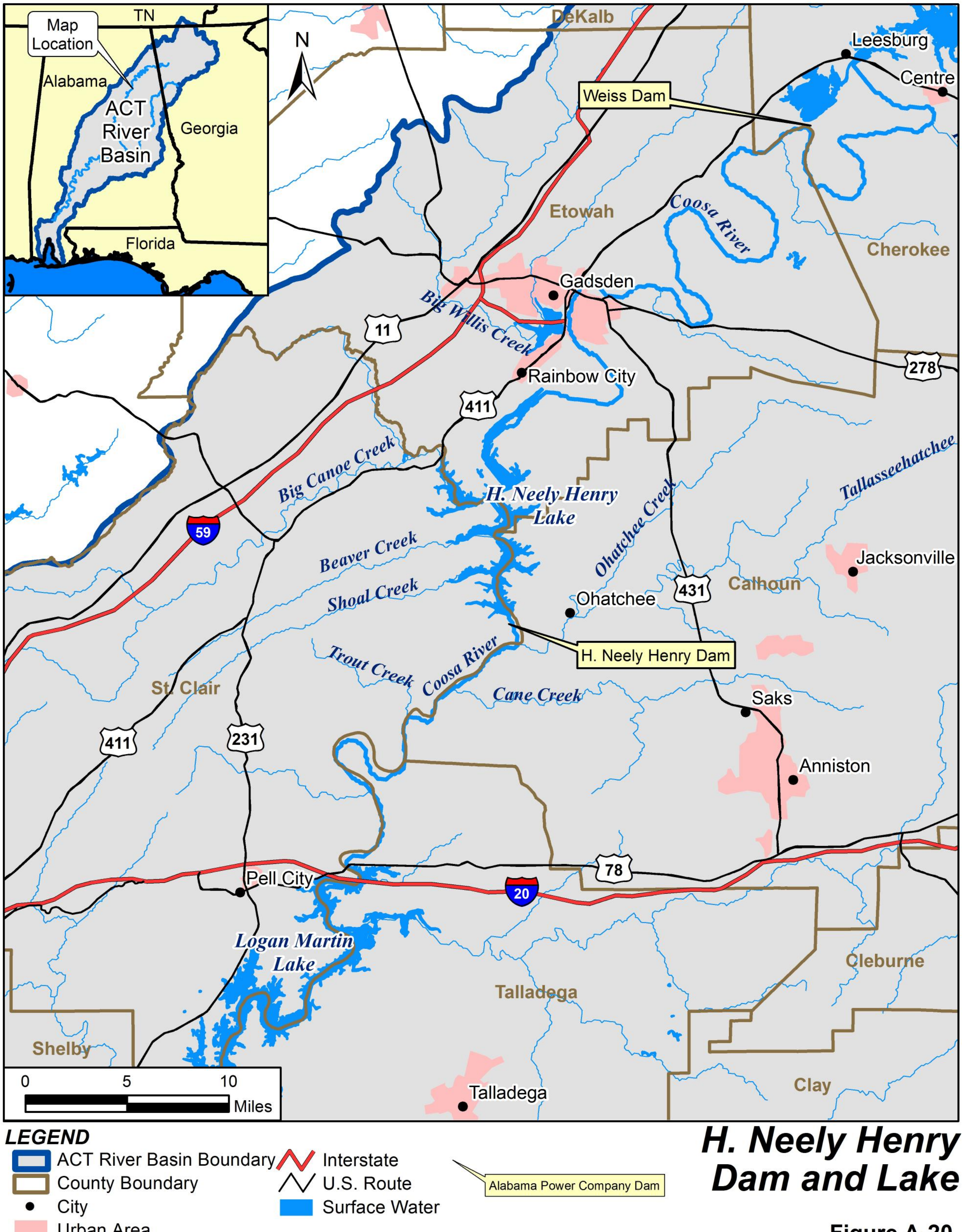
Releases from Weiss Lake enter the upper reaches of the H. Neely Henry Lake, a multipurpose project owned and operated by APC. H. Neely Henry Lake extends from the tailwater area of Weiss Lake 78 mi downstream to the H. Neely Henry Dam. The reservoir has 339 mi of shoreline and a maximum depth of 53 ft, but is relatively shallow with an average depth of 10.8 ft. Figure A-20 provides a map of H. Neely Henry Lake. The reservoir has a surface area of 11,235 ac and a total storage capacity of 120,853 ac-ft at the normal lake elevation of 508 ft. Available conservation storage is 118,210 ac-ft (USACE Mobile District, 2014a). Similar to Weiss Lake, H. Neely Henry Lake is used for hydropower generation, flood risk management, navigation flow augmentation, maintenance of water quality, M&I water supply, irrigation withdrawals, recreation, and habitat for fish and wildlife conservation (FERC, 2009).

APC normally operates the H. Neely Henry Lake development in a peaking mode with a typical daily fluctuation of about 1.5 ft. The facility generally provides several hours of generation each weekday, as power needs require, with no generation on the weekend. The generating capacity of the project is 72.9 MW. Discharges from the powerhouse enter the upper reaches of the Logan Martin Lake immediately downstream. Under existing guide curve conditions from May 1 through the end of September, the water level is kept at or near the normal maximum water level of elevation 508 ft.

Beginning in October and continuing to the end of November, the water level is drawn down to an APC and USACE interim-approved winter guide curve elevation 507 ft, where it is kept until the end of March. During April, the water level is raised to the summer elevation of 508 ft by April 30. Historically under low-flow conditions, the reservoir level falls below the reservoir guide curve values. The interim-approved guide curve was incorporated into the new FERC license for continued operation of the APC Coosa River projects, which was issued on June 20, 2013.

APC operates the H. Neely Henry Lake in coordination with its other hydropower projects on the Coosa River for flood risk management in accordance with regulations prescribed by the Secretary of the Army (33 CFR 208.65). APC and USACE adopted an MOU in January 1979 on the operation of the H. Neely Henry Lake project, which, along with the USACE 1979 WCM for the project, is used to implement the prescribed regulations. The purpose of the MOU and the associated WCM is to clarify the responsibilities of the two agencies in operating the project for flood risk management and other purposes and to provide for the orderly exchange of hydrologic data (USACE, Mobile District 1965). A draft revision to the manual was prepared in June 2004 but was never finalized (USACE, Mobile District 2004b). The H. Neely Henry Lake project WCM was revised in May 2015 along with the WCMs for other projects in the basin (US Army Corps of Engineers, Mobile District, 2015).

There is no dedicated flood risk management storage for this project. However, to limit flood damage to the City of Gadsden, AL, about midway on the H. Neely Henry Lake, the reservoir is lowered in advance of an impending flood if APC receives sufficient warning. The time to begin the drawdown as well as the rate and level of drawdown are determined by analysis of the Coosa River USGS gage no. 02400500 at Gadsden, near the midpoint of the H. Neely Henry Lake. A series of trigger points at 0.5-ft increments between 508.0 ft and 511.0 ft correspond to the lowering (or raising) of the water at the dam in increments down to 502.5 ft (FERC, 2009).



H. Neely Henry Dam and Lake

Figure A-20

In June 1999, APC requested a temporary 3-year variance to H. Neely Henry Lake's guide curve to maintain higher water levels during the winter (i.e., increase the winter pool level by 2 ft from 505 ft to 507 ft). FERC issued an approval for the variance on February 26, 2001. On March 18, 2004, FERC issued an extension to operate on an interim basis using the variance pending a final decision on APC's relicensing application filed in July 2005 for its Coosa River projects. The licenses expired on July 31, 2007, and were annually renewed until completion of the relicense process. FERC and USACE prepared a joint Environmental Assessment addressing the effects of the proposed 2004 extension (FERC, 2009). APC has proposed that the interim operating plan be included in the new FERC license, and USACE has concurred with that proposal. On June 20, 2013, following public review of the Draft EIS for the ACT River Basin WCM update, FERC issued a new license for the APC projects on the Coosa River (No. 2146), which included the revised guide curve for H. Neely Henry Lake.

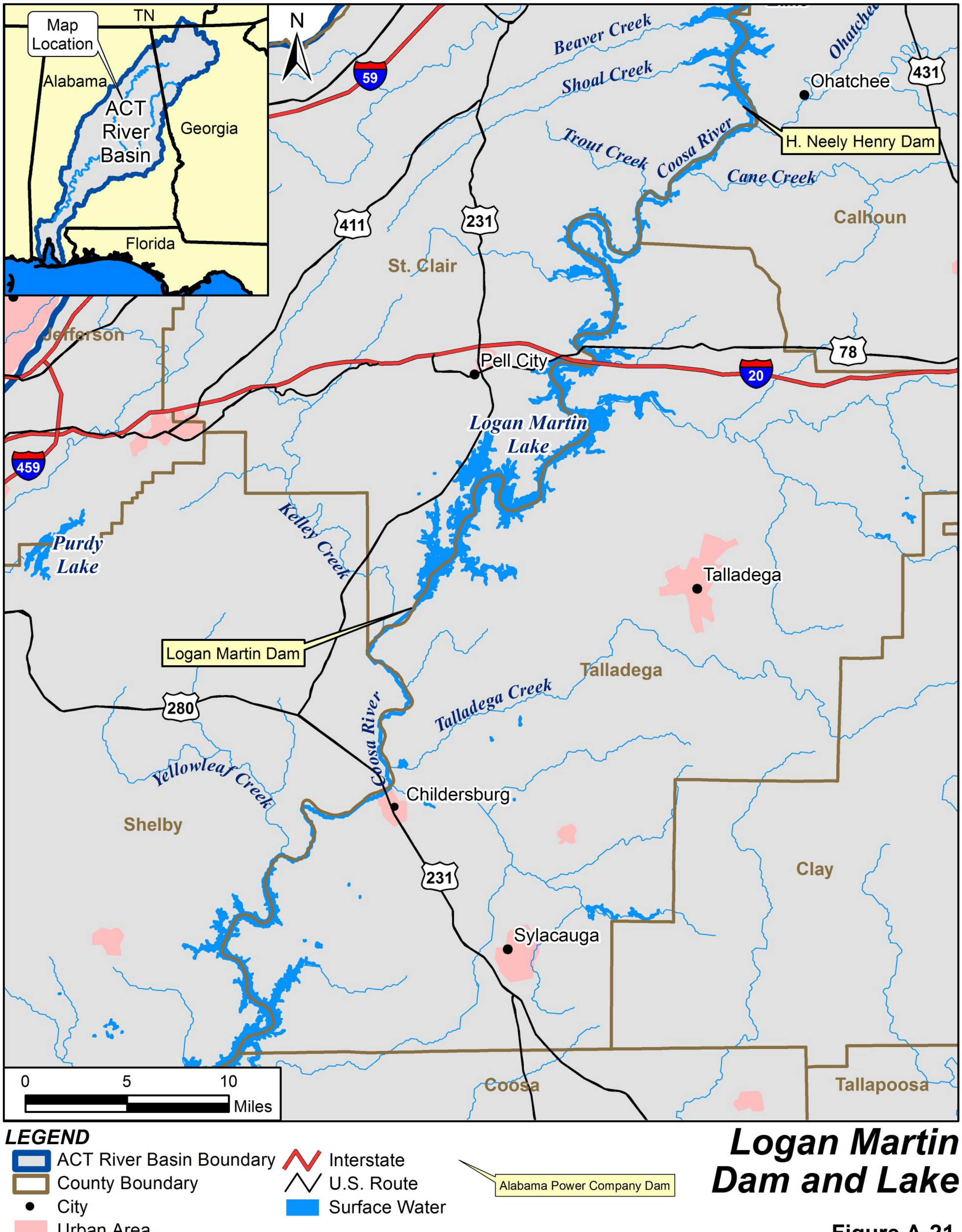
APC has voluntarily established a drought curve for the H. Neely Henry Lake at elevation 505 ft from the beginning of December to the end of March, rising to elevation 507 ft at the beginning of June, and then falling back to elevation 505 ft by the beginning of December (FERC, 2009). Background information on establishing drought curves (or drought contingency curves) for selected APC projects in the ACT River Basin is presented in Section A.1.1.10 (Martin Dam and Lake). USACE and APC cooperatively developed a drought plan for the overall ACT River Basin as part of the update of USACE's Master Manual, which is presented in Exhibit C of the Master Manual (USACE Mobile District, 2015a).

A.1.1.5 Logan Martin Dam and Lake

Releases from H. Neely Henry Lake enter the upper reaches of Logan Martin Lake, which extends from the tailwater area of the H. Neely Henry Lake 48.5 mi downstream to Logan Martin Dam. The lake has 275 mi of shoreline and a maximum depth of 69 ft at the dam (FERC, 2009). The lake has a surface area of 15,269 ac and a total storage capacity of 273,467 ac-ft at the top of the conservation pool. Available conservation storage is 144,383 ac-ft (USACE Mobile District, 2014a). The lake's conservation storage is used for hydropower production, augmentation of low inflow, and seasonally for flood risk management. Figure A-21 provides a map of Logan Martin Lake. Uses for this reservoir are similar to those of H. Neely Henry Lake. The dedicated flood risk management pool for Logan Martin Lake is from 465 ft to 477 ft and provides 245,300 ac-ft of storage (FERC, 2009). APC coordinates the operation of Logan Martin Lake with other projects on the Coosa River to minimize flooding. When inflow exceeds the power plant's capacity of 32,700 cfs, the excess is released through the spillway.

APC normally operates the Logan Martin Lake in a peaking mode for several hours each weekday, depending on electrical power demand. Discharges from Logan Martin Lake's powerhouse enter the upper reaches of the Lay Lake immediately downstream from the reservoir. The generating capacity of the project is 128.25 MW. From May 8 through the end of September, APC operates Logan Martin Lake from the full pool elevation of 465.0 ft during normal inflows and system generating requirements. Beginning on October 1, the guide curve decreases to elevation 463.0 ft by the end of the month. Between November 1 and December 31, the water level drops to elevation 460 ft, where it remains until March 30. On April 1, the water level begins rising toward the normal full pool elevation of 465.0 ft on May 8 (FERC, 2009).

APC operates the Logan Martin Lake, in coordination with its other hydropower projects on the Coosa River, for flood risk management in accordance with regulations prescribed by the Secretary of the Army (33 CFR 208.65). APC and USACE adopted an MOU in November 1967 on the operation of the Logan Martin Lake project, which, along with the USACE 1968 WCM for the project, is used to implement the prescribed regulations. The purpose of the MOU and the associated WCM is to clarify the responsibilities of the two agencies in operating the project for flood risk management and other purposes and to provide for the orderly exchange of hydrologic data (USACE, Mobile District 1968). In 2004, an administrative update to the Logan Martin water control manual was approved by SAM DE Col Pete Taylor.



Logan Martin Dam and Lake

Figure A-21

As part of the FERC relicensing process for the Coosa River Project, APC proposed to raise the winter pool at the Logan Martin Lake by 2 ft, from the existing winter elevation of 460 ft to 462 ft. From January 1 to April 14, the pool would be at 462 ft. Beginning on April 15, lake levels would gradually increase to the normal summer pool elevation of 465 ft by May 1. On October 1, the water elevation would begin to fall to the winter pool elevation (462 ft) by January 1 (FERC, 2009). That proposal could have had some adverse effects on the flood risk management function of the Logan Martin Lake project. Additional analyses (and NEPA documentation) would have been required to allow revisions to the operations. In May 2015, USACE completed a long-term effort to update the ACT River Basin Master Manual and the proposed APC changes were not updated at that time. As part of this current action, the proposed APC changes are now being considered. On July 9, 2018, a federal court overturned the FERC license for the Coosa River projects because of issues with the thoroughness of the EIS. The projects will continue to operate under their existing licenses until the issue is resolved.

APC has voluntarily established a drought curve for the Logan Martin Lake project at elevation 458 ft from the beginning of December to the end of March, which then rises to elevation 462 ft at the beginning of June and falls back to elevation 458 ft by the beginning of December (FERC, 2009). Establishing drought curves (or drought contingency curves) for selected APC projects in the ACT River Basin is discussed in more detail in sections A.1.1.4 and A.1.1.10. USACE and APC cooperatively developed a drought plan for the overall ACT River Basin as part of the update of USACE's Master Manual, which is presented in Exhibit C of the Master Manual.

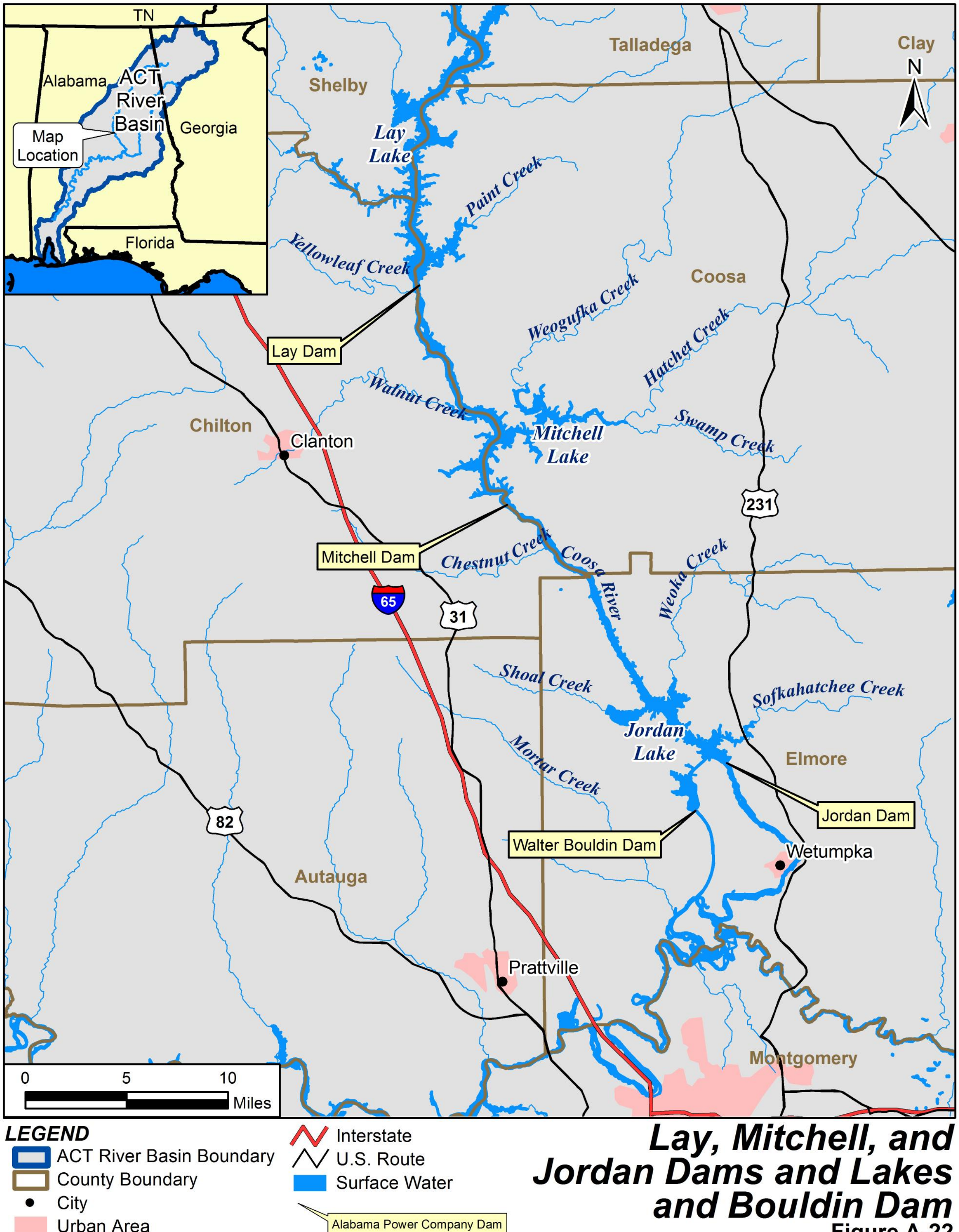
A.1.1.6 Lay Dam and Lake

Discharges from the Logan Martin Dam enter directly into the upper reaches of Lay Lake, which also is owned and operated by APC. Lay Lake extends from the tailwater area of the Logan Martin Lake 48 RMs downstream to Lay Dam. The 11,795-ac reservoir has about 289 mi of shoreline and a maximum depth of 88 ft (FERC, 2009). Figure A-22 provides a map depicting Lay Dam and Lake. The project's primary purpose is hydropower production, but the reservoir also provides storage for recreation, water quality, and water supply. A major paper product company also releases treated wastewater into Lay Lake. The reservoir is typically maintained near the top of the conservation pool (396 ft) but can be drawn down 1 ft to meet high power demands. The power plant operates as necessary to keep the lake from exceeding the top of the conservation pool. Generally, the project is operated in a run-of-river mode, releasing daily outflows that approximate reservoir inflows. The generating capacity of the Lay Lake project is 177 MW. Discharges from the powerhouse enter the upper reaches of the Mitchell Lake immediately downstream.

Although Lay Lake has no flood risk management storage, APC coordinates the operation with other projects on the Coosa River to minimize flooding. Lay Lake is also operated together with the Mitchell Lake and Jordan Dam and Lake projects to maintain downstream flow requirements on the weekend, since the upper storage projects do not normally operate then. Lay Lake contributes its run-of-river flows in meeting the downstream requirements at Jordan Dam and Lake.

A.1.1.7 Mitchell Dam and Lake

Discharges from Lay Lake enter directly into the upper reaches of Mitchell Lake, owned and operated by APC. Mitchell Lake extends from the tailwater area of Lay Lake 14 RMs downstream to the Mitchell Dam. The 5,855-ac reservoir has 147 mi of shoreline and a maximum depth of 90 ft (FERC, 2009). Figure A-22 provides a map depicting Mitchell Dam and Lake.



Lay, Mitchell, and Jordan Dams and Lakes and Bouldin Dam

Figure A-22

Mitchell Lake is operated by APC primarily for hydropower production. The project is operated in a run-of-river mode with a daily inflow basically equaling outflow. Discharges from the powerhouse enter the upper reaches of the Jordan Dam and Lake reservoir immediately downstream (FERC, 2009). The reservoir also provides storage for recreation, water quality, and water supply. APC maintains the reservoir as close to the top of the conservation pool as possible (312 ft). If necessary, the reservoir can be drawn down 1 ft to meet power demands. The project has a generating capacity of 170 MW. There is no flood risk management storage at the Mitchell Lake project.

Mitchell Lake is operated together with Lay Lake and Jordan Dam and Lake to maintain downstream flow requirements on the weekend, since the upper storage projects do not normally operate then. Mitchell Lake contributes its run-of-river flows in meeting the downstream requirements at Jordan Dam and Lake.

A.1.1.8 Jordan Dam and Lake and Bouldin Dam

Discharges from Mitchell Lake enter directly into the upper reaches of Jordan Dam and Lake. Jordan Lake extends from the tailwater area of the Mitchell Lake development downstream 18 mi to Jordan Dam. The reservoir has 118 mi of shoreline and a maximum depth of 110 ft. Jordan Dam and Lake and Bouldin Dam are the farthest downstream of the APC facilities on the Coosa River. Jordan Lake is a 5,890-ac reservoir at its normal elevation of 252 ft. The Bouldin Dam is on a 3-mi-long forebay canal about 1 mi upstream from Jordan Dam and Lake. Its tailrace canal is 5 mi long and discharges into the Coosa River downstream of Jordan Dam and Lake near the confluence of the Tallapoosa and Coosa rivers at Wetumpka, AL. The Bouldin Dam forebay and intake canal have a surface area of 734 ac and a maximum depth of 52 ft. Figure A-22 provides a map depicting Jordan Dam and Lake and Bouldin Dam.

The Jordan Dam and Lake and Bouldin Dam projects provide for hydropower generation by APC and have generating capacities of 100 MW and 225 MW, respectively. APC normally operates them in a run-of-river mode, with daily inflow basically equaling outflow. Discharges from the projects enter the Coosa River near Montgomery, AL. Normal operations maintain a lake level near elevation 252 ft throughout the year, with no storage available for flood risk management. The lake level is frequently lowered by up to 1 ft to meet power or minimum flow demands (FERC, 2009).

APC operates Lay Lake, Mitchell Lake, and Jordan Dam and Lake as necessary to maintain downstream flow requirements on the weekend since the upper storage projects normally do not operate then. Jordan Dam and Lake is the only APC project on the Coosa River that has a FERC mandatory minimum flow for ecological and recreational purposes. Flow releases are also made from the Jordan project to support navigation on the Alabama River. More discussion is found in the Navigation discussion in section A.1.2.3. APC has operated the Jordan Dam and Lake under minimum flow requirements since the late 1960s. Those requirements have been modified on several occasions, with the most recent modification implemented in July 2001. The current flow requirements are summarized as follows:

- April 1 through May 31: 4,000 cfs continuous flow from 12 p.m. to 6 a.m., and 8,000 cfs pulse flow from 6 a.m. to 12 p.m.
- June 1 through June 15: Reduce continuous 4,000 cfs flow at a rate of 66.7 cfs per day, and reduce 8,000 cfs pulse flow at a rate of 133.3 cfs per day.
- June 16 through June 30: Continue to reduce continuous flow at a rate of 66.7 cfs per day, and eliminate pulse flow.
- July 1 through March 31: 2,000 cfs continuous flow at all times.
- Recreation flows—June 16 through October 31: Flows to vary from 4,000 to 10,000 cfs, depending on weekend day, holiday, and time of day, but may be suspended because of insufficient inflow; lower reservoir levels at the upstream Weiss, H. Neely Henry, and Logan Martin lakes; or releases causing DO levels to fall below 4 milligrams per liter (mg/L) (FERC, 2009).

All flows in excess of the minimum flow requirement at Jordan Dam and Lake pass through a canal to Bouldin Dam. Flows greater than the penstock capacity at Bouldin Dam of 30,000 cfs are passed through the Jordan Dam turbines or spillway. Bouldin Dam has no minimum flow requirements and no spillway.

A.1.1.9 R.L. Harris Dam and Lake

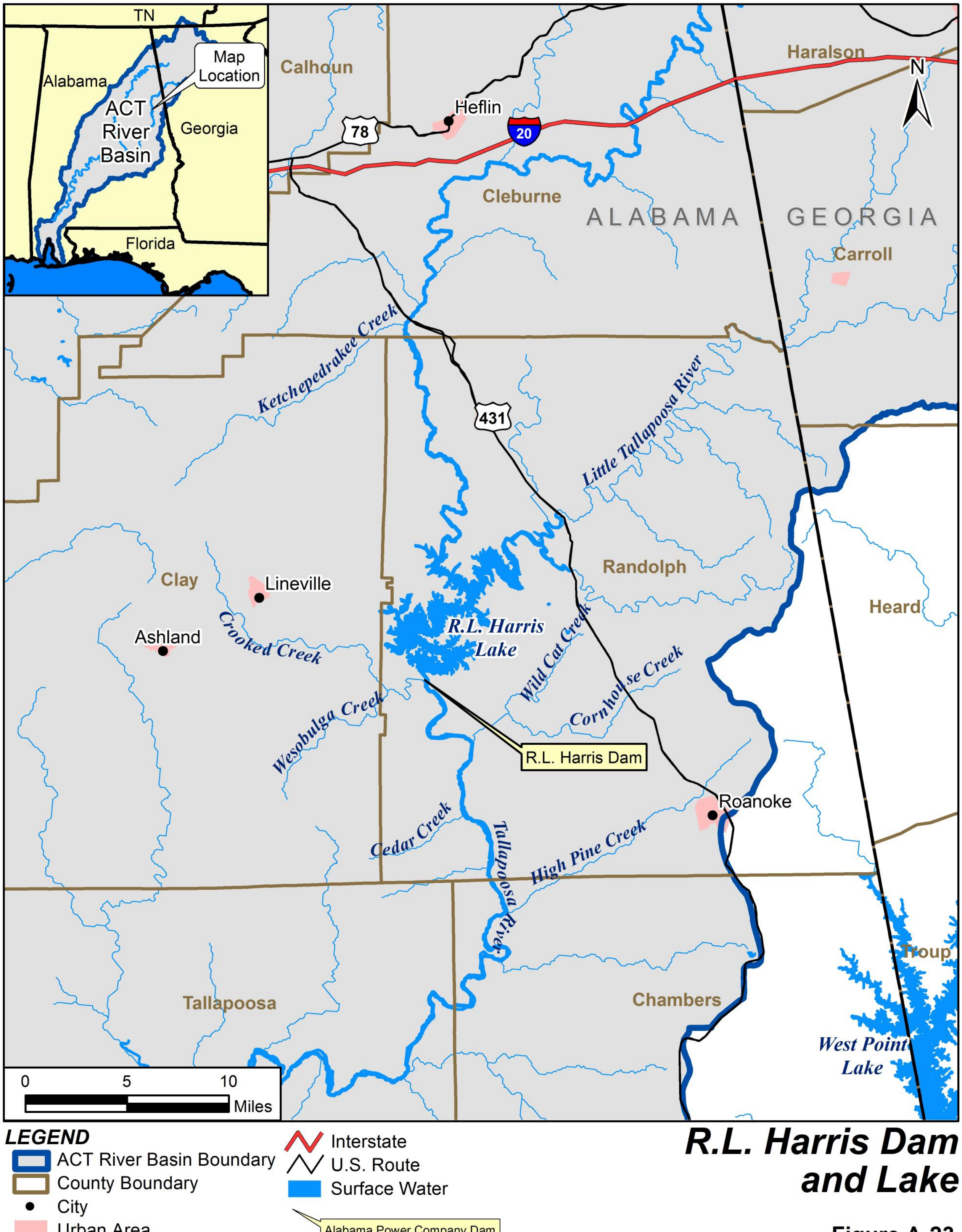
The R.L. Harris Dam and Lake project is an APC facility on the Tallapoosa River (Tallapoosa RM 139.1) in Randolph and Clay counties, AL. R.L. Harris Dam, completed in 1983, is the furthest upstream of a series of four APC dams on the Tallapoosa River. The other three dams are discussed in the following subsections. R.L. Harris Dam and Lake provide for hydropower generation, flood risk management, and recreation as well as for minimum continuous downstream releases for fish and wildlife conservation and water quality purposes. Figure A-23 provides a map of R.L. Harris Lake. The lake created by R.L. Harris Dam extends for 29 mi up both the Tallapoosa and the Little Tallapoosa rivers. The reservoir summer level is elevation 793 ft, which provides total storage of 425,721 ac-ft and a surface area of about 10,660 ac. During the flood season, the reservoir is normally maintained at elevation 785 ft, which provides 100,108 ac-ft of storage for flood risk management operations (USACE, Mobile District 2003a). Available conservation storage for hydropower generation and other purposes is 207,317 ac-ft (USACE Mobile District, 2014a).

The project has 135 MW total generating capacity. The penstock capacity is 16,000 cfs. APC operates the R.L. Harris Dam in a peaking mode, generating power as demands dictate, typically on a Monday through Friday schedule. The power plant is operated as needed to keep the lake from exceeding the guide curve (or top of conservation pool—summer elevation 793 ft, winter elevation 785 ft). When the reservoir is above the guide curve, releases are made in accordance with prescribed operating plans for flood risk management. The power plant can be used to meet any required releases or supplement the spillway releases as needed to satisfy the designated outflow requirements. APC operates R.L. Harris Dam to maintain a continuous minimum flow of 45 cfs at the Wadley gage (USGS 02414500), which is about 15 mi downstream of the dam (USACE Mobile District, 2014b).

Operations for flood risk management are conducted in accordance with regulations prescribed by the Secretary of the Army (33 CFR 208.65). Before beginning construction of the R.L. Harris Dam and Lake, APC and USACE adopted an MOU (dated September 27, 1972) on the project's operation. The purpose of the MOU was to clarify the responsibilities of the two agencies in operating the project for flood risk management and other purposes and to provide direction for the orderly exchange of hydrologic data. Following completion of the R.L. Harris Dam and Lake, the operating instructions for flood risk management were modified, as reflected in a revised MOU (1990) and in the USACE WCM for the R.L. Harris Dam and Lake project (USACE, Mobile District 2003a). The manual also was updated in May 2015 along with the WCMs for other projects in the basin (USACE Mobile District, 2015a).

Beginning in 2003, USGS's Alabama Cooperative Fish and Wildlife Research Unit, U.S. Fish and Wildlife Service (USFWS), APC, Alabama Department of Conservation and Natural Resources (ADCNR), Alabama Rivers Alliance, and other stakeholder interests (e.g., local government, property owners, and environmental organizations) initiated efforts to develop a stakeholder-based approach to adaptive management using structured decision analysis. The reach downstream of R.L. Harris Dam was selected as the study site, and the management issues have focused on the effects of the hydropower operation on values associated with the Tallapoosa River, including ecosystem health, aquatic species populations, power production, economic development potential reservoir user satisfaction, river landowner satisfaction, and river boater satisfaction (Irwin and Kennedy 2008). To develop that model, the stakeholder group addressed the following objectives (Kennedy et al. 2006):

- Determine stakeholder values and objectives.
- Develop models relating aquatic community (specifically fish) responses to changes in habitat and flow regime.



R.L. Harris Dam and Lake

Figure A-23

- Develop decision models for evaluating the impacts of current and alternative dam operating procedures on stakeholder-valued outcomes.
- Develop explicit recommendations for alternative dam operating procedures that will produce the information for resolving key uncertainties about the effects of dam operation on the aquatic community.

Since the process was initiated, the stakeholder group has considered, tested, and monitored various operational adjustments. Monitoring and evaluation is continuing, and the stakeholder group continues to work collaboratively on effective dam operating strategies.

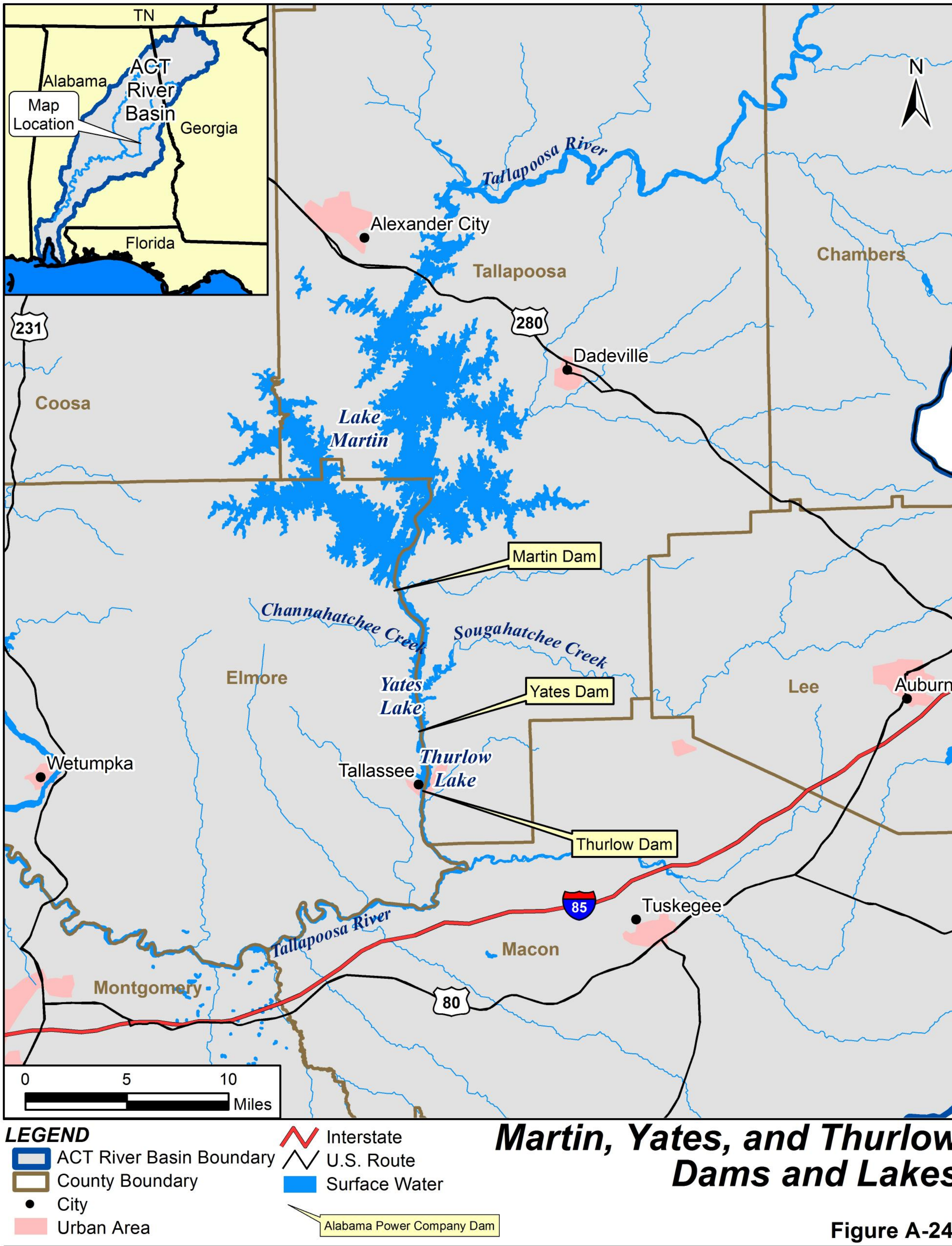
A.1.1.10 Martin Dam and Lake

Martin Lake is a 31-mi-long APC impoundment in Coosa, Elmore, and Tallapoosa counties, AL, on the Tallapoosa River, near Dadeville, in east-central Alabama. Martin Dam is approximately 60.6 RMs upstream of the junction of the Tallapoosa and Coosa rivers, which forms the Alabama River, and 79.5 RMs downstream of R.L Harris Lake. Figure A-24 provides a map depicting Martin Dam and Lake.

The lake has 880 mi of shoreline and a surface area of 39,210 ac. Martin Lake is a multipurpose storage project with a total storage capacity of 1,628,303 ac-ft and available conservation storage of 1,202,340 ac-ft (USACE Mobile District, 2014a). The lake has a normal summer full pool elevation of 491 ft NGVD29 and a mandatory drawdown of 7 ft in the winter months. The lake level fluctuates seasonally to provide the benefits the project was built to support, including hydropower, limited seasonal flood risk management when the reservoir is in drawdown condition, recreation, M&I water supply, water quality enhancement, aquatic flow maintenance, and navigation flow support. The normal tailwater elevation is 343 ft.

APC began construction of the project in 1923, and it was placed in service with three generating units in 1926. APC added a fourth generating unit in 1952. Project features include a concrete gravity dam with an earth dike section about 2,000 ft long and a maximum height of 168 ft; a 720-ft-long gated spillway section with 20 spillway gates; headworks containing 12 intake gates and four steel penstocks; and a powerhouse, containing four vertical Francis turbines that power four generating units for a total installed capacity of 182.5 MW. The project's intake structures' inverts are 68 ft below normal full pool elevation.

Martin Lake is usually operated for peaking hydropower generation on Monday through Friday. During generation, the dam's four turbines release up to 17,900 cfs. There is no specific continuous minimum flow release requirement at Martin Lake. Hours of generation per day depend on reservoir inflow. Normally, the project operates for at least 8 hours daily on weekdays and 5–6 hours on Saturday, as needed. The project does not typically operate on Sunday. On average, Martin Lake generates about 40 percent of the electricity of APC's Tallapoosa River fleet of dams. In addition, Martin Lake contributes to the energy that is generated at Yates and Thurlow lakes because of its ability to store and release water that would otherwise be spilled. Because of Martin Lake's operational flexibility, it can store water during low electrical usage periods and then use the same water to generate during periods of high electrical usage when production costs would normally be higher.



Martin, Yates, and Thurlow Dams and Lakes

Figure A-24

APC uses three different guide curves in its operations of Martin Lake—the flood control guide, the operating guide, and the drought contingency curve. Figure A-25 illustrates those curves. APC has defined and uses these terms to describe the operation of its projects, and they might be different than the terminology used by USACE to describe operation of its reservoirs (such as action zones).

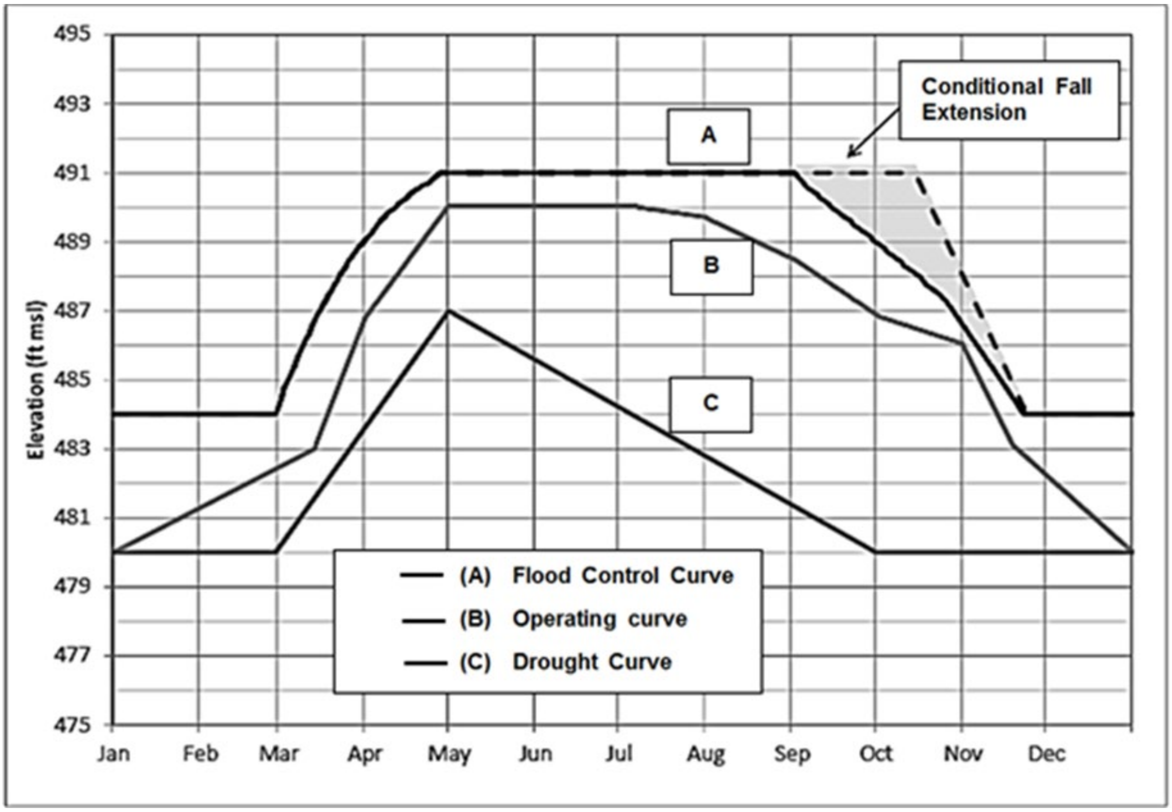


Figure A-25. Martin Lake, Tallapoosa River, APC Guide Curve

The flood control curve reflects the maximum elevation at which the lake may be maintained before implementing the flood control provisions summarized below. On January 1, the curve is at elevation 484 feet mean sea level and remains at this elevation until February 28, when filling begins. The curve gradually rises until it reaches elevation 491 feet msl on April 28. The curve remains at 491 feet msl until September 2, then is gradually lowered to 484 feet msl by the third week in November, and remains at 484 feet msl until December 31, except when the conditional fall extension is implemented. The conditional fall extension is discussed below.

Conditional Fall Extension. The licensee must initiate the following monitoring process on an annual basis to evaluate implementation of the Conditional Fall Extension. The flood control curve, identified in Article 402, must be at elevation 491 feet mean sea level (msl) from September 1 to October, provided that the following hydrologic and operational conditions are met:

1. Lake Martin is above its operating curve during September (487 to 488.5 feet msl);
2. the rolling 7-day average total basin inflow (i.e., the average of the total daily basin inflow for the previous 7 days recalculated on a daily basis for a given period of time) on the Tallapoosa River, calculated at Thurlow Dam, is at or higher than the median flow (i.e., the median of the recorded daily flows over the period of record for the particular day of interest);

3. the rolling 7-day average total basin inflow on the Coosa River, calculated at Jordan Dam, is at or higher than the median flow; and
4. the elevations at the Weiss, Neely Henry, and Logan Martin developments on the Coosa River and the R.L. Harris Project on the Tallapoosa River must all be within 1 foot of their respective operating curves.

No later than July 14 of each year, the licensee must monitor conditions daily. Beginning on September 1 of each year, once the four conditions are met, the Conditional Fall Extension will be implemented and continue to October 15. The normal reservoir drawdown to the winter pool must begin October 15.

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:

1. When the lake is above the flood control guide and between elevations 484 ft and 486 ft msl, the turbines at Martin Dam will be operated to provide for a continuous outflow from Thurlow Lake of at least the equivalent of the hydraulic capacity of the turbines at Yates Lake, approximately 12,400 cfs.
2. When the lake is above the flood control guide and between elevations 486 ft msl and 489 ft msl, turbines at Martin Dam will be operated to provide for a continuous outflow from Thurlow Lake of at least the plant capacity at that dam of approximately 13,200 cfs.
    a) With increasing inflows, the turbines at Martin Dam must be operated to provide an outflow from Thurlow Dam of at least the equivalent of the hydraulic capacity of the turbines at Thurlow Dam (about 13,200 cfs).
    b) With decreasing inflows, the turbines at Martin Dam must be operated to provide for an outflow from Thurlow Dam of at least the equivalent of the hydraulic capacity of the turbines at Yates Dam (about 12,400 cfs).
3. When the lake is above the flood control guide and above elevation 489 ft msl, turbines at Martin Dam will be operated as in number 2 above. In addition, as required to avoid rising above elevation 491 ft-msl, the project will be operated to provide an outflow from Martin Dam at least equivalent to all turbine units available operating at full gate, and the spillway gates will be raised so that the reservoir will not exceed elevation 491ft, up to a discharge capacity of 133,000 cfs.
4. During periods when inflow exceeds the total hydraulic capacity of the turbines, the 3-hour average outflow rate from Lake Martin must not exceed the concurrent 3-hour average inflow rate, except to evacuate surcharge storage which may be accumulated after the period of peak inflow. This measure should ensure that the outflow from Lake Martin is lower than the inflow.
5. APC must continue its current practice of notifying the National Weather Service (NWS) when spillway gate operation is used in flood control operations and must continue to share data with the NWS' Southeast River Forecast Center (SERFC), and the USACE.

The middle curve reflected on Figure A-25. is the APC *operating guide*, which was developed in the 1970s through discussions with homeowner and boat owner groups that preferred a higher pool elevation with less seasonal fluctuation than had been experienced historically. Under the original FERC license for Martin Dam and Lake (1923), APC often operated the project in a manner that lowered the lake 20 or more feet below the elevation 491 ft. As part of the relicensing of the project during the 1970s, APC and stakeholders agreed that the normal project operation should maintain a higher pool elevation. The area between the flood control guide and the operating guide represents the range in which APC will operate Martin Lake under normal conditions. APC attempts to maintain Martin Lake at or near the upper end of that operating range as often as possible. By operating the project at or near the flood control guide*,* APC can optimize the project benefits and improve the likelihood that Martin Lake can refill to near full pool each summer. When the lake elevation drops below the operating guide for extended periods, APC begins to restrict discharges to those necessary to fulfill requirements that include critical electrical system needs, downstream flow augmentation for navigation, water quality, fish and wildlife conservation, and M&I water supply purposes until lake levels can recover.

The lower curve on Figure A-25. is the APC *drought contingency curve*, which provides an indication of impending hydrologic drought conditions. During the 1990s, APC developed drought contingency curves for Martin Dam and its other hydropower projects. The intent of the curve is to indicate when the project is considered to be under drought conditions. The Martin Lake drought contingency curve does not directly trigger a change in operations. It is used as one of several factors in evaluating drought reservoir operations. The curve was developed to reflect drought operations that occurred in 1986 and 1988. In the recent droughts of 2000 and 2007, reservoir operations did not change immediately when Martin Lake fell below the drought contingency curve, but that occurrence was one of several factors used in planning reservoir operations in coordination with APC's other reservoirs and USACE's reservoirs in the ACT River Basin during the past two droughts. USACE and APC cooperatively developed a drought plan for the overall ACT River Basin as part of the update of USACE's Master Manual, which is presented in Exhibit C of the Master Manual.

FERC issued APC a 40-year license for the continued operation of the Martin Dam and Lake in May 1978. During the life of the previous license, FERC issued an Order Amending License in August 2003 approving turbine upgrades at the dam for units 1, 2, and 3. Those upgrades were completed in February 2005.

APC filed a Notice of Intent and preapplication with FERC to initiate the relicensing process in June 2008. As part of the process, APC evaluated the effects of a change in the winter guide curve on environmental, recreational, cultural, and socioeconomic resources; flood risk management; and power generation based on stakeholder input requesting the change be considered. Using modeling tools, APC evaluated the possibility of raising the winter guide curve elevation of Martin Lake or extending the time that Martin Lake is at summer pool. APC did not propose any operational change that would adversely affect or require a change to the minimum release downstream of Thurlow Lake. USACE participated in the FERC relicensing process for Martin Dam with respect to potential effects on the USACE projects in the ACT River Basin. A change in the winter guide curve for Martin Lake was not considered as part of the ACT WCM update process. The final EIS for the FERC relicensing process for Martin Lake was circulated for public review on April 2, 2015. The final EIS addressed an APC proposal to raise the winter pool at Martin Lake by 3 ft to elevation 484 ft NGVD29) and to extend the summer pool elevation of 491 ft NGVD29 from September 1 to October 15 (Conditional Fall Extension). On December 17, 2015, FERC issued the new license for Martin Dam and Lake.

A.1.1.11 Yates Dam and Lake

Yates Dam and Lake, completed in 1928, is the third in a series of four APC projects on the Tallapoosa River. The project is at Tallapoosa RM 52.7, about 7.9 mi downstream of Martin Dam. Figure A-24 provides a map depicting Yates Dam and Lake. The project's primary purpose is hydropower, but the reservoir also provides for recreation, water quality, and water supply. APC coordinates the Yates Lake operation with the other Tallapoosa River projects to minimize flooding. Releases from Martin Dam flow directly into the headwaters of Yates Lake. The lake has a surface area of 2,004 ac and a storage capacity of 53,908 ac-ft. Yates Lake has an open-crest spillway with an elevation of 345 ft. Flows in excess of turbine capacity flow over the spillway. The project has a 44.25-MW powerhouse with a hydraulic capacity of approximately 12,400 cfs (APC 2008).

APC operates Yates Dam with the downstream Thurlow Dam to meet a 1,200-cfs minimum flow requirement at Thurlow Dam on the weekend, because the upper two storage projects—R.L. Harris Dam and Martin Dam—do not normally operate then.

A.1.1.12 Thurlow Dam and Lake

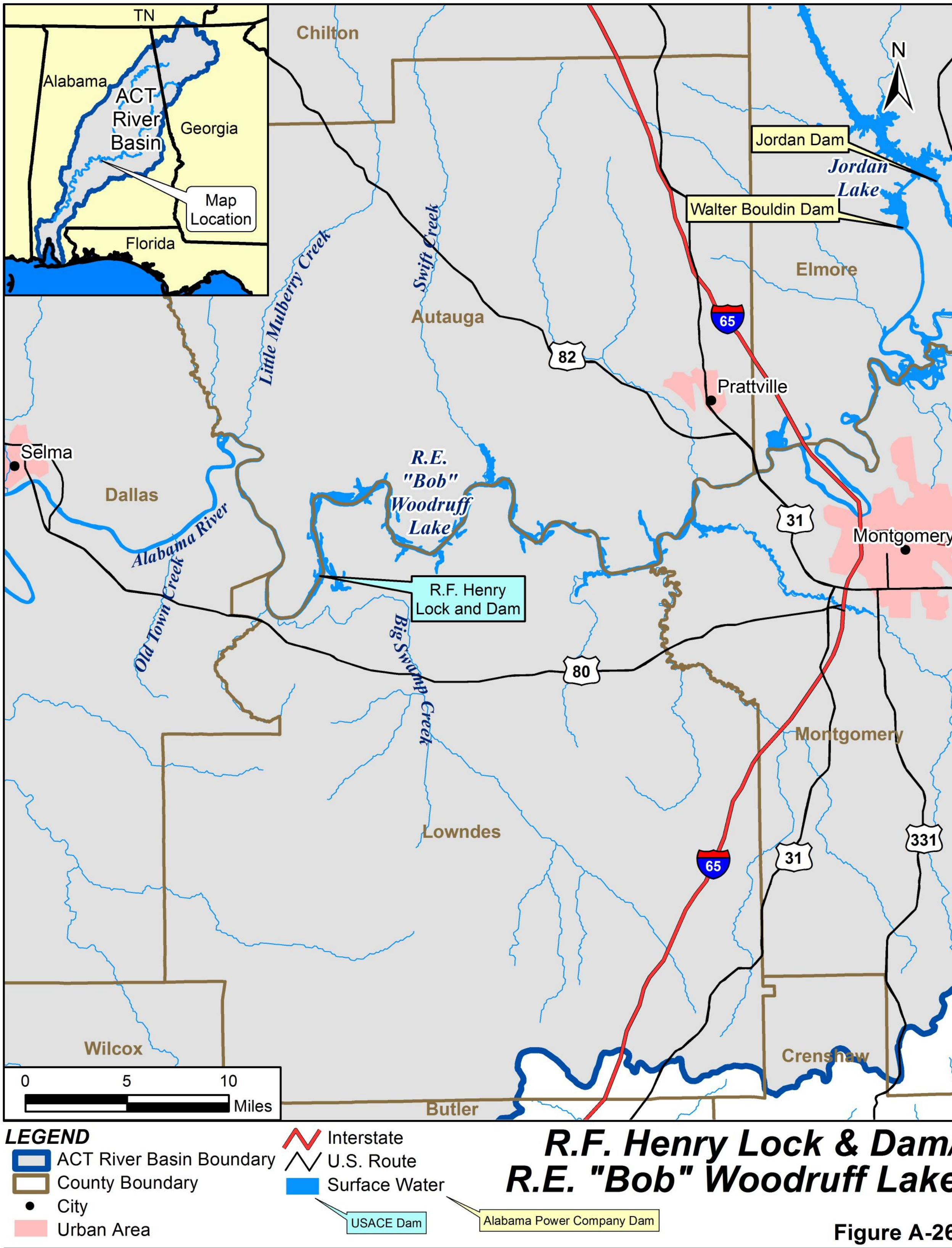
Thurlow Dam and Lake, completed in 1930, is the fourth and farthest downstream of APC's dams on the Tallapoosa River. The project is at Tallapoosa RM 49.7, about 3.0 mi downstream of Yates Lake. Figure A-24 provides a map that depicts Thurlow Dam and Lake. As stated above, APC operates Thurlow Lake with the Yates Lake project to meet downstream flow requirements on the weekend. Thurlow Lake's primary purpose is hydropower, but the reservoir also provides for recreation, water quality, and water supply. Thurlow Lake has no flood risk management storage. APC coordinates the Thurlow Lake operation with its other Tallapoosa River projects to minimize flooding and to provide support for navigation on the Alabama River. See section A.1.2.3.

Thurlow Lake is by far the smallest of the four Tallapoosa River reservoirs. Its surface area is 570 ac, and its total storage capacity is 17,976 ac-ft. APC typically operates the project at elevation 289 ft with little fluctuation. Generating capacity at Thurlow Lake is 81.35 MW with a hydraulic capacity of approximately 13,200 cfs. Downstream of Thurlow Lake, the Tallapoosa River flows unimpeded for 49 mi to its confluence with the Coosa River (APC 2008).

APC operates the Yates and Thurlow lakes as run-of-river projects that take advantage of peaking releases from Martin Lake. Since 1991, APC has provided a continuous 1,200-cfs minimum release from the Thurlow Lake powerhouse, other than in extreme drought conditions. On many occasions, releases from Martin Lake are necessary to allow the Thurlow Lake powerhouse to meet this requirement. Procedures are specified in the Yates and Thurlow lakes FERC license (FERC Project No. 2407) that reduce the release requirement at Thurlow Lake whenever inflows to the Yates and Thurlow lakes are abnormally low. Normal flows downstream of Thurlow Lake typically vary from 1,200 cfs to 17,900 cfs (APC 2008). APC operates its reservoirs on the Coosa and Tallapoosa rivers to provide Jordan-Bouldin-and Thurlow (JBT) releases of at least 4,640 cfs (weekly average) near Montgomery, AL.

A.1.1.13 Robert F. Henry L&D and R.E. "Bob" Woodruff Lake

R.E. "Bob" Woodruff Lake is created by the Robert F. Henry L&D (formerly known as Jones Bluff L&D), 281 mi upstream of Mobile Bay. This is the furthest upstream of three USACE projects on the Alabama River, also known as the Alabama River lakes. R.E. "Bob" Woodruff Lake extends from the Robert F. Henry L&D upstream to Bouldin Dam. Montgomery, AL, is near the headwaters of the lake. Figure A-26 is a vicinity map depicting Robert F. Henry L&D and R.E. "Bob" Woodruff Lake. The project purposes are fish and wildlife conservation, hydropower, navigation, recreation, and water quality. The lake is a popular recreation destination, receiving up to 2 million visitors annually. In addition to management of project lands for fish and wildlife conservation, consistent with other project purposes, USACE acquired 10,566 ac of land along the lake in Lowndes County, AL, in the 1990s as part of a comprehensive mitigation plan for effects of construction of the Tennessee-Tombigbee Waterway in Alabama and Mississippi (Day, personal communication 2010). The Water Resources Development Act (WRDA) of 1986 authorized the mitigation plan. The acquired lands are dedicated solely to intensive management for fish and wildlife mitigation. The property is on the left bank of the Alabama River, just upstream of the Robert F. Henry L&D, near Selma, AL. ADCNR manages the mitigation lands. ADCNR acquired additional contiguous lands with funding from other sources and manages the entire 12,531-ac site as the Lowndes Wildlife Management Area.



R.F. Henry Lock & Dam/ R.E. "Bob" Woodruff Lake

Figure A-26

R.E. "Bob" Woodruff Lake is 81.1 mi long with an average width of 1,300 ft. It has a surface area of 13,500 ac and a total storage capacity of 247,210 ac-ft (available conservation storage of 36,450 ac-ft) at a normal pool elevation of 126 ft. Lake levels are typically stable with minimal fluctuation, except for temporary periods during flood events when some increases are observed. There is a 9-ft-deep by 200-ft-wide navigation channel over the entire length of the lake. USACE operates the project for hydropower generation and navigation. The facility has a generation capacity of 82 MW. The Robert F. Henry L&D is operated in tandem with the downstream Millers Ferry L&D to provide an average daily outflow of 6,600-cfs downstream of Claiborne L&D and Lake for navigation and waste assimilation needs on the Alabama River. This flow is a nonmandatory minimum flow target or guide, representing the 7Q10 flow level (6,600 cfs) at the downstream Claiborne L&D and Lake. The *7Q10 flow* is defined as the lowest flow over a 7-day period that would occur once in 10 years. That flow level cannot be met in all circumstances, particularly under extreme drought conditions. Sections A.1.2.3.1 and A.1.2.6 provide more detailed information on the 6,600-cfs flow target and actions USACE takes when basin inflows are insufficient to meet that target.

Figure A-27, Figure A-28 and Figure A-29 depict typical release patterns that may occur at Robert F. Henry L&D over a 1-week period under normal, wet, and dry conditions respectively. Each figure presents data for inflows above Robert F. Henry L&D, lake elevations, and discharges from the dam. Robert F. Henry L&D functions as a run-of-river project, meaning that the natural flow and elevation drop of a river are used to generate electricity on rivers with a consistent and steady flow. The normal condition in Figure A-27 shows a relatively steady pool elevation and inflows.

Water is released daily in various durations to match the inflows coming into the project. The wet condition for Robert F. Henry L&D displays a continuous discharge because of high inflows (Figure A-28). A drop in the pool elevation occurs after a large volume of water is released and inflows lessen. Low inflows and a low pool elevation can be seen in Figure A-29 for the dry condition at Robert F. Henry L&D (Figure A-29). Discharges are kept to a minimum and in short duration to match low inflows that come into the system under this condition.

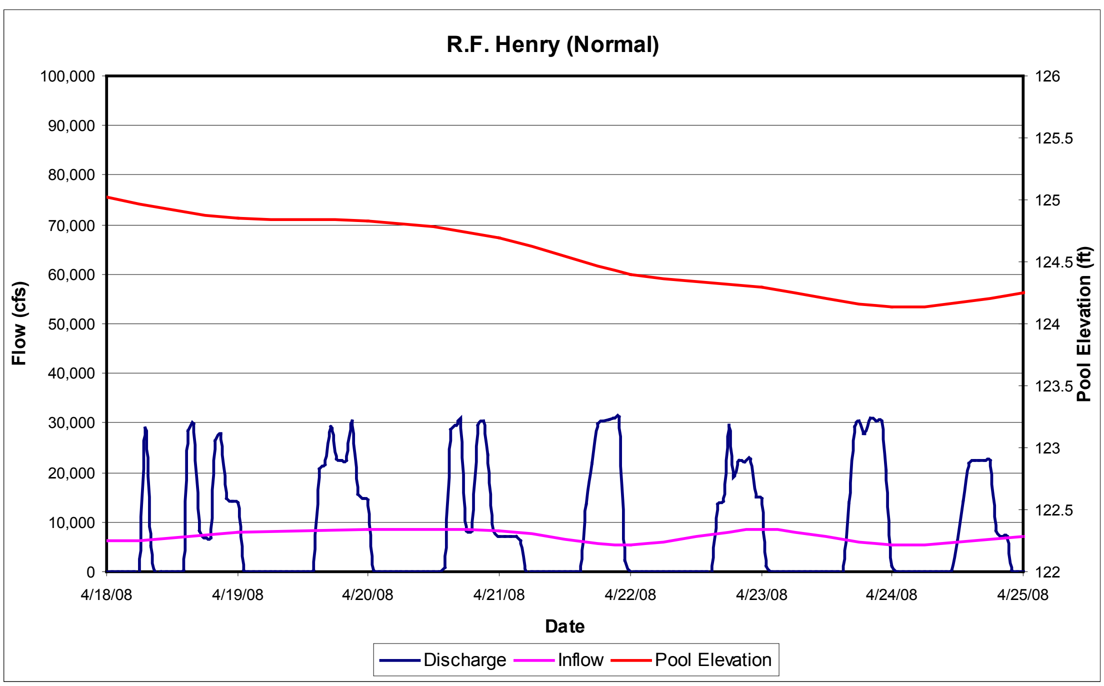
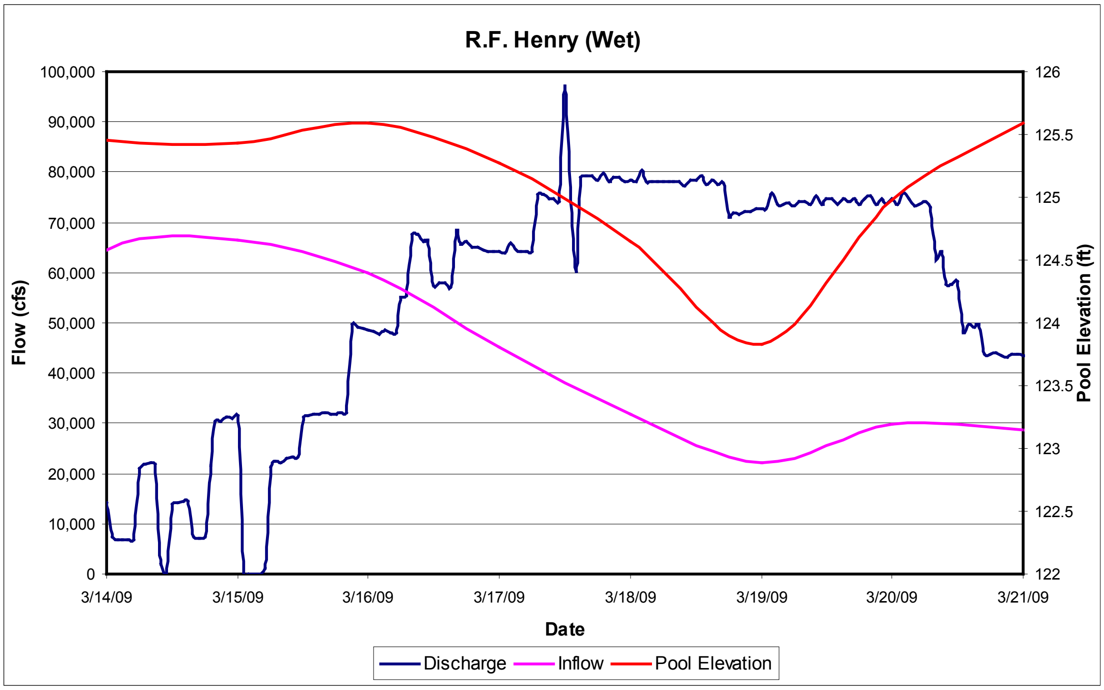
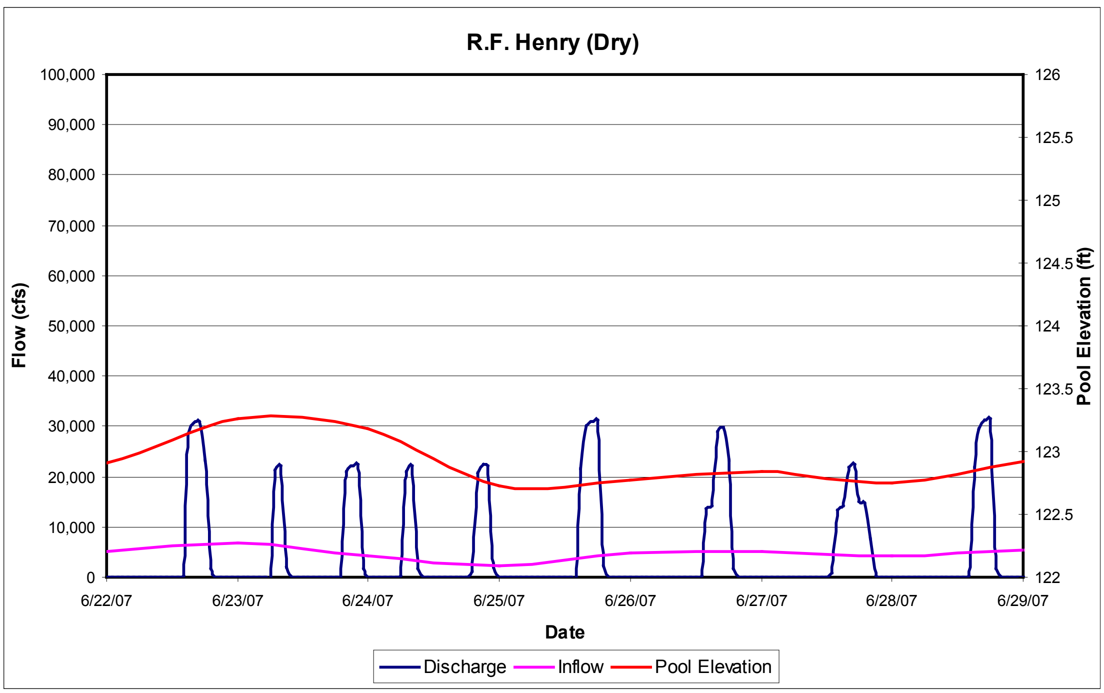


Figure A-27. Robert F. Henry L&D Typical Release Pattern in Normal Conditions.



1
2 **Figure A-28. Robert F. Henry L&D Typical Release Pattern in Wet Conditions.**



3
4 **Figure A-29. Robert F. Henry L&D Typical Release Pattern in Dry Conditions.**

Under normal and dryer conditions, hydropower generation at the Robert F. Henry L&D is not continuous. While operating as a run-of-river facility, it might generate several hours a day, 7 days per week, followed by hours of nongeneration. Consequently, tailwater stages might vary significantly daily because of these peak hydropower operations, characterized by a rapid rise in river stage immediately after generation is initiated and a rapid fall in stage as generation is ceased. Figure A-30 depicts river stages immediately downstream of Robert F. Henry L&D over a typical 1-week period under normal conditions. River stages may rise and fall by as much as 5–7 ft during periods of hydropower generation. Except during higher flow conditions when hydropower might be generated for more extended periods of time, this pattern of power generation and fluctuating stages in the tailrace is routinely repeated daily.

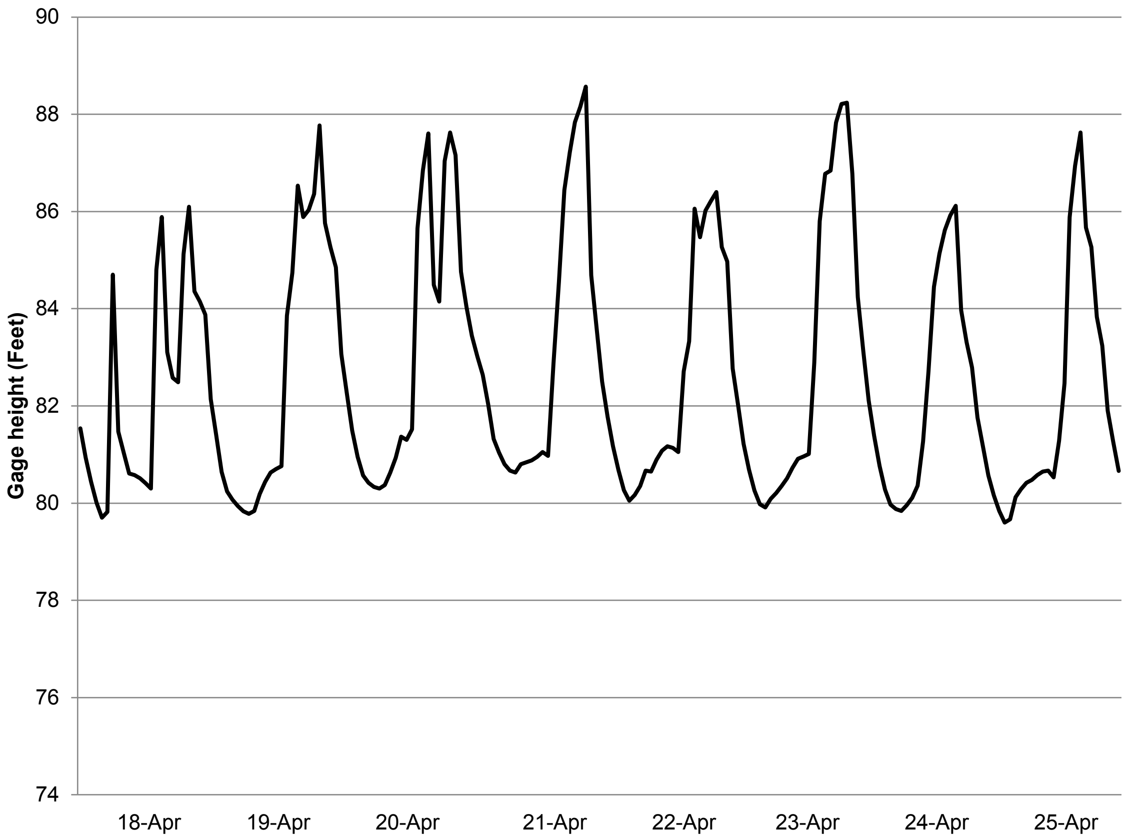
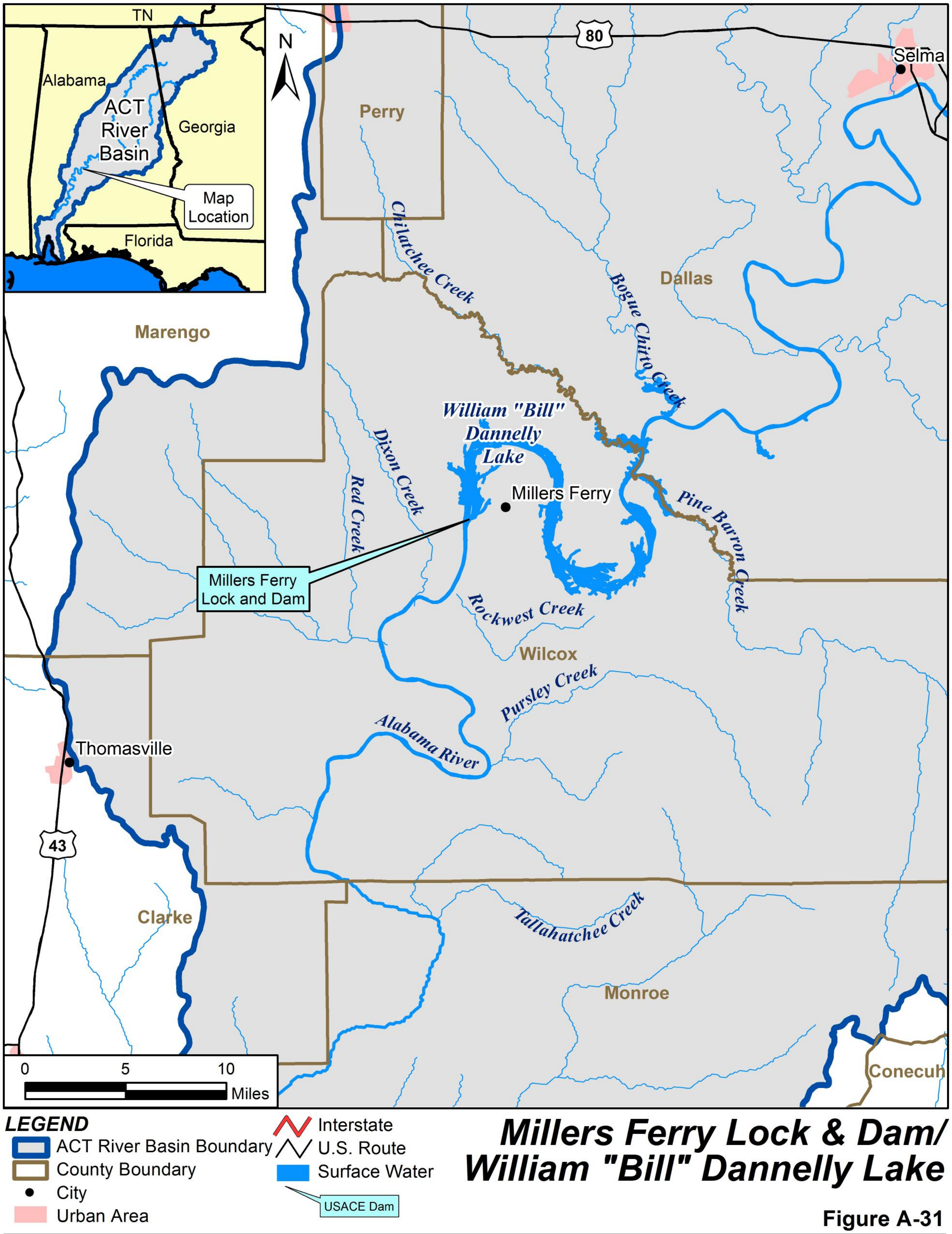


Figure A-30. Alabama River Downstream of Robert F. Henry L&D, near Selma, AL (USGS 02421351), Tailrace Gage Height (2011).

A.1.1.14 Millers Ferry L&D and William "Bill" Dannelly Lake

William "Bill" Dannelly Lake is created by the Millers Ferry L&D on the Alabama River, 178 mi upstream of Mobile Bay. William "Bill" Dannelly Lake is 103 mi long with an average width of almost 1,400 ft. The reservoir partially inundates several tributary streams. The Cahaba River flows into the upper reaches of William "Bill" Dannelly Lake. Figure A-31 is a vicinity map depicting Millers Ferry L&D and William "Bill" Dannelly Lake.



Millers Ferry Lock & Dam/ William "Bill" Dannelly Lake

Figure A-31

William "Bill" Dannelly Lake has a total storage capacity of 346,254 ac-ft (available conservation storage of 46,704 ac-ft), at a normal pool elevation of 80.8 ft. It has a surface area of 18,528 ac. There is a 9-ft-deep by 200-ft-wide navigation channel extending the entire length of the reservoir. The facility is a multipurpose reservoir constructed by USACE for both hydropower and navigation. The hydropower-generating capacity of the project is 90 MW. The reservoir also provides fish and wildlife conservation, recreation, and water quality benefits. In addition to managing project lands for fish and wildlife conservation, consistent with other project purposes, 1,703 ac of project lands are specifically designated for intensive management as part of a comprehensive mitigation plan for impacts from construction of the Tennessee-Tombigbee Waterway (Lyon, personal communication 2010). The WRDA of 1986 authorized the mitigation plan. A daily average minimum flow of 6,600 cfs is provided through Claiborne L&D for downstream navigation and assimilative flow needs on the Alabama River, as long as basin inflows are sufficient. Lake levels remain fairly stable on a day-to-day basis but rise slightly by up to 0.5 ft in wet weather. The reservoir provides ample recreation opportunities.

Figure A-32, Figure A-33, and Figure A-34 depict typical release patterns that can occur at Millers Ferry L&D over a 1-week period under normal, wet, and dry conditions, respectively. Each figure presents data for inflows above Millers Ferry L&D, lake elevations, and discharges from the dam. Millers Ferry L&D is operated as a run-of -river project. The normal condition depicted in Figure A-32 shows relatively steady inflows. Water is released daily in various durations to match the inflows coming into the project. A clear run-of -river pattern is seen in Figure A-33 for the wet condition at Millers Ferry L&D. The inflows are high for this period, which leads to higher discharges. Inflows and discharge both increase and decrease together to keep a steady flow of water through the system. The associated pool elevation also follows the same pattern for this weeklong period. A significant decrease in inflow can be seen in the dry condition hydrograph for Millers Ferry L&D. Discharges are kept to a minimum and in short duration to match low inflows that are coming into the system.

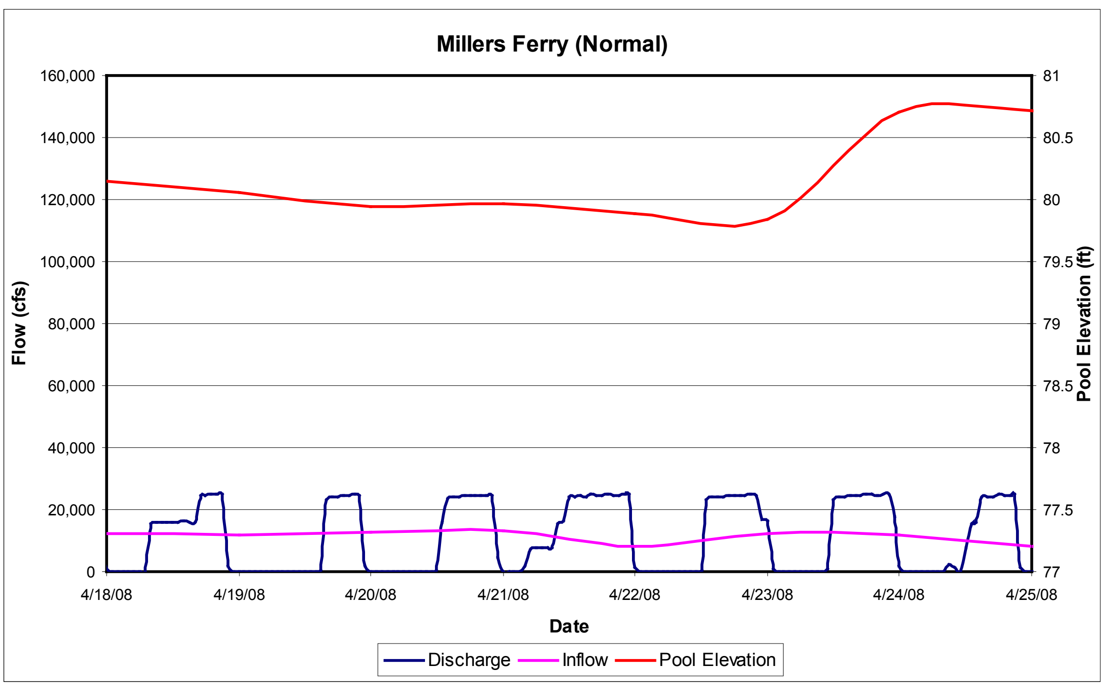


Figure A-32. Millers Ferry L&D Typical Release Pattern in Normal Conditions.

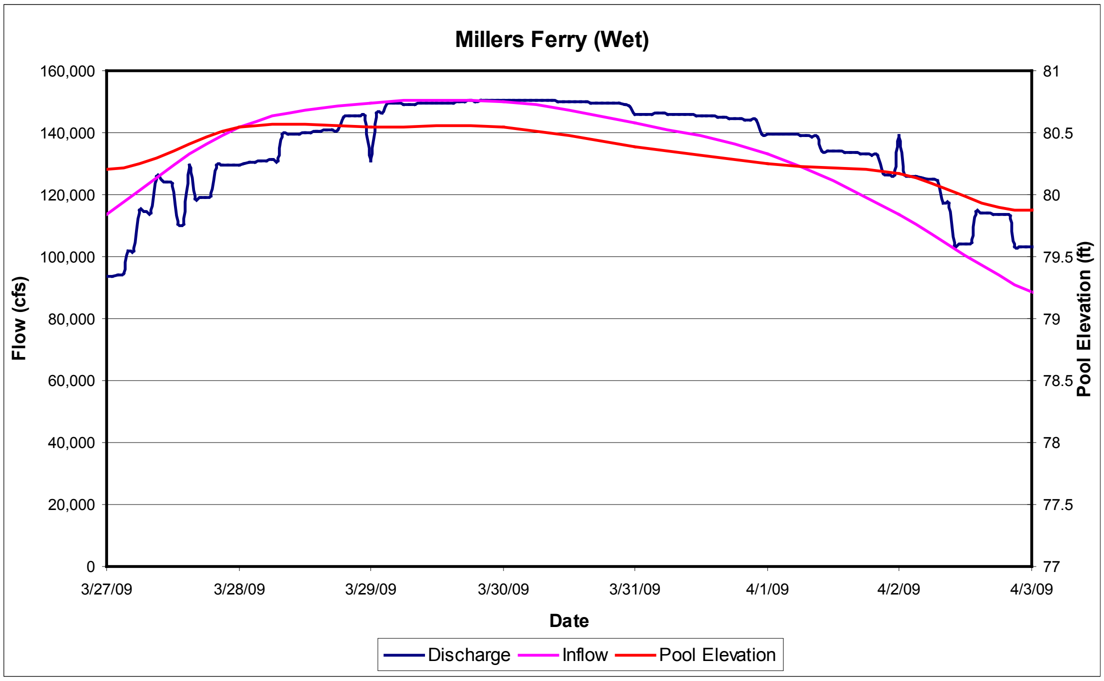


Figure A-33. Millers Ferry L&D Typical Release Pattern in Wet Conditions.

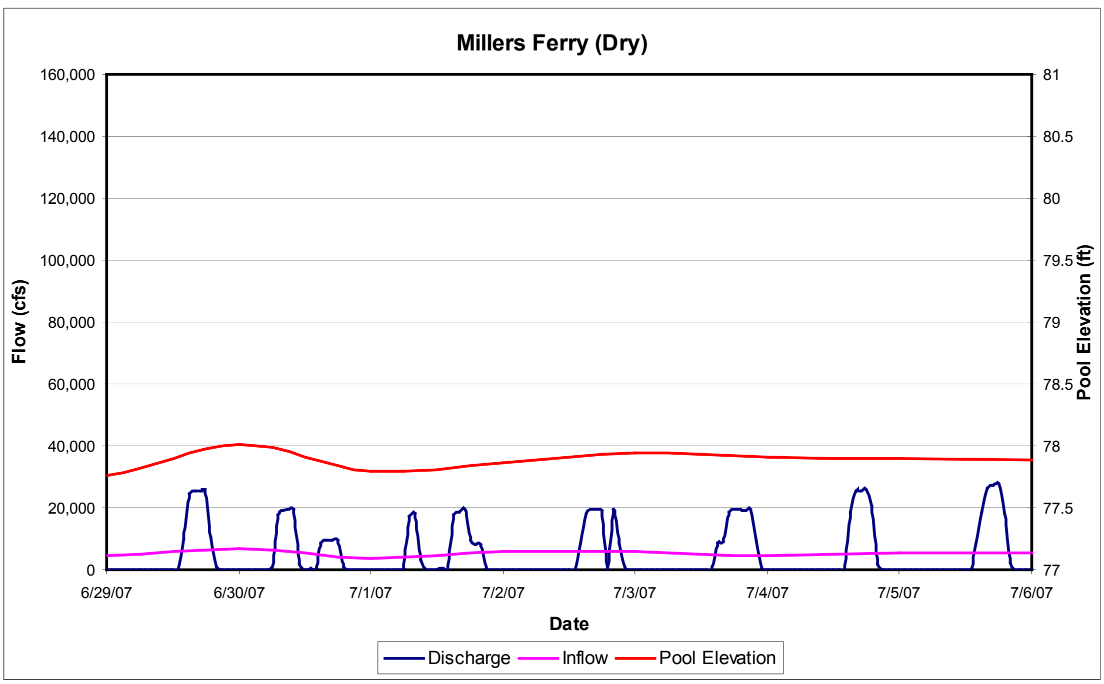


Figure A-34. Millers Ferry L&D Typical Release Pattern in Dry Conditions.

Under normal and dryer conditions, hydropower generation at Millers Ferry L&D is not continuous. While operating as a run-of-river facility, it might generate several hours a day, 7 days a week, followed by hours of nongeneration. Consequently, tailwater stages can vary significantly daily because of the peak hydropower operations, characterized by a rapid rise in river stage immediately after generation is initiated and a rapid fall in stage when generation is ceased. Figure A-35 depicts river stages immediately downstream of Millers Ferry L&D over a typical 1-week period under normal conditions. River stages can rise and fall by as much as 2.5–3.5 ft during periods of hydropower generation. Except during higher flow conditions, when hydropower can be generated for more extended periods of time, that pattern of power generation and fluctuating stages in the tailrace is routinely repeated daily.

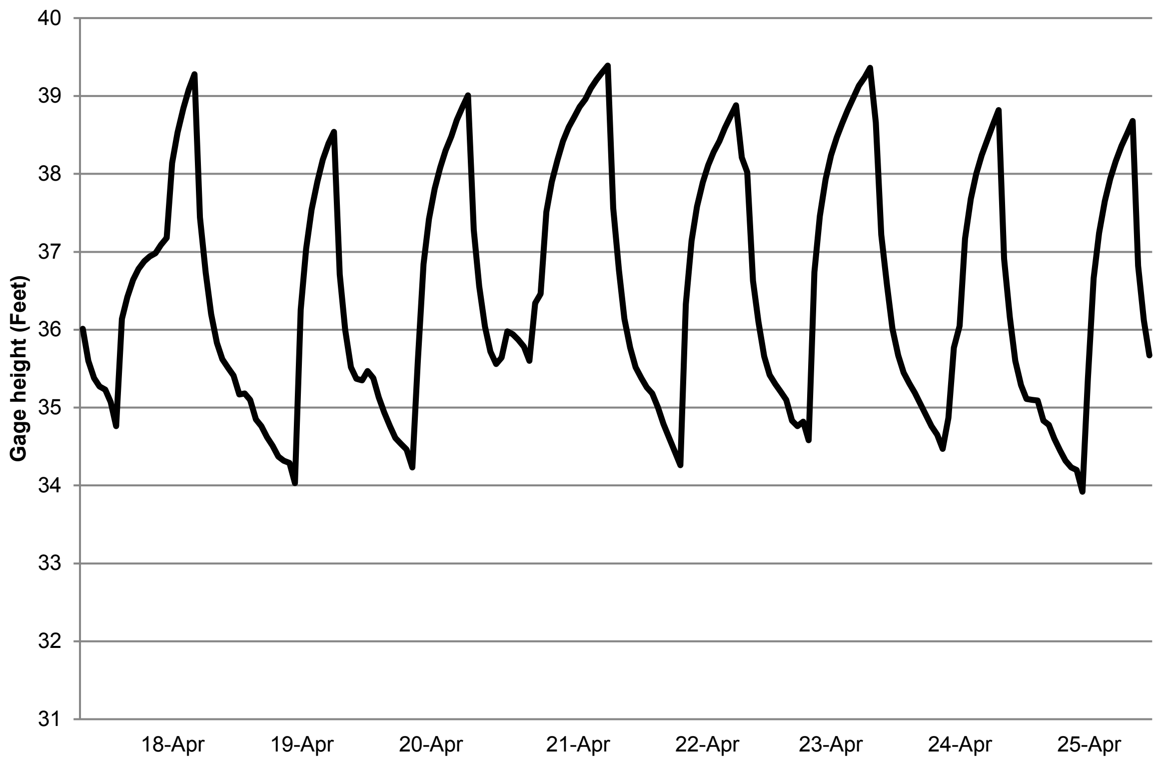
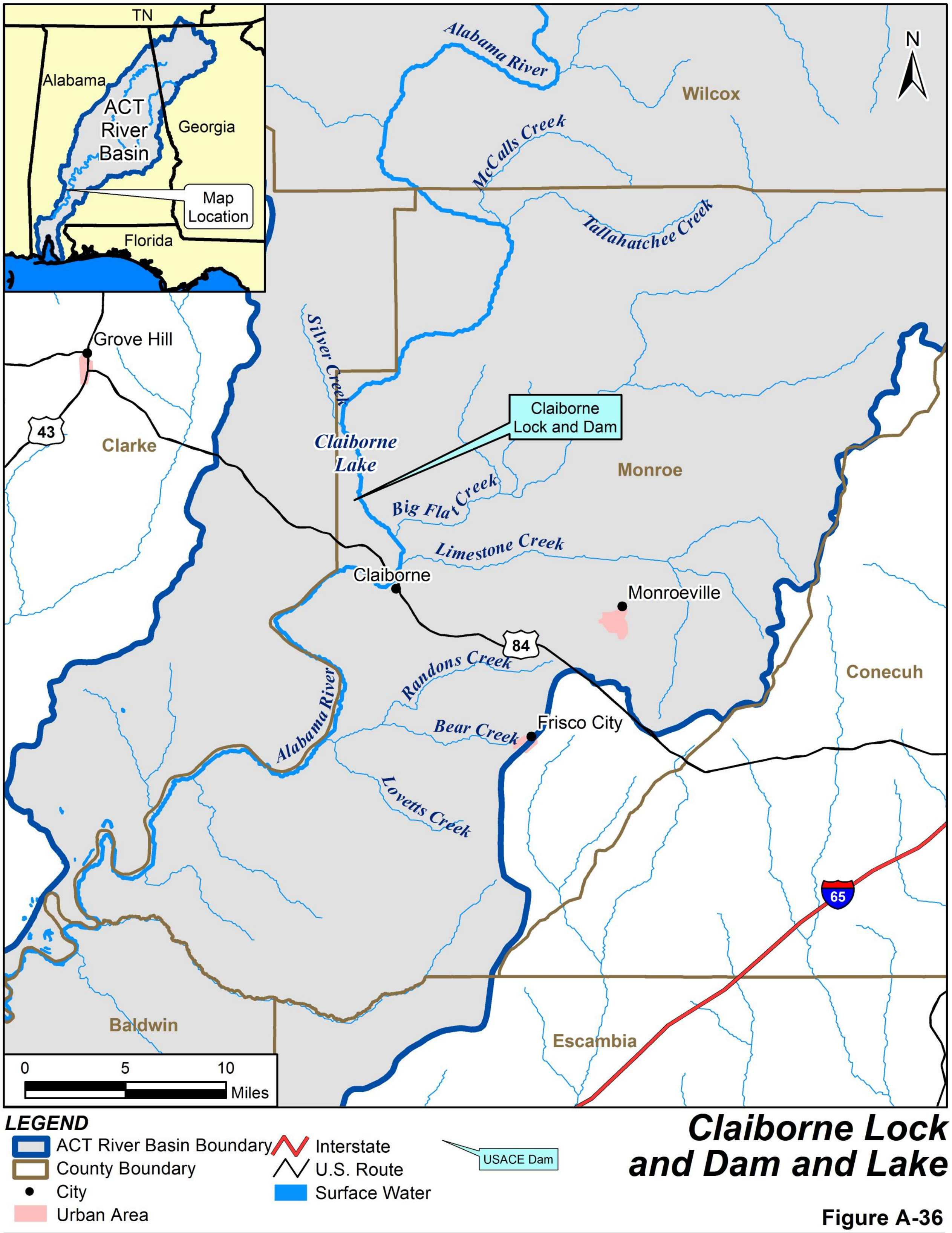


Figure A-35. Alabama River Downstream of Millers Ferry L&D (USGS 02427506), Tailrace Gage Height (2011).

A.1.1.15 Claiborne L&D and Lake

Claiborne L&D and Lake is on the Alabama River about 118 mi upstream of Mobile Bay. The lake created by the dam is similar to a wide river, with an average width of about 800 ft, with a surface area of 6,290 ac. Claiborne Lake extends 60 mi upstream to Millers Ferry L&D. Figure A-36 depicts Claiborne L&D and Lake. Total storage capacity in the lake is 102,480 ac-ft (negligible conservation storage) at a maximum operating pool elevation of 36 ft. The lake has a 9-ft-deep, 200-ft-wide navigation channel extending its entire length. The primary purpose of this project is navigation; it has no hydropower generating capability. The lake also provides fish and wildlife conservation, recreation, and water quality benefits. In addition to management of project lands for fish and wildlife conservation, consistent with other project purposes, 2,567 ac of project lands are specifically designated for intensive management as part of a comprehensive mitigation plan for impacts from construction of the Tennessee-Tombigbee Waterway (Lyon, personal communication 2010). The WRDA of 1986 authorized the mitigation plan.



Claiborne Lock and Dam and Lake

Figure A-36

Claiborne Lake is the most natural and undeveloped of the three Alabama River lakes. It remains mostly within its original banks and is surrounded by a rustic atmosphere. USACE is allowing the shoreline to revert to its natural state, providing important wildlife habitat. Recreation visitors number over 1 million annually (USACE, Mobile District 1998a).

Between May 1983 and February 1986, private sector hydropower interests pursued efforts to acquire a license from FERC to add nonfederal hydropower generation at the Claiborne L&D. FERC did not grant preliminary permits to any of these interests to proceed with detailed investigations. In July 1999, Universal Electric Power, Inc. (UEP) applied for and received a preliminary permit from FERC to pursue nonfederal hydropower development at Claiborne L&D (FERC Project No. 11629) (FERC, 2010d). In July 2002, the preliminary permit expired, and UEP applied for a new preliminary permit from FERC on August 20, 2002. The permit was reissued under FERC Project No. 12351 (FERC, 2013b). On June 9, 2003, UEP surrendered its preliminary permit for Claiborne L&D (P-12351) (FERC, 2013c).

In June 2004, AMG Energy, LLC applied for and received (a preliminary permit from FERC to pursue studies for nonfederal hydropower development at Claiborne L&D (Project No. 12485) (FERC, 2013d). AMG Energy completed feasibility studies and surrendered its preliminary permit in November 2006 (FERC, 2013e). The Alabama River Newsprint Company (ARNC) subsequently received a FERC preliminary permit in November 2007 to study nonfederal hydropower development at Claiborne L&D (FERC Project No. 12808) (FERC, 2013f). Having completed its evaluation and determining that the project was not economically feasible, ARNC surrendered its preliminary permit in April 2009 (FERC, 2013g).

In April 2010, Lock+ Hydro Friends Fund XIX, LLC (HFF XIX) (a subsidiary of Hydro Green Energy, LLC) received a preliminary permit from FERC to study proposed nonfederal hydropower development at Claiborne L&D (FERC Project No. 13519) (FERC, 2013h). HFF XIX filed a Draft License Application with FERC for the Claiborne Hydroelectric Project in March 2013 (FERC, 2013i), proposing to deploy two 11-MW hydropower turbines within a new powerhouse adjacent to the existing L&D and to construct associated intake and tailrace areas. The proposed project would include an inflatable rubber dam crest to be installed in the top of the existing overflow spillway at the L&D to increase the crest from elevation 33 feet to 36 feet. The inflatable rubber dam crest would be deflated when flows are sufficiently high to overtop it. In December 2013, FERC issued a successive preliminary permit and granted priority to file a license application to Lock+ HFF XIX (FERC, 2013j). A Final License Application for the project was filed with FERC by Lock+ HFF XIX on December 28, 2016 (Hydro Green Energy, LLC, 2016). In March 2017, FERC rejected the Final License Application filed by Lock+ HFF XIX because of major deficiencies (FERC, 2017). No other efforts are currently underway to pursue nonfederal hydropower development at Claiborne L&D.

Downstream of Claiborne L&D, the Alabama River flows about 72 miles farther to its confluence with the Tombigbee River to form the Mobile River. That reach of the Alabama River has a federally authorized navigation channel, authorized at 9-ft deep by 200-ft wide. The navigation channel is sustained by a combination of flows from Claiborne L&D, maintenance dredging, and training works. One major industry, Alabama River Cellulose LLC (a Georgia Pacific subsidiary), operates on that reach of the Alabama River about 3.5 miles downstream of Claiborne L&D and draws its water supply directly from the river.

A.1.2 Operations for Authorized Purposes

A.1.2.1 Flood Risk Management

Carters Lake provides flood risk management benefits to the rich farm lands along the Coosawattee and Oostanaula rivers. Peak flood stages are reduced as far downstream as Rome, GA, about 72 RMs downstream from the project. Flood risk management operations at Allatoona Lake reduce 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 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 affected by operations at Allatoona Lake. 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 sq mi), and Carters Lake controls about 9 percent of that area. The evacuation of flood storage at Allatoona and Carters lakes is coordinated so the combined discharges will not cause or aggravate flooding at Rome. Generally, the Allatoona Lake flood inflows are stored longer than the Carters Lake flood inflows because Allatoona has a larger flood storage capacity and a shorter routing time to Rome. Flood operations at the two lakes also assist in the flood risk management operation at Weiss Lake on the Coosa River by reducing the inflows into that project during flood events. The extent to which Allatoona Lake can manage flood risk from a storm depends on the rainfall distribution and movement, storm centering, and flood characteristics. Flood risk from general area storms tend to be more effectively managed because the local runoff downstream of Allatoona Lake will have flowed through Weiss Lake before the flood evacuation releases are required at Allatoona (USACE Mobile District, 2015a).

Weiss and Neely Henry projects contain about 14 percent of the conservation storage in the ACT basin and thus will have a minor impact on flood reduction for major events to areas downstream of these dams. The reduction in flood peaks at Gadsden, Alabama may be reduced from 1 to 2 feet through the evacuation plan at Neely Henry based on the following assumptions: floods with peak inflows of 80,000 to 90,000 cfs into the project, starting elevation of 507 feet NGVD29, and whether the event occurs in the winter or the summer. The flood regulation plan for Logan Martin Reservoir will provide substantial reductions in downstream flood peaks during minor and moderate floods. The limited amount of storage allocated to flood risk management will generally not affect any appreciable reduction in major flood peaks, but the available storage will be utilized through an induced surcharge schedule so that the peak discharge for major floods will not be any greater than would have occurred under natural conditions.

The Robert F. Henry L&D, Millers Ferry L&D, and Claiborne L&D projects on the Alabama River are run-of-river projects and do not have dedicated storage capacity for flood risk management purposes. Those projects simply pass flood flows received from upstream projects and uncontrolled tributary streams, using the hydropower turbines to the maximum extent possible and the spillways to pass flows.

A.1.2.2 Hydropower

Energy and capacity produced at USACE projects in the ACT River Basin are marketed by SEPA, an agency of the U.S. Department of Energy (DOE), in accordance with the Flood Control Act of 1944. Power from Allatoona Lake on the Etowah River, Carters Lake on the Coosawattee River, and Robert F. Henry and Millers Ferry L&D projects on the Alabama River is marketed as part of a system of hydropower resources known as the Georgia-Alabama-South Carolina system. A system contract for those resources provides a portion of the power needs for several preference customers (cooperatives and municipals) throughout the Southeast. The system includes the following projects: Hartwell, Richard B. Russell, and Thurmond dams on the Savannah River and Buford, West Point, and Walter F. George dams on the Chattahoochee River.

Hydropower is a relatively small, but key, feature in meeting the power demands of the region. The importance of hydropower is that it is instantaneously available to meet extreme increases in power demand or to replace unexpected interruptions in thermoelectric generation. The 10 powerhouses in the Georgia-Alabama-South Carolina system have been operated most of the time as *peaking plants* in an integrated fashion to produce an aggregate hydropower supply for the system. As a result, power generation demands have been balanced between the projects weekly to enhance the long-term generating capability of the entire system. By integrating the projects' operations, the total utility and marketability of power produced for the entire system is greatly increased, and the adverse effects on the reservoirs are more balanced.

Droughts experienced over the basin in the past 20–30 years have revealed that, during extended low-flow periods, ACT River Basin projects' operation for hydropower production to meet the SEPA contract requests do not provide sufficient flexibility to adequately meet other authorized purposes. During those times, water taken from storage during the high-energy-demand months (June–September) would draw the pools down to such an extent that recreation would be affected in Allatoona Lake and Carters Lake and less storage would be available late in the year to meet other release requirements such as for navigation or water quality. In those instances, hydropower production has been curtailed, as necessary, to balance operation of the entire system.

Current project operations at Allatoona are governed by *action zones* that define general operating principles and parameters when lake level conditions are below the top of the conservation pool at any point during the year. Figure A-13 shows the action zones for Allatoona Lake. The zones are used to guide generation at the Allatoona Lake project toward meeting the overall system hydropower contract. When pool levels are in Zone 1, full consideration will be given to meeting hydropower demand by typically providing up to 4 hours of peak generation. However, the duration of peak generation could be zero or exceed 4 hours based on various factors or activities such as maintenance and repair of turbines, emergency situations such as a drowning or chemical spill, drawdowns for shoreline maintenance, drought operations, or increased or decreased hydropower demand.

When pool levels are 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 3 hours of peak generation. However, the duration of peak generation could be zero or exceed 3 hours based on various factors or activities such as those mentioned for Zone 1.

When pool levels are in Zone 3 during the months of January–April, a reduced amount of peaking generation will be provided to meet system hydropower demand while USACE makes 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 2 hours of peak generation. However, the duration of peak generation could be zero or exceed 2 hours based on various factors or activities as mentioned in the earlier paragraphs.

Reservoir elevations in Zone 4 at Allatoona 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, and other conservation measures will be taken that are appropriate to the drought severity. Continuous operation of the small unit will continue to maintain the 240 cfs minimum flow release.

Carters Lake and the downstream reregulation reservoir are operated under a *balance point method* for the pumped storage operation (USACE Mobile District, 2015b). A seasonal pool regulation guide curve and conservation storage action zones have been developed to guide the water control management decisions in meeting the balanced strategy. Carters Lake conservation includes two action zones, which are used as a general guide to determine the minimum discharge releases available from the Reregulation Dam. Figure A-6 shows the Carters Lake guide curve. When the pools are *balanced*, the actual inflows to the project are being released from the Reregulation Dam, and there is enough water in the reregulation pool above elevation 677 to allow the pumping units to restore the main reservoir to the top of the conservation pool elevation. Carters Lake is regulated between the minimum year-round conservation pool elevation of 1,072 ft NGVD29 and a seasonal maximum conservation pool elevation of 1,074 ft NGVD29 during May 1 to November 1 and 1,072 feet NGVD29 from December 1 to April 1, with 4-week transition periods in April and November. The normal, year-round operating range for the reregulation pool is 677–698 ft. The 677 ft level ensures enough water to permit a minimum flow of 240 cfs downstream for 3 days. Power customers have unrestrained use of the storage in the reregulation pool between 677 ft and 698 ft for generation and pumping, provided the main reservoir is at or below the top of the conservation pool level. The reregulation pool will likely reach both the maximum level (698 ft) and the minimum level (677 ft) at least once during the week. In addition, power customers may request daily the use of the reregulation pool between elevations 696 ft and 698 ft for additional generation ((USACE Mobile District, 2015b).

At the Carters Lake project, generation during the weekdays normally occurs intermittently between 6 a.m. and 10 p.m. In general, little or no generation occurs during the weekend. However, generation can occur on the weekend if warranted by power demands. Pumpback normally occurs between 10 p.m. and 6 a.m. on weekdays and on the weekend. Pumpback can also occur any time of the day when power customers have excess energy and storage is available in the main pool. The reregulation pool will likely reach both the maximum elevation 696 ft NGVD29 and the minimum elevation 677 ft NGVD29 at least once during the course of the week. The reregulation pool is at its peak late on Friday and is at its low point early Monday a.m. because of the significant pumping over the weekend. The total downward fluctuation of the reregulation pool is up to 20 ft over a weekend. The main pool is at its high point early Monday a.m. and at its low point mid to late week. The typical fluctuation of the main pool ranges from 2 ft to 4 ft during the week (USACE Mobile District, 2015b).

The Robert F. Henry and Millers Ferry L&D projects have relatively little conservation storage, are dependent on releases from the upstream impoundments, and consequently are operated essentially as run-of-river power plants. The outputs of the plants vary with changes in the inflow entering the Alabama River from the Coosa and Tallapoosa river projects and local tributary streams. Depending on flow, the plants are either continuously running (high flow) or peaking (low flow) on a 7-day basis. Power from the projects is marketed to provide a specific minimum capacity and weekly energy. When that obligation cannot be met, SEPA arranges for supplemental power from projects in the Georgia-Alabama-South Carolina system or purchase from other sources, or both.

A.1.2.3 Navigation

Allatoona Lake and Carters Lake, while originally authorized to support downstream navigation, are not regulated for navigation 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 Lake and Carters Lake projects for the other authorized purposes (USACE HEC, 1994).

Claiborne, William “Bill” Dannelly, and R.E. “Bob” Woodruff lakes are operated to maintain stable pool levels, coupled with the necessary channel maintenance dredging, to support sustained use of the authorized navigation channel. The navigation channel downstream of Claiborne L&D was initially designed for a 9-ft channel depth at a flow of approximately 8,500 cfs (or more). As discussed in Section A.1.2.3.1, APC operates its reservoirs on the Coosa and Tallapoosa rivers to provide Jordan-Bouldin-and Thurlow (JBT) releases of at least 4,640 cfs (weekly average) near Montgomery, AL. Additional intervening flow or drawdown discharge from Robert F. Henry and Millers Ferry L&D projects must be used to provide a usable depth for navigation and, if those flow levels cannot be sustained, at least meet the 7Q10 flow of 6,600 cfs downstream of Claiborne L&D. However, the limited storage available in both the Robert F. Henry and Millers Ferry L&D reservoirs (R.E. “Bob” Woodruff Lake and William “Bill” Dannelly Lake, respectively) can help meet the 6,600 cfs level downstream of Claiborne L&D for only a short period. As local inflows decrease or the storage is exhausted, a lesser amount would be released depending on the amount of local inflows (USACE Mobile District, 1974). During low-flow periods, it is not always possible to provide the authorized 9-ft-deep by 200-ft-wide channel dimensions. This is discussed in more detail in the next section.

A.1.2.3.1 Flows at the Confluence of Coosa and Tallapoosa Rivers (Pre-2015 Master Manual update)

Flow in the Alabama River is largely controlled by the APC impoundments on the Coosa and Tallapoosa rivers above Robert F. Henry L&D: Jordan and Bouldin Dams, which both discharge into the Coosa River from Jordan Lake, and Thurlow Dam on the Tallapoosa River. Pursuant to articles in the FERC licenses for those impoundments, a minimum discharge must be released to support navigation on the Alabama River based on a

1972 agreement between APC and USACE. Although that agreement is related to navigation, the flow also provides conjunctive support for downstream fish and wildlife conservation, hydropower generation, recreation, and water quality.

Prior to 1941, APC was required by its FERC license to maintain a minimum flow of 6,000 cfs at Montgomery, AL, to support navigation. In 1941, because of wartime priorities, the minimum flow was modified to 3,000 cfs. Under the current operations, APC's JBT projects provide a minimum 7-day average flow of 4,640 cfs (32,480 day second feet (dsf)/7-day).[1] The minimum of 4,640 cfs was originally derived in 1972 by prorating the 7Q10 flow at the USGS Montgomery gage of 5,200 cfs using a drainage area ratio. The ratio was derived by dividing the portion of the basin controlled by APC projects (13,465 square miles) by the drainage area at the Montgomery gage (15,100 square miles). USACE and APC agreed that the 7-day flow of 4,640 cfs was an adequate volume of flow from APC's JBT projects to meet the 7Q10 flow of 6,600 cfs at Claiborne L&D when combined with the intervening local inflows. Thus, 4,640 cfs became the minimum weekly releases from the JBT projects. The 7-day minimum total is computed by adding the discharges from the three projects. In 1980, the agreement was modified to require a minimum volume of at least 8,000 dsf for any 3-day period within the present 7-day 32,480 dsf requirement. The flow requirement changed for two major reasons: (1) the construction of the Robert F. Henry L&D caused backwater at the Montgomery gage, making it difficult to monitor the flow; and (2) the critical area for navigation changed from Montgomery, AL, to the section of the Alabama River below Claiborne L&D (USACE Mobile District, 2015a).

Under extreme drought conditions, the minimum flow can be reduced after consultation with USACE and concurrence from FERC. Reducing JBT releases below 4,640 cfs (weekly average) occurred during extreme drought conditions in 2007. Flows were also temporarily reduced below the weekly average target during drought conditions from September through early November 1986.

A.1.2.3.2 Navigation Flow Support (Post-2015 Master Manual Update)

USACE considered several factors in developing options to support navigation on the ACT Basin. First, it reviewed historic channel availability, flow depth patterns, and the relationship between basin inflows and storage usage to determine flow levels necessary to support navigation on the system. To accomplish that, USACE also considered dredging impacts (timing and extent) during low- and high-flow periods. Dredging typically occurs in the summer and fall months, after which less flow would be required during those periods to provide the necessary channel depths. As dredging proceeds, more flow is required to produce the 9-ft channel over shoals until the shoals are removed. USACE also examined storage relationships between USACE and APC projects, taking into account such factors as drainage areas, storage volumes, and historic contributions to flows.

USACE selected the Navigation Template from 1992 to 1994 as the basis for determining navigation flow targets for the Alabama River downstream of Claiborne Lock and Dam. Monthly flow targets for a 9.0-ft and 7.5-ft channel were incorporated into the alternatives to represent the system navigation demand. When a 9.0-ft channel cannot be met, the shallower 7.5-ft channel would still allow for light loaded barges moving through the navigation system. During the discussions and development of navigation flow support concept drought plan with APC, USACE and APC agreed to transition to a navigation channel depth less than 9.0-ft before complete suspension during drought operation. The designated navigation template provided estimated flow requirements for channel depths ranging from 7.5-ft to 9.0-ft at half foot increments. The parties decided to use the lowest available channel depth flows for transition navigation channel. There is enough flexibility in the navigation plan to support shallower channel depth if required flow data are provided. In short, USACE and APC agreed to a navigation plan that provides necessary navigable channel flows. The actual channel depth will vary with USACE ability to dredge. Figure A-37 shows the effect of dredging on flow requirements for different navigation channel depths during normal hydrologic conditions (1992–1994) (USACE Mobile District, 2015a).

[1] 1 dsf = the volume of 1 cfs over a 24-hour period.

Historically, navigation has been supported by releases from storage in the ACT Basin. Therefore, another critical component in developing the navigation operation would involve using reservoir storage in a more efficient manner than it had been historically used. In developing the navigation operations plan, USACE did not include flow requirements from Allatoona Lake and Carters Lake because they are not regulated specifically for navigation. Further, because they are subject to congressional action, federal projects are more likely to experience future changes in storage usage than are the APC projects. Linking the basin inflow to an expected storage usage from federal projects could require a reciprocating change in storage usage from APC projects. In other words, if the navigation target remains the same and there is a reduction in releases from the federal projects, there could be an expected increase in storage usage required from APC projects.

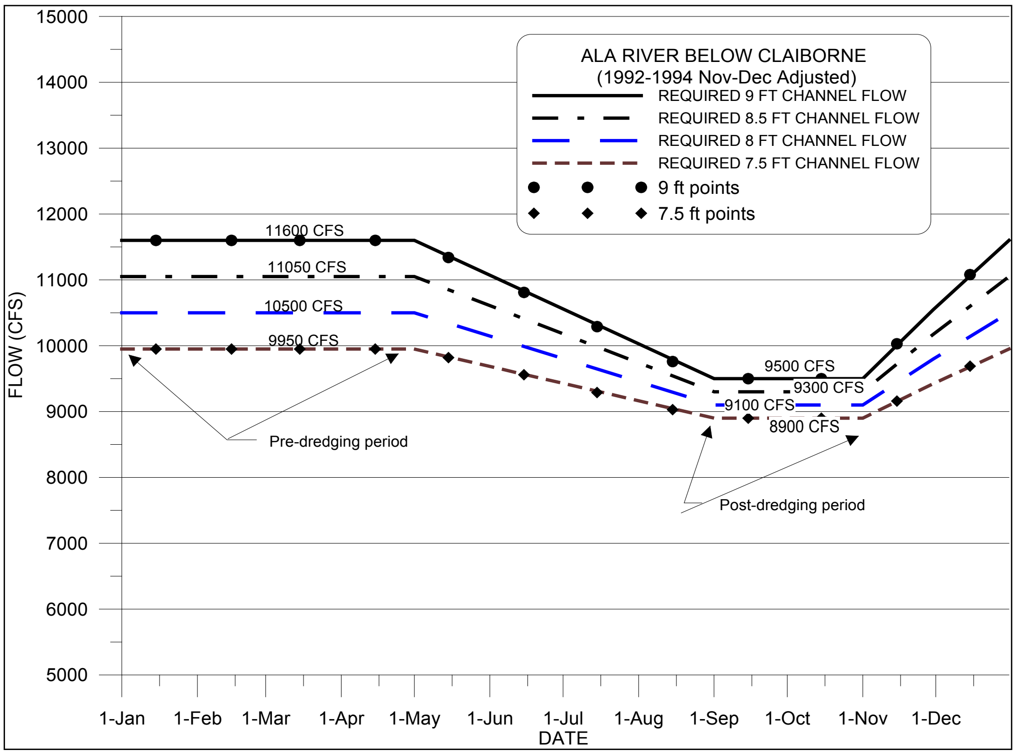


Figure A-37. Flow-depth pattern (navigation template) from 1992–1994 data (revised Nov 2013)

After completing the storage and flow/stage/channel depth analyses, USACE developed a navigation operation in coordination with APC based on 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, USACE and APC make releases that support navigation when basin inflows meet or exceed seasonal targets for either the 9.0-ft or 7.5-ft channel templates. Triggers were also identified (e.g., when basin inflow are less than required natural flows) to change operational goals between the 9.0-ft and 7.5-ft channels. Similarly, basin inflow triggers were identified when releases for navigation would be suspended and only releases from JBT of 4,640 cfs (weekly average) would occur. The basin inflow is the total flow above the APC projects excluding inflow into Allatoona Lake and Carters Lake; however, it does include releases from Allatoona and Carters. During drought operations, releases to support navigation would be suspended until system recovery occurs as defined in the basin Drought Management Plan (Section A.1.2.9). Monthly navigation flow targets downstream of Claiborne Lock and Dam are depicted in Table A-2 (USACE Mobile District, 2015a).

To achieve the 9.0-ft and 7.5-ft flow targets downstream of Claiborne Lock and Dam requires flows from JBT as defined in Table A-2. The JBT goal values were computed using the drainage area ratio between Claiborne Lock and Dam site and total area above JBT dam sites, a factor of 0.8. The difference in flow between targets downstream of Claiborne Lock and Dam and the JBT goal would come in flows downstream of JBT from rainfall and overland flow (USACE Mobile District, 2015a).

Table A-2. Monthly Navigation Flow Target in cfs (revised November 2013)

Month	9.0-ft target downstream of Claiborne L&D (cfs)	9.0-ft JBT goal (cfs)	7.5-ft target downstream of Claiborne L&D (cfs)	7.5-ft JBT 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 A-3 and Figure A-38 show the required basin inflow for a 9.0-ft channel, and Table A-4 and Figure A-39 show the required basin inflow for a 7.5-ft channel. The required basin inflow to support navigation is a function of the navigation flow target for 9.0-ft and 7.5-ft channel depths and the monthly historic use of storage from the APC projects. The derivation of the required monthly basin inflow levels is described in detail in Section 4 of the HEC-ResSim Modeling Report for the ACT Master WCM updates (Appendix C of this EIS). Based on observed monthly average flows, those figures indicate that the required navigation flow target could be met entirely by basin inflow or rainfall in some months (January through May) with the excess inflow above the required target available to replenish storage in the APC reservoirs. In June through December, basin inflow or rainfall is typically not adequate to provide the required navigation flow target and releases from JBT must be made to supplement the natural flow. The assumptions made about water releases and holding water are consistent with seasonal management where water is released from reservoirs in the fall to reduce flooding during months of high rainfall (January through April) (USACE Mobile District, 2015a).

Management measures for navigation included consideration of a 9.0-ft or 7.5-ft channel and assumed dredging would occur each year from May to September. Under the management measure to support navigation, USACE and APC would make releases for navigation when basin inflows meet or exceed seasonal targets for either the 9.0-ft or 7.5-ft channel template. Modeling effort for the WCM update process assumed the navigation template or channel condition remains the same for each calendar year because required dredging occurs. In actual operation channel conditions may vary, because required dredging may not occur. For this situation, the flow required to support the 7.5-ft and 9.0-ft channel will be determined from the latest channel survey and will consequently define the temporary navigation template. From this information, the required basin inflow to support navigation will be recomputed. The monthly historic storage usage from the APC projects would remain the same. In summary, if the temporary navigation template requires a higher flow for the 9-ft and 7.5-ft channels, then the basin inflow required to support navigation will increase. Conversely the required basin inflow will also decrease if the navigation flow decreases. In all situations the expected use of storage to support navigation from the APC projects would remain the same (USACE Mobile District, 2015a).

Table A-3. Basin inflow (cfs) above APC projects required to meet a 9.0-ft navigation channel (revised November 2013)

Month	APC Navigation Target	Monthly Historic Storage Usage	Required Basin Inflow
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**

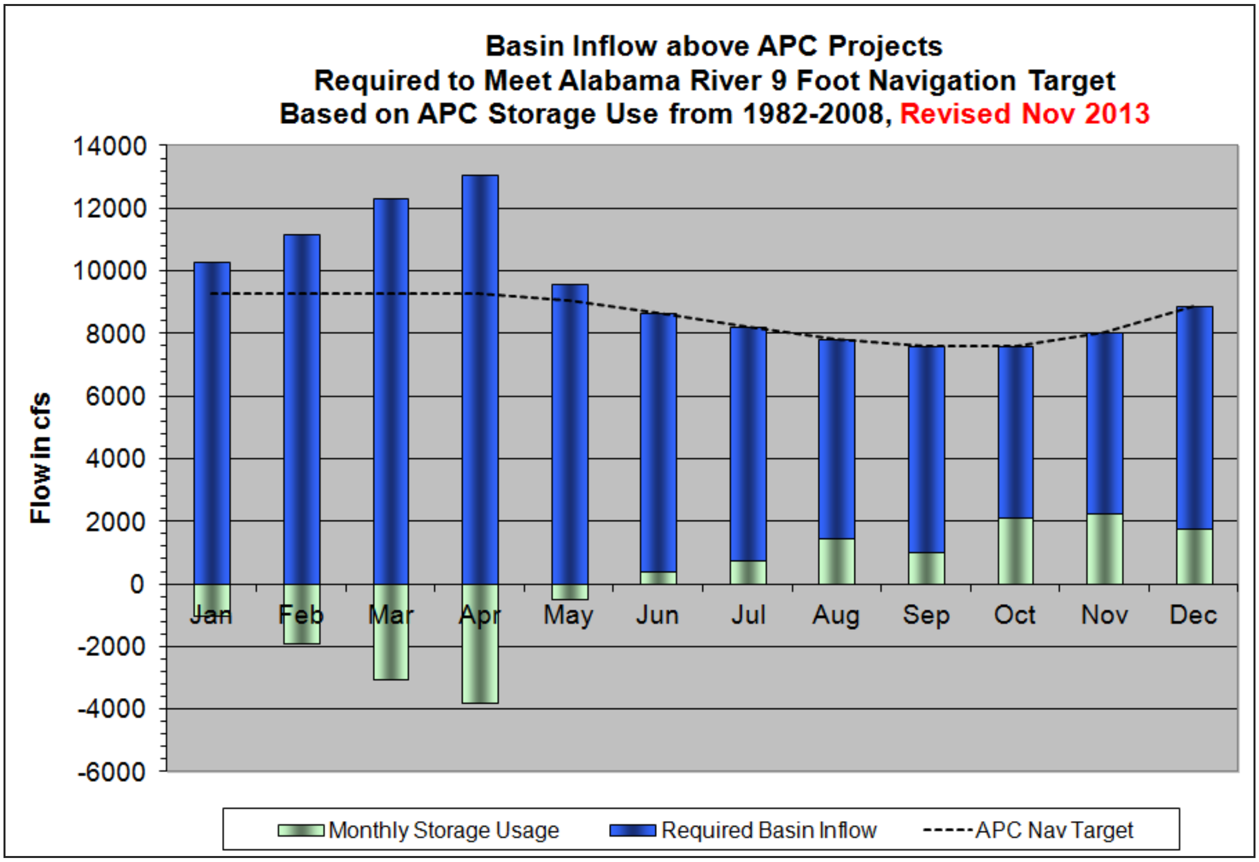


Figure A-38. Flow requirements from rainfall (or natural sources) and reservoir storage to achieve the JBT goal for navigation flows for a 9-ft channel (revised November 2013).

Table A-4. Basin inflow (cfs) above APC projects required to meet a 7.5-ft navigation channel (revised November 2013)

Month	APC Navigation Target	Monthly Historic Storage Usage	Required Basin Inflow
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**

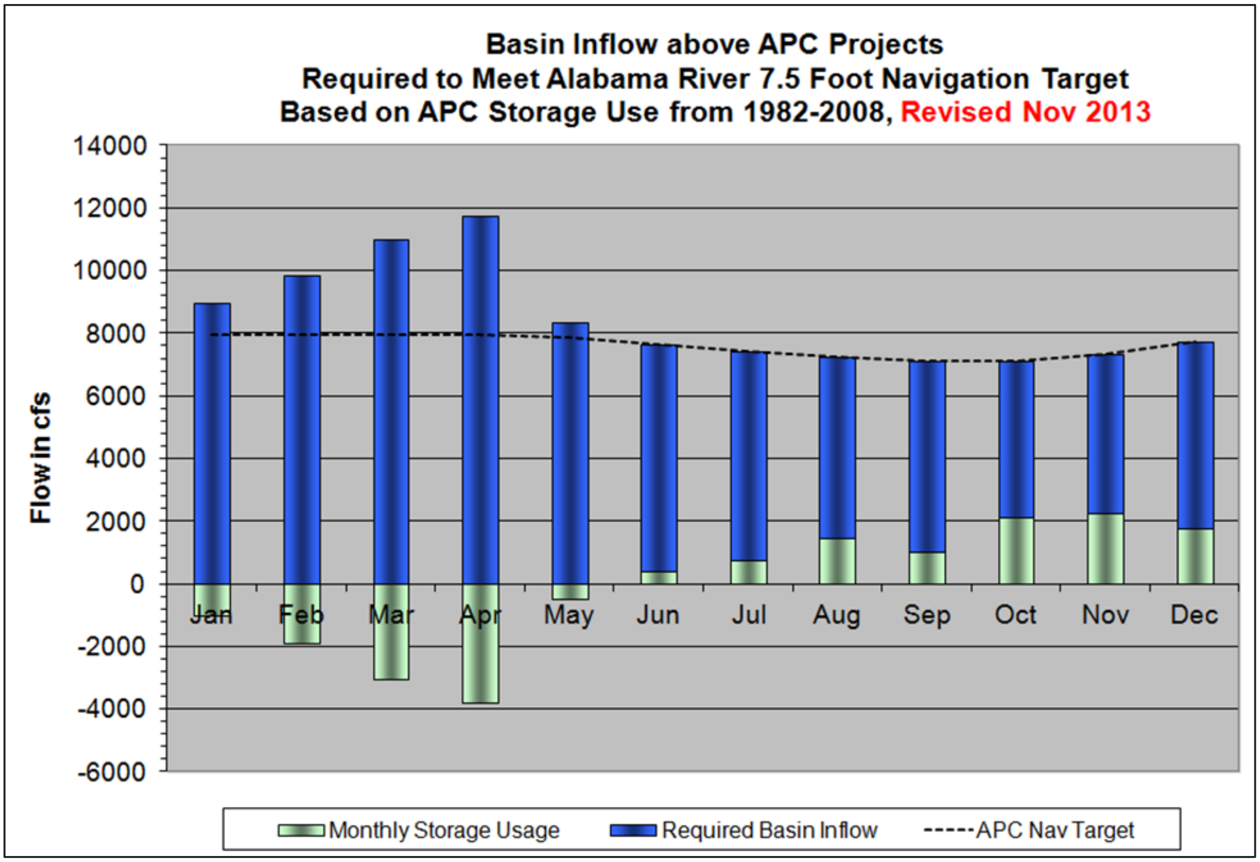


Figure A-39. Flow requirements from rainfall (or natural sources) and reservoir storage to achieve the JBT goal for navigation flows for a 7.5-ft channel (revised November 2013).

Triggers were also identified to change operations between the 9.0-ft and 7.5-ft channel. Similarly, basin inflow triggers were identified when releases for navigation would be suspended. In such cases, the JBT releases would provide only a flow of 4,640 cfs, which with inflows downstream of JBT would be sufficient to provide for a 7Q10 flow (the lowest stream flow for 7 consecutive days that would be expected to occur once in 10 years) downstream of Claiborne Lock and Dam. During drought operations (discussed below), releases to support navigation would be suspended until system recovery occurs as defined in the drought management plan.

A.1.2.4 Recreation

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, USACE considers recreational needs at the Allatoona Lake project in making water management decisions. USACE has developed a series of threshold impact elevations that serves as a guide to understanding the recreational effects of water management decisions (USACE Mobile District, 2015a). Those levels and definitions are as follows:

- Initial Impact Level–837 ft. This is the elevation at which the recreational usage and recreation-related economy would begin to be affected. Swimming areas would be reduced in size. Private docks would need adjusting, and some boating hazards would become evident in remote areas of the reservoir. Marina concessionaires would begin to need to move docks, and water-related business would decline.

- Recreation Impact Level–835 ft. Recreation would be more severely affected at this level. All regular swimming areas would be exposed. Two boat ramps would be closed. Almost half of the private docks would be affected. Marina business would be severely reduced.
- Water Access Level–828 ft. Recreation would be severely restricted. Only half of the boat ramps would be usable. Private docks would be totally unusable. Hazards to navigation would be numerous. Marinas would have severe problems such as gas docks being grounded and some slips being unusable. There would be reduction in recreational business activity.

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 ft during the summer and 1,072 ft during the winter). However, the level of the pool can drop significantly below those elevations under extremely dry conditions. In such cases, the use of water-related recreation facilities could be adversely affected and certain hazards within the lake would be exposed. The following are general descriptions each impact level for low water conditions (USACE Mobile District, 2015b):

- Initial Impact Level–1,068 ft. The swim area would be reduced at Harris Branch Beach. No unmarked hazards to navigation would be expected at this level, and there would be no effects on the marina.
- Recreation Impact Level–1,060 ft. Swim areas would be unusable because buoy lines could not be moved farther out. Harris Branch Beach would be closed. Boating and other water recreation activities would become increasingly hazardous because unmarked navigational hazards would begin to emerge. Two day-use boat ramp areas would be closed to the public.
- Water Access Level–1,055 ft. Harris Branch Beach would remain closed and swim areas remain unusable. Navigational hazards would become more prevalent. Boat slips at marinas would still be usable, but docks to the shoreline would be extremely sloped. Five boat ramp areas would be closed.

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.

The areas immediately downstream of dams typically have public access areas and are heavily used for recreation, principally fishing from the river banks or from boats. Public safety is an important consideration in the operation of USACE dams in the ACT River Basin, especially for projects where peaking hydropower operations, when initiated, can rapidly increase flow and stage conditions in downstream areas.

To warn the public at the start of a hydropower release downstream at Allatoona Dam, a warning horn sounds when the operator initiates a generator start. An audio detector verifies the horn has sounded and allows the unit start-up sequence to continue. The horn continues to sound for 3 minutes. The spillway at Allatoona Dam has a manually operated warning horn switch, located at gate No.1. The horn switch is activated by the operator opening the spillway gates. The horn for the spillway gates also sounds for 3 minutes. There is no audio detector for the spillway gates.

At Carters Dam, a warning horn sounds when an operator initiates a generator start. An audio detector verifies the horn has sounded and allows the unit start-up sequence to continue. The horn sounds for 3 minutes. The Reregulation Dam does not have a downstream warning horn system because the routine releases are small and gradual. If there is a need for a large single-gate change at the Reregulation Dam, the rangers would specifically notify individuals in the recreation area immediately downstream of the dam.

At R.F. Henry and Millers Ferry L&Ds, a warning horn is activated by the operator from the unit controls at the start of a hydropower release downstream. An audio detector verifies the horn has sounded and allows the unit start-up sequence to continue. The horn sounds for 2 minutes before the unit starts. The Millers Ferry spillway has three horns that are initiated from the Millers Ferry/Jones Bluff Powerhouse SCADA system. The horns are activated by powerhouse operators before a gate is raised from its sill. The horns sound for 2 minutes and are verified through audio detectors and electrical current detectors. Since Claiborne L&D has continuous overflow of the spillway that gradually increases or decreases depending on flow conditions in the Alabama River, no specific warning system is in place at the project.

USACE Mobile District also uses the its public website at https://www.sam.usace.army.mil/Missions/Civil-Works/Water-Management/, to share real-time, historical, and general information with the public about conditions at the projects as well as telephone auto-answer recorded messages at the projects. More information on public safety/public communication at USACE projects is available in the ACT Master Manual.

A.1.2.5 Water Supply

The City of Chatsworth, GA, has a water supply storage agreement with USACE for 818 ac-ft of storage in Carters Lake. The City of Cartersville, GA, and CCMWA have water supply storage agreements with USACE for 6,054 ac-ft and 12,485 ac-ft of storage, respectively, in Allatoona Lake (USACE Mobile District, 2015a). In 2010, a study was conducted that collect sufficient bathymetric data to update and evaluate the area-capacity curves for Allatoona Lake (Tetra Tech, Inc., 2012). The storage amounts shown decreased from the previous values of 6,371 ac-ft and 13,140 ac-ft respectively, as a result of the updated sedimentation survey.

In addition to the minimum flows from USACE and APC projects in the ACT River Basin being generally associated with fish and wildlife conservation, navigation, and water quality needs in the system, they also support water supply needs of users throughout the system. Allatoona Lake has a continuous minimum flow of 240 cfs. The Carters Reregulation Dam has a seasonal minimum release that varies from month to month throughout the year as long as the Carters Lake main pool is in Zone 1 (see Figure A-10). When Carters Lake pool levels are in Zone 2, the minimum release in any month is 240 cfs. Target releases of 4,640 cfs are made from APC JBT projects near Montgomery, AL, and 6,600 cfs (7Q10 flow) releases are made downstream of Claiborne L&D and Lake.

A.1.2.6 Water Quality

Minimum flows from USACE and APC projects have been established to maintain downstream water quality. Carters Lake has a seasonal minimum flow that varies monthly throughout the year. Minimum flows are provided from the reregulation pool at Carters Lake through the balanced approach for pumped storage hydropower operations, as described in Section A.1.1.1.

USACE operates the small turbine-generator unit continuously at Allatoona Lake to provide the minimum continuous release of 240 cfs. If the small unit is out of service, continuous releases can be made through the spillway or sluices. During long periods of only minimum flow release, USACE will periodically release some water from the large turbines to attain minimum flows to provide streamflow diversity for environmental purposes. In addition to the turbines releasing water for continuous minimum streamflow maintenance, releases can be made through the spillway or through sluices. Releases through the spillway, particularly during periods when the lake would be stratified, can be used to help maintain acceptable water quality conditions downstream (USACE, Mobile District 1993).

Flows from the Robert F. Henry and Millers Ferry L&D projects are used downstream to help provide the 7Q10 flow of 6,600 cfs downstream of Claiborne L&D and Lake. Several industries on the Alabama River have designed effluent discharges on the basis of that dilution flow. Whenever flows recede to that level, conditions are closely monitored so adequate warning can be given 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 existing WCMs for the Robert F. Henry and Millers Ferry L&D projects prescribe a process for notification of, and coordination with, state and federal agencies and affected industries along the river (USACE, Mobile District 1999; USACE, Mobile District 1991). Aside from the minimum flow target downstream of Claiborne L&D, no other water management activities occur at the Robert F. Henry and Millers Ferry L&D projects to specifically address water quality objectives.

A.1.2.7 Fish and Wildlife Conservation

Fish and wildlife conservation is an authorized purpose of the reservoirs in the ACT River Basin in accordance with the Fish and Wildlife Coordination Act of 1958. All USACE reservoirs in the ACT River Basin support important fisheries and are operated accordingly, consistent with other project purposes. In addition to fishery management, those 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.

USACE South Atlantic Division Regulation 1130-2-16 (March 30, 2001), *Lake Regulation and Coordination for Fish Management Purposes*, and Mobile District Draft Standard Operating Procedure (SOP) 1130-2-9 (February 2005), *Reservoir Regulation and Coordination for Fish Management Purposes*, were developed to address lake regulation and coordination for fish management purposes. The SOP specifically applies to the Allatoona Lake project in the ACT River Basin to 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 not to lower the lake level more than 6 inches in elevation during the reproduction period to prevent stranding or exposing fish eggs.

Minimum flow requirements of 240 cfs downstream of Allatoona Lake and the seasonal flow releases from the Carters Lake project for water quality purposes also support fish and wildlife conservation downstream of the projects, particularly during periods of extremely dry weather. APC's release target of 4,640 cfs from JBT projects near Montgomery, AL (at the headwaters of 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.

For each of the remaining USACE reservoirs in the ACT River Basin (R.E. “Bob” Woodruff, William “Bill” Dannelly, and Claiborne lakes), USACE conducts routine natural resource management activities to improve fishery conditions. The lakes do not have specific water management procedures directed at fish and wildlife conservation, however, except for seasonal operation of the locks for fish passage. The impoundments support a healthy sport fishery. The pools are generally maintained at 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 bass, Alabama (spotted) bass, shellcracker, warmouth, and sunfishes. Because the project is regulated for navigation and hydropower, however, it might not be possible to maintain the optimum conditions for fish spawning that can be accomplished at other projects (USACE Mobile District, 1974).

During each spring since 2009 (February–June), USACE has operated the locks at Claiborne L&D and Millers Ferry L&D to facilitate the upstream passage of migratory fishes (USACE Mobile District, 2018a). USACE has cooperated with The Nature Conservancy, USFWS, ADCNR, Auburn University, and the Geological Survey of Alabama to develop a schedule to most effectively implement the operation. The locking schedule varies slightly each year, and alterations can occur depending on local hydrologic conditions and staffing schedules at the project sites. The operation consists of opening the lower lock gate and allowing fish to enter for a period of 4–6 hours. The lock is then filled to the lake elevation and the upper gate is opened, allowing fish to enter and exit for the next 4–6 hours, after which the cycle is repeated. Vessel passage, maintenance, safety, and other operational requirements continue unaffected by the fish passage schedule. Studies are ongoing to determine the success and most appropriate techniques to employ to provide maximum benefit to fish populations.

USACE implements routine wildlife conservation activities on project lands at each of the ACT River Basin projects, consistent with other operational activities. In addition, as discussed in A.1.1.13, USACE has acquired 10,566 ac contiguous to project lands on R.E. “Bob” Woodruff Lake for fish and wildlife mitigation to address impacts associated with construction of the Tennessee-Tombigbee Waterway. Further, as discussed in sections A.1.1.14 and A.1.1.15, about 1,703 ac of project lands on “Bill Dannelly Lake and 2,567 ac on Claiborne Lake have been designated and are intensively managed for wildlife mitigation for impacts resulting Tennessee-Tombigbee Waterway construction.

A.1.2.8 Special Releases and Reservoir Operations

Occasionally, a temporary deviation from the normal regulation of a lake is needed to accommodate a special activity in the lake area or downstream. Construction accounts for a major portion of those incidents and includes utility stream crossings, bridge work, and improvements to recreation structures; tailrace surveying; and major construction contracts. Special releases have also been made to help move grounded barges downstream of Claiborne L&D.

Special releases are made to facilitate lake shore cleanup operations and recreational activities such as fishing tournaments. Special high-flow releases from the spillway have also been made to allow rapid water rescue training of emergency medical services personnel. Special operations have been made to facilitate search and rescue associated with drowning victims. Variances at Allatoona Lake to allow early refilling of the summer pool have also been implemented. Those actions have occurred during dry springs to capture limited rainfall to ensure refilling of the project summer pool levels.

Special operations and deviations are generally coordinated with the USACE Mobile District Water Management Section in advance. Requests for release changes are usually for the duration of a few hours or days. Before a deviation is granted, USACE considers the upstream watershed conditions, potential flood threat, conditions of downstream lakes, environmental factors, and water supply and hydropower needs. To the extent that hydrologic conditions in the basin allow, water control regulation can assist with critical stakeholder needs throughout the basin, including water quality considerations. Processes for deviations from “normal” reservoir regulation, as defined in the ACT River Basin Master Manual and individual project WCMs are discussed in more detail in Paragraph 7-15 of the WCM documents. In accordance with established review and coordination procedures, any extended temporary deviation or long-term adjustment in reservoir operations would be approved by USACE South Atlantic Division.

A.1.2.9 Drought Management

The Drought Contingency Plan (DCP) for the ACT River Basin implements drought conservation actions on the basis of basin inflow, composite conservation storage, and state line flows as triggers to drive drought response actions. The DCP also recognizes that a basinwide 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 environmental flow requirements must still be met to the maximum extent practicable. The ACT River Basinwide 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 USACE projects downstream of Montgomery, AL. The following sections, which are found in more detail in the ACT Master Manual, provide a summary of the drought contingency plan (USACE Mobile District, 2015a).

A.1.2.9.1 Headwater Regulation 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 0–2 hours per day. If the Carters Lake pool level drops into conservation storage Zone 2, seasonal varying minimum target flows would be reduced to 240 cfs. The WCM for each project describes the drought water control regulation plan in more detail.

A.1.2.9.2 Drought Regulation at APC Projects on the Coosa, Tallapoosa, and Alabama Rivers

Regulation guidelines for the Coosa, Tallapoosa, and Alabama rivers have been defined in a drought regulation matrix (Table A-5) on the basis of a Drought Intensity Level (DIL). The DIL is a drought indicator, ranging from 1 to 3 and 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 0: (normal operation) no 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

Table A-5. ACT River Basin Drought Regulation 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 Operations: 2,000 cfs</td><td colspan="2">4,000 (8,000) cfs</td><td colspan="2">4,000 – 2,000 cfs</td><td colspan="6">Normal Operations: 2,000 cfs</td></tr>
<tr><td colspan="3">Jordan Lake 2,000 +/-cfs</td><td colspan="3">4,000 +/- cfs</td><td>6/15 Linear Ramp down</td><td colspan="3">Jordan Lake 2,000 +/-cfs</td><td colspan="3">Jordan Lake 2,000 +/-cfs</td></tr>
<tr><td colspan="3">Jordan Lake 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 Lake 2,000 +/-cfs</td><td colspan="3">Jordan Lake 1,600 to 2,000 +/-cfs</td></tr>
<tr><td colspan="3">Jordan Lake 1,600 +/-cfs</td><td colspan="4">Jordan Lake 1,600 to 2,000 +/-cfs</td><td colspan="3">Jordan Lake 2,000 +/-cfs</td><td colspan="2">Jordan Lake 1,600 to 2,000 +/-cfs</td><td>Jordan Lake 1,600 +/-cfs</td></tr>
<tr><td rowspan="4">Tallapoosa River Flow[c]</td><td colspan="13">Normal Operations: 1,200 cfs</td></tr>
<tr><td colspan="4">Greater of 1/2 Yates Lake Inflow or 2 x Heflin Gage (Thurlow Lake releases > 350 cfs)</td><td colspan="6">1/2 Yates Lake Inflow</td><td colspan="3">1/2 Yates Lake Inflow</td></tr>
<tr><td colspan="4">Thurlow Lake 350 cfs</td><td colspan="6">1/2 Yates Lake 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 Operations: 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">USACE Variances: As Needed; FERC Variance for Martin Lake</td></tr>
<tr><td colspan="13">USACE Variances: As Needed; FERC Variance for Martin Lake</td></tr>
<tr><td colspan="13">USACE Variances: As Needed; FERC Variance for Martin Lake</td></tr>
</table>

Notes:

a. Based on flows that will be exceeded when possible.
b. Jordan Lake 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 at noon each Tuesday based on the prior day's daily average at Heflin or Yates.
d. Alabama River flows are 7-Day average flow.

A.1.2.9.2.1 Drought Indicator Triggers

Low Basin Inflow

The total basin inflow needed is the sum of the total filling volume plus minimum releases from JBT of 4,640 cfs (weekly average). 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. 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.

Low Composite Conservation Storage in APC Projects

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, Martin Lake, and Weiss Lake. Figure A-40 plots the APC composite zones. Figure A-41 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.

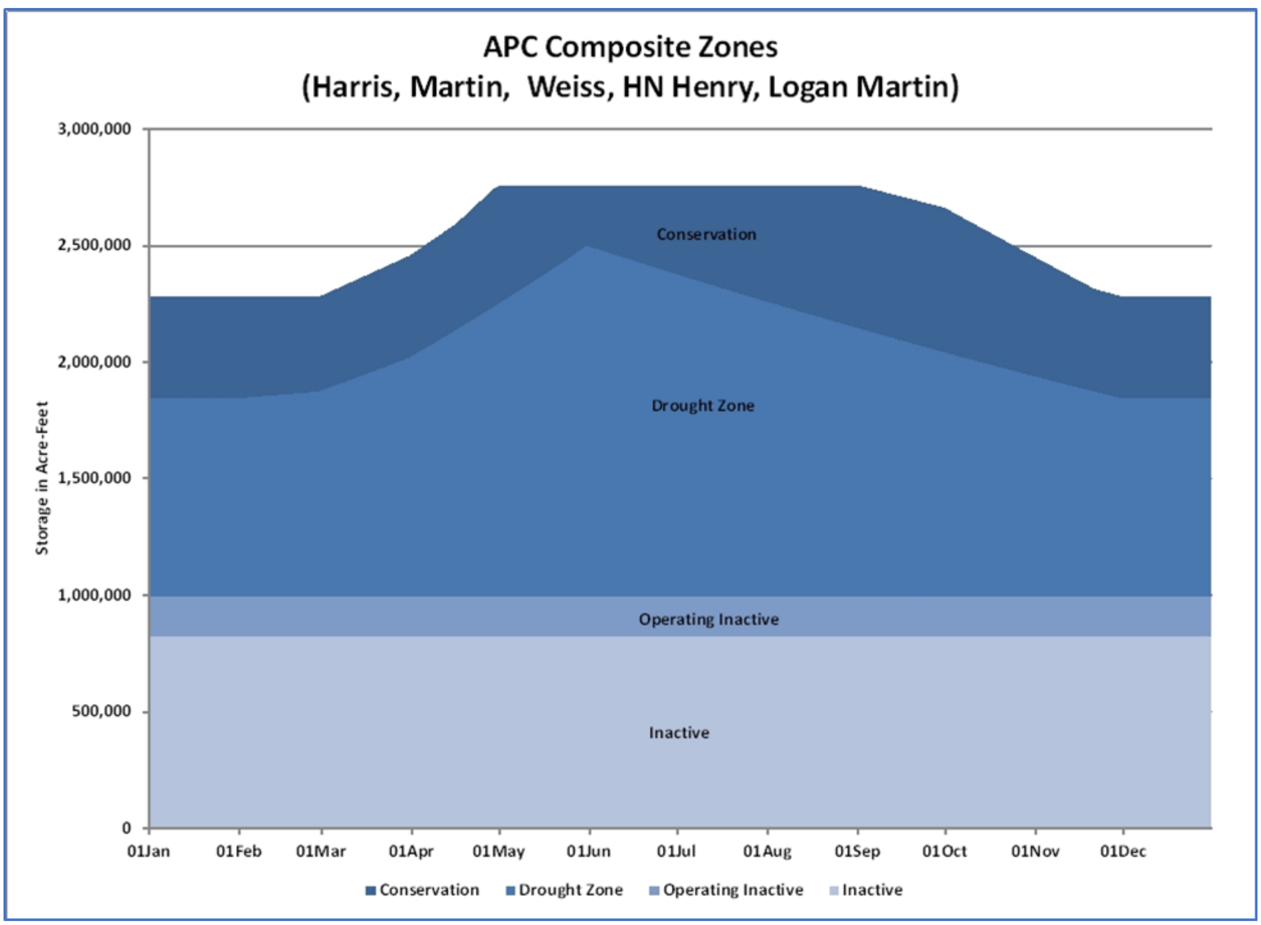


Figure A-40. APC Composite Zones

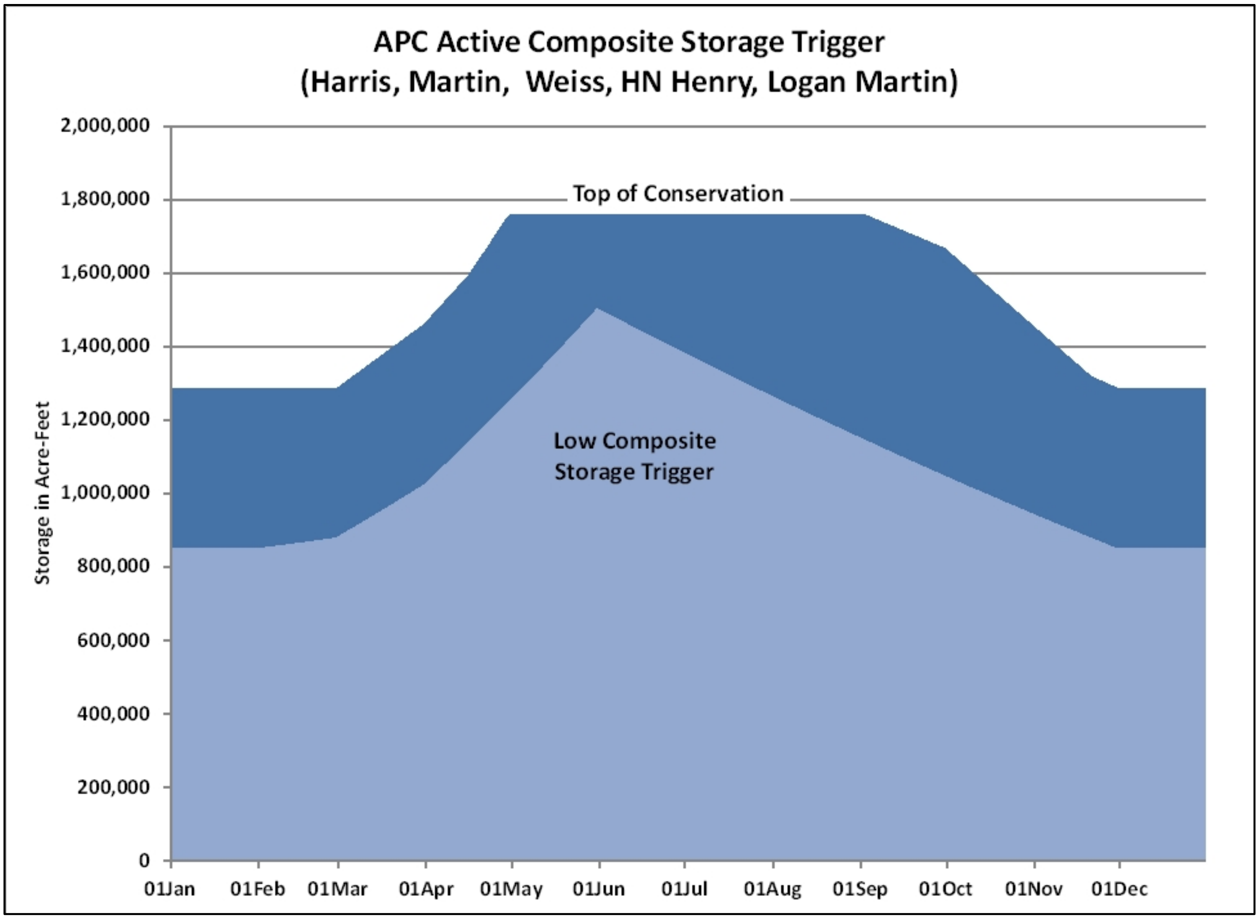


Figure A-41. APC Composite Storage Trigger

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 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.

A.1.2.9.2.2 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, Table A-5 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 through 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 1,600 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 Section A.1.2.3. Once drought operations begin, flow regulation to support navigation operations is suspended.

A.1.2.9.3 Operations for USACE Projects Downstream of Montgomery

Drought operations of the USACE Alabama River projects (R.E. “Bob” Woodruff Lake [Robert F. Henry L&D], and William “Bill” Dannelly Lake [Millers Ferry L&D]) will respond to drought operation of the APC projects. When combined releases from APC’s JBT projects are reduced to 4,640 cfs, the USACE Alabama River projects will operate to maintain a minimum flow of 6,600 cfs downstream of Claiborne L&D. This flow at Claiborne L&D is a nonmandatory minimum flow target or guide, representing the 7Q10 flow level at that point. Under drought conditions, that flow cannot be met under all circumstances. When the drought contingency plan requires flows less than 4,640 cfs, the minimum flow downstream of Claiborne L&D is equal to the inflow into Millers Ferry L&D. There is inadequate storage in the Alabama River projects to sustain 6,600 cfs when combined releases from the APC projects are less than 4,640 cfs.

A.1.2.10 Coordination between USACE and APC Project Operations

FERC (2009) summarized the history and key areas of collaboration regarding project operations in the Coosa River portion of the ACT River Basin. USACE and APC have a long history on the Coosa River. APC completed construction of Lay Lake in 1914. APC received a 50-year license from the Federal Power Commission (FPC) (the predecessor to FERC) for Mitchell Lake in 1921 and completed the project in 1923. APC received a 50-year license from the FPC for the Jordan Dam and Lake in 1925, and construction was completed in 1928. In 1925, APC conducted a study of the storage possibilities of the Coosa River upstream of the existing Lay Lake for potential development of five additional power dams. In 1928, APC prepared a report on complete *canalization* of the Coosa River. That report included the study of a power and navigation dam at the site of the existing Federal Lock 2 (identified as the Patlay site) (FERC, 2009).

In 1934, USACE developed a general plan for the overall development of the Alabama-Coosa River system. That plan included a power and navigation dam on the Coosa River at the Patlay site previously studied by APC, which is about 1.5 mi upstream from H. Neely Henry Lake.

Further studies were directed by Congress in resolutions adopted by the Committee on Rivers and Harbors, House of Representatives, on April 1 and 28, 1936, and then by the Committee on Commerce, U.S. Senate, on January 18, 1939. In response to those resolutions, an interim report was submitted to Congress in October 1941. The report recommended development of the Alabama-Coosa River and tributaries for navigation, flood risk management, power generation, and other purposes in accordance with the plans proposed by the Chief of

Engineers. The improvement, which was outlined in House Document (H.D.) No. 414, included a dam with a powerhouse at the Patlay site.

On June 28, 1954, the 83rd Congress enacted P.L. 83-436, which suspended the authorization under the River and Harbor Act of March 2, 1945, insofar as it concerned federal development of the Coosa River for the generation of electric power. That action was taken to permit development of the river by private interests under a license to be issued by the FPC. The law stipulated that the license should require provisions for flood risk management storage and for future navigation. It further stated that the projects must be operated for flood risk management and navigation in accordance with reasonable rules and regulations of the Secretary of the Army.

APC began commercial operations of the Weiss Lake, Logan Martin Lake, H. Neely Henry Lake, and Bouldin Dam in 1962, 1964, 1966, and 1967, respectively.

The relationship between APC and USACE in developing the Tallapoosa River Basin is closely linked as well. APC began construction on Martin Lake in 1923 and placed the project into service in 1926. Yates Lake, downstream of Martin Lake, was completed in 1928, and Thurlow Lake, downstream of Yates Lake, was completed in 1930.

The U.S. government was authorized by the River and Harbor Act, approved March 2, 1945, (59 Stat. 10), to develop a site on the Tallapoosa River at Crooked Creek for flood risk management, hydropower, and other purposes. The project was part of the comprehensive plan for developing the Alabama-Coosa River System as contained in H.D. No. 414, 77th Congress, 1st Session. Subsequently, Section 12 of P.L. 89-789 (80 Stat. 1405), approved November 7, 1966, suspended the authority for 2 years with respect to hydropower, to permit development of the Tallapoosa River by private concerns.

Also on November 7, 1966, APC filed an application for a preliminary permit with the FPC to study the Crooked Creek site for development. Subsequently, APC filed an application for a license for the proposed project on November 5, 1968. On December 28, 1973, the FPC issued a license to APC for construction of the Crooked Creek Hydroelectric Project, No. 2628. APC requested a name change and on February 15, 1974, the project was renamed R.L. Harris Lake. The project was completed and placed into service in 1983.

USACE is responsible for the review and approval of the flood risk management plans, as reflected in WCMs for Weiss, H. Neely Henry, and Logan Martin lakes on the Coosa River, and R.L. Harris Lake on the Tallapoosa River, all of which are APC projects with flood storage. The latest USACE-approved WCMs for Weiss and Logan Martin lakes are dated 2004. The WCMs for H. Neely Henry and R.L. Harris lakes were updated in 2015. The purpose of the WCMs is to define the plan of operation at the reservoirs during the occurrence or threatened occurrence of damaging flood conditions at downstream stations, when those conditions can be alleviated or partially alleviated by the operation of the dam and power plant in the interest of flood risk management. The WCMs also define the plan of operation per USACE Engineering Regulation 1110-2-241, *Use of Storage Allocated for Flood Control and Navigation at Non-Corps Projects* (33 CFR 208.11).

There is no signed Memorandum of Agreement (MOA) for APC projects. USACE previously signed an MOA with APC after updates to the WCMs for the projects within the basin. A new MOA will be drafted providing that APC accepts the operation described in the WCMs. APC is required to follow the WCMs as compliance with their FERC license (USACE Mobile District, 2018b).

A.1.3 References

APC. (2019). Email correspondence from APC to USACE on operation of Weiss Bypass Minimum Flow.

FERC. (2009). *Final Environmental Assessment for Hydropower License, Coosa River Hydroelectric Project - FERC Project No. 2146-111.* Washington, DC: Federal Energy Regulatory Commission.

FERC. (2010a). *FERC (Federal Energy Regulatory Commission). Carters Reregulation Dam, Docket P-6897, Accession Number: 19821207-0109.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2010b). *FERC (Federal Energy Regulatory Commission). Carters Reregulation Dam, Docket P-6897, Accession Number: 19910502-0071.* Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2010c). *FERC (Federal Energy Regulatory Commission). Carters Reregulation Dam, Docket P-13598, Accession Number: 20091001-5014*. Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2010d). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-11629, Accession Number: 19990730-0461.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/ercgensearch.asp>.

FERC. (2013a). *FERC (Federal Energy Regulatory Commission). Carters Reregulation Dam, Docket P-13598, Accession Number: 20110301-5021.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013b). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-12351, Accession Number: 20020829-0029.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013c). *FERC (Federal Energy Regulatory Commission). 2013c. Claiborne Lock and Dam, Docket P-12351, Accession Number: 20030627-0027.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013d). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-12485, Accession Number: 20040628-3035.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013e). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-12485, Accession Number: 20051208-0030.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013f). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-12808, Accession Number: 20071106-3008.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013g). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-12808, Accession Number: 20090421-0342.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013h). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-13519, Accession Number: 20100402-3039.* Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013i). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-13519, Accession Number: 20130325-5197.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2013j). *FERC (Federal Energy Regulatory Commission). Claiborne Lock and Dam, Docket P-13519, Accession Number: 20131212-3018.* . Retrieved from <http://elibrary.ferc.gov/idmws/search/fercgensearch.asp>.

FERC. (2017). *Claiborne Lock and Dam, Docket P-13519-004, Accession Number 20170328-3015 - Lock + Hydro Friends Fund XIX, LLC, Rejection of License Application (March 28, 2017).* Retrieved September 17, 2018, from FERC online elibrary: https://elibrary.ferc.gov/idmws/search/fercgensearch.asp.

FERC. (2019a). *Carters Reregulation Dam, Docket P-14985, Accession Number 20190822-5103 - Notice of Intent to File License Application, Lower Coosawattee Hydroelectric Project (August 22, 2019).* Washington, DC: Federal Energy Regulatory Commission. Retrieved October 10, 2019, from https://elibrary.ferc.gov/idmws/search/fercgensearch.asp.

FERC. (2019b). *Carters Reregulation Dam, Docket P14985, Accession Number: 20190624-3031 -Notice of Preliminary Permit Application Accepted for Filing and Soliciting Comments, Motions to Intervene, and Competing Applications - Cherokee River Company, LLC.* Washington DC: FERC (Federal Energy Regulatory Commission). Retrieved October 10, 2019, from https://elibrary.ferc.gov/idmws/search/fercgensearch.asp.

Hydro Green Energy, LLC. (2016). *Lock+ Hydro Friends Fund XIX, LLC - Final License Application, Claiborne Hydroelectric Project (P-13519).* Birmingham, AL: Hydro Green Energy, LLC. Retrieved October 10, 2019, from https://elibrary.ferc.gov/idmws/search/fercgensearch.asp.

Tetra Tech, Inc. (2012, April 16). Memorandum to USACE Mobile District - Allatoona Lake, Georgia, Area-Capacity Curves. Atlanta, Georgia.

USACE HEC. (1994). *Authorized and Operating Purposes of Corps of Engineers Reservoirs, Report No. PR-19.* Davis, California: U.S. Army Corps of Engineers, Hydrologic Engineering Center.

USACE Mobile District. (1974). *Final Environmental Statement, Claiborne Lock and Dam, Alabama River, Alabama.* Mobile, Alabama: U.S. Army Corps of Engineers, Mobile District.

USACE Mobile District. (1997). *ACT/ACF Comprehensive Water Resources Study, Surface Water Availability, Volume I, Unimpaired Flow.* Mobile, Alabama: U.S. Army Corps of Engineers, Mobile District.

USACE Mobile District. (1998). *Allatoona Lake Shoreline Management Plan.* Mobile, AL: USACE Mobile District.

USACE Mobile District. (2014a). *Alabama-Coosa-Tallapoosa (ACT) Watershed, HEC-ResSim Modeling of Reservoir Operations in Support of Water Control Manual Update.* U.S.Army Corps of Engineers, Mobile District.

USACE Mobile District. (2014b). *Alabama-Coosa-Tallapoosa River Basin Water Control Manual, Appendix I, R. L. Harris Dam and Lake (Alabama Power Company), Tallapoosa River, Alabama.* Mobile, Alabama: U.S. Army Corps of Engineers, Mobile District.

USACE Mobile District. (2015a). *Alabama-Coosa-Tallapoosa River Basin Master Water Control Manual.* Mobile, Alabama: US Army Corps of Engineers, Mobile District.

USACE Mobile District. (2015b). *Alabama-Coosa-Tallapoosa River Basin Water Control Manual, Appendix H, Carters Dam and Lake and Carters Reregulation Dam.* Mobile, Alabama: US Army Corps of Engineers, Mobile District.

USACE Mobile District. (2018a, November). Confirmation of Fish Passage Operations on Alabama River (Email from David Turberville via Leon Cromartie). Alabama.

USACE Mobile District. (2018b). *Allatoona Lake Water Supply Storage Reallocation Study and Updates To Weiss And Logan Martin Reservoirs Project Water Control Manuals, Report Summary.* Mobile, Alabama: U.S. Army Corps of Engineers, Mobile District.